TESE DE DOUTORAMENTO

PROCESSING LONG-DISTANCE DEPENDENCIES: AN EXPERIMENTAL INVESTIGATION OF GRAMMATICAL ILLUSIONS IN ENGLISH AND SPANISH

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ABSTRACT

A central concern in the study of sentence comprehension has to do with defining the role that grammatical information plays during the incremental interpretation of language. In order to successfully achieve the complex task of understanding a linguistic message, the language comprehension system (the parser) must – among other things – be able to resolve the wide variety of relations that are established between the different parts of a sentence. These relations are known as linguistic dependencies. Linguistic dependencies are subject to a diverse range of grammatical constraints (e.g. syntactic, morphological, lexical, etc.), and how these constraints are implemented in real-time comprehension is one of the fundamental questions in psycholinguistic research. In this quest, the focus has been often placed on studying the sensitivity that language users exhibit to grammatical contrasts during sentence processing. The grammatical richness with which the parser seems to operate makes it even more interesting when the results of sentence processing do not converge with the constraints of the grammar. Misalignments between grammar and parsing provide a unique window into the principles that guide language comprehension, and their study has generated a fruitful research program.

This work aims to contribute to the broad and exciting research agenda that is concerned with how the parser navigates linguistic dependencies by focusing on several instances of a phenomenon that has come to be known as grammatical illusions (or linguistic illusions). Grammatical illusions represent a case of misalignment between grammar and parsing which occurs when certain linguistic dependencies that are knowingly ungrammatical are (at least temporarily) parsed as if they were correct (Phillips et al. 2011). Specifically, this work is concerned with the presence of grammatical illusions in two types of dependencies: the processing of negative polarity items (NPIs) in English, and the processing of null-subject antecedent dependencies in Spanish. These two phenomena are respectively instantiated by the sentences in (1) and (2):

(1) *The bills [that no senators voted for] have ever become law.

(2) *Juan$_i$ prometió a Ana$_j$ [Ø$_i$ ser más cuidadosa con los documentos].

Juan$_i$ promised Ana$_j$ [Ø$_i$ to be more careful^{fem} with the documents].

In (1), the NPI *ever* is ungrammatical because it violates the constraint which entails that NPIs must be licensed under the scope of negation. In (2), the feminine adjective *cuidadosa* ("careful") violates the constraint which entails that adjectives must agree with the noun they modify –in this case, *Juan*, the implicit subject of the embedded clause marked with Ø in the example. Several recent works have shown that the presence of structurally irrelevant but feature matching items –such as the negative quantifier *no* in the relative clause in (1) or the presence of the feminine noun *Ana* in the matrix clause in (2) – facilitate the integration of the ungrammatical elements like *ever* in (1) or *cuidadosa* in (2), yielding a pattern of grammatical illusions. The work carried out in this dissertation aims at enriching our knowledge of these two constructions, and mainly, to study if and why different configurations yield a pattern of grammatical illusions.

Given the distinct nature of these two types of dependencies in terms of the specific grammatical constraints that must be applied and the languages in which the experiments are carried out, this dissertation is organized in two parts. The first part will present the results from 6 experiments and a corpus study aimed at studying grammatical illusions in the processing of NPIs. The empirical evidence collected in these experiments is incompatible with the existing hypotheses of NPI illusions, which leads us to propose two alternative accounts on the phenomenon. The second part of this dissertation will present the results of 6 experiments aimed at studying the processing of null-subject antecedent dependencies and the presence of grammatical illusions in these structures. The results obtained in this second part provides evidence for the existence of interference effects in these type of anaphoric dependencies, while they also point to the fact that lexical control information is used from early parsing stages in both subject and object control dependencies, challenging some of the results obtained in previous works.

Keywords: sentence processing, grammatical illusions, linguistic dependencies, negative polarity items, control, anaphora.

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go from being a naive linguistics student to being able to design, run, and analyze complex psycholinguistic experiments. When I came across one of Colin Phillips' papers and told Carlos , my advisor, that I wanted to change topics and work on grammatical illusions, I never imagined that I would have the opportunity to work with Colin. I would like to thank him for his time and the warm hospitality he showed me at the Cognitive Neuroscience of Language Laboratory of the University of Maryland. Being able to attend his classes and discuss my (many times half-baked) ideas with him has immensely influenced my work and my views on (psycho)linguistics. He also provided me with the necessary technical resources to collect English data, both during my three-month research stay under his guidance and throughout our collaboration, which is still ongoing. I am also grateful to all of the members of the Linguistics Department of the University of Maryland, and in particular to Hanna Muller, from whom I have learned tremendously and still continue learning. Furthermore, I am extremely grateful to everyone at the Basque Center on Cognition, Brain and Language for treating me as a member of their big research family. The year that I spent at the BCBL laboratories was by far the most challenging intellectual experience I have undergone. I would like to mention in particular Simona Mancini and all the members of the research group Neurolinguistics and Aphasia, and the incredible community of predoctoral students –many of which I am lucky to call friends. I would also like to show my appreciation to Ana Paula Soares for receiving me in the Psycholinguistics Research Group at the Universidade do Minho for a four-month research stay, and for her helpful suggestions and encouragement when I started writing this manuscript. Last, I am indebted to Juan Andrés Hernández Cabrera for inviting me to the Universidad de la Laguna for a research visit so that I could incessantly fire all my doubts on statistical modelling.

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LIST OF ABBREVIATIONS

AMT = Amazon Mechanical Turk

DP = determiner phrase

EEG= electroencephalography

EPP = Extended Projection Principle

ERP = event/evoked response potentials

IP = inflectional phrase

MDP = Minimal Distance Principle

MLC = Minimal Link Condition

MRFS = Most Recent Filler Strategy

Ms. = milliseconds

MTC = Movement Theory of Control

NOC = non-obligatory control

NP = noun phrase

NPI = negative polarity item

OC = obligatory control

PP = prepositional phrase

PPI = positive polarity item

QUD = question under discussion

RC = relative clause

RTs = reading times

TP = tense phrase

WMC = working memory capacity

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1 INTRODUCTION

A central concern in the study of sentence comprehension has to do with defining the role that grammatical information plays during the incremental interpretation of language. In order to successfully achieve the complex task of understanding a linguistic message, the language comprehension system must –among other things– be able to resolve the wide variety of relations that are established between the different parts of a sentence.[1] These relations are known as linguistic dependencies. Linguistic dependencies are subject to a diverse range of grammatical constraints (e.g. syntactic, morphological, lexical, etc.), and how these constraints are implemented in real-time comprehension is one of the fundamental questions in psycholinguistic research. In this quest, the focus has been often placed on studying the sensitivity that language users exhibit to grammatical contrasts during sentence processing. This sensitivity appears to be quite detailed, as instantiated by the skillful accuracy with which language users routinely detect grammatical anomalies both in online experiments and in offline judgments (Phillips et al. 2011; for other reviews on the topic see Kaan 2007; Lewis & Phillips 2015; Sprouse & Lau 2013; Sprouse et al. 2013). The grammatical richness with which the comprehension system operates makes it even more interesting when the results of sentence processing do not converge with the constraints of the grammar. Misalignments between grammar and parsing provide a unique window into the principles that guide language comprehension, and their study has generated a fruitful research program. Such grammar-parser discrepancies have been identified in a variety of structures and are explained by appealing to (sometimes very) different grammatical and psychological principles.

This work aims to contribute to the broad and exciting research agenda that is concerned with how the parser navigates linguistic dependencies by focusing on several instances of a phenomenon that has come to be known as *grammatical illusions* (or *linguistic illusions*). Grammatical illusions represent a case of misalignment between grammar and parsing which occurs when certain linguistic dependencies that are knowingly ungrammatical are (at least

[1] It goes without saying that successful sentence comprehension involves many crucial steps that precede, accompany, or follow dependency resolution such as lexical access, morphosyntactic analysis, pragmatic interpretation, etc.

temporarily) parsed as if they were correct (Phillips et al. 2011). Specifically, this work is concerned with the presence of grammatical illusions in two types of dependencies: the processing of negative polarity items (NPIs) in English, and the processing of null-subject antecedent dependencies in Spanish. These two phenomena are respectively instantiated by the ungrammatical sentences in (1) and (2):

(1) *The bills [that **no** senators voted for] have **ever** become law.

(2) *Juan$_i$ prometió a **Ana**$_j$ [Ø$_i$ ser más **cuidadosa** con los documentos].

**Juan$_i^{masc}$ promised Ana$_j^{fem}$ [Ø$_i$ to be more careful^{fem} with the documents].*

In (1), the NPI *ever* is ungrammatical because it violates the constraint which entails that NPIs must be licensed under the scope of negation. In (2), the feminine adjective *cuidadosa* (*careful*) violates the constraint which entails that adjectives must agree with the noun they modify; in this case, *Juan,* the implicit subject of the embedded clause –marked with Ø in the example. Several recent works have shown that the presence of structurally irrelevant but feature matching items –such as the negative quantifier *no* in the relative clause in (1) or the presence of the feminine noun *Ana* in the matrix clause in (2)– facilitate the integration of the ungrammatical elements (e.g. *ever* or *cuidadosa*), yielding a pattern of grammatical illusions. The work carried out in this dissertation aims at enriching our knowledge of these two constructions, and mainly, to study *if* and *why* different configurations yield grammatical illusions. Given the distinct nature of these two types of dependencies in terms of the specific grammatical constraints that must be applied and the languages in which the experiments are carried out, this dissertation is organized in two parts. The first part will present a research agenda aimed at studying grammatical illusions in the processing of NPIs. The second part of this dissertation will present a research agenda aimed at studying the processing of null-subject antecedent dependencies and the presence of grammatical illusions in these structures. Before moving into the two parts that conform the core of this work, let us first introduce a brief overview of the general context in which this investigation is framed.

1.1 GRAMMAR-PARSER MISALIGNMENTS AND THE LANDSCAPE OF GRAMMATICAL ILLUSIONS

The study of the implementation of grammatical constraints and the existence of misalignments between grammar and parsing goes back at least to the 1960s, when the tenets of Generative

Grammar started to be looked at through the lens of experimental psychology. The great variety of works that have been accumulating since then have run in parallel in several (more often than not) unconnected literatures –although there have also been interesting proposals that attempt to bring these findings together (e.g. Phillips et al. 2011; Lewis & Phillips 2015). For our purposes, and by way of summary, the current mosaic of misalignments between grammar and parsing can be classified attending to two criteria: first, whether they occur in grammatical or ungrammatical sentences; second, whether they are revealed in *fast* responses (observed in online processing tasks) or they also impact *slow* responses (observed in offline acceptability judgments).

Since its early days, linguistics has subscribed to the relatively uncontroversial view that grammatical sentences may be deemed unacceptable for reasons that are independent of grammatical theory (Chomsky 1957). Some sentences are (almost) impossible to parse because their complexity or structural ambiguity exceeds the capacity of the system, leading to processing overload. This is the case of widely studied phenomena like multiple center-embedding (Chomsky & Miller 1963; Gibson 1998; Miller & Isard 1964) or strong garden path sentences (Bever 1970; Frazier & Rayner 1982; MacDonald et al. 1994), illustrated in (3) and (4) respectively.[2]

(3) The patient who the nurse who the clinic had hired admitted met Jack.
(4) The horse raced past the barn fell.

Even though these sentences abide by the constraints of the grammar of English, it has long been known that most native speakers find them incomprehensible, exhibiting great difficulties in online processing tasks and judging them as unacceptable in offline ratings. These examples constitute cases in which grammatical sentences are perceived and processes as if they were not, which entails a convergence between fast and slow responses on the one hand, and a divergence with grammatical knowledge on the other hand. The opposite phenomenon can also be found, as certain ungrammatical configurations are sometimes processed and judged as if they were correct. So-called comparative illusions, illustrated in (5), are one of the most striking

[2] In (3), the difficulty comes from the need to embed a number of relative clauses which seem to exceed the computational capacity of the parser. In (4), the difficulty comes from a temporal syntactic ambiguity: readers initially treat *raced* as the main verb instead of a treating it as the head of a reduced relative clause (*raced passed the barn*), and as a consequence of this initial parsing, they are lured into a dead end when the verb *fell* comes in.

examples of this (Pullum 2004; Wellwood et al. 2018). When native speakers are presented with sentences like (5), they remarkably judge them as both acceptable and meaningful; and only upon guided examination do they become aware of their ungrammaticality and semantic incoherence. A similar effect is observed when the multiple center-embedded sentence in (3) is presented to speakers with only two verbs instead of the required three, as shown in (6).

(5) *More people have been to Russia than I have.
(6) *The patient who the nurse who the clinic had hired met Jack.

Whereas the sentence in (6) is now ungrammatical, processing measurements and acceptability ratings improve when compared to its grammatical counterpart in (3). This effect is sometimes referred to as the missing VP illusion (Frazier 1985; Gibson & Thomas 1999; Gimenes et al. 2009; Häussler & Bader 2015). Comparative illusions and missing VP illusions are explained on the basis of different mechanisms, but display the same pattern of misalignment that opposes grammatical knowledge with online/offline experimental measures. That is, they are cases in which ungrammatical sentences are perceived and processed as if there were not.

Although sentences like (5) and (6) are referred to as a comparative illusions or missing VP illusions, the label grammatical illusions is generally reserved to describe situations in which comprehenders fail to notice a grammatical error in online processing tasks, but clearly recognize the same sentences as unacceptable in offline judgments (Phillips et al. 2011; Lewis & Phillips 2015). A grammatical illusion occurs when an ungrammatical structure gives rise to the online perception of syntactic and semantic well-formedness or, in other words, when "native speakers experience a fleeting perception of acceptability or unacceptability that mismatches their more considered judgements" (Muller & Phillips 2020: 656). Studying the error profile of illusion-generating structures can provide valuable insights into the inner workings of the linguistic system and the mechanisms deployed during the online implementation of grammatical constraints. Following this logic, a large number of the works carried out under the umbrella term of grammatical illusions were concerned with subject-verb agreement dependencies, known as agreement illusions or agreement attraction (Bock & Miller 1991; Lago et al. 2015; Pearlmutter et al. 1999; Schlueter et al. 2018; Staub 2009; Wagers et al. 2009), and similar effects have been attested in the processing of other linguistic dependencies such as NPIs, ellipsis, case licensing or certain anaphoric dependencies (Bader et

al. 2000; Martin et al. 2012; Martin et al. 2014; Parker et al. 2015; Parker & Phillips 2016; Parker & Phillips 2017; Vasishth et al. 2008; Xiang et al. 2009). Agreement illusions are illustrated by the well-known example reproduced in (7). Despite the ungrammaticality of the sentence in (7), online processing measures indicate that the parser initially treats it as correct due to the presence of intervening elements (such as the plural lure cabinets) that ameliorate the integration of the ungrammatical verb, creating the illusion that the plural verb is licensed.

(7) *The key to the **cabinets are** on the table.

In this respect, a grammatical illusion is generally understood as a temporary effect which only affects possibly intermediate parsing stages of structure building, but does not arise in untimed (end-state) acceptability perception processes. That is, grammatical illusions are typically described as discrepancies between fast (online) and slow (offline) responses, implying that online and offline measures of acceptability reflect qualitatively different aspects of linguistic behavior. The results presented in this manuscript will challenge such a neat view of grammatical illusions, as it will be shown that illusion-like patterns can emerge in the absence of a straightforward contrast between online and offline responses. In other words, the results from this investigation will show that grammatical illusions can also be found in offline tasks.

Furthermore, even though grammatical illusions have attracted much interest in the past few years, the opposite phenomenon (i.e. illusions of ungrammaticality), is less often discussed. Attending to the standard definition of illusions of grammaticality, an illusion of ungrammaticality would represent a case in which a perfectly grammatical sentence that is judged as such in offline tasks exhibits some sort of disruption in online measures when compared to a similarly grammatical sentence. As we will expand below, some authors have argued that agreement illusions only surface in ungrammatical sentences (e.g. Wagers et al. 2009), while other works have gathered evidence that point to the presence of attraction effects in grammatical sentences (Lago et al. 2015; Laurinavichyute & von-der-Malsburg 2019; Martin et al. 2014). A good candidate structure to be considered as example of illusion of ungrammaticality comes from the licensing of pronoun-antecedent dependencies, illustrated in (8). The two sentences in (8) are perfectly grammatical in English. In both cases, the antecedent of the pronoun *him* is *John*, a masculine name. However, in a self-paced reading task conducted by Badecker & Straub (2002, exp. 1), it was found that the words following the pronoun *him*

were read significantly slower in (8a) compared to (8b). This result is interpreted as evidence that structurally inaccessible but gender matching candidates (such as *Bill* in (8a)) can interfere with antecedent selection processes. It is due to the fact that these effects take place in grammatical sentences that they are prone to be conceptualized as an example of illusions of ungrammaticality. In the present work, we will also explore the possible presence of illusions of ungrammaticality in the processing of negation and null subject-antecedent dependencies.

(8) a. John$_i$ thought that Bill$_j$ owed **him**$_i$ another chance to solve the problem.
b. John$_i$ thought that Beth$_j$ owed **him**$_i$ another chance to solve the problem.

The heterogeneous inventory of misalignments that was succinctly reviewed in the previous paragraphs has motivated a debate about the role that grammatical information plays during sentence comprehension. This debate is embodied in the two-systems/one-system divide (Lewis & Phillips 2015; Parker 2019). In general terms, proponents of a two system architecture (e.g. Bever 1970; Ferreira et al. 2002; Ferreira & Patson 2007; Frank et al. 2012; Townsend & Bever 2001) argue that the system for language comprehension and production (i.e. the parser) is supported by a set of heuristic procedures used for fast efficient communication that make use of 'quick-and dirty' or 'good-enough' representations that do not require speakers to build detailed grammatical information. Under this dual-system view, the grammar is conceived of as a static body of knowledge that speakers can consult as a backup to verify the acceptability of sentences, and misalignments simply reflect the different outputs of these two separate cognitive systems: the parser and the grammar. In the words of Parker (Parker 2019: 2):

> Under this account [the two-system view], the parser and grammar reflect separate cognitive systems because they have independent functions (rapid communication vs. knowledge representation), operate over representations of a distinct kind (noisy "good-enough" templates vs. detailed hierarchical structure), and use a distinct set of rules (fallible heuristics vs. grammatical constraints) that operate on different time scales (fast vs. slow).

Linguistic illusions and other grammar-parser misalignments can be easily accommodated under a two-system view as it suffices with assuming that they represent the outputs of two different systems –a fast and a slow analyzer that operate on different rules and representations.

Yet, as Lewis & Phillips (2015) point out, the two-system architecture is faced with the crucial challenge of explaining how, in the majority of cases, comprehension and production actually exhibit grammatical richness and accuracy, and errors are often easily detected in both fast and slow responses. The two-system view faces the challenge of explaining how grammar and parsing actually interact. In addition, the architecture proposed under the two-system view has the crucial consequence of conceptually ruling out the possibility of studying the nature of grammatical representations by focusing on processing data –a challenge known as *the linking problem* (Lewis & Phillips 2015; Parker 2019). By contrast, the strong convergence between grammar and parsing can be easily explained under an alternative account: the one-system view. In a one-system view, the traditional concepts of grammar and parsing are fused, understood as forming a single cognitive system that serves the needs of comprehending and producing language. In this account, the linking problem is dissolved, as grammatical knowledge is conceived as a dynamic system that serves structure building operations, rather than a static consultative body of knowledge (Embick & Poeppel 2015; Lewis & Phillips 2015; Mancini 2018; Parker 2019; Phillips 2013; Phillips & Lewis 2013). Even though the one-system account also lacks a detailed description of its internal structure and functioning laws, it is generally assumed to be composed by the lexicon and the grammar, whose implementation makes use of limited general purpose resources like working memory, cognitive control, or world knowledge (Phillips 1996). In this architecture, grammar is conceived as an abstract description of the representations that the system builds (i.e. a procedural grammar for incremental structure building). Consequently, both online and offline measurements are understood as the result of this single system, but captured at different levels of abstraction or 'snapshots' at different points in time. Instead of considering misalignments to be arbitrary failures that result for 'rough-and-ready' representations, proponents of the one system view seek to understand the common profile of misalignments in order to systematically predict which linguistic computations will cause the system to err (Lewis & Phillips 2015). In this vein, the present work takes NPI illusions and null subject antecedent dependencies as a starting point in order to explore new and interesting instances of misalignment between grammar and parsing that will enrich the landscape of grammatical illusions and will hopefully contribute to a better understanding of the common profile of misalignments in dependency formation.

1.2 THE ROLE OF MEMORY RETRIEVAL IN DEPENDENCY FORMATION

In the last decade, a number of psycholinguistic investigations have put the focus on the mechanisms that are used in the online resolution of linguistic dependencies, and it has been argued that grammatical illusions are the result of limitations in the memory retrieval system that is engaged in order to implement grammatical computations during dependency formation (Dillon et al. 2013; Lago et al. 2015; Lewis & Phillips 2015; Martin et al. 2012; Parker et al. 2015; Phillips et al. 2011; Schlueter et al. 2018; Sturt & Kwon 2015; Vasishth et al. 2008; Wagers et al. 2009). A consequence of the sequential nature of the linguistic input and the ample combinatorial possibilities of human languages is that the two points of a dependency –the antecedent/licensor and the dependent element– are by necessity separated in time and, most importantly, need not be adjacent. This property of language entails that, in addition to the correct implementation of linguistic constraints, a crucial aspect that determines the successful resolution of linguistic dependencies is memory retrieval.

Cases in which there is a relatively unlimited amount of material that can be introduced between the two points of a dependency are often known as a long-distance or discontinuous dependencies. Even though most of the sentences presented in the previous pages also instantiate long-distance dependencies, a more dramatic illustration is provided in (9), which shows that the dependency established between a verb and its subject can be separated by multiple words conforming intervening phrases and clauses.

(9) The key to the new wooden cabinets that were installed at the teachers' office **is** on the table.

Dependent elements, such as the verb *is* in (9), are integrated on the basis of their compatibility with a target antecedent, the licensor, which imposes different structural and morphological constraints. The consequence of this is that dependency formation requires accessing previous items in memory and, therefore, the parser must preserve previously encountered information over time to later access it in order to license relations between words and phrases in the incoming input. For instance, in order to integrate the verb in (9), the head of the subject of the main clause must be retrieved from working memory and it must be distinguished from other intervening potential targets such as the nouns *cabinets* or *teachers*. In this regard, as noted by Vasishth et al., one of the main goals of psycholinguistic theories is to "provide insights into

the fundamental properties of the linguistic working memory systems that support the rich combinatorial capacity of human language" (2008: 686).

Recent work carried out in order to investigate the architecture of the memory systems that support dependency formation has proposed that this process operates on the basis of cue-based retrieval of content-addressable items, in which different potential target items are activated in memory by means of retrieval cues (Lewis & Vasishth 2005; Lewis et al. 2006; Martin & McElree 2009; McElree 2000; McElree et al. 2003; Parker et al. 2017; Van Dyke & McElree 2006; Vasishth et al. 2019). This cue-based memory retrieval system is of particular relevance in the context of grammatical illusions because it puts the focus on dependency resolution and provides specific accounts and predictions aimed at capturing illusion-like outcomes identified in a variety of linguistic dependencies. In this context, grammatical illusions can be reconciled with a one-system architecture in that they are explained in terms of the ways in which linguistic representations are retrieved from memory.

In the cue-based memory retrieval system, each encountered linguistic item is thought to be encoded in working memory as a bundle of features which specify it by means of abstract grammatical qualities (e.g. morphosyntactic, semantic, etc.). What is meant by 'content-addressable' is that once encoded, items are later accessed (i.e. retrieved) on the basis of their content –the features they have been encoded with–, not their location. The basic idea is that, in order to integrate each incoming word into the preceding linguistic context, the system triggers a content-based retrieval process guided by the items' set of retrieval cues as specified by the grammar. Each of the items stored in memory display a different level of activation as a function of the retrieval cues that trigger the search, and the items that match the retrieval cues receive a boost of activation. The item that receives the highest activation is retrieved in order to license the dependency or dependent element (Lewis & Vasishth 2005; Lewis et al. 2006). For instance, when the verb *is* is encountered in (9), it triggers a search for a subject licensor. The retrieval cues used in this search might include the number information of the verb (i.e. singular) and the structural information of the antecedent noun that licenses the verb (i.e. subject position). The only constituent that matches these two retrieval cues is the subject NP *the keys*.

According to this model, the activation of the target item follows a parallel process, rather than a serial one, in which the retrieval probe is simultaneously matched against all the existing

encoded constituents.[3] One of the consequences of parallel content-addressable cue-based memory retrieval is that it is error-prone because it allows the possibility that multiple potential targets could be simultaneously activated when there exist similarities between distractor and target items in terms of the retrieval cues, an outcome that could difficult the retrieval of the correct target. This effect is known as *similarity-based interference* (or *partial cue-match*), and it can be of two types: *inhibitory* or *facilitatory interference*. As reviewed in several works (e.g. Jäger et al. 2017; Parker et al. 2017), these two types of interference effects display different behavioral signatures. Inhibitory interference effects appear as increased difficulty (i.e. processing slowdown) in dependency formation when the activation of the correct target licensor is hampered by the presence of other items in memory that overlap in feature content with respect to the retrieval cues, making the target item less distinct in memory. This outcome is also known as a fan effect. For instance, in the case of the examples in (8) involving pronoun resolution, it was noted that the integration of the pronoun *him* took longer in the context of two preceding masculine nouns (e.g. *John* and *Bill* in (8a)) in contrast with cases in which the preceding nouns differed in gender (e.g. *John* and *Beth* in (8b)). In both (8a) and (8b), the correct target *John* fully matches the retrieval cues in that it holds the appropriate structure position and bears the required masculine feature. Yet, in in (8a), there is another noun that partially matches the masculine feature, leading to competition, even though it is not a grammatically possible antecedent due to its structural position in the sentence. The results obtained by Badecker and Straub (2002) are often interpreted as a parade case of inhibitory interference, and other examples are to be found in Van Dyke & McElree (2006) or Van Dyke (2007).

In contrast, facilitatory interference effects have been reported as reduced difficulty (i.e. processing speed-up) in dependency formation in cases in which a full match is not available but there is an item that partially matches the retrieval cues. Agreement attraction configurations such as (7) above are a good example of facilitatory interference. Several processing studies on subject-verb agreement dependencies have argued that agreement attraction effects reflect the incorrect retrieval of the distractor item due to partial cue-match (e.g. Lago et al. 2015;

[3] It must be noted that there are two main computational implementations of cue-based retrieval: the activation-based and the direct-access model. In the activation-based model (Lewis & Vasishth 2005), activation is based on the item's cues, which determine both retrieval latencies and probabilities of retrieval. In the direct-access model (Martin & McElree 2009; McElree 2000; McElree et al. 2003) cues enable direct-access to the items and retrieval latencies are constant while the probabilities of retrieval vary. See Vasishth et al. (2019) for a recent overview.

Schlueter et al. 2018; Wagers et al. 2009), and other works have argued that grammatical illusions in the processing of ungrammatical NPIs are generated in the same way (e.g. Vasishth et al. 2008). In sum, the phenomenon of inhibitory interference is related to grammatical contexts (i.e. target-match configurations) and the phenomenon of facilitatory interference is related to ungrammatical contexts (i.e. target-mismatch configurations), and both types of effects have been generally argued to reflect cue-based retrieval in a content addressable memory (for detailed discussions see Jäger et al. 2017; Parker et al. 2017). Generally, only cases of facilitatory interference are conceived as instances of grammatical illusions although, as noted in §1.1, cases of inhibitory interference could be understood as instances of illusions of ungrammaticality.

Even though the computational model proposed by Lewis and Vasishth (2005) and Lewis et al. (2006) provides a promising start to cluster many cases of inhibitory and facilitatory interference that have been reported in the literature, it must be noted that this model is still under development and it is subject to modifications and specifications in the course of accounting for various profiles of interference effects found in different types of dependencies. In spite of the fact that the model's conceptual predictions for the prevalence of facilitatory and inhibitory interference effects is (relatively) straightforward, the empirical reality has shown a more complex picture, as processes of inhibitory or facilitatory interference have not been found to operate consistently across linguistic contexts. For example, in a well-known study conducted to investigate interference processes in subject-verb agreement dependencies, Wagers et al. compared sentences like (10) using the self-paced reading procedure. Their stimuli varied the presence of plural distractors (e.g. *cells*) in grammatical (10a) and ungrammatical sentences (10b).

(10) a. The key to the cell(s) unsurprisingly **was** rusty from many years of disuse.

b. *The key to the cell(s) unsurprisingly **were** rusty from many years of disuse.

Their results showed that the presence of a plural distractor in ungrammatical sentences facilitated the integration of the ungrammatical plural verb relative to ungrammatical sentences with no plural distractor. However, the presence of a plural distractor did not have an impact in the integration of the verb in grammatical sentences, and the authors neither found effects of

inhibitory interference in grammatical sentences.[4] The fact that the parser does not seem to be misled by structurally inaccessible distractors in grammatical sentences is known as a 'grammatical asymmetry', and it has been taken to mean that structural constraints are actively used to guide retrieval. Wagers et al. (2009) propose two ways to capture the grammatical asymmetry found in their results. One possibility is that subject-verb agreement dependencies are always resolved using a cue-based retrieval mechanism that is activated upon encountering the verb. In ungrammatical sentences with a matching distractor, the distractor is incorrectly retrieved on some proportion of trials due to partial match. However, in grammatical sentences, the partially matching distractor is not retrieved because the correct antecedent is a full match and outcompetes the distractor.[5] The alternative possibility is that subject-verb agreement is computed through a predictive process in that encountering a subject fires a prediction for the features of the yet-to-appear verb. When the verb is encountered, if it matches the top-down predictions, nothing else needs to be done –no retrieval needs to be launched. Yet, if it the verb does not conform with the predicted features, a reanalysis process is triggered. This reanalysis is argued to take place using the cue-based retrieval mechanism, yielding the possibility that the partially-matching distractor is sometimes retrieved, causing the facilitatory interference (or attraction) effects. The authors do not arbitrate among these two possibilities, although later works by Lago et al. (2015) and Schlueter et al. (2018) have argued that facilitatory interference effects in subject-verb agreement dependencies are likely the result of an error-driven reanalysis.

In general, it is unclear whether the parser always relies on a cue-based retrieval mechanism, whether it only resorts to it as an error-driven reanalysis and, furthermore, whether all types of dependencies are resolved using this procedure. A thorough revision of interference effects in sentence processing falls outside the scope of this work. Nonetheless, the existing pattern of misalignments seem to exceed the current state of explanatory possibilities laid out by Lewis & Vasishth's (2005) model. This is because, as explained above, this model only predicts the presence of inhibitory interference effects in grammatical contexts and facilitatory interference effects in ungrammatical contexts. Yet, evidence for the opposite pattern of results

[4] Note that the concepts of 'attraction in grammatical sentences' and 'inhibitory interference effects' are not the same. As explained above, the term inhibitory interference is used to refer to cases in which a target and a distractor item overlap in features, causing a processing disruption. As used in Wagers et al. (2009), the concept of attraction effects in grammatical sentences is conceived as a hypothetical difficulty that could be generated by a plural distractor in grammatical sentences with a singular verb, a pattern that is ultimately not borne out in their results.

[5] This contrasts with the results observed in grammatical sentences in the work by Badecker & Straub (2002).

has also been reported. For instance, in a study that focused on reflexive-antecedent dependencies carried out by Cunnings & Felser (2013), it was found that a reflexive pronoun was integrated faster in grammatical sentences in which both the antecedent and the distractor matched with the gender of the reflexive pronoun –an outcome that is the opposite to what would be expected in a context of inhibitory interference. Furthermore, in ungrammatical sentences in which only the distractor matched in gender with the reflexive pronoun, reading times were slower in comparison with ungrammatical sentences in which none of the nouns matched in gender with the reflexive pronoun –an outcome that is the opposite to what would be expected in a context of facilitatory interference. Similar effects were also reported by Sturt (2003). As noted in a thorough meta-analysis on studies investigating interference effects in subject-verb and reflexive-antecedent dependencies carried out by Jäger et al. (2017), some of the existing findings are difficult to reconcile under a cue-based memory retrieval model, which must admittedly be revised. Nonetheless, the authors emphasize several issues that could explain the different results among studies, including the prominence of the distractor items in the manipulations, the differences between the types of dependencies under study, and the statistical validity of some the existing empirical findings.

A recurring debate at the interface of dependency formation and memory retrieval has to do with the observation that whereas some dependencies are susceptible to interference effects (e.g. subject-verb agreement), others seem to exhibit a more robust processing profile (e.g. reflexive-antecedent); and the reasons behind this contrast are still poorly understood. Even though the general assumption of Lewis & Vasishth's (2005) model is that all linguistic dependencies are computed using the same error-prone cue-based retrieval system, some researchers have argued that the type of retrieval mechanism used may depend on the type of dependency being processed. For instance, Phillips et al. (2011) have suggested that the system may make use of either content-addressable retrieval or structure access based on syntactic position depending of the grammatical constraints of the dependency under consideration. Yet, other authors such as Parker et al. (2017) argue that all types of dependencies involve content addressable retrieval processes, and that differences in interference and interference-free retrieval profiles could arise "if retrieval engaged both structural and non-structural cues using a weighted cue-combinatorics scheme that weights structural cues more heavily than agreement cues" (2017: 132). The issue of how grammatical constraints are mapped into retrieval cues, a precise theory of retrieval cues, and whether cues of different nature (e.g. syntactic,

morphological, semantic, etc.) are weighted differently as a function of the dependency being processed conform some of the fundamental challenges for future research in memory retrieval (Jäger et al. 2017; Martin & McElree 2008; Parker et al. 2017). A notable gap in the current landscape of interference effects is that most of the existing research has focused on a limited set of constraints on dependency formation. For instance, as noted in Sturt & Kwon (2015), very few studies have examined memory retrieval processes in dependencies that are lexically guided, as opposed to structurally or morphologically guided ones. Among other things, the configurations studied in this work will provide novel contexts to study the presence of interference effects in configurations that probe multiple grammatical constraints.

1.3 STRUCTURE OF THE DISSERTATION

As it was already advanced at the beginning of the introduction, this dissertation is organized in two parts. Each of the parts is, in turn, composed of two chapters. The roadmap for each of the parts is the same: the first chapter introduces the necessary linguistic and psycholinguistic background, and the second chapter presents the empirical evidence collected for each project.

Part I focuses on NPI illusions and is formed by Chapters 2 and 3. In Chapter 2 we will introduce the phenomenon of NPIs, their grammar, and the existing psycholinguistic studies on NPI illusions. Chapter 2 is conceived as the background for Chapter 3. In Chapter 3 we will present the results from 6 experiments carried out in English in order to delve deeper into the phenomenon NPI illusions. These experiments are organized in two groups. Experiments 1-3 focus on the processing of sentences with multiple negations that mirror illusion-like configurations. This will be attained by substituting the NPI *ever* in classic illusion sentences with the negative adverb *never* (e.g. *The bills that no senators voted for have never become law*). Experiments 4-6 test whether NPI illusions arise in the presence of intrusive licensors other than the negative quantifier *no*. To this end, we created illusion-like sentences which contain an intervening verbal negation (e.g. *The bills that the senators haven't voted for have ever become law*). In addition, we will also include the results from a corpus analysis of the co-occurrence frequencies of the NPI *ever* in the presence of quantificational and verbal negation. The results from these experiments demonstrate that the configurations that generate NPI illusions are more limited than it was initially thought, and they contribute to narrow down the landscape of hypotheses put forth to explain this intrusion phenomenon.

Part II focuses on null subject-antecedent dependencies and is composed of Chapters 4 and 5. In Chapter 4 we introduce the phenomenon of null subjects and their grammar, paying particular attention to different aspects of what has come to be known as Control Theory. Then, we will review the psycholinguistic investigations aimed at studying null subject antecedent dependencies and the presence of grammatical illusions in these structures. Chapter 4 is conceived as the background for Chapter 5. In Chapter 5 we will present the results from 6 experiments carried out in Spanish with the aim of delving deeper into some open issues regarding the processing of null subject-antecedent dependencies in Spanish, while we will also study the presence of grammatical illusions in these type of constructions. The 6 experiments that conform the empirical core of Part II are devoted to analyze linguistic dependencies that are lexically guided, and in this respect, the configurations under study represent a novel context to test for the presence of interference effects. Specifically, we will study dependencies that are determined by the lexical properties of predicates by contrasting what are known as subject control verbs (e.g. *promise*, as in *John promised Mary to be careful*) and object control verbs (e.g. *order*, as in *John ordered Mary to be careful*). The results from this second part provide evidence for the presence of interesting patterns of interference, while they also contribute to clarify previous findings on the processing of null subject-antecedent dependencies.

Even though the two parts that conform this thesis focus on different grammatical phenomena, the empirical evidence obtained does not only provide interesting insights for the understanding of each phenomenon separately, but also, for the broad conception of grammatical illusions and misalignment phenomena. A discussion of these issues is presented in the final chapter, Chapter 6, in which we will lay out some (hopefully) thought-provoking concluding remarks.

The experiments that are presented in Chapters 3 and 5 of this manuscript appear in the order they were conducted. Even though the structure of this dissertation was not purposefully aimed at respecting chronological order, the unfolding of the empirical contribution of this work will hopefully provide a depiction of the learning process undergone in the course of this investigation in terms of experimental methods and analysis techniques. The experiments from Part I described in Chapter 3 were conducted over the years 2016 and 2017. The data were mainly collected during a three-month research stay carried out at the Department of Linguistics of the University of Maryland. In particular, Experiments 4-6 from Chapter 3 are the result of a collaboration with Colin Phillips and Hanna Muller. Experiments 1-3 from Chapter 3 have

been published in de-Dios-Flores (2019), and some of the findings from the same chapter have been partially presented in several venues, including AMLAP-2016, CUNY-2017, BICLCE-2017, AMLAP-2018, AEDEAN-2018, CUNY-2019, The Parsing & Prediction Conference-2019, and The Processing of Negation & Polarity Conference-2020. The experiments from Part II described in Chapter 5 were conducted over the years 2018 and 2019. Most of the online results were collected during several research stays summing up to a year carried out at the Basque Center on Cognition, Brain and Language. The eye-tracking tasks reported in Chapter 5 (Experiments 3 and 6) were conducted in collaboration with Simona Mancini, and the statistical analyses from the same chapter were performed under the guidance of Juan Andrés Hernández-Cabrera. All the mistakes are, of course, my own. Finally, partial products of the findings from Chapter 5 of this dissertation were presented at the XIV International Symposium of Psycholinguistics-2019, AMLAP-2020, and the 56th Linguistics Colloquium-2020, among other places.

USC UNIVERSIDADE DE SANTIAGO DE COMPOSTELA

PART I

NEGATIVE POLARITY ITEM ILLUSIONS

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Chapters 2 and 3

2 NEGATIVE POLARITY ITEM ILLUSIONS: BACKGROUND

This first part of the dissertation is concerned with the emergence of grammatical illusions in the processing of negative polarity items (henceforth NPIs) in English. As introduced in Chapter 1, a grammatical illusion represents a discrepancy between grammar and parsing which occurs when a linguistic dependency that is ungrammatical is misperceived, at least temporarily, as if it was correct. NPI licensing has been identified as one of such dependencies that are error-prone. The phenomenon of NPI illusions has been found to occur in sentences like (11) because comprehenders are disproportionately likely to initially perceive the unlicensed NPI *ever* as grammatical, generating a grammatical illusion. NPIs are only acceptable when they occur in a negative sentence – hence the name. In spite of the presence of the negative quantifier *no* in the sentence in (11), the NPI *ever* is undoubtedly unlicensed. This is because the negative quantifier *no* occurs in an embedded clause, a structural position from which it cannot take scope over the NPI. Putting aside the intricacies of NPI grammar, which will be addressed later on, what is relevant here is that *no* cannot operate as a grammatical licensor of *ever*.

(11) *The authors [that no critics recommended] have **ever** received acknowledgement.

The interesting point about sentences like (11) is that it is the presence of the structurally inaccessible negation in the embedded clause what causes the illusory perception of grammaticality. Nevertheless, the processes whereby such an erroneous licensing takes place are not still fully understood. NPI illusions represent a paradigmatic case of grammatical illusions and understanding the mechanisms that give rise to such a behavior has the potential of simultaneously informing the literature on the processing of linguistic dependencies and the literature on NPI grammar. The work carried out here aims at contributing to the understanding

on NPI illusions by putting to the test some of the existing hypotheses proposed in previous works to account for this interesting phenomenon.

Part I of this dissertation is formed by Chapter 2 (the present chapter), and Chapter 3 (the following chapter). Chapter 2 is conceived as the background for Chapter 3. To put things briefly into context, we shall advance that in Chapter 3 we will present a series of experiments that investigate the processing of sentences like (12) and (13). In (12), the NPI *ever* is substituted by the negative adverb *never*, making the sentence now grammatical (cf. (11) and (12)). In (13), the structurally inaccessible negative quantifier *no* is substituted by verbal negation *not* (cf. (11) and (13)). The linguistic contexts that we will study in Chapter 3 are very similar to the classic illusion presented above, but these configurations provide a critical testing ground for some of the existing hypotheses on NPI illusions. We will not dwell on this matter any longer here, as the motivations for these manipulations will be explained in detail when we move into the experimental agenda presented in the next chapter.

(12) The authors [that **no** critics recommended] have **never** received acknowledgement.
(13) *The authors [that the critics did **not** recommend] have **ever** received acknowledgement.

The current chapter provides a review of the relevant linguistic and psycholinguistic background on the central topics that will pave the way into the experiments presented in Chapter 3. The structure of this chapter is organized in three main parts. First, we will provide a brief description of the grammar of NPIs. Second, we will focus on the psycholinguistic literature on NPI illusions, paying special attention to the accounts elaborated to explain the phenomenon. Finally, we will end with some notes on the grammar and processing of sentences with multiple negation markers.

2.1 THE GRAMMAR OF NPIS

The vast majority of words that are found in the lexical inventories of natural languages are items that can occur in both positive and negative contexts. However, languages also exhibit some lexical items whose distribution is restricted by the polarity of the context in which they appear. These elements are known as *polarity items*, and the most salient subtypes of polarity-sensitive expressions are positive polarity items (PPIs) and negative polarity items (NPIs). Polarity items constitute a closed but extremely varied class of words that are characterized by

the fact that they require the presence of another element (a licensor) or that they are incompatible with certain elements or contexts. As their name implies, NPIs are licensed in negative contexts, or in other words, they must occur within the scope of a negative element which acts as licensor. Frequent examples of NPIs are *ever*, *any* or *yet*. Contrarily, PPIs are words that are licensed in positive (or affirmative) contexts, or, in other words, are "expressions that are repelled by negation and tend to escape its scope" (Giannakidou 2011: 1665). Examples of PPIs are *still*, *already* or *would rather*. The distributional properties of NPIs and PPIs can be respectively observed in the contrasting grammaticality of examples (14a/b) and (15a/b).

(14) a. John isn't here **yet**.
b. *John is here **yet**.

(15) a. John is here **already**.
b. *John isn't here **already**.

The succinct grammatical review that will be presented in this first part of the chapter is circumscribed to NPIs in English, as this is the subject matter of our work. Nonetheless, it is important to bear in mind that polarity sensitive elements are assumed to exist in every language.[6] Ever since Klima's (1964) seminal work on English negation and Baker's (1970) first extensive characterization of polarity phenomena, NPIs and the intricacies of NPI licensing have given rise to a multifaceted and dynamic area of linguistic inquiry. The heterogeneous nature of the contexts in which NPIs are licensed has motivated a wide range of theories within formal linguistics which tend to capture the licensing conditions as an interaction of syntactic, semantic and pragmatic mechanisms. In the words of Giannakidou (2011: 1665):

> Polarity phenomena are significant because they provide a case of well-formedness that is not fully determined by syntax: the distribution of NPIs is not predicted by their syntactic category alone, and they seem to be sensitive to semantic factors of the sentence (roughly at this stage, the presence or not of negation). This sensitivity addresses the fundamental relation between syntactic and semantic well-formedness,

[6] For instance, Haspelmath (1997) attests the existence of NPIs in forty languages, although the distributional restrictions of polarity items elements vary considerably across languages.

> and polarity thus provides a uniquely complex domain to investigate the relation between syntax and semantics, and the nature of semantic knowledge.

As a result, NPI licensing, and polarity sensitivity more broadly, represent one of those core linguistic phenomena around which frequent discussions on the relation between grammar and meaning have revolved, leading to fruitful and controversial debates over the years. The linguistic domain of NPI research could be said to swirl around one fundamental question or problem, which Ladusaw (1996) termed *the licensing question*. As introduced above, the complexity of NPI licensing lies in the fact that it involves the interaction of various constraints of different nature (i.e. syntactic, semantic, pragmatic). Given this diversity, the main objective of most theories has been to provide a unified analysis of the collection of elements and contexts that can act as NPI licensors and to advance an explanation for such a behavior. That is, what guides NPIs' distributional behavior? The overview presented in the next section will try to do justice to this issue –which is, indeed, far from simple– by presenting some of the major accounts on NPI grammar. The presentation of such accounts requires us to go beyond the specific case which is the focus of our research –namely, the NPI *ever* in the context of explicit negation. This is not a capricious decision as the linguistic hypotheses reviewed next will be essential in order to understand some of the proposals that have been elaborated to explain NPI illusions and their relation to the observed grammatical properties of NPIs.

2.1.1 Licensors, licensing environments, and licensing accounts

This section is articulated around two main objectives: to outline the main distributional properties of NPIs in English and to briefly review the main hypotheses on NPI licensing. In our view, it would be unproductive to dissociate a presentation of the data on the distribution of NPIs (i.e. a descriptive approach) from the theories and generalizations elaborated to explain the behavior of NPIs (i.e. an explanatory approach). This is because the development of such theories has mainly been motivated by the analyses of the various contexts in which NPIs are found. It could be said that, to date, no existent theory of NPIs is uncontroversial in that no single proposal has produced an overarching set of generalizations that can cover all the aspects of NPI licensing. This is precisely because the domains in which NPIs are licensed in English are not only diverse, but also because not all the NPIs are subject to the same configurational constraints –let alone if a cross-linguistic approach is taken. As a note of caution, this review

should not be taken as exhaustive, as it solely attempts to provide an overview of the issue with the additional criterion of including those proposals that have been appealed to in previous works of NPI illusions or that will be relevant in our discussion of the experiments presented in Chapter 3.

The heterogeneous group of English NPIs contains words and phrases that belong to different parts of speech and that add a wide variety of meanings. The class of English NPIs is instantiated by adverbs like *ever*, *anymore*, *yet*, *in years* or *much*, the determiner *any*, NPs such as *a red cent* or *a thin dime* and verbs and verb phrase idioms like *budge an inch*, *lift a finger*, *have a hope in hell*, *bat an eyelash* and so forth. As it has already been noted, what all these elements have in common is the idea that they are often found in negative contexts. That is, as a first step (that will be refined in the course of the review), these elements must occur in sentences that have a negative element, and thus, are deemed unacceptable in their positive sentence counterparts (cf. (14) above). Moreover, the relation between the NPI and the negative element that licenses it is also subject to a crucial configurational restriction. In the first place, this restriction is often phrased as the requirement that the licensor must precede its clausemate licensee (Linebarger 1987; Ladusaw 1996). Yet, mere linear precedence of the negative element with respect to the NPI is not enough: the NPI must be under the scope of the negative element, and scope is generally understood as corresponding to overt syntactic c-command (Laka 1994; Progovac 1994)[7]. This configurational requirement becomes apparent when comparing the sentences in (16), taken from Giannakidouu (2017). In (16a) the NPI *anything* is being licensed by the presence of the negative quantifier *no* in subject position, while in (16b), the negative element inside the prepositional phrase is not structurally accessible to license the NPI. The reader may notice that the sentence in (16b), which illustrates the failure to meet the configurational requirement on NPI licensing, bears strong similarities with the example of NPI illusion that was provided at the beginning of the chapter in (11).

(16) a. No student said **anything**.

b. *The sister of no student said **anything**.

[7] The term c-command (constituent command) describes a relation of syntactic dominance that is established between the nodes that result from syntactic trees. It is said that a node X c-commands a node Y if a mother of X dominates Y. It must be noted that there are exceptions to the c-command requirement on NPI licensing, as not all NPIs are overtly c-commanded by the licensor in all contexts (e.g. *Nobody's mother has ever complained about his grades*). For this reason, c-command is generally observed as a by-product, rather than a proper requirement for licensing. We have avoided going into this issue in depth here but refer the reader to Giannakidou (1998) for a detailed discussion.

Even though the focus of the existing investigations on NPI illusions has been placed on sentences in which NPIs are licensed –or more accurately, erroneously licensed– by explicit negative markers, the actual distribution of NPIs is not exclusive to contexts containing an overt negation. When an NPI is licensed by explicit negation (e.g. *not*, *no*, *never*, etc.) it is known as direct licensing. NPIs that exclusively require direct licensing are termed strong or strict NPIs (e.g. *either* or *in weeks*), but other NPIs can appear in a wider variety of contexts giving rise to instances of indirect licensing. NPIs that can also appear in indirect licensing configurations are termed weak NPIs (e.g. *ever* or *any*). Below we provide a non-exhaustive list of the most representative contexts, other than explicit negative sentences, in which weak NPIs like *ever* can be found. These include, among other cases, adversative predicates (17), questions (18), comparative structures (19), the antecedent of conditionals (20), the restriction of *every* (21), or sentences containing *few* (22) or *only* (23).[8]

(17) I doubt that you will **ever** pass the exam.
(18) Have you **ever** taken the Syntax exam?
(19) The exam was harder than I **ever** imagined.
(20) If you have **ever** taken the Syntax exam you know how hard it is.
(21) Every student who has **ever** been to class passed the Syntax exam.
(22) Few people have **ever** passed the Syntax exam in the first call.
(23) Only John has **ever** taken the Syntax exam.

In the examples above, the licensor has been underlined when possible, although in cases like questions (18), comparatives (19) or conditionals (20) it is difficult to pinpoint any specific element inducing the licensing. By merely observing the sentences in (17)-(23) one immediately notices the diversity of the contexts in which (weak) NPIs are found. It is precisely this diversity which poses the following fundamental question: what do these environments have in common so that NPIs can be understood as a natural class? (Penka 2020). The vast majority of works on the grammar of NPIs have undertaken the challenge of trying to provide the appropriate generalizations that can account for this varied distribution.

[8] In this regard, it is also important to signal that not all NPIs are restricted to appear in the same range of licensing environments.

The first approximation to this issue is to be found in Klima's (1964) seminal work entitled *Negation in English*. He signaled the fact that the contexts that license NPIs were wider than those restricted to overt negation, and proposed that these contexts (including those depicted in (17)-(23)) could be "described as resulting from the presence of a common grammatico-semantic feature to be referred to as *affective*" (1964: 313). The property of *affectivity* was conceived as a semantic feature that was carried by the licensor or licensing context, and an NPI was observed as legitimate when it occurred "in construction with" a licensor holding that property.[9] An important component of Klima's analysis of NPI grammar was the proposal that NPIs came in semantic pairs such that they were somehow derived from a positive counterpart. For instance, *any-some*, *yet-already*, etc. Nonetheless, as Linebarger (1987) points out, not all NPIs come in pairs with a positive element (e.g. *lift a finger*), and what is more important, the vagueness of Klima's affectivity component leaves unanswered the important question of why the so-called affective elements trigger NPIs. The work by Baker (1970) soon took over Klima's proposal, and described NPIs licensing as a two-stage process in which NPIs could either be licensed in sentences containing an overt and c-commanding negative expression (i.e. direct licensing) or by virtue of a logical entailment (i.e. indirect, secondary or pragmatic licensing). In his view, for instance, the NPI *ever* in a sentence like (24a) is thought to be licensed because the proposition in (24a) entails that in (24b), in which there is a surface relation between the NPI and an overt and c-commanding negative element. Another example that would be derived from such a reasoning is provided in (25).

(24) a. I doubt that you will **ever** pass the exam. [=(15)]
b. I don't think that you will **ever** pass the exam.

(25) a. Only John has **ever** taken the exam. [=20]
b Nobody other than John has **ever** taken the exam.

On the basis of Baker's proposal, Linebarger (1987) provided a detailed analysis of the contexts and conditions under which NPIs are (un)grammatical. She elaborated on the notion of licensing by entailment and argued that it should rather be expressed in terms of *implicature*,

[9] The expression "in construction with" is understood as the relational restriction described above as c-command.

which does not only subsume entailments, but also presuppositions and implicatures. Her theory, which is known as the *negative implicatum theory,* argues that, in cases in which an NPI is not directly licensed because it fails to occur in the syntactic scope of negation, it "contributes to the sentence in which it occurs the conventional implicature that the sentence is being used to convey some proposition in whose lexical representation the NPI does occur in the immediate scope of negation" (Linebarger 1987: 382). Thus, in (24a), the NPI *ever* is assumed to be licit because it gives rise to plausible inferences like (24b), in which *ever* meets the condition of being licensed under the scope of negation. The same reasoning would apply to (25). In Linebarger's approach, the licensing operation in cases like (24a) and (25a) is context-dependent since it requires that the negative implicature assumed to produce the licensing is available in the discourse. That is, it must be assumed that the speaker is attempting to convey the implicated message (e.g. (24b) or (25b)) when uttering the sentence ((e.g. (24a) or (25a)).

However, as Linebarger herself notices, her account lacks a theory of how these implicatures are calculated and judged as available, given that the range of implicatures to be derived from a message is relatively unbounded. This means that her theory could potentially overgenerate to cases in which NPIs are actually ill-formed. Licensing by entailment or implicature, as presented in Baker's or Linebarger's accounts, is often known as pragmatic licensing (or derivative licensing), while licensing by overt negation (i.e. direct licensing) is considered in these works as the paradigmatic case of licensing. Consequently, negation, either overt or derived by pragmatic operations, emerges as the key aspect of NPI licensing in these theories. However, a contrasting idea was simultaneously emerging in the works of Ladusaw (1979; 1980; 1996), which observed negation as merely one the many expressions that could license NPIs, rather than the paradigmatic case. The fundamental claim of Ladusaw's work is that the property that NPI-licensing expressions have in common is the capacity to reverse the direction of entailment of the proposition in which they appear. This proposal, known as the *downward entailing theory*, has been one of the most influential accounts on NPI grammar. Ladusaw's (1979) licensing condition is stated in (26):

(26) α is a trigger for negative polarity items in its scope iff α is downward entailing.[10]

[10] Trigger should be understood as licensor.

This condition is proposed in order to capture the observation that (at least many of) the contexts in which NPIs are found share the property of giving rise to downward entailing inferences –a consideration that is also present in the work of Fauconnier (1975). What is meant by downward entailing (also known as downward monoticity) is that these propositions allow to generate inferences from general to more specific statements –or what is the same, from sets to subsets. Downward entailing functions are the opposite of upward entailing ones. Upward entailing functions support inferences from sets to supersets, and are considered order preserving. Contrarily, by supporting inferences from sets to subsets, downward entailing functions reverse the direction of the entailment pattern, which is why they are seen as order reversing (Giannakidou 2011: 1668–1670). By means of illustration, consider the two examples below. In both cases, the sentences in (27a)-(28a) entail the sentences (27b)-(28b), but not those in (27c)-(28c). From this, it follows that the presence of the sentential negation *don't* in (27) and the indefinite pronoun *everyone* in (28) support downward entailing inferences from sets to subsets (i.e. given that apples are fruits, or that convertibles are cars), but not upward entailing ones (even if fruits are food and cars are vehicles).

(27) a. The kids don't like fruit.
b. The kids don't like apples. (downward entailment)
c. The kids don't like food. (upward entailment)

(28) a. Everyone who owns a car has to pay a parking fee.
b. Everyone who owns a convertible has to pay a parking fee. (downward entailment)
c. Everyone who owns a vehicle has to pay a parking fee. (upward entailment)

Besides explicit negation, the notion of downward entailing captures the grammaticality of NPIs in contexts that are not directly connected to negation, such as adversative predicates (e.g. (17)), the restriction of *every* (e.g. (21)) or the quantifier *few* (e.g. (22)). The downward entailing theory proposed by Ladusaw was an exciting achievement, and it is considered as the outset of what are known as semantic accounts of NPI licensing, in contrast with Klima's and Linebarger's pragmatic accounts reviewed above. As Giannakidou (2011: 1668) put it:

> Klima (1964) coined the term "affective" to unify descriptively negation, questions, and the other environments […], but "affective" remains merely a descriptive label in Klima. Real progress beyond that was made with Ladusaw (1980) who argued that there is an underlying semantic property characterizing all affective contexts: downward entailment.

This line of research on NPI grammar opened the door to a fruitful program in semantics (e.g. Postal 2000; Progovac 1994; von-Fintel 1999; Zwarts 1986). Yet, as it occurred with all the accounts reviewed so far, there are still cases that are not covered by the downward entailing generalization. Challenging examples are questions (e.g. (18)) or the antecedent of conditionals (e.g. (20)), which are not connected to the generation of downward entailing inferences (see Giannakidou 2011 or Rothschild 2006 for analyses of the cases in which the downward entailing hypothesis fails to predict the occurrence of NPIs). Despite the fact that Ladusaw's proposal faces some objections, the relevance of the notion of downward entailing was not discarded but, rather, it was taken as a starting point for further elaborations in the works of many semanticists. As a complementary proposal, we find the *nonveridicality theory of polarity* (Giannakidou 1998; 2006; 2011; 2017) to which we turn below.

The extensive cross-linguistic work carried out by Giannakidou led her to conclude that Ladusaw's licensing condition (i.e. (26)) was too strong, given that there are contexts in which NPIs do not occur in the scope of a downward entailing expression. Consequently, she proposes the concept of *nonveridicality* as a way to capture the logical semantic property that unifies the class of NPI licensors. She argues, instead, that "the main distributional fact about NPIs is that they are excluded from veridical sentences and are allowed in nonveridical ones" (Giannakidou 2011: 1674). The notion of (non)veridicality is defined in terms or truth: "veridical operators express certainty and an individual's commitment to the truth of a proposition, but nonveridical expressions express uncertainty and lack of commitment" (Giannakidou 2011: 1675). Negation, as the prototypical licensor of NPIs, is also the paradigmatic case of a nonveridical expression given that *NOT p* entails that *p* is false. Furthermore, questions or adversative predicates also fail to be veridical (i.e. to track some truth), and are thus seen as nonveridical.[11] To illustrate the notion of (non)veridicality let us compare the sentences in (29), which show the contrast in terms of veridicality of the predicates *believe* and *doubt*. The context *I believe that…* is seen as

[11] In this view, downward entailing operators are conceived as a subtype of nonveridical expressions.

a veridical expression, as it is veridical relative to the speaker (i.e. *I*) because it expresses commitment to truth –even if the content expressed may ultimately fail to be true. In this environment, we observe that the inclusion of the NPI *ever* is ungrammatical. Contrarily, the context *I doubt that…* is nonveridical and hence, the NPI *ever* is licensed.

(29) a. *I <u>believe</u> that you will **ever** pass the exam.

b. I <u>doubt</u> that you will **ever** pass the exam. [=(15)]

The semantic intricacies on which the *nonveridicality hypothesis* is articulated are far more complex than the succinct presentation offered here. Even though we had to gloss over them for reasons of space, the bottom line is that the conception that NPIs are licensed in downward entailing and nonveridical contexts is often taken as the mainstream view on the distribution of NPIs inasmuch as these two notions together succeed in capturing many of the contexts in which these elements are found (although see Barker 2018 for criticisms and alternative proposals).

In the theoretical review presented so far, we have been focusing on how some of the existent hypotheses account for the distribution and licensing conditions of NPIs. In other words, how they provide an answer to Ladusaw's licensing question. Nonetheless, there is a parallel sphere in which NPIs must also be evaluated: this has to do with their functional contribution. As Barker (2018: 2) put it, "what use is polarity? In particular, what communicative purposes might it serve?". The accounts presented earlier have, to a greater or lesser degree, attempted to provide an answer to this question, even if this was not their primary focus. To put it very briefly, it could be said that NPIs serve the function of a) allowing to derive conversational implicatures in Baker's and Linebarger's view, b) signaling that downward entailing inferences are safe in Ladusaw's view, or c) signaling the presence of a non-veridical context in Giannakidou's view. To conclude this revision on the grammar of NPIs, we will turn the focus now to two complementary proposals that are functional in nature because they swirl around the use of polarity to articulate a theory of how NPIs are licensed.

Kadmon & Landman's (1993) analysis of the NPI *any* is one of the most influential theories that focus on the contribution to meaning of NPIs. The functional perspective that the authors take is such that they do away with the licensing contexts, and explain the licensing conditions of NPIs with respect to the semantic suitability of their meaning contribution. This theory could

be called the *widening + strengthening theory* because the fundamental idea is that the function of NPIs is to strengthen the claim expressed by the sentence in which they occur.[12] In this vein, instead of considering that NPIs are licensed (in terms of specific licensing conditions/contexts), the observation is that NPIs occur in contexts in which their contribution to meaning (i.e. widening + strengthening) is pragmatically felicitous, and are banned from contexts in which this contribution to meaning is not met – i.e. it is not pragmatically opportune. The three main ingredients of Kadmon & Landman's theory are listed as follows:

- **Widening**: in an NP of the form *any potatoes*, *any* widens the interpretation of the common NP along a contextual dimension.
- **Strengthening**: *any* is licensed only if the widening that it induces creates a stronger statement, i.e., if the statement on the wide interpretation entails the statement on the narrow interpretation.
- **Locality**: strengthening is to be satisfied by the 'local' proposition that *any* occurs in.

Starting from the last, the so-called locality component captures the configurational requirement on NPIs, an issue which has already been tackled. The notions of widening and strengthening deserve closer examination. To get a concrete idea of the concepts of widening and strengthening, let us consider the dialog in (30), adapted from Kadmon & Landman (1993: 360), where speaker B is presented as a cook who is preparing a meal for 50 people.

(30) A_1: Will there be French fries tonight?
B_1: No, I don't have potatoes.
A_2: Maybe you have just a couple of potatoes that I could take and fry in my room?
B_2: Sorry, I don't have **any** potatoes.

The authors reason that, in a conversational context like (30), the sentence *I don't have potatoes* is only relevant with regard to large quantities of potatoes given that s/he is preparing a meal for 50 people. Even if speaker B has two or three potatoes, this quantity is not enough for a 50 people meal, and thus, the sentence in B_1 would still be true. Nonetheless, when the sentence *I*

[12] Even though the authors focus almost exclusively on *any*, they overtly note that their analysis extends to other NPIs as well (cf. Kadmon & Landman 1993: 375).

don't have ***any*** *potatoes* is used, it shows that speaker B is indicating that s/he does not even have small quantities of potatoes –a reference that was originally excluded from the domain of quantification assumed in B_1. The contrast between the statements in B_1 and B_2 illustrates how the NPI *any* is used to widen the domain of quantification that was previously given. Still, in addition to the widening effect contributed by *any*, for the NPI to be pragmatically felicitous (i.e. licensed) it must also strengthen the statement in which it occurs. That is, the widening effect must make the statement stronger than it would be without the widening, and by stronger, it is meant that the statement with the wider interpretation must entail the statement with the narrow interpretation. That is, B_2 is stronger than B_1 inasmuch as B_2 entails B_1. Kadmon & Landman's conceptualization of *any* –which has not gone without criticisms (cf. Arregui 2008; Giannakidou & Quer 2013)– is the outset of what are known as *scalar* approaches to polarity (e.g. Chierchia 2006; 2013; Fauconnier 1975; Krifka 1992; 1995; Israel 1996; 1997; 2011). Following this current, Chierchia (2006, 2013) and others implemented the notion of widening by focusing on the relevance of subdomain alternatives and scalar inferences in the occurrence of NPIs.

Generally, there is agreement in considering that a great number of NPIs are scalar in nature in that their meaning contains quantificational notions such as amount, degree or intensity. Some authors like Israel have argued that "polarity items as a class are scalar operators and that their peculiar distributions reflect their particular scalar semantics" (1997: 209). The idea that the distribution of NPIs relies on the scalar contribution to meaning they add is often referred to as *scalarity theory*. Among the authors cited above, Chierchia's recent work (2006, 2013) is considered as one of the leading illustrations of this view. In such accounts, the semantic strength of the NPI-containing sentence relative to the inferred set of activated alternatives is observed as a key aspect for licensing. The central idea of scalar approaches to polarity is that the lexical contribution of NPIs like *any* or *ever* corresponds to extreme values along a scale of ordered alternatives that can be contextually inferred, in which the NPI-containing proposition represents the endpoint of the scale –the strongest claim. From this, their distribution follows, such that NPIs are unacceptable in cases in which this meaning contribution is not possible or felicitous. For instance, if we consider the short dialogue in (31), we can see that *ever* refers to a broad time interval which corresponds to speaker B sisters' entire life, the most extreme value in contrast with shorter time intervals that are contextually activated and represent weaker claims, like "during high school" (or "five years ago", "last month", etc.). Consequently, the

NPI *ever* in (31b) is seen as licensed because the claim expressed by the sentence containing it is semantically stronger than the contextually activated alternatives.

(31) a. One of your sisters played the guitar back in high school, right?
b. No, you're mistaken. None of my sisters have **ever** played the guitar.

To conclude, what could be extracted from this simplified presentation of some of the main theoretical analyses of NPI grammar is that the diverse behavior of NPIs still offers some puzzles for linguists to decipher. No single theory is able to account for all the possible environments in which these elements are found to occur, but all existent theories contribute critical insights and emphasize the importance of looking at NPI grammar at the interface of syntactic, semantic and pragmatic mechanisms –even if some theories put more importance in one aspect or another. The different approaches revised, which were only covered in a nutshell, are both varied and complex. Even though cases of direct licensing by explicit negative markers are often observed as the most representative licensing environments, the existent accounts diverge on how the occurrence of indirect licensing is derived, and whether it follows from the same precepts as licensing by explicit negation. While early pragmatic accounts presented a two-step theory that distinguished between direct and pragmatic (i.e. indirect or secondary) cases of licensing, semantic accounts succeed in proposing interesting generalizations like downward entailing and nonveridicality as a means to capture a wide variety of licensing environments appealing to the same operations. Alternatively, other more functionally-oriented proposals focused on the contribution of NPIs in terms of widening, strengthening, and scalar inferences. Ultimately, an important source of commonality is that the existent proposals tend to observe the requirement(s) for polarity licensing as relating to properties of the sentence as a whole in terms of an item-to-context dependency rather than an item-to-item dependency, while most also emphasize the existence of a configurational locality component. Against this backdrop, we now turn to examine the existent studies that focused on the illusory processing of NPIs.

2.2 NPI ILLUSIONS

Overlooking now the divergences among the different linguistic proposals on which are the defining properties that restrict the occurrence of NPIs, there are two ideas that are fairly well

established: first, NPIs must occur within the scope of a licensor or licensing context (i.e. the configurational restriction), and second, one of the most readily recognizable licensing environments is contexts that have a negative element. These two ideas are precisely the features of NPI grammar that have been exploited in the experimental investigations on NPI illusions. Frequently, these investigations make use of a three-way manipulation such as the one showed in (32), which is an example of the experimental materials created by Parker & Phillips (2016). In (32a) the NPI *ever* is grammatically licensed by the presence of the negative quantifier *no* in subject position, while its absence in (32b-c) renders the sentences ungrammatical. In spite of the presence of a negative element in (32b), mere linear precedence is not enough: the negation in (32b) is not structurally accessible to license *ever,* failing to respect the configurational restriction on NPI licensing. Yet, as it was advanced at the introduction of this chapter, the interesting property of sentences like (32b) is that comprehenders often fail to notice their ungrammaticality in online tasks, giving way to a grammatical illusion. Even though (32b) and (32c) are equally ungrammatical, processing experiments find (32b) to be parsed with much more ease than (32c) because the presence of the negative quantifier in the relative clause in (32b) reduces the effects of disruption observed for unlicensed NPIs, such as *ever* in (32c). In this type of design, conditions like (32a) and (32c) are respectively taken as grammatical and ungrammatical baselines, and the key contrast is whether (32b) patterns with one or the other.

(32) a. No authors [that the critics recommended] have **ever** received acknowledgement…

b. *The authors [that no critics recommended] have **ever** received acknowledgement…

c. *The authors [that the critics recommended] have **ever** received acknowledgement…

…for a best-selling novel.

Notwithstanding the above, illusion effects do not always improve ungrammatical sentences like (32b) on a par with perfectly grammatical ones (i.e. 32a). For example, in speeded acceptability tasks, NPI illusions often arise as a three-way distinction among the conditions.[13] In this regard, an NPI illusion is identified when the perception of sentences like (32b) is improved with respect to (32c). Another important idea is that the misperceived acceptability

[13] Given that speeded acceptability tasks present a two-alternative forced choice (yes/no), the three-way distinction arises because not all the participants experience an illusion for all the items.

generated by the inaccessible intrusive licensor seems to be only temporary. When participants are given enough time to judge the sentences, as in offline acceptability ratings, both (32b) and (32c) are generally recognized as equally unacceptable (although cf. Schlueter et al. 2017; Orth et al. 2020a; Xiang et al. 2006; Yun et al. 2017 for evidence of intrusion effects in offline ratings).

The existence of intrusion effects in the processing of unlicensed NPIs, a finding that was later termed NPI illusion, was first discovered by Drenhaus et al. (2005) in German. Comparing sentences like the ones in (33), the authors examined the influence of hierarchical constituency and linear order of the negation *kein* (*no*) on the processing of the NPI *jemals* (*ever*) using an speeded acceptability judgement task[14] and event-related brain potentials (ERPs).[15] The results from their speeded acceptability judgement task revealed that native speakers of German were more accurate in judging sentences like (33a) as acceptable and (33c) as unacceptable than sentences like (33b), which were erroneously accepted in 30% of the cases, doubling the number of errors with respect to the other two conditions. Similarly, the results from their ERP experiment showed that the two ungrammatical conditions elicited an N400 effect followed by a P600. Simplifying considerably, the N400 component reflects cost of semantic integration and the P600 component reflects attempts of syntactic repairs. Yet, the crucial finding from this experiment was that (33b) and (33c) differed significantly in the enhanced amplitude of the N400 component, such that the N400 was weaker in conditions with an inaccessible licensor (i.e. (33b)) compared to conditions with no licensor at all (i.e. (33c)). These results were taken to show that the presence of a linearly preceding but structurally inaccessible negation can promote the semantic/pragmatic integration of an unlicensed NPI.

(33) a. Kein Mann, [der einen Bart hatte], war **jemals** glücklich.
*No man [who had a beard] was **ever** happy.*

[14] By limiting the response time, it is assumed that the speeded acceptability technique provides a close reflection of online parsing decisions, as subjects' responses are not contaminated by conscious grammatical intuitions.
[15] An ERP is the electrophysiological brain response measured using an electroencephalography (EEG) that arises as the result of a specific sensory event, such as exposure to linguistic stimuli. It is an ideal tool to study online linguistic processes because it provides a continuous and millisecond-by-millisecond monitoring of the brain's electrical activity. Different ERP effects (or components) have been identified in the course of the use of this technique in language research. These components are described using quantitative (e.g. peak latency) and qualitative (e.g. polarity or topography) parameters. Common components identified in language processing are the ELAN-early left anterior negativity (which occurs 120-220ms after stimulus presentation), LAN-left anterior negativity (which occurs 300-500ms after stimulus presentation), N400 (a negativity peaking around 400ms after stimulus presentation) or P600 (a positivity peaking between 600-900ms). Each component is typically associated with different linguistic processes (Swaab et al. 2012).

b. *Ein Mann, [der keinen Bart hatte], war **jemals** glücklich.
A man [who had no beard] was **ever happy.*
c. *Ein Mann, [der einen Bart hatte], war **jemals** glücklich.
A man [who had a beard] was **ever happy.*

The interesting discovery reported by Drenhaus and colleagues attracted the attention of many researchers in the field of sentence comprehension, and the existence of intrusion effects in the processing of unlicensed NPIs soon proved to be an empirically robust phenomenon, both across languages and measurements. It has been replicated using methods such as speeded acceptability (*German*: Drenhaus et al. 2005; *English*: de-Dios-Flores et al. 2017; Hildebrandt & Husband 2019; Muller et al. 2019; Orth et al. 2019; Parker & Phillips 2016; Xiang et al. 2006; *Korean*: Yun et al. 2018), self-paced reading (*English*: Parker & Phillips 2011; Parker & Phillips 2016; Ng & Husband 2017; Xiang et al. 2013; *Turkish*: Yanilmaz & Drury 2018; *Turkish-German bilinguals*: Arslan et al. 2017), eye-tracking (*German*: Vasishth et al. 2008; *English*: Orth et al. 2020a; Orth et al. 2020b) or event-response potentials (*German*: Drenhaus et al. 2005; *English*: Xiang et al. 2009; *Turkish*: Yanilmaz & Drury 2018; Lee et al. 2018; *Korean*: Lee et al. 2018). In addition, parallel intrusion effects have been recently identified in the processing of PPIs using eye-tracking (Orth et al. 2020b), and in tag polar questions using speeded acceptability judgements (Orth 2020).

2.2.1 Accounts of NPI illusions

In the present section we will review the main theories that have been developed to explain the emergence of grammatical illusions in the processing of unlicensed NPIs. Picking up on the pioneering work by Drenhaus et al. (2005), the authors suggested that the misperceived acceptability observed for unlicensed NPIs facilitation occurs because "the processor tries to integrate the polarity item by 'looking for' a negator in the sentence context" such that in cases like (33b) "the processor finds a suitable target and a potential analysis is entertained" (2005: 159). Even though this initial approximation to the intrusion effect already advances some ideas that will be developed in later works –namely in Vasishth. et al (2008)– it lacks a detailed account of the grammatical licensing mechanisms or cognitive/memory processes that give way to the illusion effect. The subsequent experimental investigations that continued this line of research explored the source of the interference as the consequence of the misapplication of

two different licensing routes debated in the grammar of NPIs (cf. §2.1): direct licensing by explicit negation (Vasishth et al. 2008) and pragmatic licensing (Xiang et al. 2009; Xiang et al. 2013).

On the one hand, we find the work by Vasishth et al. (2008), who conducted an eye-tracking experiment in German using sentences similar to those in (33a-c).[16] Their eye-tracking findings replicated the pattern of results observed in the speeded acceptability and ERP experiments collected by Drenhaus et al. (2005): while increased processing difficulty was observed at the NPI when it was not licensed, ungrammatical sentences containing an intrusive negation (e.g. (33b)) were read faster this the critical word than ungrammatical sentences containing no negation at all (e.g. (33c)).[17] The main objective of the work conducted by Vasishth and colleagues was to test the predictions of the cue-based memory model with respect to the intrusion effects observed for NPIs.

As reviewed in Chapter 1 (§1.2), the cue-based memory model is based on the idea that the architecture of the memory system(s) that support the resolution of linguistic dependencies operates on the basis of cue-based retrieval of content-addressable items, in which different potential target items are activated in memory by means of retrieval cues (Lewis & Vasishth 2005; Lewis et al. 2006 i.a.). In this model, the successful retrieval of a given item (or chunk) is the result of the item's level of activation and the item's feature match to the retrieval cues. The notion of partial match, which can occur when multiple cues are used during memory access processes, is a key idea in this model's analysis of interference effects during dependency resolution. Figure 1 provides a schema of how the authors apply the theoretical machinery of the cue-based retrieval model to the specific case of (illusory) NPI licensing. This account will be discussed under the label *memory-based hypothesis*, which is, in fact, the most prominent account of NPI illusions these days. Each of the lines in Figure 1 illustrate the matching of the retrieval cues launched at the NPI for each of the three experimental conditions (e.g. (33a-c)). The assumption is that, upon encountering the NPI *jemals*, the parser initiates a search for a target grammatical licensor using semantic (i.e. [+negative]) and syntactic (i.e. [+c-

[16] In addition to the three-way manipulation exemplified in (31a-c) using the NPI *jemals*, the experiment conducted by Vasishth et al. (2008) also included another three conditions that deployed a similar contrast using the PPI *durchaus* (*centrainly*). As we know, PPIs have the property of being incompatible with negative statements. The authors included this additional manipulation in order to test the predictions of the cue-based retrieval model using a type of polarity item that is subject to different licensing conditions. No effect of intrusion was found for PPIs (but cf. Orth et al. 2020b).

[17] The contrast revealing intrusive facilitation reached statistical significance in two eye-tracking measures that are assumed to reflect a mix of early and late processes: right-bounded reading times and regression path duration.

commander]) cues. In the grammatical condition, the two retrieval cues match the feature specifications of the matrix clause subject NP *Kein Pirat* (the target), which is then successfully retrieved. Full match of the retrieval cues is represented in the schema by the use of solid-line arrows. Conversely, in the two ungrammatical conditions, the dashed lines indicate partial-cue matches. In the intrusive condition (e.g. (33b)) the cue [+c-commander] matches the subject NP *Ein Pirat*, while the cue [+negative] matches the embedded NP *keinen Bart*. The authors propose that the intrusion effect arises as the consequence of retrieving the structurally irrelevant embedded licensor due to partial match with one of the two cues (i.e. [+negative]), generating the grammatical illusion – in other words, giving way to similarity-based facilitatory interference.

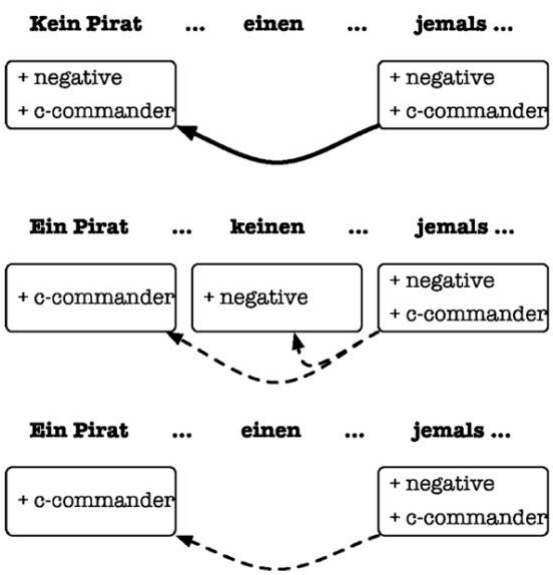


Figure 1: Schematic illustration of retrieval cues at the negative polarity item taken from Vasishth et al. (2008: 695).

Vasishth et al. articulate a detailed computational framing to support the *memory-based hypothesis*, contrasting the cue-based model's quantitative reading time predictions for the experimental conditions against the reading measures obtained in the eye-tracking experiment. Given that the empirical data fit to the model's predictions, it is concluded that the intrusion effect can be best explained by the constraints defined in the cue-based memory architecture. In doing so, they treat NPI licensing on a par with other cases of dependency resolution, providing a unified explanation for cases of interference occurring during the resolution of different linguistic dependencies (e.g. agreement illusions). Crucially, the *memory-based*

hypothesis rests on the assumption that NPI licensing involves establishing a direct item-to-item dependency between the NPI and a grammatical licensor using two retrieval cues (i.e. [+negative] and [+c-command]) –an idea which retains some flavor from cases of direct licensing described in the linguistic literature on the grammar of NPIs. However, as reviewed earlier in the chapter, the reality of NPI licensing is far more complex than resolving dependencies between two syntactic constituents or specific lexical items. Indeed, in spite of the existing discrepancies between the different proposals, there is some consensus among the current leading linguistic accounts to observe NPI licensing as resulting from the semantics and pragmatics of entire propositions.

One of the licensing routes that has been proposed in some linguistic analyses of NPIs argues that that these elements can be licensed pragmatically through negative inferences (Baker 1970; Giannakidou 2006; Linebarger 1987). Building on this idea, Xiang et al. (2009; 2013) contended that illusory licensing could be the result of generating negative inferences about the contrasting set of referents denoted by the relative clause that would rescue the NPI in illusion-like sentences. This proposal, which is described in detail further down, will be referred to as the *pragmatic rescuing hypothesis*. In an ERP experiment, Xiang et al. (2009) put to the test sentences like those in (34).[18] Their manipulation was very similar to the one used in previous studies: they compared sentences with licensed NPIs (e.g. (34a)), ungrammatical sentences with intrusive licensors (e.g. (34b)) and ungrammatical sentences with no licensor at al (e.g. (34c)). Besides using the transparent negation *no* as licensor, they also included grammatical and intrusive sentences containing the less common licensor *very few*, resulting in a five-condition design. This additional manipulation allowed them to test for the existence of interference effects in the absence of overt negation.

(34) a. No/Very few restaurants [that the local newspapers have recommended in their dining reviews] have **ever** gone out of business.

b. The restaurants [that no/very few local newspapers have recommended in their dining reviews] have **ever** gone out of business.

[18]In this study, the authors also included another set of conditions manipulating reflexive binding dependencies. The main goal in doing so was to establish a side-by-side comparison of intrusion patterns between reflexive binding (a "purely" syntactically-driven dependency) and NPI licensing (a dependency that is subject to semantic/pragmatic constraints. In short, their results show that whereas NPIs exhibit illusion effects, reflexives do not.

c. Most restaurants [that the local newspapers have recommended in their dining reviews] have **ever** gone out of business.

The data collected by Xiang and colleagues revealed that encountering the NPI *ever* in the absence of a licensor triggered a P600 effect relative to the grammatical conditions. Nonetheless, the emergence of the P600 component was either attenuated or absent in ungrammatical sentences containing a structurally inaccessible licensor. The effects of intrusive licensing did not differ as a function of licensor type (i.e. *no* vs. *very few*). One insightful characteristic of the ERP patterns reported in this study is that there was no time lapse between the onset of the grammaticality effect and the onset of the intrusive licensing effect, suggesting that "the intrusion effect is not a consequence of processes that are triggered only after the parser fails to identify a grammatically accessible licensor, e.g., reanalysis processes", but rather, "the intrusion effect appears to reflect representations or processes that are already in place at the earliest stages of licensing an NPI" (Xiang et al. 2009: 48). In contrast to Vasishth et al.'s (2008) understanding of intrusive licensing as the result of partial cue match during retrieval –and thus, as a natural consequence of the memory architecture used for dependency resolution– Xiang and colleagues propose instead to look at NPI illusions as an independent phenomenon, emanating from the over-application of indirect or secondary licensing mechanisms that are specific to NPIs.

Their criticism to the *memory-based hypothesis* is motivated by several facts that make the retrieval mechanisms assumed in Vasishth et al.'s proposal unable to account for the range of environments in which NPIs are found. To recall, in the *memory-based hypothesis*, NPI licensing is described as an item-to-item dependency that is resolved by initiating a search for a licensor, activated upon encountering an NPI, which is driven by two cues (i.e. [+negative] and [+c-commander]). However, despite the fact that some lexical items such as negators are often referred to as 'licensors' when describing the distribution of NPIs, the reality is that this is not completely accurate. This is because, as the authors argue, "the root of the licensing conditions does not lie in the lexical licensors themselves" (Xiang et al. 2009: 42). Proof of this can be found in the fact that in some environments it is not possible to pinpoint any specific lexical item as the licensor (e.g. questions). Furthermore, the account by Vasishth et al. (2008) treats negation and c-command as the fundamental features of the licensing process, even though, as already noted earlier in the chapter, none of these features can provide an

exceptionless formal condition on the grammar of NPIs: as shown in (35), NPIs can be licensed in the absence of c-command, and as shown in (36), NPIs can be licensed in the absence of negation.

(35) Nobody's mother has **ever** complained about his grades.
(36) I'm surprised we have **any** sugar.

Thereupon, under the *pragmatic rescuing hypothesis*, it is contended that the erroneous licensing effect observed for illusion-like sentences is the result of the over-application of pragmatic licensing mechanisms that are claimed to be available for some instances of routine successful NPI licensing. This hypothesis builds on two main ingredients: first, some linguistic theories on NPI licensing have argued that sentences like (36) are licensed because they promote negative inferences that place the NPI under the scope of negation (Baker 1970; Giannakidou 2006; Linebarger 1987). For instance, the NPI *any* in (36) is thought to be rescued by the pragmatic inference stated in (37). Second, there exist psycholinguistic evidence showing that the presence of restrictive modifiers (such as relative clauses) triggers the generation of negative contrastive implicatures (e.g. Sedivy et al. 1999). For instance, the relative clause modifier *that are red* in (38a) allows comprehenders to infer a contrast with those apples *that are not red.* Moreover, when there is a property being asserted regarding one member of a contrastive set "the comprehender is invited to consider whether the speaker intends to convey that the assertion is not true of the other members of the contrastive set" (Xiang et al. 2009: 53). Accordingly, a statement like (38b) could be derived from (38a) by a negative contrastive implicature.

(37) I thought we didn't have **any** sugar.
(38) a. The apples [that are red] are sweet.
b. The apples [that are not red] are not sweet.

Putting these two ingredients together allows the authors to draw an interesting parallelism with illusion-like sentences. All the cases of intrusive licensing reported in the literature at that point had been obtained using sentences with restrictive relative clause modifiers. Therefore, in their view, illusory licensing could arise from the generation of negative inferences about the

contrasting set of referents denoted by the relative clause which would not have the asserted property *P*. For instance, in (39), the contrasting set of referents would be formed by those other authors that the critics recommended, which would not have *P* (i.e. they have NOT ever received an acknowledgement). According to the *pragmatic rescuing hypothesis*, the generation of such "pragmatically sensible but by no means logically necessary" (Xiang et al. 2009: 53) negative inferences could be enough to rescue the NPI, producing the licensing illusion. Critically, the claim being made is not that NPI illusions result from valid negative inferences that support pragmatic licensing as it is the case with (36)-(37), but rather, that the possibility of generating those negative inferences results in some momentary pragmatic confusion that is enough to rescue the unlicensed NPI.[19]

(39) *The authors [that no critics recommended] have **ever** received an acknowledgement.

The rationale behind the *pragmatic rescuing hypothesis* is admittedly intricate and, as noted in Muller and Phillips (2020), lacks a detailed explanation for why such negative inferences are not predicted to occur in order to rescue the NPI in the ungrammatical baseline conditions. In this regard, it is worth noting that Xiang et al. (2009) emphasize the importance of the presence of embedded negation in illusion sentences. According to the authors, the presence of a negative quantifier in the relative clause could be the reason why the contrasting set of referents are more salient in the discourse, motivating the generation of negative inferences in those cases. This reasoning would explain why they NPI is not rescued in the ungrammatical baselined condition, as it does not display a negative quantifier in the relative clause. Nonetheless, in our view, the assumption that the presence of a negative quantifier is essential leaves unexplained the fact that NPI illusions are also obtained in sentences using *very few as* an intrusive licensor, as it is indeed shown in their work.

Notwithstanding the above, there is a data point that deserves mentioning inasmuch as it provides interim evidence in favor of the *pragmatic rescuing hypothesis*. In a self-paced reading experiment conducted by Parker & Phillips (2011), the authors compared classic illusion sentences similar to (39), in which the intrusive licensor is nested in a relative clause, with

[19] An explanation along similar lines is proposed in (Mendia et al. 2018). Emphasizing the role of interpretive processes, the authors suggest that some instances of intrusive licensing occur because there is a covert exhaustive operator (e.g. a "silent" *only*) being inferred in a position from which it would scope over the NPI.

sentences in which the intrusive licensor is nested in a complement clause as in (40). Interestingly, their results only showed clear evidence for the existence of a facilitation for ungrammatical NPIs in sentences containing the ineligible licensor within a relative clause (i.e. a restrictive modifier). Given that the presence of a restrictive modifier is a critical ingredient of the *pragmatic rescuing hypothesis*, the lack of intrusive licensing effects in sentences containing complement clauses follows naturally from this account, as these clauses would not promote the generation of negative contrastive implicatures.

(40) *The analyst's prediction [that no stock would fall overnight] was **ever** taken seriously by the financial executive.

A noteworthy aspect regarding the contrast between clause types is that the *memory-based hypothesis* predicts that both relative and complement clauses should generate intrusive effects since the two cases would rely on the same set of retrieval cues and the same configuration of partial cue matches –a prediction that is disconfirmed by Parker & Phillips' data. Nonetheless, their results must be taken with caution given that the reading times obtained in their experiment for relative and complement clauses show a similar trend, and the pattern of statistical contrasts is not as clear as in other studies reporting the presence/absence of illusions. Indeed, a recent ERP investigation conducted by Yanilmaz & Drury (2018b) in Turkish used materials with embedded complement clauses instead of relative clauses, and found clear effects of intrusion, calling the generality of the *pragmatic rescuing hypothesis* into question. Turkish is a particularly interesting language to study NPI licensing because it has configurations in which NPIs precede the licensor or licensing context, generating a prospective dependency.[20] This means that encountering an NPI in the discourse predicts the upcoming presence of a licensor. Turkish NPI configurations contrast with the English and German examples discussed so far, where NPIs are licensed retrospectively by the preceding context. Even though Turkish NPIs are subject to similar structural restrictions (i.e. they are licensed within the scope of negation), a critical grammatical feature is that the range of possible licensing environments in Turkish is more restrictive than that of English. In the authors' view, the "confined source of available environments might in fact make these dependencies in Turkish more like an item-to-item

[20] Other languages like Japanese and Korean also exhibit proactive NPI licensing configurations. See Yun et al. (2018) for evidence of intrusive processes in Korean.

dependency". This observation prompts the authors to frame the attested intrusion results in Turkish within the postulates of the *memory-based hypothesis*, with the additional caveat that it may be a valid explanation for Turkish specifically, further suggesting that NPI illusions could have several possible sources that surface cross-linguistically or even for different NPI configurations within a given language.

While the *memory-based hypothesis* and the *pragmatic rescuing hypothesis* appeal to different grammatical resources that have been discussed in the linguistic literature to license NPIs (i.e. direct item-to-item vs. pragmatic inferences), they both explain the intrusion effect by appealing to the misapplication of the licensing mechanisms activated when encountering the NPI. Accordingly, the two views predict, in broad terms, that the intrusion pattern should generalize to different items and configurations whenever an NPI is encountered in illusion-like sentences –at least when relative clauses are used to host the intrusive licensor. Nonetheless, a more recent investigation by Parker and Phillips (2016) has provided compelling experimental and modeling evidence showing that the configurations that yield NPI illusions are more restricted than it was initially thought. In a series of experiments, they demonstrate that the intrusion effect can be turned off by simply increasing the distance between the NPI and the illicit licensor, using sentences like in (41) and (42).[21] This behavior is not predicted by previous accounts.

(41) The authors [that no critics recommended] have received **any** acknowledgement for a best-selling novel.
(42) The authors [that no editors recommended] have, as the editor mentioned, **ever** received a pay raise.

Parker and Phillips (2016) argue that the *on/off* behavior of NPI illusions points to changes in the status of the encoding that is probed for licensing at the point of dependency formation, emphasizing the idea that linguistic encodings are not stable but, rather, take some time to

[21] Note that the post-verbal placement of *any* in (41) is already enough distance in order to turn the illusion off. This result may seem initially surprising if distance alone is taken into account given that *any* only appears one word to the right in comparison with the classic illusion configuration with *ever*. Nonetheless, the fact that it appears after the main verb is not a trivial issue. The authors propose that the lack of illusion effects in sentences like (41) is due to the fact that the NPI occurs after the main verb, which is possibly a highly informative cue for structure-building operations, preventing thus the appearance of illusions. It is unlikely that this behavior is explained due to semantic or licensing differences between *ever* and *any*, given that the two NPIs are subject to similar licensing requirements. Indeed, studies carried out using NPI equivalents to *any* in other languages have shown evidence for intrusion effects (e.g. Lee et al. 2018; Yanilmaz & Drury 2018a).

complete. According to this proposal, which will be referred to as the *changing encodings hypothesis*, NPI illusions reflect access to intermediate stages of the encoding process. When the NPI is checked against the licensing context soon after the relative clause has been encountered, the irrelevant negation may be transparently accessible to spuriously license the NPI. However, when the encoding of the licensing context is accessed at a later point in time, as in (41) and (42), the material inside the relative clause is presumed to be fully encoded and no longer accessible for licensing. Even though this proposal focuses on memory encoding mechanisms rather than retrieval ones, this view is presented as compatible with a cue-based parsing architecture. Putting together ideas from Vasishth et al.'s (2008) proposal with other parsing models that do assume that the format of representations changes over time (e.g. tensor-product variable bindings or vector-based models), Parker and Phillips (2016) speculate that NPI illusions could result from a two-stage representation building process: during a first stage, individual feature values –such as negation– are thought to be transparently accessible giving way to partial match interference. Thus, the licensing illusion could occur during this first stage. In the second stage, individual features are thought to be bound together into a distributed representation and they could no longer be independently evaluated, blocking illusions to happen. This explanation can account for the presence of interference in classic illusion examples like (39), and its absence in sentences like (41) and (42).

The work by Parker & Phillips does not only demonstrate the impact of distance in cancelling the occurrence of NPI illusions. By including a similar distance manipulation using agreement dependencies, the authors also show that increasing the amount of material that intervenes in the subject-verb dependency does not turn agreement illusions off such that similar intrusion effects are found in sentences like (43a) and (43b). Likewise, Xiang et al. (2013) compared the intrusion profiles of NPIs and agreement dependencies as a function of individual differences with the goal of providing further evidence to support the *pragmatic rescuing hypothesis.* They showed that interference effects in NPI dependencies were modulated by participants' pragmatic abilities (quantified by the Autism Spectrum Quotient), such that participants with more autistic traits were less susceptible to intrusion effects. However, the presence of intrusion effects in agreement dependencies was not modulated by individual pragmatic abilities. Further evidence showing differences between NPI and agreement illusions is shown in a work conducted by Ng & Husband (2017) which investigates the at-issue/not-at-issue divide. By placing the intrusive licensor within relative clauses (at-

issue) and appositives (not-at-issue), the authors show that agreement illusions disappear in the later context, while NPI illusions arise in the two types of sentences.

(43) a. According to the janitor, the key to the cabinets probably **was/*were** destroyed by the fire.

b. The key to the cabinets, according to the janitor, probably **was/*were** destroyed by the fire.

All in all, the existent variability in the illusion profiles of agreement and NPIs underscores the challenge of explaining the two phenomena as a result of the same mechanism, as it is elegantly attempted under the *memory-based hypothesis*. The uniform treatment of illusory phenomena proposed by the cue-based memory retrieval model has the advantage of emphasizing the similarity of the two phenomena regarding (some of) the processing outcomes, but such a treatment neglects the existent differences in the grammatical constraints that define the dependencies. Closer grammatical inspection of the phenomena could provide significant insights into the observed intrusion profiles and the parser's implementation of such grammatical operations.

To come to the end of this review, we will introduce an existing speculation about NPI illusions that has not been explicitly maintained or experimentally tested so far, but which will be particularly relevant for some of the experiments presented in Chapter 3. We will refer to this alternative as the *ever-never confusability hypothesis*, and in spite of the lack of attention in the literature, it is briefly discussed by Parker and Phillips (2016: 227–228).[22] This account proposes that an error in signal detection generating a confusion between *ever* and *never* could be behind the improved perception of NPI illusion sentences. Such a confusion is thought to be facilitated by the orthographic and phonological similarities of the two words, and crucially, because substituting *ever* with *never* would provide a grammatical continuation for NPI illusion sentences (e.g. (44)).

(44) The authors [that no critics recommended] have ***ever/never** received acknowledgement for a best-selling novel.

[22] A brief vindication of this proposal was introduced by Roger Levy during the question period of Dan Parker's talk at the 2017 CUNY Conference. It can be watched in this link https://ats.ucdavis.edu/ats-video/?kpid=0_pnanun9p by scrolling down to Dan Parker's talk (nº94) and advancing to minute 28:04.

A process of this sort can be conceptualized under a noisy-channel architecture of sentence comprehension (Levy 2008a; 2008b; Levy et al. 2009; Gibson et al. 2013). Noisy-channel models assume that retaining each individual word in short-term memory introduces a degree of uncertainty about the previous input. When processing problems are encountered, this uncertainty gives rise to the possibility of misrepresenting previous words in the sentence in cases in which a near neighbor would allow a more probable structure and/or repair an error in the input. For the case of NPI illusions, uncertainty about the input is expected to increase when comprehenders encounter an unlicensed NPI, causing *ever* to be misrepresented in a proportion of cases as its near neighbor *never*, repairing the ungrammaticality. But, why would comprehenders misrepresent the input for sentences with an irrelevant licensor (e.g. (44)) and not for sentences with no licensor at all (e.g. (45))? A possible explanation is that *never* is actually a more plausible continuation for sentences containing the negative quantifier in the relative clause than it is for sentences without it. If we compare (44) and (45), it seems easier to conceive a situation in which a set of authors have never received acknowledgement when they were not recommended by the critics as in (44), than when they were recommended by the critics as in (45). Consequently, *ever* could be more often misrepresented as *never* in (44) than in (45), explaining the improved perception of NPI illusion sentences.

(45) The authors [that the critics recommended] have ***ever/never** received acknowledgement for a best-selling novel.

To sum up, in this section we have reviewed the collection of existing psycholinguistic investigations on NPI illusions that have been brought to our attention. Through these investigations, we have learned that intrusion effects are consistent across languages and methods, that NPI illusions obtain when using different configurations and intrusive licensors, that they can be modulated by general pragmatic abilities and that they can be turned off by increasing the distance between the intrusive licensor and the NPI. This evidence was grouped around four main accounts: the *memory-based hypothesis,* the *pragmatic rescuing hypothesis*, the *changing encodings hypothesis* and the *ever-never confusability hypothesis*. Each of these accounts is supported by different data points or observations and makes different predictions, paving the way for further research. With this in mind, the research agenda presented in Chapter 3 will investigate two hitherto unexplored configurations in an attempt to narrow down the

landscape of hypotheses on NPI illusions. Before moving to Chapter 3, the next section will present some more relevant background information on multiple negation.[23]

2.3 SOME NOTES ON THE GRAMMAR AND PROCESSING OF MULTIPLE NEGATION

Leaving NPIs momentarily aside, in this section we change the subject in order to introduce some important considerations on sentences containing multiple negation markers. In Experiments 1-3 from Chapter 3, we will be studying the processing and acceptability of sentences like (46). The reader might have possibly noticed that these sentences are very similar to those used by Parker & Phillips' study on NPI illusions, with the only change that the NPI *ever* has been replaced by the negative adverb *never*. Such a manipulation will be particularly relevant in order to put the *ever-never confusability hypothesis* to the test, even though the specific assumptions and hypotheses regarding how these sentences relate to NPI illusions will be described in detail in the corresponding sections of Chapter 3. Nonetheless, the reason to introduce them here is to advance some relevant background information on the (psycho)linguistics on sentences containing multiple negation markers and to clarify a few labels.

(46) a. The authors [that the critics recommended] have **never** received acknowledgement…
b. The authors [that no critics recommended] have **never** received acknowledgement…
c. No authors [that the critics recommended] have **never** received acknowledgement…
…for a best-selling novel.

It is a well-known observation that all natural languages express negation (Horn 2001). Yet, in spite of the high frequency with which negative expressions appear in routine language use, negative statements have been related to an increase in processing effort when compared to

[23] To the best of our knowledge, the only existing hypothesis or speculation that has not been covered in this review is the possibility that NPI illusions are the result of a misparse which makes the NPI being initially built within the relative clause -» structure. There are two main reasons why this proposal is not covered in the main text. First, it is disconnected from the research agenda presented in Chapter 3. Second, and most importantly, it seems an unpromising route of enquiry. The possibility that NPI illusions arise as a consequence of a parsing error seems to be discarded by the existence of unpublished data collected by M. Xiang (C. Phillips, personal communication, September-December 2016). In their experiment, comprehenders were presented with an auditory version of NPI illusion sentences in which the phrase boundaries were made salient through prosody. The results showed that illusions appeared irrespectively of whether prosodic boundaries were clearly marked. However, this finding does not coincide with the results from a study conducted by Yun et al. (2017) in Korean using an offline acceptability listening task. In this work, the authors argue that illusions are modulated when phrase boundaries are made salient through prosody. Nonetheless, the effects reported by Yun et al. are statistically marginal, and the fact that Korean displays prospective NPI licensing is another factor that should be taken into account when comparing the two works.

equivalent affirmative statements (Carpenter et al. 1999; Fischler et al. 1983; Herbert & Kübler 2011; Kaup et al. 2006; Wason 1961).Within the existing theories and debates on the processing and representation of negation, some authors have proposed that the increased difficulty comes from the fact that negative sentences are processed in two stages: first, by representing the affirmative proposition, and second, by reversing the truth conditions of such a representation (Clark & Chase 1972). Nonetheless, this is an ongoing debate which is far from concluded, and other works have shown that negative statements are actually not as hard to parse when the negation is pragmatically licensed –or in their words, when it is "a natural thing to say" (Nieuwland & Kuperberg 2008). Another important point about negation in natural language is that there is vast cross-linguistic variation on how the operation of negation can be carried out with regard to "the position of negative elements, the form of negative elements and the interpretation of sentences that consist of multiple negative elements" (Zeijlstra 2007: 498), the latter being of particular relevance here.

In English, negation can be marked by words (e.g. *no, not* or *never*) or by affixes (e.g. *-n't* or *in-*). For instance, in the single negation condition in (46a), the negative adverb *never* expresses sentential negation. As regards the presence of more than one negative element in a sentence, one can often find sentences composed of two clauses that are independently negated. This case is illustrated by multiple negation sentences such as (46b), where we find the negative quantifier *no* nested in the relative clause and the negative adverb *never* in the main clause. Zeijlstra points out that these sentences should not be considered as double negation because "two propositions are negated once, but no proposition is negated twice" (2004: 58), which means that each negation must be interpreted independently. To avoid confusion, the label *multiple negation* will only be used to refer to sentences of this type. Furthermore, sometimes one finds two negative elements occurring in the same clause. When negations interact in the same clause, they can form two types of dependencies: negative concord or double negation. Negative concord dependencies are observed in languages in which the presence two negative elements is interpreted as a single semantic negation (e.g. Spanish, Italian or African-American Language). Conversely, Standard English is commonly classified as a double negation language, in which each negative marker contributes an independent semantic negation. In double negation languages, the two negative elements cancel each other out yielding an affirmative interpretation as a result (Horn 2001; 2010; Puskás 2012; Swart 2010 i.a.). This is exemplified by the double negation sentence in (46c), which could be paraphrased as *All the*

authors that the critics recommended have received acknowledgement for a best-selling novel at least once.

Double negation dependencies are known to be difficult to interpret and entail complex operations in terms of the syntactic, semantic and prosodic marks that are needed. For instance, it has been found that the use of specific contradictory intonational contour and denial gesture features are crucial for the felicitous interpretation of double negation dependencies in oral comprehension tasks (Espinal & Prieto 2011; Prieto et al. 2013). In written format, a corpus study conducted by Larrivée (2016) found that double negation dependencies are generally triggered in restricted information-structure configurations in which a discourse-old negative statement is being denied by the second negation. Due to their complexity, double negation dependencies are assumed to engage in greater processing cost than negative concord dependencies or single negation (Corblin 1996). Yet, unfortunately, the psycholinguistic studies on the processing of double negatives are very scarce.

Using a sentence verification task, Sherman (1976) tested multiple combinations of negative elements (from one up to five negative markers) including combinations of sentential negation with affixal and semantic negation (e.g. *not, no one, doubted, un-*). His results clearly show that the presence of two negative elements in a sentence considerably increases comprehension time and error rates. Another study by Schiller and colleagues (2017) used the Event-Related Potential technique in order to study configurations that combine verbal negation and affixal negation (e.g. *not impossible*). Their findings show that, at least for these simpler combinations, the processing disruptions associated with double negation can be overruled by discourse contexts that clearly evoke negative expectations. Putting the evidence from these previous studies together, it appears that instances of double negation seem to present parsing difficulties when there are not explicit pragmatic cues that help predict the double negative dependency. Along these lines, Blanchette (2013; see also Blanchette et al. 2018) maintains that speakers of Standard English tend to interpret instances of double negation as negative concord dependencies when they are encountered in the absence of the relevant cues. This claim is also supported by experimental evidence provided by Thornton et al. (2016), showing that young children acquiring Standard English initially perceive double negation configurations as forming negative concord dependencies. Taking all this into account, our starting assumption is that the double negation dependencies such as (46c) will generate strong processing difficulties and will be deemed unlicensed when encountered in isolation. The remaining

information regarding our assumptions for the sentences in (46) and their relevance for the study of negation and NPI illusions will be presented in the corresponding section of Chapter 3 (§3.1).

2.4 CONCLUSIONS

This chapter provides the necessary linguistic and psycholinguistic background for the experimental agenda that is laid out in Chapter 3. First, we revised the main linguistic theories on the distribution of NPIs. Then, we focused on the phenomenon of NPI illusions and the relatively recent but somewhat abundant experimental investigations on the topic, paying particular attention to the hypotheses that attempted to explain the intrusion effect. Finally, we introduced some basic information about sentences containing multiple negation markers. All this information is interrelated in several ways. As we have seen, there are two hypotheses on NPI illusions –namely, the *memory-based hypothesis* and the *pragmatic recuing hypothesis*– that appeal to the misapplication of different constraints discussed for NPI licensing: direct licensing by negation in an item-to-item dependency and pragmatic licensing. The other two hypotheses for NPI illusions discussed in this chapter –namely, the *changing encodings hypothesis* and the *ever-never confusability hypothesis*– resort to processes that are not directly related to NPI grammar, but instead, appeal to other cognitive domains such as encoding and errors in signal detection. Furthermore, the existent linguistic theories on NPI licensing and the information provided on sentences with multiple negation markers will be of high importance for our discussion of the research presented in Chapter 3. Our experiments are designed to test a few predictions that can be directly extracted from the different hypothesis on NPI illusions in an attempt to narrow down the landscape of inquiry by testing two novel configurations which represent the first experimental attempt to study the *ever-never confusability hypothesis* and the occurrence of NPI illusions in sentences containing intrusive verbal negation. In doing so, we also hope that our results enable us to extract significant conclusions that can inform the grammar of NPIs and the processing of sentences with (multiple) negation markers.

3 NEGATIVE POLARITY ITEM ILLUSIONS: EXPERIMENTAL EVIDENCE

In this chapter we present the results from 6 experiments and a corpus study conducted in English aimed at contributing to a better understanding of NPI illusions. To this end, we will take as a starting point the classic illusion configuration –instantiated in (47)–, to which we will introduce minimal changes that will provide a testing ground for some of the main existing hypotheses on the intrusion effect that have been proposed by previous works on the topic and which have been reviewed in the previous chapter (§2.2.1).

(47) *The authors [that no critics recommended] have **ever** received acknowledgement for a best-selling novel.

The chapter is organized in two main blocks which correspond to the two types of manipulations that will be investigated. In the first part, we will study multiple negation configurations. Specifically, we will focus on sentences like (48), in which the NPI *ever* has been substituted by the negative adverb *never*. As can be observed by the absence of an asterisk at the beginning of the sentence –in contrast with (47)– the sole introduction of an *n*– renders the string grammatical. It is likely that the reader has been able to deduce that this configuration will allow us to test the predictions of the *ever-never confusability hypothesis*. But this is not the only hypothesis whose predictions will be relevant here. In our view, and as it will be detailed shortly, the results obtained in this first part of the chapter are also relevant in the context of the *changing encodings hypothesis*.

(48) The authors [that no critics recommended] have **never** received acknowledgement for a best-selling novel.

The second part of the chapter will focus on contrasting licensor types. To do so, we will compare the online and offline behavior of illusion-like sentences containing a negative quantificational intrusive licensor (i.e. *no* as in (47)) and similar sentences containing verbal negation (i.e. *not* as in (49)). According to the main hypotheses on NPI illusions reviewed in Chapter 2, sentences such as (49) would be expected to exhibit a similar illusion pattern to the widely attested intrusion effects in sentences like (47). Nonetheless, no negative element other than the quantifier *no* had been previously used as intrusive licensor. For this reason, the research presented in the second part of this chapter represents a crucial empirical test for the applicability of the proposed explanations of NPI illusions while it can also restrict in a critical way our view of the linguistic environments in which illusions obtain.

(49) *The authors [that the critics did not recommend] have **ever** received acknowledgement for a best-selling novel.

The empirical evidence collected in this chapter will allow us to narrow down the landscape of hypotheses on NPI illusions. We shall advance here that the existing leading accounts on the phenomenon have been found to be unable to account for the patterns observed. This will lead us to consider some alternative explanations introduced towards the end of the chapter that chart a path for further research. It must be emphasized that the objective of this research is not to arbitrate among competing linguistic theories on NPI licensing but to examine the online processing mechanisms that give rise to NPI illusions. In other words, what causes NPI illusions? Such an endeavor has the potential of informing on the online grammatical implementation of NPI licensing mechanisms and the processing and perception of (multiple) negation.

3.1 MULTIPLE NEGATION CONFIGURATIONS

The experiments[24] that conform this first part of the project make use of different configurations of negative elements that were devised as a means to put to the test the contrasting predictions

[24] The three experiments that are presented in §3.1 have been published in de-Dios-Flores (2019), a paper contribution entitled *Processing sentences with multiple negations: Grammatical structures that are perceived as unacceptable* that appeared in Frontiers in Psychology – Language Sciences. Accordingly, there is a substantial overlap between the text that conforms §3.1 and the contents of the published article, which can be found here: https://doi.org/10.3389/fpsyg.2019.02346. All Frontiers articles are Open Access and distributed under the terms of the Creative Commons Attribution License, which permits the -»

of two previous accounts of NPI illusions: the *changing encodings hypothesis* and *the ever-never confusability hypothesis.* For this purpose, we will examine the processing and acceptability of grammatical sentences which vary the presence and structural location of the negative determiner *no* with respect to the negative adverb *never*. This manipulation results in the three contrasts shown in (50): single negation (50a), multiple negation (50b), and double negation (50c).

(50) a. The authors [that the critics recommended] have **never** received acknowledgement…
b. The authors [that no critics recommended] have **never** received acknowledgement…
c. No authors [that the critics recommended] have **never** received acknowledgement…
…for a best-selling novel.

The main objective of the project is to study the processing and acceptability of multiple negation sentences like (50b). In these sentences, the negative adverb *never* is linearly preceded by a structurally inaccessible negation, the quantifier *no* inside the relative clause. Multiple negation sentences could be considered the opposite configuration of NPI illusions in that when the NPI *ever* is substituted by *never* they become grammatical strings. More importantly, as noted in Huddleston and Pullum (2002: 831–832), the words *ever* and *never* are semantically and etymologically related: both elements express a quantification in terms of frequency or temporal location, despite having different syntactic distributions. While the NPI *ever* adds a quantificational force to an already negated statement, *never* expresses the negative and quantificational forces at the same time. Thus, sentences like *No authors have ever received acknowledgement* and *The authors have never received acknowledgement* are roughly equivalent. In order to study the processing and acceptability of multiple negation sentences, they will be compared to single negation and double negation sentences using three tasks: a speeded acceptability task (Experiment 1), a self-paced reading task (Experiment 2) and an untimed acceptability judgment task (Experiment 3). The first two experiments are devised to tap into the online/fast processing of these structures while Experiment 3 focuses on speakers' offline/slow perception of acceptability.[25] A conjoint discussion of Experiments 1-3 will be

use, distribution, and reproduction in other forums. At the time of publication, Frontiers in Psychology was a SJR-Q1 journal (Psychology-misc.) and had an impact factor of 2.067.

[25] The order of presentation of these experiments differs from the structure that is used in the rest of the dissertation, in which the offline acceptability ratings are presented before the online experiments, as it is generally done in most works on the topic of grammatical illusions. The chief rationale for inverting the order of presentation in this section is twofold: first, we wanted

provided at the end of this first part of the chapter, before moving to the second set of experiments presented in §3.2.

Importantly, the three experimental conditions tested here are grammatical in English, even though they vary in their syntactic and semantic complexity. For the purpose of this investigation, single negation sentences are taken to be the simplest of the three and serve as an unproblematic baseline for comparison given that they are expected to be processed with relative ease and to be recognize as acceptable. On the other end, instances of double negation are assumed to generate processing and acceptability problems, and are used as some sort of 'unacceptable' or degraded baseline. These initial assumptions are based on previous linguistic considerations which have been reviewed in Chapter 2 (§2.3). Nonetheless, these assumptions are set to test in the experiments that follow, and their endorsement is essential in order to interpret them as baselines against which multiple negation sentences will be compared. Before moving into the experimental evidence, let us discuss the specific predictions that relate multiple negation sentences to NPI illusions.

Given that the grammar of *never* is not constrained by the licensing conditions that affect NPIs, this investigation does not address explanations of NPI illusions that invoke the faulty implementation of NPI-specific licensing mechanisms (Vasishth et al. 2008; Xiang et al. 2009; Xiang et al. 2013). The interest of this project lies, instead, in exploring two conflicting predictions that can be extracted from the *ever-never confusability* and the *changing encodings hypotheses*. Multiple negation sentences provide a ground for testing these two proposals because they predict opposite patterns of results.

On the one hand, if NPI illusions are the result of misrepresenting *ever* as *never*, as argued within the *ever-never confusability hypothesis*, multiple negation sentences display the precise configuration that is assumed to rescue unlicensed NPIs. In a noisy-channel architecture, comprehenders are assumed to be likely to misinterpret *ever* as *never* in cases in which *never* provides a more plausible and/or natural sentence. Here, a correspondence is assumed between plausibility and grammaticality, as sentences containing *never* are thought to be more plausible because they provide a grammatical and meaningful continuation. This account on NPI illusions predicts that multiple negation sentences should be recognized as acceptable by native speakers

to respect the way in which the experiments were published in de-Dios-Flores (2019). Second, we believe it is easier to account for the results if the online experiments are presented before the offline rating –which was the reason why the experiments were published in this order in the first place.

of English and should be parsed with ease. Accordingly, if multiple negation sentences are perceived as acceptable, they are expected to pattern closer to single negation sentences (which are assumed to be perceived as acceptable) than to double negation sentences (which are assumed to generate problems). We should emphasize that these predictions result from our interpretation of the *ever-never confusability hypothesis* within a noisy-channel architecture, as this proposal had not been explicitly articulated until now. In our view, an explanation that appeals to a misrepresentation of *ever* as *never* is in conflict with multiple negation sentences generating strong processing or acceptability problems because such a misrepresentation is only motivated when it leads the parser into an acceptable and unproblematic structure. Nonetheless, it is true that the *ever-never confusability hypothesis* –or for that matter, any other account of NPI illusions– does not predict illusion sentences to be perceived on a pair with perfectly grammatical ones. Yet, this hypothesis rests on the assumption that similar sentences containing *never* should be generally processed and recognized as acceptable.[26]

On the other hand, the *changing encodings hypothesis* put forth by Parker and Phillips (2016) predicts the opposite outcome. Under this view, NPI illusions are seen as result of accessing incomplete computations of the material inside the relative clause that includes the quantifier *no*, facilitating a dependency between the spurious licensor and *ever*. The negative quantifier could be retrieved as a licensor –possibly following a cue-based procedure– because its individual features would be transparently accessible in early stages. Accordingly, the same intermediate stage computations could be in place in multiple negation sentences up to the point when participants reach *never*. If the negation inside the relative clause has not been bounded into a distributed representation when *never* is encountered, the parser may experience problems in having to integrate two negative elements simultaneously. This cost is predicted to manifest as a disruption in reading times in multiple negation sentences relative to single negation. Importantly, the content that precedes *never* in multiple negation sentences is the same that precedes *ever* in Parker and Phillips' (2016) illusion configurations. Thus, finding similar interference effects in online tasks could indicate that the same incomplete encodings that temporarily improve the perception of ungrammatical NPI configurations are responsible

[26] It must be noted that under the assumptions of a noisy-channel architecture, it is possible that *never* is misrepresented as *ever* in cases in which the later allows a more probable structure (e.g. *No one never came*). Nonetheless, as an explanation of NPI illusions, the *ever-never confusability hypothesis* is not assumed to go both ways. If substituting *ever* with *never* is what is thought to improve the perception of the unlicensed NPI *ever* in illusion sentences, then, *never* is assumed to be parsed without problems.

for hampering the comprehension of grammatical multiple negation sentences. A possible speculation is that the disruption predicted in multiple negation sentences could index the parser's difficulties evaluating a double negation dependency between *no* and *never*. Assuming that double negative dependencies are problematic in the absence of enough contextual cues, entertaining an illusory double negation dependency is expected to generate similar effects to those predicted for actual double negation sentences. In this respect, we are drawing from NPI illusions in order to explore a candidate structure for illusions of ungrammaticality: that illustrated by multiple negation sentences (i.e. (50b)).

In sum, the fundamental question that this research aims to answer is whether multiple negation sentences are processed and judged closer to single negation sentences (which are expected to be processed without any problems), or to double negation sentences (which are expected to generate strong disruptions). Moreover, although this investigation takes NPI illusions as a point of departure, we hope that it will also provide insights into the processing and grammatical status of double negation dependencies, a phenomenon that still remains poorly explored from a psycholinguistic perspective.

3.1.1 Experiment 1: speeded acceptability

Experiment 1 used the speeded acceptability technique to investigate whether the perception of grammatical sentences containing two negation markers is degraded for sentences in which these negative elements do not engage in a negative dependency –i.e. for the multiple negation condition. Speeded acceptability judgments are generally considered an online technique because the limited amount of time provided to respond forces participants to operate on fast and unconscious intuitions of grammaticality. They have been reliably used as a time-sensitive measure to test NPI illusion configurations (e.g. Yanilmaz & Drury 2018; Drenhaus et al. 2005; Muller et al. 2019a; Parker & Phillips 2016).

3.1.1.1 Participants

28 native speakers of English (19 female, mean age 20 y/o) participated in this experiment. They were recruited through the University of Maryland's participant database. Participation was compensated with a credit in an introductory linguistics course or, alternatively, with $10. The speeded acceptability task was administered together with another unrelated experiment as part of a 1-hour testing session. All the participants in this and the following experiments

provided informed consent and were naïve to the purpose of the task. For all the experiments presented in this chapter, none of the subjects that took part in a given task were allowed to participate in any other experiment.

3.1.1.2 Materials

The experimental materials consisted of 36 sets of 3 items like those presented above which are repeated in Table 1. The entire list of experimental materials can be consulted in Appendix A.1. These were adapted from the stimuli used in Parker and Phillips (2016) by solely substituting the NPI *ever* by the negative adverb *never*. The experimental conditions were counterbalanced in three lists using a Latin Square design, together with 72 filler sentences of similar internal structure, length and complexity. Each list had a total of 108 items and participants were randomly assigned to one of the three lists. Grammaticality was balanced so that half of the sentences were ungrammatical. This ensured that the initial probabilities of providing a *yes* or a *no* answer were equal across the task. For this purpose, double negation sentences (condition C) were counted as ungrammatical. To achieve a 1:1 grammatical-to-ungrammatical ratio roughly half of the fillers contained ungrammaticalities. The grammatical violations introduced included preposition usage, number agreement, verbal morphology and pronoun-antecedent mismatches. During the delivery of the instructions, participants were asked to complete 6 practice items to ensure that they had understood the procedure.

Table 1. Experimental materials for Experiment 1.

A. Single negation	The authors [that the critics recommended] have **never** received acknowledgement…
B. Multiple negation	The authors [that **no** critics recommended] have **never** received acknowledgement…
C. Double negation	**No** authors [that the critics recommended] have **never** received acknowledgement…
	… for a best-selling novel.

3.1.1.3 Procedure

The stimuli for this speeded acceptability task were presented on a desktop PC using Ibex (Drummond 2013). Each sentence was displayed word by word at a rate of 400 ms per word, in the center of the screen, using the rapid serial visual presentation (RSVP) paradigm. At the end of each sentence, a response screen appeared and participants were asked to provide a *yes*/*no* button press judgment in a maximum time of 2 seconds. When participants failed to provide the judgment in time, a message indicated that they were too slow. Participants were instructed to read the sentences carefully and judge whether they came across as well-formed

English. They only received feedback for the first two practice items. All participants were tested on the same computer. The task lasted for approximately 30 minutes and the order of presentation for experimental and filler sentences was randomized for each participant.

3.1.1.4 Analysis

The *yes/no* responses collected were analyzed using a generalized linear mixed model for binomial distributions (also known as logistic mixed model, Baayen et al. 2008; Jaeger 2008). A maximal model with a fully specified random effects structure was initially built. This model included the experimental conditions as fixed effects and by-participants and by-items random intercepts and slopes for the experimental conditions. Yet, this model failed to converge and had to be reduced to a model with random intercepts but no slopes. This was the maximally converging model. As noted in Barr et al. (2013: 23–24), categorical data tend to pose more difficulties for maximal models to converge. For this and the following two experiments, the contrasts among the three experimental conditions were obtained as follows: first, condition A (single negation) was used as the reference level of the intercept in order to obtain the contrasts between A and B (multiple negation) and A and C (double negation). Then, the contrasts between B and C were obtained by setting B as the intercept. All the analyses reported in this chapter were carried out using R, an open-source programming environment for statistical computing (R Development Core Team 2014). Specifically, the models were estimated using the package *lme4* for linear mixed effects models (Bates et al. 2015). Following Gelman and Hill (2006) an effect was considered statistically significant at the $p>0.05$ level when the absolute *z*-value was above 2.

3.1.1.5 Results

Figure 2 shows the percentage of *yes* responses to each of the three experimental conditions. Sentences containing a single negation (condition A) were judged as acceptable in most cases (above 80% acceptance). The presence of two negations significantly reduced the perception of acceptability for both multiple negation (A vs. B: Estimate= -1.48, *SE*= 0.21, *z*= -7.06) and double negation sentences (A vs. C: Estimate= -3.05, *SE*= 0.23, *z*= -13.35). Nonetheless, the decrease in acceptability was less acute when the two negations appeared in different clauses (condition B, above 60% acceptance) than for traditional double negatives (condition C, below

30% acceptance). This contrast was statistically significant (B vs. C: Estimate= -1.57, *SE*= 0.19, *z*= -8.31).

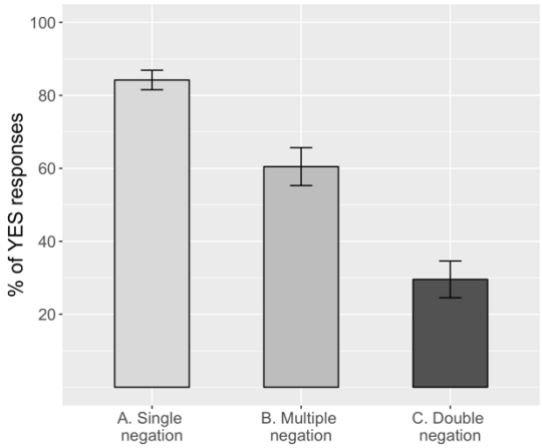


Figure 2. Mean percentage of 'YES' responses for the experimental conditions in Experiment 1. Error bars indicate standard error of the mean.

3.1.1.6 Discussion

This experiment tested the impact of different negation configurations on fast perceptions of acceptability using a processing demand task. Based on linguistic and psycholinguistic considerations, it was initially assumed that single negation sentences would be unproblematic for native speakers of English, and that double negation sentences would possibly be deemed unacceptable in the absence of the appropriate licensing context. These assumptions are borne out in the results. Importantly, the perception of acceptability of grammatical multiple negation sentences is penalized, although there is a significant three-way distinction among the conditions: single negation sentences are accepted in the vast majority of cases, multiple negation sentences exhibit a lower but still greater proportion of *yes* over *no* responses, and double negation sentences are rejected in the majority of cases. That is, the perceived ungrammaticality increased when *no* c-commanded *never* than when it did not. The acceptability contrast between single negation and multiple negation sentences cannot be attributed to constraints of the grammar or other linguistic considerations, as both sentences are perfectly grammatical. Instead, it points to a processing problem as the source of the effect. These results are interpreted as initial evidence that the presence of a structurally inaccessible negative quantifier *no* interferes with the integration of the adverb *never* in the main clause. The pattern of results bears significant resemblance to the picture that arises in speeded acceptability studies of NPI illusions (e.g. Yanilmaz & Drury 2018; Drenhaus et al. 2005;

Muller et al. 2019a; Parker & Phillips 2016). In these studies, an illusion of grammaticality is identified with higher acceptance rates for unlicensed NPIs in sentences with *no* inside the relative clause (e.g. *The authors [that no critics recommended] have ever received acknowledgement for a best-selling novel*), compared to sentences without it. The pattern found in this experiment is the exact opposite: lower acceptance rates for grammatical sentences with *no* inside the relative clause (i.e. multiple negation) than for similar grammatical sentences without it (i.e. single negation). In other words, while the intrusive *no* ameliorates the perception of *ever* in ungrammatical sentences, it seems to deteriorate the perception of *never* in grammatical sentences.

Speeded acceptability tasks gather information about the participants' overall initial perception of acceptability, and they have been proved to be a reliable technique uncovering grammatical illusions. Even though participants respond once the full sentence has been presented, the proportion of correct judgments is generally assumed to relate to processing operations due to the time pressure under which these are elicited. However, as Vasishth et al. (2008: 696–697) point out, "the source of the judgment itself is presumably a decision process that takes as input the products of (possibly partially) completed online processing". Thus, this task does not allow us to ascertain which are the specific sentence regions that generate this behavior or to disentangle sentence comprehension mechanisms from other processes that affect end-of-sentence decisions. The next experiment was designed to delve deeper into the source of the interference effect.

3.1.2 Experiment 2: self-paced reading

This experiment uses a self-paced reading task in order to study the online processing of the sentences under investigation. This method provides access to moment-by-moment processing during the automatic integration of each word in the sentence and the possible difficulty generated by it. In light of Experiment 1, the integration of *never* is expected to take place without problems in single negation sentences and to generate strong processing disruptions in double negation sentences. With regard to the critical condition (i.e. multiple negation sentences), if the presence of the negative quantifier *no* in the relative clause interferes with the integration of *never* in the main clause, longer reading times are expected at the point of *never* in multiple negation sentences relative to single negation sentences.

3.1.2.1 Participants

The participants in this experiment were 36 native speakers of English (30 female, mean age 24 y/o) who were recruited in the area of Santiago de Compostela. All of them were pursuing or had just finished university education (BA or MA) in different disciplines in the US and were serving as high school language assistants as part of a 1-year exchange program funded by the Galician Regional Ministry of Education.[27] Special care was taken to ensure that none of the participants had spent more than 48 months outside an English-speaking country across their entire life. Their participation in the study was voluntary.

3.1.2.2 Materials

The experimental materials used in this task were the same as in Experiment 1. An example set of the experimental conditions is repeated in Table 2, and the entire list of experimental materials can be consulted in Appendix A.1. The three conditions were counterbalanced in 3 lists together with a grammatical version of the same 72 filler sentences. The ratio of ungrammatical-to-grammatical sentences was reduced in order to prevent participants from developing unnatural reading strategies. In order to ensure that participants were reading for comprehension, all the experimental and filler sentences were followed by a *yes*/*no* question. These comprehension questions addressed pieces of information located in different parts of the sentences. This way, participants were forced to pay equal attention to all the sentence regions. The comprehension questions for the experimental items were never related to the negated material and the probability of providing a positive or a negative answer was balanced for all trials. During the delivery of the instructions, participants were asked to complete 4 practice items to ensure that they had understood the procedure.

Table 2: Experimental materials for Experiment 2.

A. Single negation	The authors [that the critics recommended] have **never** received acknowledgement…
B. Multiple negation	The authors [that **no** critics recommended] have **never** received acknowledgement…
C. Double negation	**No** authors [that the critics recommended] have **never** received acknowledgement…
	… for a best-selling novel.

[27] https://www.edu.xunta.gal/portal/es/linguasestranxeiras/1640/1643

3.1.2.3 Procedure

The task was implemented in Inquisit 4 (Millisecond Software 2015) using the non-cumulative word-by-word moving window version of the self-paced reading procedure (Just et al. 1982). In this version of the task, participants are presented with the entire sentence on the screen with each word masked by dashes and separated by spaces. When the predefined key is pressed (the space bar in this case), the first word is revealed. When the space bar is pressed one more time, the second word appears and the first word is re-masked. By collecting the time elapsed between bar-presses, this task allows us to measure the time spent in each word. Participants were instructed to keep their fingers on the selected keys (i.e. the space bar and *yes/no* keys) for the entire session so that they could move forward easily at their own pace and answer the questions as accurately and as fast as possible. They received on screen feedback for both wrong and right answers –the word 'right' was displayed for 1000ms. when the response was correct and the word 'wrong' was displayed for 2000ms. when the response was incorrect. All participants were tested using the same computer. The task lasted for approximately 35 minutes and the order of presentation of experimental and filler sentences was randomized for each participant.

3.1.2.4 Analysis

The acceptance threshold for accuracy in the questions was set to 80% to ensure that the final sample only contained participants that were reading for comprehension. No participant had to be excluded from the analysis due to poor performance. Unrealistic reading times were first deleted following standard practices in the self-paced reading literature (see for example Hofmeister 2011; Nicenboim et al. 2016). These included RTs above 2500ms. and below 100 ms., which are possibly the product of spurious delays or erroneous button presses that might obscure the initial stages of model fitting (Baayen 2008). This procedure resulted in the exclusion of 0.85% of the data across all sentence regions and 0.23% of the data in the regions of interest. Subsequently, the remaining reading times were log-transformed in order to reduce non-normality. Mean RTs for the experimental conditions were then compared in four regions of interest: the auxiliary verb before *never*, which signals the end of the relative clause; the negative adverb *never*, which is the critical point at which the different negation configurations are established; and the two next spillover words. These reading times were analyzed using a linear mixed effects model.

Following the same model building procedure as in Experiment 1, the RTs in the four regions of interest were analyzed using the maximally converging model (Barr et al. 2013). The maximal model included the experimental conditions as fixed effects and by-participant and by-item random intercepts and slopes. This model was applied in the pre-critical region, the critical region (*never*), and the first spillover region. In the second spillover region, the maximal model had to be reduced due to convergence problems. This reduced model included by-participant and by-item random intercepts but no slopes. The accuracy for the comprehension questions in the experimental trials was also analyzed. This was done by means of a generalized linear mixed model for binomial distributions (Jaeger 2008). The maximally converging model included fixed effects for the experimental conditions and only random intercepts for participants and items. An effect was considered to be statistically significant at the level of $p<.05$ when the absolute *t or* z-value was above 2 (Baayen et al. 2008; Gelman & Hill 2006).

3.1.2.5 Results

Figure 3 shows the word by word reading times in log-milliseconds for the three experimental conditions in all the sentence regions. The four regions of interest are highlighted inside a square. The model results for the pre-critical region (the auxiliary *have*) show a significant effect of multiple negation when compared with double negation (B vs. C: Estimate= -0.07, *SE*= 0.03, *t*= -2.20). This region was read slower for multiple negation sentences (condition B) than for double negation sentences (condition C). The contrast with single negation (condition A) was not statistically significant (A vs. B: Estimate= 0.04, *SE*= 0.03, *t*= 1.30), even though it follows a similar trend. The results for the adverb *never* (the critical region) show that sentences with two negation markers (multiple and double negation sentences) are read more slowly than sentences in which *never* was the only negative element –i.e. single negation sentences– (A vs. B: Estimate= 0.07, *SE*= 0.03, *t*= 2.21; A vs. C: Estimate= 0.06, *SE*= 0.03, *t*= 2.19). Furthermore, no differences are observed between multiple negation and double negation sentences in the *never* region (B vs. C: Estimate= -0.01, *SE*=0.03, *t*= -0.37). The slow-down for sentences with two negations extends to the first spillover region in a three-way contrast: single negation sentences were the fastest of the three (A vs. B: Estimate= -0.08, *SE*=0.03, *t*= 3.02; A vs. C: Estimate=0.16, *SE*=0.03, *t*= 4.95). Furthermore, double negation sentences displayed a more pronounced slowdown than multiple negation sentences (B vs C: Estimate= -0.08, *SE*=0.03, *t*= 2.88). In the second spillover region, there was a significant effect of double

negation, reflecting slower reading times relative to both single negation and multiple negation sentences (A vs C: Estimate= 0.08, *SE*=0.03, *t*= 3.24; B vs. C: Estimate=0.05, *SE*= 0.03, *t*= 2.12). No differences are observed between single negation sentences and multiple negation sentences in this second spillover region (A vs. B: Estimate= 0.03, *SE*=0.03, *t*= 1.11). Mean accuracy for the comprehension questions in the experimental items was 94% (condition A: 96%, condition B: 96%, condition C: 91%). The results from the logistic regression indicate a significant decrease in accuracy for double negation sentences when compared to the other two conditions (A vs. B: Estimate= -0.02 *SE*=0.38, *z*= 0.95; A vs. C: Estimate= -0.95, *SE*=0.32, *z*= -2.93; B vs. C: Estimate=-0.92, *SE*=0.32, *z*= -2.89).

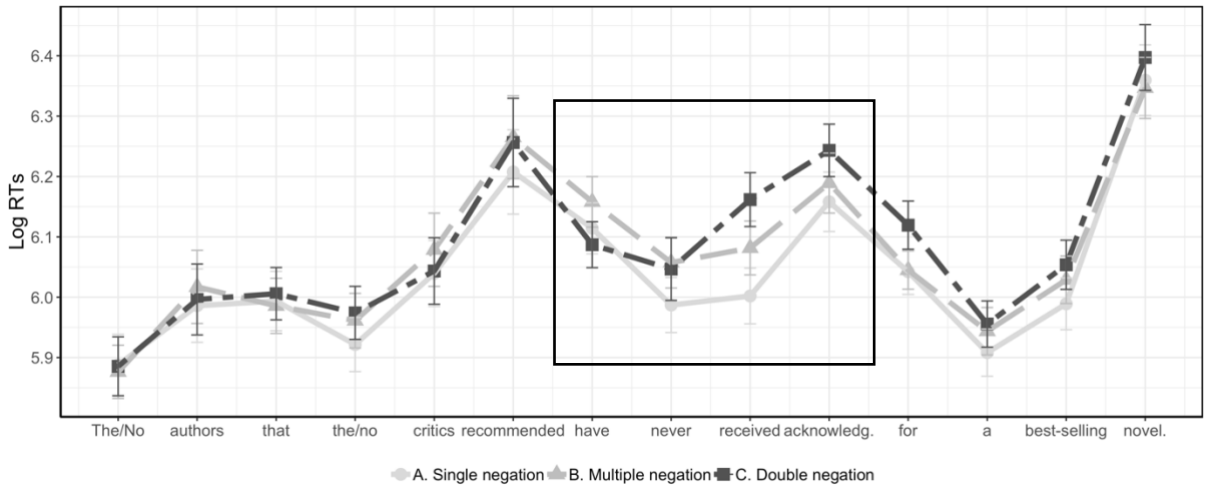


Figure 3: Word-by-word logged RTs for the experimental conditions in Experiment 2. Error bars indicate standard error of the mean.

3.1.2.6 Discussion

This experiment used the self-paced reading technique to investigate whether the interference effects found in Experiment 1 reflect difficulties in the integration of *never* during the incremental processing of multiple negation sentences. Before examining the results for this critical condition, it is important to note that the reading times for the baseline conditions are aligned with the initial predictions as well as with the results from Experiment 1: single negation sentences are read the fastest of the three, and double negation dependencies did not only impact reading times but also caused a reduction in comprehension question accuracy. This drop in accuracy could be initially surprising because the comprehension questions never targeted information related to the negations and were the same in the three experimental conditions. A

plausible explanation for this behavior is that the confusion generated when participants tried to interpret double negated sentences prevented them from paying enough attention to the rest of the contents.

Coming back to the critical condition of the experiment, the reading times for multiple negation sentences in the regions of interest seem to confirm the intuition that the decrease in acceptability observed in Experiment 1 could arise from the difficulty of integrating *never* when it is preceded by the embedded negative quantifier *no*. Importantly, when comprehenders reach the negative adverb, the reading times for multiple negation and double negation sentences are on a par. The disruption observed for sentences with two negations spills over the sentence regions following *never*, even though participants recover earlier in multiple negation than in double negation conditions. The pattern of results found in this experiment seems initially incompatible with the hypothesis that NPI illusions arise due to a misrepresentation of *ever* as *never*. The *ever-never confusability hypothesis* rests on the assumption that sentences with *never* are both an acceptable and natural continuation, but multiple negation sentences are shown to create processing problems. Such problems are not expected if multiple negation sentences represent the configuration that is thought to ameliorate NPI illusions. The fact that the RTs at the critical region show the same slowdown in both multiple and double negation sentences is particularly relevant because this is the region in which unlicensed NPIs in illusion-like configurations display the strongest facilitation effects in the self-paced reading experiments conducted by Parker & Phillips (2016). Nonetheless, it is difficult to directly map the RTs in this experiment to those in classic NPI illusion sentences because of the different baselines used. The offline ratings from the next experiment will hopefully clarify the perceived status of multiple negation sentences.

One potential concern with these results is that the reading times for multiple negation sentences are slower than the other two conditions in the region preceding *never*. Up to this point, the sentences used here are identical to those in Parker and Phillips' (2016) self-paced reading task (experiment 3 in their work), but they do not observe any significant effects in the pre-critical region. Yet, in spite of the lack of statistical contrasts, Parker and Phillip's (2016) data does display a similar trend: the auxiliary *have* is read slower in sentences containing *no* inside the relative clause. Given that our sample contained 50% more participants than Parker and Phillips' experiment (n=24), we believe that the two pre-critical effects could be qualitatively similar, but their study lacked the necessary power to detect the contrast. It is also

possible that the effect found at the pre-critical region is stronger in our data as a consequence of the experimental manipulation. The auxiliary *have* provides a structural cue that signals the end of the relative clause, and it is always followed by the critical region *–ever* in NPI illusions and *never* in our sentences. However, in the study by Parker and Phillips, the presence of the negative quantifier facilitated the integration of *ever*, while here, its presence in our sentences seems to hamper the integration of *never*. As the experiment unfolds, the problems associated with the different configurations of negative elements could have made both the quantifier *no* and the adverb *never* more salient in our experiment and, thus, participants could be placing more resources to process the negative quantifier inside the relative clause before reaching the negative adverb. Such an effect is predicted to surface as a slowdown only in multiple negation sentences, as it is the only condition that displays an embedded negation. This conjecture predicts the effect to grow across the experiment, and thus, it can be investigated by modelling the interaction with trial order. However, the results from a post-hoc analysis clearly showed the opposite: the contrast between multiple negation sentences and the other two conditions was the strongest during the first trials and shrank dramatically across the task, discarding this additional possibility.[28] In sum, the fact that the pre-critical effects only arise in multiple negation sentences is interpreted as evidence that at least some aspects of the embedded negation are still being integrated when participants reach the auxiliary *have*. That is, the difficulty associated with the integration of the negative quantifier seems to spill over outside of the relative clause.

In fact, if the quantifier *no* has not been fully encoded when comprehenders reach *never*, the slower reading times observed for multiple negation sentences could reflect the difficulties of the parser when trying to integrate two active negative elements. In order to support this interpretation, it is essential to establish whether the contrast observed at the critical and post-critical regions between single negation and multiple negation sentences is not simply the consequence of the spillover effect from the embedded negation. In other words, that there is some additional processing difficulty specifically triggered by *never*. To explore this issue, we calculated Cohen's delta (*d*) statistic (Cohen 1988) for the contrast between single and multiple negation sentences in the pre-critical, the critical and the post-critical regions. The results show

[28] It is relevant for the discussion to report that, when trial order is included in the model, the contrast between conditions A (single negation) and B (multiple negation) in the pre-critical region emerged statistically significant. This contrast had not reached significance in the analysis reported in §3.1.2.5.

that whereas the effect size in the pre-critical region is quite small (*d*=.12), the effect size in the critical region is almost three times bigger (*d*=.34), and even more so in the post-critical region (*d*=.51). The fact that the effect grows when *never* is encountered represents evidence that the negative adverb contributes its own source of processing difficulty, and thus, that the disruption observed at the critical and post-critical regions could be reflecting the combined difficulty of integrating the two negative elements. Such interpretation of the results aligns with Parker and Phillips' (2016) hypothesis that NPI illusions arise as a consequence of unstable encodings available when the NPI is being licensed. Under this account, the slow reading times observed at the negative adverb would reflect the difficulties of the parser to integrate *never* in the context of a previous negative element. As it was speculated at the presentation of the predictions in §3.1, such a disruption could be indexing initial attempts of the parser to entertain a temporary double negation dependency between *never* and *no.* This idea is motivated by the fact that the RTs at the critical region are equally slow for multiple and double negation sentences. The crucial difference between these two conditions is that, in multiple negation sentences, this dependency is not structurally supported, and this could be interpreted as an illusion of ungrammaticality. Two facts seem to support the idea that such an illusory double negation dependency could just be temporarily entertained. First, participants recover earlier from the disruption produced in multiple negation sentences than in double negation sentences. Second, this interference does not seem to have interpretive consequences, inasmuch as comprehension question accuracy is not reduced in multiple negation sentences. The discussion provided in §3.1.4 delves deeper into this issue.

Together, Experiments 1 and 2 provide clear evidence that the negative quantifier *no* inside the relative clause interferes with the online integration of *never* in the main clause. In line with Parker and Phillips' (2016) account of NPI illusions, this interference effect is expected to arise during early parsing stages in which the encodings of the material in the relative clause, and the quantifier *no* in particular, have not been fully computed. Under the assumption that comprehenders only experience an illusion of ungrammaticality in online tasks, native speakers of English are expected to recognize multiple negation sentences as acceptable when given ample time. The objective of Experiment 3 is to test the offline perception of acceptability of sentences under investigation.

3.1.3 Experiment 3: offline acceptability

This section presents the results from an offline acceptability judgment (Cowart 1997). As explained above, acceptability measures will contribute to understand the causes and interpretation of the disruption observed for multiple negation sentences in Experiments 1 and 2. In addition, these untimed ratings will further corroborate the grammatical status of the baseline conditions.

3.1.3.1 Participants

24 US-based native speakers of English (6 female, mean age 35 y/o) participated in this experiment. All participants provided informed consent and they received $3 as compensation. Participants were recruited using Amazon's Mechanical Turk (AMT, https://aws.amazon.com/mturk).[29] AMT is a crowdsourcing web-service through which institutions and companies can recruit participants for human intelligence tasks. Its use in the fields of linguistics and psychology has increased in recent years, and several studies have already validated this collecting method for many classical psychological experiments, including tasks using timing measurements (e.g. Crump et al. 2013; Enochson & Culbertson 2015). For the specific case of acceptability ratings, a large-scale comparison between laboratory-based and AMT-based acceptability ratings conducted by Sprouse (2011) concluded that acceptability data collected in AMT are almost indistinguishable from laboratory data (see also Gibson et al. 2011). In order to ensure that the people recruited via AMT were native speakers of English they had to complete a native speaker qualification test (see Appendix B). Only participants that scored at least 7/9 were allowed into the task.

3.1.3.2 Materials

The materials used in this task were the same 36 sets of experimental items and 72 filler sentences that were used in Experiment 1. An example set of the experimental conditions is repeated in Table 3, and the entire list of experimental materials can be consulted in Appendix A.1. The ratio of grammatical-to-ungrammatical sentences was balanced so that half of the sentences across the task contained ungrammaticalities. During the delivery of the instructions,

[29] For all the experiments conducted using AMT's service the participation was restricted to 'turkers' with IP addresses located in the U.S.A.

participants were asked to complete 6 practice items to ensure that they had understood the procedure.

Table 3: Experimental materials for Experiment 3.

A. Single negation	The authors [that the critics recommended] have **never** received acknowledgement…
B. Multiple negation	The authors [that **no** critics recommended] have **never** received acknowledgement…
C. Double negation	**No** authors [that the critics recommended] have **never** received acknowledgement…
	… for a best-selling novel.

3.1.3.3 Procedure

The stimuli were delivered using Ibex (Drummond 2013). Participants were presented with the entire sentence in the middle of the screen along with a rating scale. Each sentence was presented in an individual screen and participants could only move to the next one once they had emitted a rating by clicking on the scale numbers or, alternatively, using the numbers on their keyboard. Participants were instructed to rate the sentences according to their acceptability in a 7-point scale in terms of whether they came across as well-formed English: 7 meaning totally acceptable and 1 totally unacceptable. In order to help them adjust to the scale, the first two practice items were followed by feedback on "the rating that most people would give in that case" (1 or 2 for an ungrammatical example and 6 o 7 for a grammatical one). They were encouraged to take as much time as they needed and to use the entire range of the scale. The order of presentation of experimental items and fillers was randomized for each participant. The task was completed by all participants in less than 20 minutes.

3.1.3.4 Analysis

The ratings collected were analyzed using a linear mixed-effects model that included the experimental conditions as fixed effects and participants and items crossed as random effects. A maximal model with a fully specified random effects structure was initially built. This model failed to converge and the random structure was simplified following Barr and colleagues (2013). The results reported in the next section correspond to the model with the maximal converging random effects structure, which included by-subject and by-item random intercepts and slopes but no correlation parameters for the by-item grouping. An effect was considered to be statistically significant at the level of $p<.05$ when the absolute t-value was above 2 (Gelman & Hill 2006; Baayen et al. 2008).

3.1.3.5 Results

The results from this experiment are presented in Figure 4. Single negation sentences had the highest rating and double negation sentences the lowest. The acceptability of multiple negation sentences was rated quite low. The model results revealed statistically significant differences among the three experimental conditions (A vs. B: Estimate= -2.02, *SE*=0.18, *t*= -11.15; A vs C: Estimate= -2.76, *SE*=0.28, *t*=-9.93; B vs. C: Estimate= -0.74, *SE*=0.21, *t*= -3.46).

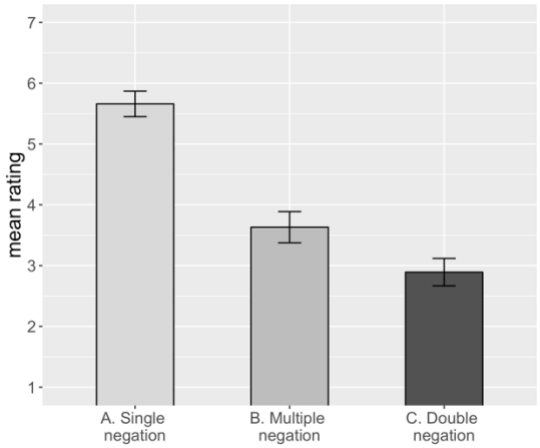


Figure 4. Mean ratings for the experimental conditions in Experiment 3. Error bars indicate standard error of the mean.

3.1.3.6 Discussion

The first thing to note about these results is that they confirm the grammatical status that was initially assumed for the baseline conditions: while single negation sentences were judged as perfectly grammatical, double negation sentences were highly rejected. This result is unsurprising in light of Experiments 1 and 2, and it also coincides with the low acceptability ratings reported for double negation sentences in Blanchette (2015). Nonetheless, Experiment 3 was mainly designed to test whether native speakers of English recognize multiple negation sentences as acceptable in spite of the attested processing problems they generate. If these grammatical sentences were recognized as such, the ratings attributed to them should approach those of single negation sentences. However, the results from this task confirm the opposite: the perception of multiple negation sentences is highly degraded compared to single negation sentences. Multiple negation sentences patterned closer to double negation ones, although mean ratings were still lower for the latter. The key finding from this experiment is that native

speakers of English fail to recognize multiple negation sentences as acceptable even though they are perfectly grammatical. This finding is relevant in several ways.

First, under the *changing encodings hypothesis*, participants are expected to access a fully encoded final-stage interpretation when given ample time. Therefore –in parallel with the pattern observed for NPI illusions– multiple negation sentences were expected to be recognized as acceptable in offline acceptability tasks as final-stage computations are supposed to be available when participants are asked to produce their judgement. Instead, what we observe here is a clear conflict between grammatical knowledge and offline judgments. The results show an interesting alignment between online and offline responses, and this may question the interpretation of the findings as an illusion of ungrammaticality –at least considering a narrow definition of grammatical illusions. This will not be the only finding of this sort that we will encounter along this dissertation. For this reason, a detailed discussion of this issue in the wider context of parser-grammar misalignments will be deferred until Chapter 6. Notwithstanding the above, it is important to note that processing principles alone may not be enough to account for the penalized ratings of multiple negation sentences. Extralinguistic factors related to the stigmatization of negative concord varieties of English and prescriptive bans against the use of double negation (Horn 2010; Nevalainen 2006) could have contributed to the surprisingly low ratings attributed to these grammatical sentences; particularly, in an experimental design in which they are intermixed with actual double negation sentences. In this context, the mere presence of two negative elements could have guided participants' decisions even when they had unlimited time to provide a response.

Second, the fact that multiple negation sentences are highly penalized in offline ratings provides the strongest case against the *ever-never confusability hypothesis*. The processing effects observed in Experiments 1 and 2 provided initial support against this account. Yet, the different baselines used in this research (single and double negation) and in classic NPI illusions (licensed and unlicensed NPIs) made it difficult to straightforwardly map the online behavior of multiple negation sentences to NPI illusion sentences. Likert scales, the dependent variable in offline ratings, provide a slightly less baseline-conditioned indication of the perceived status of multiple negation sentences. Even though single and double negation sentences act as anchors, the experimental conditions were also intermixed with other grammatical violations that helped participants to set a threshold. Still, multiple negation sentences were given a mean rating of 3.6/7, a score that is on a par with the mean obtained by ungrammatical fillers. These

results provide robust evidence that sentences containing *never* instead of *ever* are highly dispreferred by native speakers of English. Consequently, the fact that they are not able to recognize them as grammatical is in conflict with the idea that such representations could somehow rescue NPI illusions in processing tasks.

3.1.4 Discussion of Experiments 1-3

The series of experiments presented here used online (i.e. speeded judgments and self-paced reading) and offline (i.e. acceptability judgments) methods as a means to study different grammatical configurations of negative elements. The focus of the project was on multiple negation sentences (condition B) which displayed the negative markers *no* and *never* in different clauses. The primary objective of this project was studying the online and offline perception of these sentences. To this end, we compared them with similar sentences without the negative element in the relative clause (i.e. single negation, condition A), and with sentences in which both *no* and *never* appeared in the main clause (i.e. double negation, condition C). The observed pattern of results was consistent across experimental measures in showing that multiple negation sentences incurred in an increased processing cost (Experiments 1 and 2) and were also perceived as less acceptable (Experiments 1 and 3) than equivalent single negation sentences. Importantly, the responses for the double negation condition across the three tasks indicate a more degraded perception and slower recovery from disruption.

The fact that double negation sentences were strongly rejected confirms the initial assumptions to conceive them as a degraded baseline. Moreover, including this manipulation in the design was interesting in itself, given the limited attention that the phenomenon of double negation has received in psycholinguistics. Apart from Schiller et al. (2017), who focused on simpler combinations of verbal and affixal negation (e.g. *not unhappy*), this is, to the best of our knowledge, the first psycholinguistic study that uses time-sensitive measures to investigate double negative dependencies. Even though Standard English is commonly classified as a double negation language, this research shows that double negative dependencies do not come at free cost for the language user. This is not surprising considering that the pragmatic function of double negation is to contradict or correct a previous negative statement (Horn 1991; Puskás 2012), and thus, double negatives are subject to restricted pragmatic licensing conditions. As described in §2.3, double negatives have been found to appear in specific information structure configurations (Larrivée 2016) and to be signaled by certain prosodic cues such as contradictory

contour (Espinal & Prieto 2011; Prieto et al. 2013). In addition, this investigation provides evidence that native speakers display strong processing disruptions when double negation dependencies are encountered in isolation. This finding emphasizes the mentioned pragmatic licensing requirements as a condition for double negatives to be interpreted, placing the grammar of double negation at the interface of syntax and pragmatics.

The result that comprehenders consistently reject double negative dependencies overrules one potential concern of this research: the possibility that the participants in the experiments had grammars that allowed negative concord configurations. Native speakers of English are often exposed to instances of negative concord dependencies (e.g. *I can't get no satisfaction*) as they are allowed in many contemporary varieties of English (e.g. African American Language or Appalachian English). In fact, some theoretical proposals (e.g. Blanchette 2013; 2015; Tubau 2008; Zeijlstra 2004) have hypothesized that the underlying structure of Standard English is that of negative concord. In this vein, Blanchette and Lukyanenko (2019) demonstrate that, in the absence of the necessary licensing conditions, native speakers of English can actually interpret double negation dependencies as negative concord. The participants in our experiments were not explicitly tested for having grammars that allowed negative concord dependencies in order to avoid calling attention to the manipulation. However, we assume that interpreting double negation conditions as a case of negative concord should have facilitated its processing. On the contrary, the results regarding multiple negation and double negation conditions are the opposite to what one would expect if participants' grammars allowed for negative concord structures. Nonetheless, the strong reactions against double negation were possibly exacerbated by two factors: first, *no* and *never* are not a frequent negative concord or double negation configuration. Second, the participants in the tasks were university educated speakers of English. As Thornton et al. (2016) pointed out, people in academic settings are generally aware of the social stigma associated with negative concord and with prescriptive views on double negation. In sum, the empirical evidence does not support the possibility that participants could be parsing the two negative elements as forming a negative concord dependency.

The main aim of this research was to test two contrasting predictions made for multiple negation sentences on the basis of previous NPI illusion accounts. On the one hand, the *ever-never confusability hypothesis* predicted that these sentences should come across as well-formed in English, and accordingly, they should be processed without problems. The results

from the three experiments provide compelling evidence against this hypothesis. On the other hand, based on the *changing encodings hypothesis*, it was predicted that the negative quantifier inside the relative clause could interfere with the integration of never, generating an illusion of ungrammaticality. Under this rationale, despite the online interference, it was initially assumed that comprehenders should recognize multiple negation sentences as acceptable when given ample time. Instead, multiple negation sentences are consistently given low ratings in the untimed judgment task, making it less straightforward to map the relation between multiple negation sentences and NPI illusions. The connection between the two phenomena as well as the possible sources of the degraded perception of grammaticality are explored below.

3.1.4.1 Relating multiple negation sentences to NPI illusions

Parker and Phillips (2016) account of NPI illusions explained spurious licensing as the consequence of accessing incomplete representations of the relative clause material when the NPI is encountered. Their account shifted the attention from the previously proposed erroneous application of NPI-specific licensing mechanisms (i.e. Vasishth et al. 2008; Xiang et al. 2009; Xiang et al. 2013) to changes in the encoding of the representations that are used for licensing. In doing so, they provided the basis for an interesting parallelism between NPI illusion sentences and similar sentences containing *never*: if the negative quantifier is accessible to spuriously license the NPI when *ever* is encountered soon after the relative clause, it may also be accessible when *never* is encountered in the same position. The slow RTs observed for multiple negation sentences at the pre-critical region are taken as evidence that at least some aspects of the relative clause material are still being encoded, and thus, that individual feature values such as negation could still be transparently accessible. Even though the adverb *never*, as sentential negation, does not need to be licensed by a dependency with any previous element, under a cue-based architecture it is assumed that "each incoming words triggers retrievals to integrate that word with the preceding structure" (Lewis et al. 2006: 448). If the embedded negation is active when *never* is being integrated, we speculate that the observed difficulties could be indexing the parser's evaluation of a possible dependency between *no* and *never*. Given that double negative dependencies are shown to generate strong processing problems, similar problems are expected to emerge if the parser entertains a relation between *no* and *never* in multiple negation sentences.

The disruptions observed in Experiments 1 and 2 are compatible with this interpretation, and we argue that they could be understood as an illusion of ungrammaticality. Nonetheless, if this phenomenon represents the opposite case of NPI illusions, it may be initially surprising that comprehenders are unable to perceive multiple negation sentences as acceptable in untimed ratings, since they are uncontroversially grammatical. How are the low ratings explained, then? Even though offline judgments are generally conceived as a measure of acceptability, it is widely known that they are sensitive to issues of processability and have been reliably used to uncover processing effects (e.g. Dillon et al. 2017; Fanselow & Frisch 2006; Hofmeister et al. 2013; Sprouse 2008). With this in mind, the low ratings for multiple negation sentences could arise from the difficulties integrating *never* in the context of *no*, particularly if a double negative dependency is being temporarily entertained, prompting participants to give low ratings based on simpler heuristics such as the mere presence of two negative elements. In this way, the results from experiments 1-3 are compatible with an interpretation in terms of illusion of ungrammaticality. Yet, there is an alternative –and perhaps simpler– account that deserves exploring: the disruption observed for multiple negation sentences could simply reflect the parser's limitations in processing sentences with two negations.

Integrating a negation is a complex operation that is known to impact the incremental interpretation of sentences. In multiple negation sentences, the parser must undergo this process twice: first inside the relative clause and, then, in the main clause. Processing difficulty, understood as a measure of the resources required to compute the correspondences between forms and meanings (Culicover 2013), can accumulate during sentence processing in such a way that it can produce additive effects (e.g. Gibson 1990; Kluender & Kutas 1993). Thus, one could speculate that the comprehension system may not be able to handle the additive syntactic, semantic and pragmatic complexity of two negative operations when they appear close in the input. In multiple negation sentences, this processing overload is expected to originate when the second negation (i.e. *never*) is encountered if the first negation (i.e. *no*) is still being integrated, exceeding the computational resources of the system. As a consequence, grammar-independent factors related to the limitations of human parser may impede the identification of the correct grammatical analysis, resulting in the processing problems and low acceptability ratings observed. Assuming that processing complexity alone can account for the results eliminates the need to appeal to intermediate stages of representation building and the temporary evaluation of a dependency between *no* and *never* as the source of the effects. In

some respects, this interpretation of the findings treats multiple negation sentences on a par with other patterns of misalignment like multiple center-embeddings.[30] Indeed, some authors have conceptually associated the complexity of negation to that of multiple embedding (e.g. Bever 1970; Corblin 1996). Multiple center-embedding sentences reflect the limitations of the parser to generate a representation that is nonetheless available in the grammatical repertoire. Along the same lines, multiple negation sentences could represent another instantiation of the computational limitations of the comprehension system.

If an explanation based solely on processing complexity is the right characterization of the empirical evidence, this limitation of the human parser is expected to extend to similar sentences containing two negative markers. Nonetheless, a number of observations suggest that native speakers of English are able to generate valid representations for sentences that contain two negative elements. For instance, speakers of English can, presumably, understand and express sentences like (51) in spite of their relative complexity.

(51) I didn't promise that I wouldn't go.

Sentences like (51) are unsurprising from the perspective of theoretical linguistics because each negative element can only be interpreted independently and, thus, each clause illustrates an instance of single negation. This may explain why these type of constructions are only mentioned in passing by theoretical linguistics works, which describe them as unproblematic and frequent in natural languages (Huddleston & Pullum 2002; Zeijlstra 2004). In a recent work using the truth-value judgment task (Crain & Thornton 1998), Thornton and colleagues (2016) compared adult and children's interpretation of sentences with double negation and negative concord dependencies. In order to assess the possibility that children could experience problems with two negations simply due to processing limitations, they included sentences like (52) as a control condition.

(52) The girl who didn't skip bought nothing.

[30] For instance: **The patient who the nurse who the clinic had hired met Jack.*

Similar to our multiple negation sentences, the control condition in Thornton et al. (2016) contained two independent negative markers in different clauses: one inside a relative clause (i.e. *didn't*) and the other in the main clause (i.e. *nothing*). If an explanation based on processing is on the right track these sentences are expected to be problematic. However, the results by Thornton et al. (2016) do not seem to point in this direction, as neither adults nor children exhibited problems with them. Importantly, though, the task in Thornton et al. (2016) was a truth-value judgement which was presented in a context. Although further research should consider this more carefully, the evidence so far suggests that native speakers of English can indeed parse sentences with two negative markers, and thus, that multiple negation sentences and multiple center-embedding should not be conceptualized as analogous cases. Furthermore, there are two remarkable differences between Thornton et al.'s controls and our multiple negation sentences that strengthen the parallelisms with NPI illusions. First, in (51), the main clause negation *nothing* appears after the main clause verb (i.e. *bought*). In our stimuli, *never* appears before the verb, and thus, closer to the relative clause. This is an interesting fact if we take into account that Parker and Phillips' (2016) study demonstrates that illusory licensing disappears when the unlicensed NPI is located after the main clause verb (see example (41) in Chapter 2). Second, whereas the intervening negation in multiple negation sentences is a negative quantifier, the control sentences by Thornton and colleagues use verbal negation. By way of flash-forward, it is relevant to note that in the second part of this chapter we will be showing that the classic NPI illusion pattern does not occur when the intervening negation is verbal negation, suggesting that NPI illusions arise at least in part as a result of the use of quantificational licensors in the relative clause.

Considering the above, it is possible that differences in the type and relative position of the negations could explain the contrast between the difficulties generated by multiple negation sentences and the apparent ease with which sentences like (51) are interpreted by both adults and children. These observations about NPI illusions generate interesting predictions for multiple negation sentences. In particular, further research should clarify the role of distance and type of negation in the processing problems observed in multiple negation sentences and also, the possible interpretations that speakers ascribe to multiple and double negation sentences. In light of the above, it seems unlikely that the processing problems and degraded perception of multiple negation sentences are solely explained by the additive complexity of integrating two negations. Indeed, if comprehenders were unable to deal with these sentences

simply because they have two negations, multiple and double negation sentences should pattern alike in the three tasks. Contrary to this, the differences between these two conditions is patent across tasks and measurements. This is particularly evident in Experiment 1, in which multiple negation sentences were accepted in more than 60% of the cases whereas the acceptance of double negation sentences was below 30%.

The degree of similarity between NPI illusions and multiple negation suggests that the same processes that ameliorate the online perception of unlicensed NPIs could be responsible for deteriorating the online perception of grammatical multiple negation sentences. This interpretation of the results generalizes Parker and Phillips' (2016) account of NPI illusions to other configurations, with the additional assumption that the low ratings are the combined product of these processing difficulties and simpler heuristics such as the mere presence of two negative elements. Such heuristics could have been developed by participants as a consequence of the existing social stigmas and prescriptive bans against negative concord and double negation. The hypothesized intrusion of extralinguistic pressures is supported by the fact that multiple negation sentences were actually more penalized when participants had unlimited time (Experiment 3) than when they were asked to provide fast judgments (Experiment 1). The relation between multiple negation sentences and NPI illusions will be resumed in the general discussion at the end of the chapter. We will now move to the second part of the project in which we investigate the impact of different licensors on the emergence of NPI illusions.

3.2 CONTRASTING LICENSOR TYPES

As advanced by the title, this second part of the chapter is concerned with contrasting licensor types on the generation of intrusion effects during NPI licensing processes.[31] In particular, we will compare the impact of inaccessible quantificational negation *no* illustrated by the classic illusion in (53a) with the impact of inaccessible verbal negation *not* as illustrated in (53b), which represents a novel configuration. Therefore, in addition to conducting a replication of Parker & Phillips' findings regarding sentences like (53a), the main question that we pursue in this group of experiments is whether sentences like (53b), containing verbal negation as

[31] The three experiments and the corpus study that conform §3.2 were first presented in de-Dios-Flores et al. (2017) and have been conducted in collaboration with Hanna Muller and Colin Phillips from the University of Maryland as part of a research agenda that initiated at the end of 2016 and is still ongoing. This collaborative project on NPI illusions does not only encompass the experiments subsumed in this second part of the chapter but also many others whose results have been presented in different venues (e.g. Muller et al. 2019b; Muller, de-Dios-Flores, et al. 2020, inter alia). Reference to these other experiments will be made when discussing some of the findings presentence here due to their close rapport.

structurally inaccessible licensor, also generate intrusion effects. Or what is the same, whether sentences like (53b) generate illusions of grammaticality.

(53) a. *The authors [that no critics recommended] have **ever** received acknowledgement for a best-selling novel.

b. *The authors [that the critics did not recommend] have **ever** received acknowledgement for a best-selling novel.

The contrast between quantificational and verbal negation is interesting in two main ways. On the one hand, from an exploratory perspective, testing the impact of verbal negation as a non-c-commanding licensor provides a novel context to probe for NPI illusions, expanding thus the empirical domain. Verbal negation is the most canonical downward entailing and nonveridical operator, and thus, a perfect candidate licensor for NPIs. On the other hand, from a hypothesis-driven perspective, the use of verbal negation provides a very straightforward way of putting to the test the accounts of NPI illusions reviewed in Chapter 2 (§2.2.1): the *memory-based hypothesis*, the *pragmatic rescuing hypothesis*, *the changing encodings hypothesis*, and the *ever-never confusability hypothesis*. These main four accounts make, in our view, an unequivocal prediction: sentences containing verbal negation as structurally inaccessible licensor should generate similar intrusion effects to those observed for classic illusion sentences containing quantificational negation. In what follows, we will inspect this prediction in light of the arguments underpinning previous accounts of NPI illusions. We will overlook an evaluation of the *ever-never confusability hypothesis* because, as argued in the first part of this chapter, Experiments 1-3 provide sufficient online and offline evidence against this account.

First, as the most prominent account of NPI illusions, we should discuss the predictions of the *memory-based hypothesis* (Vasishth et al. 2008). To recall, this proposal treats NPI licensing on a par with other cases of dependency resolution, and it is based on the assumption that NPI licensing involves establishing a direct item-to-item dependency between the NPI and a grammatical licensor using two retrieval cues: [+negative] and [+c-command]. As a consequence of the memory architecture used for dependency resolution (i.e. cue-based retrieval in content-addressable memory) the intrusion effect is seen as resulting from the retrieval of the structurally irrelevant embedded licensor due to partial match with one of the two cues (i.e. [+negative]), giving way to similarity-based facilitatory interference. Returning

to the contrast between quantificational and verbal negation, the two negative lexical items *no* and *not* are undoubtedly two valid NPI licensors as downward-entailing or antiveridical operators, and the two are assumed to be encoded with the cue [+negative]. Thus, under this account, these two items would be equally likely to be erroneously retrieved as licensors. In other words, under this hypothesis, sentences containing quantificational and verbal negation should exhibit similar intrusion effects as the result of partial match.

Second, as an alternative account to Vasishth et al.'s (2008) understanding of intrusive licensing, the *pragmatic rescuing hypothesis* proposed by Xiang et al. (2009; 2013) explained NPI illusions as the result of the over-application of indirect or secondary licensing mechanisms that are specific to some NPI configurations. These indirect licensing mechanisms have to do with the generation of negative contrastive implicatures produced by the relative clause in illusion sentences, which functions as a restrictive modifier. According to this hypothesis, illusory licensing could arise from the appraisal of negative inferences about the contrasting set of referents denoted by the relative clause, resulting in some momentary pragmatic confusion that would be enough to rescue the NPI. For instance, in (53a) above, the contrasting set of referents would be formed by those other authors that the critics recommended and the negative inference would imply that this other set authors does not have the asserted property –that is, they have NOT ever received an acknowledgement. It is worth noting that according to Xiang and colleagues, the presence of a negative quantifier in the relative clause could be the reason why the contrasting set of referents are more salient in the discourse, motivating the generation of negative inferences in those cases. If negative quantifiers are taken to have a crucial role in generating NPI illusions one could expect differences between quantificational and verbal negation in the generation of intrusion effects. Nonetheless, two issues question the crucial role of quantificational negation. On the one hand, as noted in Chapter 2, the assumption that the presence of a negative quantifier is essential leaves unexplained the fact that NPI illusions are also obtained in sentences using *very few as* an intrusive licensor, as it is indeed shown in Xiang et al. (2009). On the other hand, and most importantly, sentences containing verbal negation such as (53b) also allow the type of negative contrastive inference that is claimed to be the cause for intrusive licensing. This is shown in (54), where *P* is the predicate "ever received acknowledgement for a best-selling novel". Thus, given that this inferential process is equally available in sentences containing *no* and sentences containing *not*, we take the *pragmatic rescuing hypothesis* to predict illusion effects in both cases.

(54) a. The authors [that the critics did not recommend] have *P*

b. The authors [that the critics recommended] have NOT *P*

Thirdly and lastly, we should discuss Parker and Phillips' (2016) *unstable encodings hypothesis* in relation to the contrast in licensor types. The most relevant finding from this work is that NPI illusions are turned off when the NPI *ever* is moved to the right in the main clause, a behavior that could not be predicted on the basis of the two previous hypotheses. The authors interpret this finding as evidence that increasing the distance between the inaccessible licensor *no* and the NPI *ever* is what causes the absence of intrusion effects, and take this to support the alternative hypothesis that NPI illusions represent a problem of encoding, rather than retrieval. Incremental linguistic encodings are not stable or immediate but rather take some time to complete. NPI illusions could reflect access to intermediate stages of the encoding process during which structurally irrelevant negation may still be transparently available to spuriously license the NPI while the relative clause material is still being fully encoded. Assuming that the critical feature of Parker & Phillips' finding is the distance between the intrusive negation and the NPI, sentences containing verbal negation are predicted to exhibit (at least) similar intrusion effects. Indeed, in verbal negation configurations, the negation *not* actually appears in a position which is closer to the NPI than the quantifier *no* in classic illusion sentences.

In sum, a detailed scrutiny of the three hypotheses considered above led us to the following working predictions regarding the online and offline experiments conducted here: first, we expect to replicate the illusion pattern for sentences with an intrusive quantificational negation found in previous works using online tasks. Second, a similar illusion effect is predicted to occur in sentences with an intrusive verbal negation in online tasks. Finally, native speakers of English are assumed to clearly recognize unlicensed NPIs in these two ungrammatical sentences when given ample time –i.e. in offline tasks. These predictions will be tested in three experiments: Experiment 4 consists of an offline acceptability rating devised to evaluate the untimed perception of the sentences under investigation. Experiment 5 uses the speeded acceptability task to track the online impact of quantificational and verbal intrusive licensors, and Experiment 6 is a follow-up experiment which uses the same method but slightly different materials and design. Last, we will present the findings from a corpus study. A conjoint discussion of Experiments 4-6 and the corpus study will be provided at the end of this second part of the chapter, before moving to the chapter's general discussion in §3.3.

A notable contrast between this group of experiments and those presented in the first part of the chapter is that, here, we will only make use of speeded acceptability judgements as an online technique. This type of task, which has proven to be a robust method to study NPI illusions across languages (e.g. *German*: Drenhaus et al. 2005; *English*: Hildebrandt & Husband 2019; Muller et al. 2019; Orth et al. 2019; Parker & Phillips 2016; Xiang et al. 2006; *Korean*: Yun et al. 2018), has several advantages: given that the dependent variable is categorical, it has less statistical noise when compared to other online tasks whose dependent measures are reading times (e.g. self-paced reading or eye-tracking) or event-related brain potentials. Consequently, the speeded acceptability method allows us to test the presence/absence of intrusion effects with a relatively low number of participants. As noted by Muller (2020), the key issue in studies like the ones presented here is whether there is (or not) evidence for an illusion effect in the form of an acceptability boost, and thus, the fine-grained temporal information provided by other more sophisticated methods is not necessary to arbitrate among theories that predict the presence of intrusion effects –whilst this does not entail that timing results are not interesting. A last practical benefit of this task is that it can be easily implemented online, and thus, it allows us to recruit participants using web services such as AMT.

3.2.1 Experiment 4: offline acceptability

This offline acceptability experiment was conducted as a means to test native speakers' perception of the experimental materials when given ample time. The materials used in this and the following experiments have been adapted from Parker & Phillips by adding a fourth condition with verbal negation. Thus, based on their untimed acceptability ratings (experiment 1 in their work), we expect to obtain a clear pattern of grammatical sensitivity to the NPI licensing conditions. That is, we expect high ratings for sentences in which the NPI *ever* is licensed by a structurally accessible negation and low ratings for sentences that lack an appropriate structural licensor –be that the structurally inaccessible licensor conditions with *no* and *not* or the no licensor condition. No differences are thus expected among the three ungrammatical conditions regardless of the presence of a structurally irrelevant licensor. Replicating this finding is of particular relevance in order to determine whether there exists a contrast between offline and online results between potential NPI illusion configurations.

3.2.1.1 Participants

16 US-based native speakers of English (8 female, mean age 32 y/o) participated in this experiment. All participants provided informed consent and they received $2 as compensation. As in Experiment 3, participants were recruited using AMT.[32] In order to ensure that the people recruited via AMT were native speakers of English they were asked to complete a native speaker qualification test (see Appendix B). Only participants that scored at least 7/9 were allowed into the task.

3.2.1.2 Materials

The experimental materials for this and the following tasks consisted of 36 sets of 4 items which varied the presence, location, and type of licensor with respect to the NPI *ever*. This manipulation resulted in the four experimental conditions shown in Table 4. The entire list of experimental materials can be consulted in Appendix A.2. Condition A (accessible licensor) is the only grammatical sentence. Here, the NPI *ever* is licensed by the accessible licensor *no*, which is in a structural position from which it takes scope over the NPI. Condition B (inaccessible licensor *no*) is the type of structure that has been identified in previous works as an illusion sentence, in which the potential licensor *no* is structurally inaccessible and thus cannot license the NPI. Condition C (inaccessible licensor *not*) introduces a similar structure in that the negation is also inaccessible, but this time, instead of using the quantificational negator *no*, we use verbal negation (i.e. *not*). Finally, condition D does not contain any potential licensor and operates as an ungrammatical baseline.

Table 4: Experimental materials for Experiment 4.

A. Accessible licensor	**No** authors [that the critics recommended] have **ever** received acknowledgement…
B. Inaccessible licensor *no*	The authors [that **no** critics recommended] have **ever** received acknowledgement…
C. Inaccessible licensor *not*	The authors [that the critics did **not** recommend] have **ever** received acknowledgement…
D. No licensor	The authors [that the critics recommended] have **ever** received acknowledgement…

[32] As noted in §3.1.3.1, the use of Amazon's Mechanical Turk (https://aws.amazon.com/mturk) as a crowdsourcing service has become more and more frequent in the fields of linguistics and psychology and its experimental suitability has been validated by several studies (e.g. Crump et al. 2013; Enochson & Culbertson 2015; Gibson et al. 2011; Sprouse 2011).

… for a best-selling novel.

The items, which were adapted from Parker and Phillips (2016), consisted of a subject noun phrase (NP) modified by an object relative clause followed by the main clause predicate which contains the NPI *ever* immediately after the main clause auxiliary *have*, which unambiguously marks the end of the relative clause. Special care was taken so that the matrix clause subject and the relative clause subject were both animate and plural NPs to avoid that one NP may be more salient than the other, while ensuring that these NPs were similarly plausible across all conditions.

Each participant was asked to rate 108 sentences: 36 experimental items and 72 fillers of similar length and complexity. The 36 sets of experimental sentences were distributed across 4 lists using a Latin Square design and the fillers were the same in each list. Roughly half of the fillers contained ungrammaticalities in order to achieve a 1:1 grammatical-to-ungrammatical ratio across the task. The grammatical violations included preposition usage, person and number agreement and verbal morphology. During the delivery of the instructions, participants were asked to complete 6 practice items to ensure that they had understood the procedure.

3.2.1.3 Procedure

This task used the same procedure as Experiment 3 (cf. §3.1.3.3). The sentences were presented using Ibex Farm and the presentation order was randomized for each participant. The instructions asked participants to rate the sentence's acceptability using a 7-point scale in which 7 was the most acceptable value and 1 the least acceptable. Each sentence was displayed on the screen together with the scale, and participants could take as much time as needed before providing their rating using the numerical keypad or by clicking with the mouse. In order to help them adjust to the scale, the first two practice items were followed by feedback. Participants were encouraged to take as much time as they needed and to use the entire range of the scale. The order of presentation of experimental items and fillers was randomized for each participant. The task was completed by all participants in less than 20 minutes.

3.2.1.4 Analysis

The ratings collected were analyzed using a linear mixed-effects model that included the experimental conditions as fixed effects and participants and items crossed as random effects.

The results reported correspond to the maximal model which included by-subject and by-item random intercepts and slopes for the experimental conditions. As with the previous experiments, an effect was considered to be statistically significant at the level of $p<.05$ when the absolute *t*-value was above 2 (Gelman & Hill 2006; Baayen et al. 2008). For this and the following two experiments, the contrasts among the four experimental conditions were obtained as follows: first, condition A (accessible licensor) was used as the reference level of the intercept in order to obtain the contrasts between A-B (inaccessible licensor *no*), A-C (inaccessible licensor *not*), and A-D (no licensor). Then, the contrasts between conditions B-C and B-D were obtained by setting B as the intercept. Finally, the remaining contrast between conditions C-D was obtained by setting C as the reference level.

3.2.1.5 Results

The results from this experiment are presented in Figure 5. Sentences with an accessible licensor (i.e. condition A, the grammatical condition) had the highest rating and the ratings for the other three conditions were quite low. Consequently, the model results revealed statistically significant differences between condition A and the other three experimental conditions (A vs. B: Estimate= -2.88, *SE*=0.36, *t*= -7.91; A vs C: Estimate= -3.49, *SE*=0.37, *t*=-9.51; A vs D: Estimate= -3.42, *SE*=0.40, *t*=-8.60). As can be observed in Figure 4, ungrammatical sentences containing the inaccessible licensor *no* (condition B) were rated slightly higher than ungrammatical sentences containing the inaccessible licensor *not* (condition C) and ungrammatical sentences with no licensor (condition D). This difference was shown to be statistically significant (B vs. C: Estimate= -0.61, *SE*=0.22, *t*= -2.81, B vs. D: Estimate= -0.54, *SE*=0.25, *t*= -2.16). Finally, no differences were observed between sentences containing the inaccessible licensor *not* and sentences with no licensor (C vs. D: Estimate= -0.07, *SE*=0.13, *t*= 0.55).

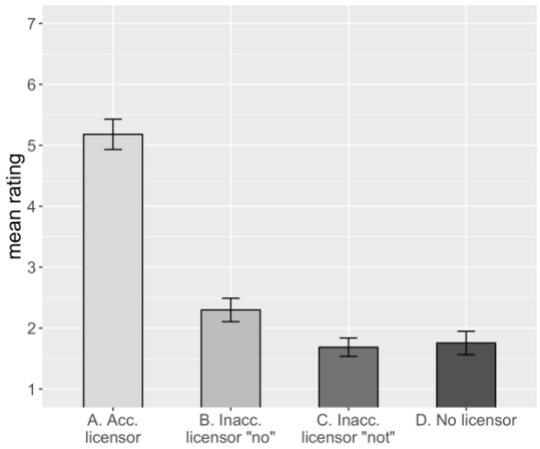


Figure 5. Mean ratings for the experimental conditions in Experiment 4. Error bars indicate standard error of the mean.

3.2.1.6 Discussion

The main objective of this task was to confirm the grammatical status of the experimental materials paying particular attention to participants' offline sensitivity to unlicensed NPIs in the context of structurally inaccessible negations *no* and *not*. The results show that participants clearly identify the grammatical baseline condition as acceptable and the ungrammatical baseline condition as unacceptable. This is shown by the high ratings given to the accessible licensor condition and the huge drop in the ratings given to the no licensor condition. In addition, the ratings observed to the two critical conditions containing inaccessible negative elements are also very degraded. In this regard, these results provide a confirmation that NPI licensing constraints are consistently implemented by native speakers' grammars.

Nonetheless, there is an interesting illusion profile revealed by the significant contrast between the inaccessible quantificational licensor condition and the other two ungrammatical conditions: in spite of the clear contrast between the cases in which the NPI *ever* is licensed and those in which it is unlicensed, ungrammatical sentences containing *no* in the relative clause (condition B) received slightly higher ratings than similarly ungrammatical sentences containing *not* in the relative clause (condition C) sentences with no licensor at all (condition D). The (moderate) boost observed for the inaccessible quantificational licensor condition when compared to the no licensor condition is precisely the contrast that is relevant in the identification of intrusion effects. Such a result represents evidence for facilitatory interference or, in other words, an offline illusion of grammaticality. A crucial finding here is that no parallel effect was found for sentences containing inaccessible verbal negation.

The illusion effect observed in this offline acceptability task is surprising because it contrasts with the neat results reported in the offline rating conducted by Parker and Phillips' (2016, Experiment 1). In spite of the fact that the two experiments use the same set of 36 items, the six-condition design used in Parker and Phillips implies that they had less items per condition than we do here (6 vs. 9), possibly resulting in less stable measurements that could have impeded the identification of small contrasts among the ungrammatical conditions.[33] Indeed, this is not the first time that intrusion effects have been identified in offline acceptability ratings even though not every study on NPI illusions reports acceptability ratings for the stimuli (e.g. Drenhaus et al. 2005; Vasishth et al. 2008; Xiang et al. 2009). For instance, previous works by Orth et al. (2020a; 2020b), Xiang et al. (2006; 2013) or Yanilmaz & Drury (2018) have reported an improved perception of acceptability for NPI illusion sentences in offline tasks even when the amelioration effects are much weaker than those obtained in online tasks. This evidence suggests that the contrast between Parker & Phillips' results and ours could be explained by a failure to detect such an effect in their work.

In sum, the results from the acceptability rating validate the experimental materials as having a clear grammatical status while they provide evidence for the existence of facilitatory interference from intrusive quantificational licensors. This means that an offline grammatical illusion arose when ungrammatical sentences contained an embedded *no* but not when they contained an embedded *not.* We had not predicted to obtain this effect in an offline task, which makes it even more interesting to test the online time-course of these constructions using an online methodology such as speeded acceptability. We turn to this below.

3.2.2 Experiment 5: speeded acceptability

Experiment 5 used the speeded acceptability technique, a widely used online method to track NPI illusions, to investigate the impact of inaccessible quantificational negation and verbal negation in the emergence of intrusion effects. Considering previous speeded acceptability findings (e.g. Drenhaus et al. 2005; Parker & Phillips 2016) and the results from Experiment 4, sentences containing the quantificational negation *no* in the relative clause are expected to display an acceptability boost in contrast with sentences with no licensor at all (i.e. an illusion of grammaticality). The key question that we hope to answer with this task is whether sentences

[33] Their study has a 3x2 design in which they compare the NPIs *ever* and *any* in the three conditions (licensed – intrusive *no* – unlicensed).

containing the verbal negation *not* in the relative clause also generate intrusion effects when participants are forced to operate on fast and unconscious intuitions of grammaticality. If, as all the existing hypothesis predict, the presence of verbal negation facilitates the integration of the ungrammatical NPI *ever*, the time-sensitive method used here should be reliable enough to capture it in the form of an acceptability boost for this type of sentences too.

3.2.2.1 Participants

35 US-based native speakers of English (15 female, mean age 40 y/o) participated in this experiment.[34] All participants provided informed consent and they received $3 as compensation. As in Experiment 4, participants were recruited using Amazon's Mechanical Turk (AMT). In order to ensure that the people recruited via AMT were native speakers of English they had to complete a native speaker qualification test (see Appendix B). Only participants that scored at least 7/9 were allowed into the task.

3.2.2.2 Materials

The materials used in this task were the same 36 sets of experimental items and 72 filler sentences that were used in Experiment 4. An example set of the experimental conditions is repeated in Table 5, and the entire list of experimental materials can be consulted in Appendix A.2. The ratio of grammatical-to-ungrammatical sentences was balanced so that half of the sentences across the task contained ungrammaticalities. During the delivery of the instructions, participants were asked to complete 6 practice items to ensure that they had understood the procedure.

Table 5: Experimental materials for Experiment 5.

A. Accessible licensor	**No** authors [that the critics recommended] have **ever** received acknowledgement…
B. Inaccessible licensor *no*	The authors [that **no** critics recommended] have **ever** received acknowledgement…
C. Inaccessible licensor *not*	The authors [that the critics did **not** recommend] have **ever** received acknowledgement…
D. No licensor	The authors [that the critics recommended] have **ever** received acknowledgement…
	… for a best-selling novel.

[34] We opened 36 spots on AMT but for some unknown reason the data from one participant was not saved on the server.

3.2.2.3 Procedure

The procedure for this speeded acceptability task was the same as the one used in Experiment 1 in the first part of this chapter. The stimuli were presented on a desktop PC using Ibex (Drummond 2013). Each sentence was displayed word by word at a rate of 400 ms per word, in the center of the screen, using the rapid serial visual presentation (RSVP) paradigm. At the end of each sentence, a response screen appeared and participants were asked to provide a *yes*/*no* button press judgment in a maximum time of 2 seconds. When participants failed to provide the judgment in time, a message indicated that they were too slow. Participants were instructed to read the sentences carefully and judge whether they came across as well-formed English. They received feedback for the first two practice items. All participants were tested on the same computer. The task lasted for approximately 30 minutes and the order of presentation for experimental and filler sentences was randomized for each participant.

3.2.2.4 Analysis

The *yes/no* responses collected were analyzed using a generalized linear mixed model for binomial distributions (also known as logistic mixed model: Baayen et al., 2008; Jaeger, 2008). A maximal model was initially built. This model included the experimental conditions as fixed effects and by-participants and by-items random intercepts and slopes for the experimental conditions. Given that the maximal model with a fully specified random effects structure failed to converge, below we report the results from the maximally converging model containing random intercepts but no slopes. An effect was considered to be statistically significant at the level of $p<.05$ when the absolute z-value was above 2 (Gelman & Hill 2006; Baayen et al. 2008).

3.2.2.5 Results

The results from this experiment are presented in Figure 6, which shows the percentage of *yes* responses given to each condition. Sentences with an accessible licensor (i.e. condition A, the grammatical condition) display the highest rate of acceptance (above 80%). The model results revealed statistically significant differences between condition A and the other the three experimental conditions (A vs. B: Estimate= -3.22, *SE*=0.24, z= -13.46; A vs C: Estimate= -3.92, *SE*=0.26, z=-15.27; A vs D: Estimate= -4.17, *SE*=0.26, z=-15.71). As can be observed in Figure 5, ungrammatical sentences containing the inaccessible licensor *no* (condition B) were

accepted in a higher proportion of cases than ungrammatical sentences containing the inaccessible licensor *not* (condition C) and ungrammatical sentences with no licensor (condition D). This difference was shown to be statistically significant (B vs. C: Estimate= -0.70, *SE*=0.21, *z*= -3.39, B vs. D: Estimate= -0.94, *SE*=0.21, *z*= -4.41). Finally, no differences were observed between sentences containing the inaccessible licensor *not* and sentences with no licensor (C vs. D: Estimate = -0.25, *SE*=0.23, *z*= -1.09).[35]

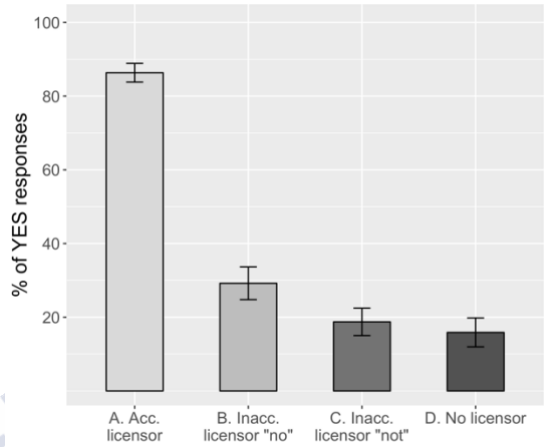


Figure 6. Mean percentage of 'YES' responses for the experimental conditions in Experiment 5. Error bars indicate standard error of the mean.

3.2.2.6 Discussion

The results from Experiment 5 replicate the widely attested intrusion effect for sentences containing *no* as inaccessible licensor (condition B). In this regard, the illusion size observed in this task is similar to the findings from previous works using the speeded acceptability method in that the acceptance rate for ungrammatical sentences containing *no* often receive twice the number of *yes* responses than ungrammatical baseline conditions with no licensor (e.g. Parker & Phillips 2016 Experiment 2). This pattern of illusory licensing is, however, not found when the intrusive licensor is *not* (i.e. verbal negation, condition C). In this respect, the results from this online task show a similar pattern of contrast as those obtained in the offline rating conducted in Experiment 4. However, the fact that verbal negation *not*, the most

[35] It should be noted that given that in this and the following experiment one of the the key issues is whether verbal negation exhibits intrusion effects or not. Given the relevance of the absence of illusion effects, further tests using Bayesian contrasts should be applied here in order to ascertain the probabilities of the null hypothesis being correct.

canonical downward entailing and non-veridical operator, does not generate intrusion effects contradicts the predictions of previous accounts described in the introduction (§3.2). We discuss this next.

First of all, the most widespread explanation of NPI illusions which we discussed as the *memory-based hypothesis* (Vasishth et al. 2008), is the account that makes the most straightforward prediction with regard to the impact of verbal negation on intrusion effects. Regardless of whether *not* is coded using the feature [+negative] or other alternatives such as [+downward entailing] or [+nonveridical], this model directly predicts that *not* as a licensor holding any of those features should be erroneously retrieved in illusion-like sentences, causing an increased perception of acceptability. Contrary to this prediction, our findings show that the acceptability perception of sentences containing intrusive *not* is as degraded as for sentences with no licensor at all, ruling out the impact of cue-based retrieval operations of the as an explanation of the cognitive processes that generate NPI illusions.

Secondly, we discuss the *pragmatic rescuing hypothesis* (Xiang et al. 2009; Xiang et al. 2013) in light of our results. This account proposes that the generation of negative contrastive inferences fostered by the use of restrictive relative clauses are behind the misapplication of secondary pragmatic licensing mechanisms that rescue unlicensed NPIs in illusion sentences. A critical ingredient of this account is the consideration that negative quantifiers play a role in making the contrasting referents "salient in the discourse" as "negative quantifiers can do exactly this" (Xiang et al. 2009: 53). If the role of negative quantifiers is seen as an essential property of the hypothesis, it could be taken to explain the observed contrast between *no* and *not* in generating intrusion effects. However, as we already noted in the introduction (§3.2), the presence of a negative quantifier appears not to be essential given that illusions are obtained with other potential NPI licensors (e.g. *very few*), and most importantly, because restrictive relative clauses containing *not* the type of inferences (i.e. negative contrastive ones) that motivate the rescuing of unlicensed NPIs. As a result, we take the pragmatic rescuing hypothesis as it was originally stated by Xiang and colleagues to be unable to account for the pattern of results reported here.

Thirdly, after examining the *unstable encodings hypothesis* proposed by Parker and Phillips' (2016), we understand that the critical feature is the linear distance between the potential licensor and the NPI. Given that the potential licensor *not* is actually closer to the NPI than *no* in classic illusion sentences, it is difficult to see how this hypothesis can account for

the contrast in licensor types observed here. Notwithstanding the above, the proposal by Parker & Phillips argues that NPI illusions represent a problem of encoding, assuming that NPI licensing mechanisms are deployed correctly and that incremental linguistic encodings take some time to complete and change over time. It could be speculated, then, that different linguistic elements might be encoded at a different speed, and thus, that the contrast between *no* and *not* could be explained by assuming that verbal negation could be computed faster than quantificational negation. If this speculation were correct, when the licensing context is probed for licensing upon encountering the NPI, the irrelevant negation *not* may not be transparently accessible as a candidate licensor, explaining the lack of intrusion effects in this case. While we will not delve deeper into this speculation, we will take up the *unstable encodings hypothesis* in the next experiment.

Before exploring alternative explanations that could account for the contrast between quantificational negation and verbal negation, it is necessary to discuss two potential confounds that emerge from our experimental materials and design and that could be behind the observed results. These issues have to do with the impact of the presence of two illusion-like configurations over the experiment and the use of the use of the non-contracted form of *not* in verbal negation conditions. Indeed, the illusion effect found in this task appears to be smaller than the one reported in previous studies, something which could be due to the fact that 3 out of the 4 experimental conditions were ungrammatical, fostering an overall bias towards responding 'no' for sentences containing *ever*. It is possible that participants' judgements across the task are influenced by having encountered four different NPI conditions, and specifically, sentences containing intrusive *no* and intrusive *not*. A concerning strategy that participants could have been using to respond has to do with making comparisons between the conditions, rather than examining each of the sentences in isolation. Simultaneously, a parallel issue has to do with the fact that sentences containing verbal negation could be more salient because the non-contracted form (*have not* vs. *haven't*) is generally seen as a marked form (i.e. less natural). While it is true that the saliency of the negative marker could predict more illusions to occur (particularly within the *memory-based hypothesis*), it is also possible that this feature has the opposite effect, allowing comprehenders to identify the ungrammaticality with more ease. If the presence of two intrusive configurations and the markedness of non-contracted verbal negation conspire together during the task, sentences containing verbal negation would be more easily identified as ungrammatical when compared with classic illusion-like sentences

containing quantificational negation, accounting thus for the observed results. We address these issues in the next experiment.

3.2.3 Experiment 6: speeded acceptability

This last experiment from Part I of the thesis explores further the contrast between quantificational and verbal negation found in Experiment 5. To do so, this task is conceived as close replication which includes some small changes on the materials and design that will allow us to rule out the potential confounds just discussed. On the one hand, the critical illusion conditions (intrusive *no* and intrusive *not*) will be tested as a between-subjects factor to avoid participants drawing from comparisons across the task when providing their answers. Therefore, we created two sub-experiments which included the grammatical and ungrammatical baseline conditions and only one of the inaccessible licensor conditions (sub-experiment 6a: A-B-D, and sub-experiment 6b: A-C-D). On the other hand, in the verbal negation condition we used a contraction form to increase naturalness and avoid extra saliency due to the use of the marked uncontracted form.

Furthermore, we added extra material in the relative clause in the form of a prepositional phrase to increase the distance between the inaccessible licensor and the NPI. This was done in order to test one of the main conclusions of Parker & Phillip's (2016) work: that distance between the licensor and the NPI is what is responsible for turning the illusions off. If this is correct, we would assume that increasing such a distance should that the size of the illusion would, at least, be reduced when compared to similar sentences without the extra material, like those used in Experiment 5.

3.2.3.1 Participants

Two groups of 24 participants each were recruited for this task. The first group (13 female, mean age 41 y/o) performed the sub-experiment 6a, which contained quantificational negation as inaccessible licensor (i.e. conditions A-B-D). The second group (8 female, mean age 40 y/o) performed the sub-experiment 6b, which contained verbal negation as inaccessible licensor (i.e. conditions A-C-D). All participants provided informed consent and they received $3 as compensation. As in previous experiments, participants were recruited using Amazon's Mechanical Turk (AMT). In order to ensure that the people recruited via AMT were native

speakers of English they had to complete a native speaker qualification test (see Appendix B). Only participants that scored at least 7/9 were allowed into the task.

3.2.3.2 Materials

The experimental materials used in this task consisted of 36 sets containing the same four experimental conditions as the two previous experiments. On the one hand, the sentence with an accessible licensor (i.e. condition A) and the sentence with no licensor (i.e. condition D) are the grammatical and ungrammatical baselines, respectively. On the one hand, the sentence with inaccessible quantificational licensor (i.e. condition B) and the sentence with an inaccessible verbal licensor (i.e. condition C) are the critical conditions. An example set of the experimental sentences is shown in Table 6, and the entire list of experimental materials can be consulted in Appendix A.3.

Table 6: Experimental materials for Experiment 6.

A. Accessible licensor	**No** authors [that the critics have recommended in their reviews] have **ever** received…
B. Inaccessible licensor *no*	The authors [that **no** critics have recommended in their reviews] have **ever** received…
C. Inaccessible licensor *not*	The authors [that the critics **haven't** recommended in their reviews] have **ever** received…
D. No licensor	The authors [that the critics have recommended in their reviews] have **ever** received…
	… acknowledgement for a best-selling novel.

Albeit highly similar, the experimental materials used here introduced some changes with respect to Experiments 4-5. As already noted above, we decided to use a contracted form of verbal negation in condition C to increase naturalness. This implied that instead of using the simple past in the relative clause, we have used the present perfect, so that all four conditions have the same structure and hence, the contracted verbal negation appears in the form of *haven't* instead of *did not* as in the previous experiments. Furthermore, extra material was included inside the relative clause. Specifically, an adjunct (e.g. *in their reviews*) was added in order to separate the appearance of the inaccessible licensor and the NPI *ever*.

The 36 sets of experimental items were counterbalanced in four lists using a Latin Square design, together with 90 filler sentences of similar internal structure, length and complexity.

The number of filler items was slightly increased with respect to the previous experiments in order to have more variability within the task. Each list had a total of 126 items and participants were randomly assigned to one of the four lists. Grammaticality was balanced so that half of the sentences were ungrammatical across the task, which entailed that a proportion of the fillers contained ungrammaticalities. The grammatical violations introduced included preposition usage, number agreement, verbal morphology and pronoun-antecedent mismatches. During the delivery of the instructions, participants were asked to complete 2 practice items to ensure that they had understood the procedure.

3.2.3.3 Procedure

The procedure for the two sub-experiments conducted here followed the same steps as in the speeded acceptability tasks reported in this chapter. The stimuli were presented on a desktop PC using Ibex (Drummond 2013). Each sentence was displayed word by word at a rate of 400 ms per word, in the center of the screen, using the rapid serial visual presentation (RSVP) paradigm. At the end of each sentence, a response screen appeared and participants were asked to provide a *yes*/*no* button press judgment in a maximum time of 2 seconds. When participants failed to provide the judgment in time, a message indicated that they were too slow. Participants were instructed to read the sentences carefully and judge whether they came across as well-formed English. They received feedback for the two practice items. All participants were tested on the same computer. The task lasted for approximately 35 minutes and the order of presentation for experimental and filler sentences was randomized for each participant.

3.2.3.4 Analysis

The *yes/no* responses collected were analyzed using a generalized linear mixed model for binomial distributions (also known as logistic mixed model: Baayen et al., 2008; Jaeger, 2008). Each of the sub-experiments was analyzed independently. A maximal model was initially built. This model included the experimental conditions as fixed effects and by-participants and by-items random intercepts and slopes for the experimental conditions. Given that the maximal model with a fully specified random effects structure failed to converge, below we report the results from the maximally converging model containing random intercepts but no slopes. An effect was considered to be statistically significant at the level of $p<.05$ when the absolute *z*-value was above 2 (Gelman & Hill 2006; Baayen et al. 2008).

3.2.3.5 Results

The results from the two sub-experiments are respectively presented in Figures 7a and 7b. The statistical results are presented separately.

Regarding sub-experiment 6a, sentences with an accessible licensor (i.e. condition A, the grammatical condition) had the highest rate of acceptance (almost 80%). The model results revealed statistically significant differences between condition A and the other the two experimental conditions (A vs. B: Estimate = -2.59, *SE*=0.25, *z*= -10.36; A vs B: Estimate = -3.85, *SE*=0.29, *z*=-13.37). Crucially, as can be observed in Figure 6a, ungrammatical sentences containing the inaccessible licensor *no* (condition B) were accepted in a higher proportion of cases than the ungrammatical baseline with no licensor (condition D). This difference was shown to be statistically significant (B vs. D: Estimate = -1.25, *SE*=0.23, *z*= -5.41).

Regarding sub-experiment 6b, as it was the case with sub-experiment 6a, sentences with an accessible licensor (i.e. condition A) had the highest rate of acceptance (above 80%). The model results revealed statistically significant differences between condition A and the other the two experimental conditions (A vs. C: Estimate = -3.86, *SE*=0.27, *z*= -14.40; A vs D: Estimate = -3.81, *SE*=0.26, *z*=-14.32). Yet, importantly, the rate of acceptance of ungrammatical sentences containing the inaccessible licensor *n't* (condition C) was as low as the ungrammatical baseline with no licensor (condition D). No statistical difference was observed between these two conditions (C vs. D: Estimate = 0.05, *SE*=0.24, *z*= 0.19).

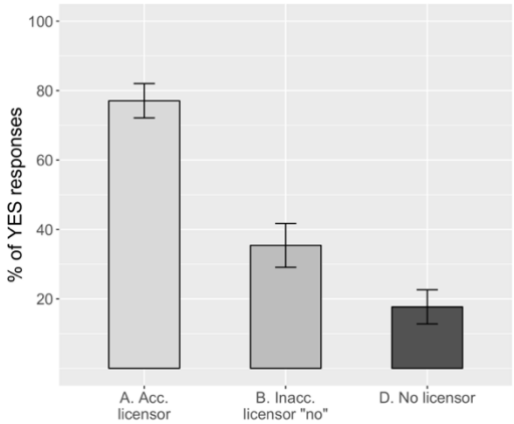


Figure 7a: Mean percentage of 'YES' responses for the experimental conditions of sub-experiment 6a (ABD). Error bars indicate standard error of the mean.

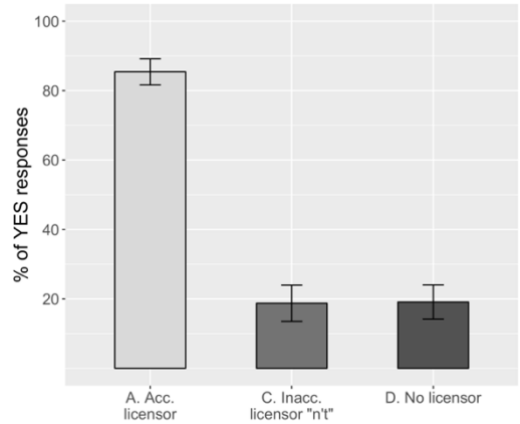


Figure 7b: Mean percentage of 'YES' responses for the experimental conditions of sub-experiment 6b (ACD). Error bars indicate standard error of the mean.

3.2.3.6 Discussion

The results from Experiment 6 replicate those from Experiment 5 in all the relevant aspects. Firstly, the sub-experiment 6a showed a clear illusion effect for sentences containing intrusive *no*, which received an acceptance boost with respect to sentences with no licensor. Secondly, the sub-experiment 6b replicated the lack of illusion effects for sentences containing intrusive *n't*, a finding that is incompatible with the predictions of the *memory-based hypothesis* and the *pragmatic rescuing hypothesis*. The fact that the results from Experiments 5 and 6 show the same pattern contrasts is interpreted as evidence that the use of uncontracted negation *not* or the presentation of the two intrusive conditions together did not have a critical influence in the results of Experiment 5.

With regard to the introduction of the prepositional phrase, the findings from this task show that increasing the distance between the licensor *no* and the NPI *ever* did not have an impact on the prevalence of illusion effects. Indeed, if anything, the size of the illusion obtained in Experiment 6 (35.66%) appears to be bigger that the one obtained in Experiment 5 (30.26%). Although the absence of a statistical comparison between the two experiments does not allow us to ascertain whether this is a significant increase it is quite possible that presenting the four conditions together in Experiment 5 had some impact on the reduced illusion size. In any case, the finding that added material did not have an impact on illusion is initially incompatible with the idea that the distance between the (intrusive) licensor and the NPI is the crucial factor for illusions to occur, as put forth by the *unstable encoding hypothesis*.

Nonetheless, it may be the case that the material introduced is not long enough to reduce or turn the illusion off. Indeed, in their work, Parker & Phillips note that the position of the NPIs before the main verb for the case of *ever* and after the main verb for the case of *any* could be the reason why illusions do not obtain in the second case, as "reactivation of the subject NP by the main verb could reduce interference from the irrelevant licensor for NPIs that occupy a position after the verb" (2016: 330).[36] If verbs represent such an important encoding landmark for illusions to disappear, it makes sense that added distance by means of a prepositional phrase did not have an impact in turning the illusion off. In order to explore this issue further, a study carried out by Muller et al. (2020) investigated whether the crucial distance for illusions to occur was between the licensor and the NPI or between the edge of the licensor-containing

[36] Remember that they compare sentences containing *ever* and *any* (e.g. *The authors that no critics recommended have ever received acknowledgement / have received any acknowledgement*…).

clause (the relative clause) and the NPI. To this aim, the authors compared three different distance configurations introducing verbs instead of PPs. These configurations are shown in (55): the classic illusion configuration (55a), added distance inside of the relative clause by means of the VP *to heal their injuries* (55b), and added distance outside of the relative by means of the VP *healed* (55c).[37]

(55) a. *The surgeons [that no patients trusted] have **ever** prescribed new experimental medications.
b. *The surgeons [that no patients trusted to heal their injuries] have **ever** prescribed new experimental medications.
c. *The surgeons [that no patients trusted] have healed **any** injuries with experimental medications.

In (55b), the linear distance between *no* and *ever* is increased, but the distance between the edge of the relative clause and *ever* is kept constant, as can be observed by comparing it with the classic illusion configuration in (55a). In (55c), the same lexical material (the VP *heal*) is used to increase the distance between the edge of the relative clause and the unlicensed NPI. Therefore, if what turns the illusion off is added distance by means of a verb –understood as a critical encoding landmark, sentences like (55b) and (55c) should exhibit the same pattern; namely, no illusion as a consequence of added distance by means of a VP. Yet, contrary to this prediction, the results from this investigation showed clear illusion effects when the extra VP was introduced inside of the relative clause increasing the distance between the (intrusive) licensor and the NPI (i.e. (55b)), and no illusion effects when it was introduced outside of the relative clause increasing the distance between the edge of the relative clause and the NPI (i.e. (55c)). This finding was interpreted as evidence that NPI illusions are only generated when the NPI appears very close (one word or less) to the potential licensing context (i.e. the relative clause), not the specific lexical licensing word (i.e. *no*), disproving the assumptions of the *unstable encodings hypothesis*.

Returning to the contrast between quantificational and verbal negation, another way to capture distance effects might be to consider structural distance, rather than linear distance.

[37] Each of these conditions was accompanied by a corresponding grammatical (i.e. licensed) and ungrammatical (i.e. no licensor at all) baselines. Note that the NPI used in condition (55c) is *any* given that *ever* cannot be placed post-verbally.

Considering the materials used in this experiment, the added prepositional phrase would not have any impact on the structural distance (e.g. number of nodes in a syntactic tree) between the intrusive licensor(s) and the NPI. However, there is indeed a structural difference between verbal negation and quantificational negation, being the former deeper embedded in the syntactic tree. In this regard, it is necessary to discuss further research carried out in collaboration with Muller and Phillips (Muller et al. 2019a; 2019b), in which we studied sentences which displayed subject relative clauses instead of object relative clauses. As shown in (56), subject relative clauses invert the order and syntactic depth of quantificational and verbal licensors.[38] Still, in line with the results reported in this PhD project, the results collected in Muller et al. for subject relative clauses only display intrusion effects in sentences containing a quantificational licensor (i.e. (56a)).

(56) a. *The critics [that have recommended very few authors of alternative genres] have **ever** objected to mainstream literary trends.

b. *The critics [that haven't recommended the authors of alternative genres] have **ever** objected to mainstream literary trends.

In sum, the results from Experiment 6 confirm the contrast established in Experiment 5 between quantificational and verbal negation in that the former generates clear illusion effects while the latter does not. In light of the results collected in Muller et al. (2019a; 2019b) on subject relative clauses, the difference between licensor types does not seem to arise from differences in syntactic position. As already elaborated in several parts of this chapter, the observed contrast between licensor types is incompatible with the predictions of the *memory-based hypothesis* and the *pragmatic rescuing hypothesis*. Furthermore, in the discussion of Experiment 5 we introduced the idea that, under the assumptions of the *changing encodings hypothesis*, it could be speculated that the contrast between *no* and *not* could be explained by assuming that verbal negation was computed faster than quantificational negation. Even though Experiment 6 does not tackle this speculation, it does show that increasing the distance between the intrusive

[38] Note that in the experiment manipulating subject relative clauses conducted by Muller et al. (2019a; 2019b), the quantificational licensor used is *very few* instead of *no*. This was motivated by the fact that introducing *no* in object position would produce less natural sentences (e.g. *The critics [that have recommended no authors of alternative genres] have **ever** objected to mainstream literary trends)*. Nonetheless, there was no initial reason to believe that using *very few* instead of *no* could affect the existence of illusion effects since a previous investigation by Xiang et al. (2009) has shown that NPI illusions were also obtained when using *very few* as intrusive licensor. Indeed, the results from Muller and colleagues further confirm this finding given that sentences like (56a) are found to exhibit illusion effects.

licensor and the NPI does not have an impact on the emergence of illusion effects. This data-point, together with the more detailed distance manipulations tested in Muller et al. (2020), clearly shows that the assumptions on which the *unstable encoding hypothesis* is articulated are inaccurate. That is, distance –be that linear or structural– between the intrusive licensor and the NPI is not the appropriate generalization for capturing NPI illusions. Instead, the critical elements that appear to determine the appearance of NPI illusions are the type intrusive licensor and the distance between the NPI and the edge of the relative clause –i.e. the potential licensing context. This will lead us to propose alternative explanations for NPI illusions, which will be clearly spelled out shortly in section §3.2.5 where we will also inspect in perspective the findings collected in this second part of the chapter. Still, before moving there, the next section briefly presents the results from a corpus investigation.

3.2.4 Corpus study

The experiments presented so far show that NPI illusions arise, at least in part, as a result of the use of quantificational licensors in the relative clause. Thus, a better understanding of NPI illusions requires a detailed analysis of the differences between these two types of negative elements. Certainly, both types of elements are good candidates for licensing NPIs as the two of them are downward entailing and nonveridical operators. In Xiang et al. (2009)**,** the authors perform an analysis of the frequencies of co-occurrence in the English English Gigaword corpus (Graff 2003) between the NPI *ever* and its possible licensors. By retrieving and analyzing the instances of *ever*, they showed that transparent negation (e.g., *not, no, didn't,* etc.) accounted for 19% of the licensing environments, and more specifically, that the negative quantifier *no* accounted for 9% of the cases of transparent negation. In addition, the authors also found that the less common licensor *few* only accounted for 2% of the licensing contexts of *ever*. Given that the authors wanted to address the hypothesis that NPI illusions could reflect frequent lexical associations, they compared illusion sentences using the frequent licensor *no* and less common licensor (*very) few*. Their results, as noted in several parts of Chapters 2 and 3, shown that the two types of licensors generated intrusion effects. However, their work does not report the differences between quantificational and verbal negation observed in the corpus, which is the question that we will attempt to answer here. That is, what is the frequency of co-occurrence of quantificational negation and sentential negation with *ever*? or to be more specific, what is the conditional probability of *ever* once *no* or *not*/*n't* has appeared?

This corpus study was performed on the Corpus of Contemporary American English (COCA, Davies 2008). Containing over 600 million words, the COCA corpus is the largest annotated and most widely used free database on the English language. Its architecture is built using Microsoft SQL and the annotation algorithm allows for the fast retrieval of complex and precise queries. At the time of the search, the corpus contained English texts from 1990 to 2016 (now up to 2019). Our query method was very simple. We draw 5000 random instances of sentences containing quantificational negation (*no*) and another 5000 random instances of sentences containing verbal negation (*n't* or *not*). After having retrieved these random samples, they were manually analyzed for the presence of the NPI *ever* at any sentence position after the negative element. That is, we looked for cases in which the NPI was licensed by either quantificational or verbal negation. The results are displayed in Table 7, which shows that environments with *no* were six times more likely to also contain *ever* than environments with *not*/*n't*. In spite of the low proportion of NPIs found in the random samples, which was something expectable, the difference was shown to be statistically significant ($X^2(1)= 31.34$, $p<0.001$).

Table 7: Frequency of *ever* per 5000 sentences containing *no* or *not/n't*.

Query	Frequency of *ever* per 5000 sentences
[no]	59 (1.18%)
[not/n't]	12 (0.24%)

It must be noted that the starting point of our corpus study was different from the one taken in Xiang et al. (2009). While Xiang and colleagues were looking at licensing environments 'retroactively' by examining the different licensors that appeared after retrieving *ever* from the database, we looked at them 'proactively' by examining the probability that *ever* would appear after having encountered *no* or *not*/*n't*. This way of looking at the differences between quantificational and verbal negation is particularly relevant when assessing intrusion effects against the backdrop of the existing linguistic theories on NPI licensing. One question we should pose at this point is why is *ever* more frequently encountered after quantificational negation than after verbal negation? Our suggestion in this regard is that negative quantifiers evoke strong and exceptionless general assertions which provide the perfect environment for semantic strengthening operations. As reviewed in §2.1.1, semantic strengthening has been

claimed by authors such as Kadmon & Landman (1993) to be the function of NPIs. Furthermore, quantifiers evoke scalar alternatives, which have also been argued to by scalar approaches to polarity as one of the licensing conditions for NPIs (e.g. Chierchia 2006; Fauconnier 1975). That is, NPIs are thought to be licensed when the NPI-containing proposition represents the endpoint of the scale –the strongest claim. These two ideas together provide a tentative explanation for the differential frequencies observed in the corpus given that negative quantifiers evoke strong assertions which activate scalar alternatives and hence, NPIs are expectable to occur more often in these type of contexts. Still, even though this observation is interesting in itself, it leaves unexplained the reasons why and the processes whereby intrusive quantificational negation yields illusions but verbal negation does not. In the next section we will provide a conjoint discussion of the results from this second part chapter. Through this evaluation we will elaborate in detail two possible alternative hypotheses that appear to be promising in terms of accounting for the general profile of NPI illusions uncovered here.

3.2.5 Discussion of Experiments 4-6 and corpus study

This second part of the chapter was concerned with examining the impact of two different types of licensors –i.e. quantificational and verbal negation– on the generation of intrusion effects during NPI licensing processes. To do so, we compared sentences containing the inaccessible negative quantifier *no* and the verbal negation *not*, being the latter a so far unattested configuration that allowed us to put to the test previous hypothesis on the phenomenon of NPI illusions. Experiment 4 shows that in an untimed acceptability task native speakers are able to properly judge as unacceptable the three ungrammatical conditions, demonstrating that they are sensitive to the grammar of NPI licensing. Nonetheless, it is important to remark that in this offline tasks we were able to observe a small illusion effect for sentences containing inaccessible *no*. This trend was further confirmed in two online speeded acceptability tasks, Experiments 5 and 6, which clearly demonstrate that whereas negative quantifiers generate intrusion effects, verbal negation does not. The lack of illusion for verbal negation was found in two experiments with different design and materials controlling for possible confounds. What is observed, then, is an interesting online-offline parallelism, rather than a contrast, given that *no* is shown to produce online and offline intrusion effects, and *not/n't* does not produce intrusion effects in either case. These findings do not fit neatly into the narrow definition of

grammatical illusions, understood as a contrast between offline and online results –a crucial point to which we return at the end of the thesis in Chapter 6.

As discussed along the experiments, none of the existent hypothesis of NPI illusions are able to accurately account for this findings, which leads us to the examination of alternative proposals. In particular, we explore two novel hypotheses that can provide promising ways of accounting for the contrast between *no* and *not/n't* and, ultimately, for NPI illusions in general. These tentative and still under construction alternatives are introduced below under the names of *scalar alternatives hypothesis* and *scope miscalculation hypothesis.*

The *scalar alternatives hypothesis* places the focus on the role of negative quantifiers and scalar alternatives on NPI licensing. Under this hypothesis, NPI illusions would be seen to occur as a consequence of the scalar inferences evoked by the negative quantifier in the relative clause when the NPI appears soon after these inferences have been activated. This proposal has been recently discussed in detail in Muller (2020; also Muller et al. 2019b) where it is condensed as having three main ingredients: a) the role of comprehension processes of sentences containing negative elements, b) a shift in the understanding of NPI licensing mechanisms as an item-to-context dependency rather than an item-to-item dependency and c) the critical role of the distance between the potential licensing context and the NPI. Let us examine each of these ingredients in detail.

As regards the first ingredient, researchers such as Tian & Breheny (2016) and Xiang et al. (2020) have proposed that the comprehension of negated statements requires the activation of Questions Under Discussion (QUD) such that the parser infers a possible question to which the negated statement could be an answer. As a consequence of this process, other possible answers to the QUD would be activated in parallel. For illusion sentences, this would affect the relative clause material containing the negative elements *no* or *not*/*n't*. Then, going back to the contrast between quantificational and verbal negation, it is reasonable to think that statements that are negated using different types of negative elements may evoke the inference of different QUDs. For instance, a statement like *the authors haven't been recommended by the critics* may evoke a QUD like *have the authors been recommended by the critics?* A QUD of this type allows for two possible answers: the already mentioned negated statement or its affirmative counterpart (*the authors have been recommended by the critics*). However, a statement like *no authors have been recommended by the critics* may evoke a QUD like *how many authors have been recommended by the critics?* to which there is a wider array of possible answers (e.g. *no*

authors<*few authors*<*some authors*< *most authors*<*all authors*). In other words, whereas verbal negation evokes binary QUDs, quantificational negation evokes scalar QUDs.[39] The notion of scalarity brings us to the second ingredient of the proposal. As noted in the discussion of the corpus results, most linguistic theories on the grammar and function of NPIs propose to understand its licensing conditions as a relation between the NPI and the sentence containing it, such that they are licensed when contained in a proposition that represents the strongest claim which occupies the endpoint point in a scale of pragmatic alternatives (see also §2.2.2). These are known as scalarity approaches to NPIs (e.g. Chierchia 2006; Fauconnier 1975). If the QUD proposal on the processing of negated statements is combined with the ideas put forth by scalarity approaches to NPI licensing, it is possible that encountering a negative quantifier such as *no* that evokes scalar alternatives may already provide an appropriate or welcoming context for NPI licensing before the NPI is encountered. Thus, when an NPI appears right after having parsed the relative clause, the scalar inferences that have been activated when processing the embedded negation provide the ideal environment for the unlicensed NPI to be temporarily perceived as correct. The fact that NPI illusions only occur soon after the relative clause material represents the third key ingredient. The discovery that the critical distance is that between the NPI and the licensing contexts –rather than between the NPI and the intrusive licensor– is of critical importance considering that most linguistic theories emphasize the ideal that NPI licensing entails relating the NPI to the semantic context of the clause that contains it.

The major strength of the *scalar alternatives hypothesis* is that it can account for the two most relevant characteristics of illusion sentences –namely, the contrast between quantificational and verbal negation and the distance effects. In light of this account, we can also interpret the frequency results from the corpus analysis as a byproduct of the scalarity proposal for NPIs such that *ever* is more frequently encountered after *no* because it provides the ideal semantic environment for strengthening operations in which NPIs can be used to make strong exceptionless claims, as argued in Kadmon & Landman (1993). Furthermore, even though there is very little variability in the materials used to test NPI illusions, this novel proposal is also able to easily integrate Xiang et al.'s (2009) identification of illusory processes

[39] This does not mean that sentential negation is only a possible answer in the context of binary QUD or that it cannot be used to answer scalar QUDs. Rather, what is meant is that the pragmatic context in which these assertions situate comprehenders generally points in this direction unless there are additional elements in the sentence which indicate otherwise.

using *very few* as intrusive licensor, inasmuch as this quantifier also has the potential of activating scalar alternatives.

We have termed the other alternative proposal as the *scope miscalculation hypothesis*. This account, which is built on a somewhat simpler reasoning, appeals to the fact that quantifiers can sometimes take various scope interpretations. Scope is an important source of structural and semantic ambiguity in natural languages. Without going into much detail on the incredibly complex and highly debated issue of scope, quantifiers are a class of elements which can be scopally ambiguous inasmuch as they allow for different interpretations. For instance, a sentence like (57) –taken from Nasta (2015)– can have the two different meanings stated in (58). The first meaning entails that the quantifier *every* takes scope only over *teacher*. The second meaning is obtained through the movement of the quantifier phrase so that it takes scope over the existential phrase *a student*.

(57) A student listens to every teacher

(58) a. There is only one student who listens to every teacher.

b. There may be several students who jointly listen to every teacher.

Considering that quantifiers can (sometimes) take different scope interpretations, there arises the possibility to explain the contrast between quantificational and verbal negation by appealing to a sort of scope miscalculation (or misrepresentation) by which the negative quantifier *no* is temporarily analyzed as scoping over the NPI, producing the illusion of grammaticality. It must be emphasized, though, that different elements have different scopal properties. Even though some quantifiers such as *every* display a wider flexibility which allows them to extend scope outside of the local domain, the grammar does not allow a non-local interpretation of *no* in the type of illusion sentences we are concerned with here. Indeed, neither *no* nor *not/n't* can display a wide scope interpretation in illusion sentences and, as noted in Liu (1990), negative quantifiers are not generally allowed to take wider scope. Thus, an account based on a scope miscalculation of *no* in illusion sentences would entail the application of an operation that is

ungrammatical across the board. In other words, under this hypothesis, NPI illusions would be understood as the result of the parser's failure to correctly calculate scope relations.[40]

In further work conducted in collaboration with Muller and Phillips (Muller et al. 2019b; Muller, de-Dios-Flores, et al. 2020) we tested one prediction developed on the basis of the *scope miscalculation hypothesis.* In short, it was assumed that if the negative quantifier *no* 'overscopes' outside of the relative clause, the polarity of the main clause should be interpreted as globally negative irrespectively of the presence or absence of the NPI *ever*. Thus, we presented participants with sentences like (59a), the classic illusion, and (59b), the same sentence without *ever*, and asked them questions like *Did the authors receive acknowledgement for a best-selling novel?* This allowed us to track whether the negation was being interpreted as part of the main clause statement as a consequence of taking scope outside of the relative clause.

(59) a.*The authors [that no critics recommended] have **ever** received acknowledgement for a best-selling novel.

b. The authors [that no critics recommended] have received acknowledgement for a best-selling novel.

The results from the interpretation task were clear in showing that sentences like (59b) were interpreted as globally negative in a much smaller proportion of cases than the classic illusion in (59a). This finding was taken to mean that the negative quantifier *no* was not overscoping outside of the relative clause as a result of the parser's general failure to properly calculate scope relations. However, it could also be the case that the parser only resorts to such an overscoping strategy when it is challenged by the presence of the unlicensed NPI –as it could be seen to occur under economy-based accounts of scope (Fox 2000; Reinhart 2006).[41]

Though interesting, the results from the interpretation task did not provide sufficient evidence to rule out the *scope miscalculation hypothesis*. Still, a further experiment carried out subsequently by Muller et al. (2019b; 2020), showed non-significant but evincing trends

[40] At least for the case of negative quantifiers in the specific context of illusion sentences. Even though the consequences of assuming that the parser fails to correctly calculate scope relations may be far-reaching.
[41] According to the economy principles, some grammatical operations are only applied "if some relevant effects are produced as the result of their application [or...] if their effects on the meanings of these forms are significant" (Nasta 2015: 7). Applying the economy principles to scope-taking elements then justifies the scopal flexibility of *every* in sentences like *A student listens to every teacher*.

towards an illusion effect for sentences like (60), in which the verbal negation *not* is paired with *any*, adding a scalar flavor.

(60) *The critics [that haven't recommended any authors of alternative genres] have **ever** objected to mainstream literary trends.

The *scope miscalculation hypothesis* would not predict an illusion-like behavior for (60) as this sentence lacks a quantificational licensor. Therefore, it seems critical to produce further tests on the *not any* manipulation in order to confirm the veracity of the effect. To complicate matters further, a recent investigation carried out by Orth et al. (2019) took up on the *no-not* contrast reported in this chapter and tested the impact of different intrusive licensors (e.g. *no, not, never*) on the emergence of NPI illusions. Their findings replicated the *no-not* contrast observed in Experiments 5 and 6, but interestingly, found no illusion effects for sentences containing the adverbial negation *never*. Given that *never* can potentially activate scalar alternatives (e.g. *never<sometimes<often<always)*, these findings are initially incompatible with the predictions of the *scalar alternatives hypothesis*. In short, given that the existing evidence on different licensor types is both very limited and contradictory, it remains clear that further empirical evidence must still be pursued in order to arbitrate among these two promising alternative hypotheses.

3.3 GENERAL DISCUSSION

The experiments presented in this chapter have demonstrated several important points. On the one hand, in Experiments 1-3 it has been shown that illusion-like sentences containing *never* instead of *ever* exhibit processing difficulties similar to those of double negation sentences, while their acceptability perception is also degraded. This finding has been crucial in ruling out the ev*er-never confusability hypothesis* as a potential explanation for NPI illusions. Furthermore, the findings from Experiment 1-3 identify a potential candidate structure for illusions of ungrammaticality, while they further contribute to our understanding of the complexities of sentences containing multiple negative elements. On the other hand, Experiments 4-6 and the corpus study demonstrate an initially surprising behavior: verbal negation, the most canonical downward entailing and nonveridical operator, does not generate intrusion effects. As discussed along the second part of the chapter, this finding represents a critical challenge for the existing accounts of NPI illusions. Particularly, the *memory-based*

hypothesis, but also the *pragmatic rescuing hypothesis* and the *unstable encodings hypothesis*. This led us to consider two promising alternative explanations which were termed the *scalar alternatives hypothesis* and the *scope miscalculation hypothesis*.

Much evidence in favor or against each of this alternative hypotheses is still needed, and in our view, this necessarily involves a wide-ranging and detailed study of more licensor types in order to figure out which are the relevant features that prompt the emergence of illusion effects. The *scalar alternatives hypothesis* and the *scope miscalculation hypothesis* make contrasting predictions on which features should the system care for: the availability of scalar inferences in the first case or the presence of a quantificational item in the second case. Yet, this contrast may be difficult to disentangle given that many quantifiers that can license NPIs can also generate scalar inferences.

An important point of divergence among these two hypotheses is their relation, or lack thereof, with existing linguistic theories on the grammar of NPIs. On the one hand, the *scalar alternative hypothesis* is clearly linked with a subset of theories on NPI licensing (i.e. scalarity approaches) and it is consistent with the current standard theoretical assumption that NPI licensing entails a relation between the NPI and the semantic properties of the licensing environment –i.e. an item-to-context dependency. Consequently, a view based on the availability of scalar inferences expedites the appealing idea that NPI illusions are the result of the (mis)application of available licensing mechanisms which are in turn motivated by detailed grammatical representations. Simultaneously, this view encompasses the idea that NPIs are (at least temporarily) erroneously integrated into the meaning of the relative clause. Such an account, however, entails that the effects observed for multiple negation sentences (Experiments 1-3) and NPI illusions (Experiments 4-6) must have different sources. On the other hand, under the *scope miscalculation hypothesis*, the intrusion effects observed for NPIs are not so much viewed as a consequence of the grammar of NPIs specifically, but, rather, as the parser's (at least initial) difficulty to accurately integrate scope-taking elements. This novel account opens the door for revisiting the findings from Experiments 1-3. That is, the difficulties observed for multiple negation sentences and the processing facilitation observed for NPI illusions could occur due to the fact that the negative quantifier scopes, respectively, over *never* and *ever*, generating an illusion of ungrammaticality in the former case and an illusion of grammaticality in the latter. One way of probing this speculation would be to test the sentences in Experiment 1-3 using verbal negation instead of quantificational negation. The prediction is

clear: given that verbal negation is not expected to overscope outside of the relative clause, sentences like (61) should be processed and perceived on a par with sentences without the embedded negation. Future research will be directed at investigating this issue as it can critically contribute to elucidate the discussion.

(61) The authors [that the critics haven't recommended] have **never** received acknowledgement for a best-selling novel.

To conclude, it is worth emphasizing that despite the fact that it is becoming clear that NPI illusions as a processing phenomenon differ in many respects with other cases of illusory processing such as agreement, understanding the mechanisms that cause them is equally valuable for understanding the comprehension of long distance dependencies and, moreover, real-time semantic interpretation.

USC UNIVERSIDADE DE SANTIAGO DE COMPOSTELA

PART II

CONTROL DEPENDENCIES



Chapters 4 and 5

4. CONTROL DEPENDENCIES: BACKGROUND

This second part of the dissertation is concerned with verbal complement control dependencies in Spanish, illustrated in (62).[42] These structures represent an interesting candidate to inspect parser-grammar relations because they provide a scenario in which complex linguistic dependencies are established across clauses.

(62) a. Ana$_i$ prometió a Juan$_j$ [Ø$_i$ ser más cuidadosa$_i$ con los documentos].

Ana$_i^{fem}$ promised Juan$_j^{masc}$ [Ø$_i$ to be more careful$_i^{fem}$ with the documents].

b. Ana$_i$ ordenó a Juan$_j$ [Ø$_j$ ser más cuidadoso$_j$ con los documentos].

Ana$_i^{fem}$ ordered Juan$_j^{masc}$ [Ø$_j$ to be more careful$_j^{masc}$ with the documents].

In these sentences, the main clause verbs require (or subcategorize for) three syntactic arguments: a subject and two objects. The subject is *Ana.* The two other arguments are instantiated by the matrix clause complement *Juan* (which is generally referred to as indirect object) and the embedded clause *to be careful with the documents* (which is also a complement of the matrix verb and is generally referred to as direct object). In this respect, these strings are similar to simpler ditransitive structures like *Ana gave Juan the ball.* Nonetheless, what is most interesting about the sentences in (62) is that one of the complements of the matrix verb is instantiated by a non-finite subject-less clause: *to be careful with the documents*. When comprehenders reach the infinitive verb (*ser*), which marks the start of the embedded clause, they have to interpret its implicit subject (signaled with Ø in the example). In other words, who is *careful with the documents*? The area of the grammar that is concerned with the interpretation of subject-less non-finite clauses is known as Control Theory. The term *control* reflects the idea that the interpretation of the implicit subject is controlled by, or is determined by, another

[42] The brackets signal the embedded complement clause and the subscripts indicate a coindexing relation.

referent. Understanding, classifying, and predicting control relations has been a core objective of syntactic theory ever since the phenomenon was first introduced into the generative literature (Rosenbaum 1967; Postal 1970).

In the examples in (62), comprehenders must interpret an anaphoric relation between the implicit subject of the embedded clause and an antecedent: one of the NPs in the main clause, either *Ana* or *Juan*. In this case, the interpretive relation is guided by specific lexical properties of the main clause predicates, to which we will the refer as control properties (or control readings). In (62a), *Ana* (the main clause subject) is also the understood or implicit subject of the embedded clause. This is because *promise* has subject control properties. In (1b), the implicit subject of the embedded clause is *Juan* (the main clause object). This is because *order* has object control properties. Even though the subject of the embedded clause is not phonetically realized (hence the term 'implicit subject'), the retrieval of an antecedent is essential in order to build the correct representation of the message. Moreover, identifying the reference of the implicit subject is indispensable in order to compute the agreement dependency that is established between the implicit subject and the adjective *careful*. Consequently, in (62), the embedded adjective agrees in gender with either *Ana* or *Juan*, depending on who is retrieved as the antecedent.[43]

Control structures provide a window into the grammar and processing of complex referential dependencies, revealing intricate syntactic, lexico-semantic and psychological connections. The research presented in this second part of the thesis was inspired by an eye-tracking study carried out by Betancort et al. (2006). Their work, which focuses on the processing of sentences like (62), started a very interesting research line with regard to the use of verb control information in online sentence processing. Before moving into our experimental work, it is necessary to introduce some theoretical aspects of control in linguistics, as well as to revise the existing literature on the processing of control dependencies. In this chapter we will review the relevant background, paying special attention to verbal complement control. The chapter is divided into two main blocks: first, we will present a synthesis of the vast and complex linguistic literature on the grammar of control. Second, we will focus on the existing psycholinguistic evidence on the processing of control dependencies. Part II of the dissertation comprises two chapters: Chapter 4 (the present chapter), and Chapter 5 (the following chapter).

[43] In Spanish, adjectives must agree in gender with the referent that they modify (e.g. *careful*: *cuidados-o*^{masc}, feminine *cuidados-a*^{fem}).

Chapter 4 is conceptualized as the background for Chapter 5. In Chapter 5 we will present a series of experiments aimed at investigating the online use of lexical control information and the presence of grammatical illusions in structures like (62).

4.1 THE GRAMMAR OF CONTROL

The study of referential dependencies is of paramount importance in the development of formal theories of grammar and psycholinguistic models of sentence comprehension. Control Theory is understood as the part of the grammar that deals with the reference, or interpretation, of the implicit subject of non-finite clauses (i.e. infinitival and gerundive clauses). In complement control structures such as the ones presented above, there is a coreferential relation between an explicit nominal element from the main clause and the null subject from the embedded clause. In the linguistic jargon, the main clause antecedent is often referred to as *controller*, and the implicit subject of the embedded clause as *controllee* or *controlled element*. In the words of Bresnan (1982a: 372):

> Control refers to a relation of referential dependence between an unexpressed subject (the controlled element) and an expressed or unexpressed constituent (the controller); the referential properties of the controlled element, including possibly the property of having no reference at all, are determined by those of the controller.

Controller and *controllee* participate in a referential dependency, but in contrast with overt referential elements such as pronouns and reflexives, the *controllee* is a null element. This null element, marked with Ø in the examples in (62) has often been referred to as PRO[44] in the linguistic tradition (Chomsky 1981). PRO relies on easy recoverability, and it inherits its identifying features from the controller, with which it is said to be coindexed (Chomsky 1981; Manzini 1983). Furthermore, as can be extracted from the quotation by Bresnan, the controller does not need to be an expressed element. Control structures expand beyond cases of complement control like (62), in which the antecedent of PRO is identified with one of the NPs in the matrix clause. For instance, in (63), the implicit subject of *abandon* is not co-indexed

[44] By convention, PRO is mentioned in capital letters (it is also sometimes called 'big PRO'), in order to distinguish it from *pro* or 'small pro', another null element which will be introduced later in the text.

with any other constituent of the sentence. In this case, the antecedent of PRO is arbitrary, as it is recovered using discourse information such as speaker or linguistic/situational context.

(63) It is unacceptable [PRO_{arb} to abandon the investigation].

As we will see, control relations are varied and intricate. In the following sections we will review several aspects related to the notion of PRO, different types of control phenomena, and the major theories of controller choice. The aim of this theoretical review is twofold: on the one hand, it is our objective to provide the reader with a general picture of control in linguistics. On the other hand –and most importantly– we want to establish the necessary linguistic background on complement control constructions before moving into the experiments of Chapter 5. Control has been at the center of linguistic theorizing over the past decades and it has been addressed from every possible theoretical angle. The more than 900 works collected in Jan Engh's (2019) bibliography of control are a clear proof of this. Doing justice to this vast amount of work in a few pages is, admittedly, an impossible task. We hope, nonetheless, that this succinct presentation provides the reader with an idea of the complexity of the structures that Control Theory attempts to account for.

4.1.1 The notion of PRO

The notion of PRO is a fundamental concept in the study of control phenomena. As noted by Radford (1988: 83):

> Part of the motivation for positing PRO is semantic in nature. In traditional grammar it is claimed that subjectless infinitive clauses have an *understood* or *implicit* subject –and positing a PRO subject in such clauses is one way of capturing the relevant intuition.

PRO is one of the so-called empty category elements that were introduced in the linguistic arena by the syntactic framework of Government and Binding (Chomsky 1981; Chomsky 1982). Empty categories, or gaps, can be defined as "phonetically null place-holders for locally absent constituents" (Featherston 2001: 1). Government and Binding approaches assume empty categories to be covert constituents that are syntactically active and represented, and thus, that

hold a position in the sentence structure representation. For instance, the syntactic representation of PRO in example (63) is depicted in the parse tree analysis in Figure 8, adapted from Haegeman (1991: 243).

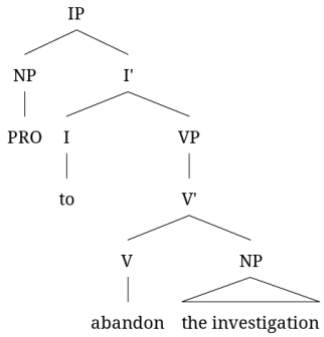


Figure 8. Syntactic representation of PRO in the non-finite clause in *It is unacceptable [to abandon the investigation]*.

The existence of PRO is theoretically derived from several principles of the Chomskyan theory: namely, the so-called Extended Projection Principle (EPP) and the Theta Criterion. The EPP (Chomsky 1982: 10) states the requirement that all sentences must have a subject filling the specifier position of a Tense Phrase (TP) or Inflectional Phrase (IP), as PRO in Figure 8. Furthermore, the Theta Criterion states that "each argument bears one and only one theta role, and each theta role is assigned to one and only one argument" (Chomsky, 1981: 36). For instance, a verb like *abandon* in the example in Figure 8 requires –or licenses– an argument in subject position, and another argument in object position (which is already satisfied by the NP *the investigation*). As a consequence of both the EPP and the Theta Criterion, arguments in subject position must be filled with overt or non-overt NPs. PRO is conceived as a non-overt NP that occupies the subject position of non-finite clauses in order to fulfill these requirements. It should be advanced that there are linguistic models that move away from the notion of PRO in their analyses, either by proposing alternative syntactic mechanisms or by emphasizing the lexical/semantic status of control relations. Nonetheless, it is undeniable that the discussion on PRO has influenced a vast amount of the work on control relations, and, for this reason, it is essential to contextualize it.

Since Government and Binding, the Generative tradition has examined four types of empty categories that correspond to implicit nominal entities: PRO, *pro*, NP-trace, and *Wh*-trace. They are illustrated in the following examples:

(64) Ana$_i$ tried **PRO**$_i$ to be careful with the documents.

(65) Me fío de Ana$_i$. ***pro***$_i$ Es cuidadosa con los documentos.

I trust Ana$_i$. She(=pro$_i$) is careful^{fem} with the documents.

(66) Ana$_i$ seemed $\boldsymbol{t}^{\mathbf{NP}}_i$ to be careful with the documents.

(67) What$_i$ was Ana careful with $\boldsymbol{t}^{\mathbf{WH}}_i$?

These four null elements differ in the syntactic configurations in which they appear and the semantic properties that they exhibit. A fundamental contrast among them lies in the processes whereby these elements were thought to enter the syntactic derivation. On the one hand, both PRO and *pro* were assumed to be generated in situ (or in *deep structure*) like pronouns, and thus, they are assumed to be inserted as lexical entries. On the other hand, NP-trace and *Wh*-trace are thought to appear as a consequence of movement operations such as raising, topicalization or *wh*-question formation (Chomsky 1981; Chomsky 1982). According to Trace Theory, the module that regulates traces, "any moved constituent of category X^n leaves behind at its extraction-site an identical empty category […] known as a trace, and the moved constituent is said to be the antecedent of the trace" (Radford 1988: 555). The concept of empty categories was outlined in Chomsky's seminal book *Lectures on Government and Binding* (1981), often known as *The Pisa Lectures*. In this formal program, Binding Theory is the module of the grammar that deals with referential relations between nominal entities. Binding Theory establishes a typology of referentially dependent elements according to whether they are specified positively or negatively for the binary features [+/- anaphoric] and [+/- pronominal]. This typology is summarized in Table 8, which is adapted from Chomsky (1982: 78). It presents non-overt referential elements and their equivalent overt elements. Even though a deep explanation of the vast theoretical apparatus of Government and Binding falls outside the scope of this presentation, this typology is useful to understand the nature of PRO as it was initially conceived.

Table 8. Typology of referentially dependent elements adapted from Chomsky (1982: 78).

Features	Non-overt element	Overt element
[+ anaphoric + pronominal]	PRO	___
[- anaphoric + pronominal]	*pro*	Pronouns
[+ anaphoric - pronominal]	NP-trace	Reflexives and reciprocals
[- anaphoric - pronominal]	Wh-trace	Referential expressions

The features [+/- anaphoric] and [+/- pronominal] capture the behavior of each element according to the principles of Binding Theory, stated by Haegeman (1991: 221) as follows:

- Principle A: an anaphor must be bound in its governing category.[45]
- Principle B: a pronoun must be free in its governing category.
- Principle C: a referential expression must be free everywhere.

Principle A represents the idea that anaphors must have a clause-mate c-commanding antecedent. For instance, in the sentence *Ana likes herself*, the reflexive *herself* and *Ana* are coreferential. Principle B represents the idea that pronouns may or may not have an antecedent within the sentence, because pronouns can also get their meaning from previously mentioned nouns or from the context. Principle B blocks coreference between locally c-commanding antecedents. For instance, in *Ana likes her*, the pronoun *her* and *Ana* cannot be coreferential. In the third place, referential expressions such as *Ana* or *the documents*, which identify a referent directly, are neither anaphoric nor pronominal. They are inherently referential and thus, as stated in Principle C, they are always free (Haegeman 1991: 210–214).

Non-overt nominal elements (i.e. empty categories) are also specified with the features [+/- anaphoric] and [+/-pronominal] according to their behavior regarding the principles of Binding Theory. As a means to explore the place of PRO in the architecture of referentially dependent elements, let us focus on an important contrast between the two pronoun-like null elements: PRO and *pro*. The crucial difference between examples (64) and (65) is that whereas PRO appears as the empty subject of a non-finite clause, *pro* appears as the empty subject of a finite clause. The situation whereby the subject of a finite clause is omitted is called *pro*-drop. *Pro*-

[45] A *governing category* for a given element is the "minimal domain containing it, its governor, and an accessible subject" (Haegeman 1991: 209). In simplistic terms, a governing category roughly corresponds to the local clause that contains the element.

drop occurs in languages with rich agreement morphology, like Spanish in example (65), because agreement features such as person and number facilitate recovering the content of the omitted element (cf. Huang 1989). Therefore, *pro* is described as [+ pronominal] because it does not need a c-commanding antecedent to be licensed. In other words, the null element *pro* and overt pronouns display parallel behaviors. PRO, instead, is described as being both [+ anaphoric] and [+ pronominal]. But, how can an element be specified positively for the two features? Let us have a look at examples (68) and (69), which contain a PRO constituent as the subject of the non-finite clause.

(68) Ana_i preferred very much [PRO_i to be less demanding with herself].

(69) It is unacceptable [PRO_{arb} to abandon the investigation].

In (68), *Ana* is the antecedent of PRO. In other words, *Ana* controls the interpretation of PRO. Therefore, in this case PRO behaves like an anaphor, because its interpretation is controlled by a c-commanding NP. *Ana* and PRO entertain a syntactic dependency which is similar to that of reflexive pronouns. Example (68) also serves to illustrate the constraint on reflexive pronouns (Principle A) because in the embedded clause we can find another referential dependency between PRO and *herself*. Constructions like (68) have been presented as syntactic evidence for the existence of PRO: given that reflexive pronouns require a local antecedent, this requirement can only be satisfied in (68) if we assume that the embedded clause has a PRO subject which serves as the antecedent of *herself* (Radford 1997: 83–84). Conversely, in (69), PRO has no specific antecedent within the structure in which it is inserted, and its interpretation is arbitrary: extra-sentential information (e.g. speaker, linguistic and situational context) is necessary in order to recover the referent of PRO. In this case, PRO behaves like an overt pronoun (Chomsky 1981; Manzini 1983).

We have seen that PRO can behave as either an anaphor or a pronoun, and this is why it is positively specified for the two features. If this is correct, according to the principles of Binding Theory, PRO must obey two contradictory constraints: it must be both bound (Principle A) and free (Principle B) in its governing category. This fact represents a paradox on the distribution of PRO. This theoretical problem was initially tackled through the PRO Theorem (Chomsky 1981). The PRO Theorem states that PRO must be ungoverned, meaning that PRO does not have a governing category, and consequently, it is not subject to the principles of Binding

Theory. The PRO Theorem placed PRO as the only empty category that did not need to be governed. As examined by Haegeman (1991: 246–247), the assumption that PRO must be ungoverned followed from several observations regarding the restrictions on the distribution of PRO. First, as shown in (70), PRO cannot be licensed as the subject of a finite clause. Second, as shown in (71), PRO cannot be licensed in direct object position. Third, as shown in (72), not every infinitival clause allows PRO as subject.

(70) ***PRO** should invite the student.

(71) *Ana asked John to invite **PRO**.

(72) *Ana preferred for **PRO** to invite the student.

According to Haegeman, what distinguishes the ungrammatical occurrences of PRO in (70)-(72) from the grammatical ones in (68)-(69) is that "in the former, an overt NP can replace the illegitimate PRO and lead to grammaticality […], while this is not possible for the legitimate occurrences of PRO" (1991: 248). Substituting legitimate occurrences of PRO by an overt NP generates an ungrammatical structure. Thus, PRO and overt NPs are in complementary distribution. When introducing overt NPs, it can be easily observed that the legitimate instances of PRO become ungrammatical (e.g. **It is unacceptable anyone to abandon the investigation*). This ungrammaticality was explained on the basis of Case Theory. Case Theory is a module of Government and Binding which argues that all overt NPs must be assigned a case (e.g. nominative or accusative) depending on their position in the sentence structure (Chomsky 1981: 43). Given that i) overt NPs must be case-marked, ii) PRO is in complementary distribution with overt NPs, and iii) case is assigned under government, it was concluded that PRO was ungoverned and, consequently, it was not assigned case (Haegeman 1991: 249). From this picture, it also followed that PRO could not have an equivalent overt NP (cf. Table 8).

Notwithstanding the above, the conclusion that PRO is not case-marked has been questioned by evidence showing that some languages allow PRO to be case-marked (e.g. Icelandic, Sigurđsson 1991; 2008). This finding poses a problem for the assumptions of the PRO Theorem, which ended up being abandoned by developments of Binding Theory (e.g. Chomsky & Lasnik 1993) and later formal accounts proposed in the context of the Minimalist Program such as the Movement Theory of Control (Hornstein 1999; Hornstein & Polinsky

2010). As it was hinted at the beginning of this section, the syntactic program presented so far has also been challenged by alternative proposals that have postulated that the implicit subject of non-finite clauses is assigned only at the semantic level (e.g. Bresnan 1982a; Chierchia 1984; Sag & Pollard 1991). The fundamental question in this regard is whether PRO is a syntactic category and whether its status determines control relations. The formal representation of this covert subject is still open to debate in the linguistic arena. In contrast with the Chomskyan approach sketched here, theories of grammar such as Lexical Functional Grammar (Bresnan 1982b) and Head-Driven Phrase Structure Grammar (Pollard & Sag 1994) abandoned the syntactic representation of phonetically empty elements. In these theories, controlled infinitival clauses are considered as subjectless VPs which are linked to a subject only in terms of semantic representation. This idea will be recovered in the revision of lexico-semantic theories of control provided in §4.1.3.3.

As a note of caution, we want to emphasize the following terminological decision: in the remainder of the chapter we will be using the term 'PRO' to refer to the implicit subject of non-finite clauses in general, not only when describing theories that assume its representational reality. This decision is not motivated by an assumption on its existence, and as a matter of fact, the aim of this work is not to evaluate the theoretical validity of the proposals of Generative Grammar (or any other framework) presented in this and the following sections. However, there is no theoretically neutral way to refer to the implicit subject of non-finite clauses, and thus, we stick to the traditional use of the term PRO with the reservation that it may not exist in the (syntactic) form that was initially conceived. Furthermore, when PRO is marked in the examples, the intention is simply to signal the location of the implicit subject. We do not use the more neutral symbol 'Ø' because it can be confusing when examples with more than one null element are discussed. In any case, it is essential to keep in mind that the discussion about control does not rely on whether the implicit subject of the non-finite clauses is conceived as the empty category PRO or any other null (syntactic) element. That is, control relations are a linguistic reality irrespective of the syntactic or representational status of PRO.

4.1.1.1 Some notes on control and raising

Before presenting an overview of the different configurations of control, it is important to delve into an essential contrast that will further clarify the initial conception of PRO: the contrast between PRO and NP-trace. This distinction is epitomized by the well-known debate on the

analysis of control and raising structures, which has been a major concern in Generative models from the Standard Theory (Chomsky 1965) to the Minimalist Program (Chomsky 1995). It is an issue that has generated many heated debates since the seminal works of Rosembaum (1967) and Postal (1974), and has featured prominently in the outset of Generative Semantics and the so-called linguistic wars (cf. Harris 1995; Goldsmith & Huck 1995). Control and raising constructions are instantiated in (73) (a repetition of examples (64) and (66) from the previous section). What is most interesting about these sentences is that, at first sight, the contrast is far from obvious given the superficial similarities: both PRO and NP-trace appear as implicit subjects of non-finite complement clauses.[46]

(73) a. Ana$_i$ tried [PRO$_i$ to be careful with the documents]. *Control*

b. Ana$_i$ seemed [~~Ana~~ $t^{NP}{}_i$ to be careful with the documents]. *Raising*

Returning to what was already advanced in the previous section, PRO and NP-trace differ in the processes whereby these elements are thought to enter the syntactic derivation. On the one hand, PRO is thought to be generated in situ, inserted as a lexical item that is an independent argument, similar to an unpronounced pronoun. On the other hand, NP-trace is thought to be an unpronounced copy of the moved NP that appears when the NP is raised to another position in the structure (Chomsky 1981; 1982). In (73b), *Ana* raises from the subject position of the embedded clause to the subject position of the main clause. The fundamental contrast between control and raising is driven by differences in thematic role (Θ-role) assignment; specifically, from differences in the theta grid structure between two types of predicates (i.e. control and raising predicates). As noted by Davies & Dubinsky (2004), it is the properties of the matrix predicate that determine if the sentences in (73) represent a case of control or raising. In (73a), the verb *try* is a two-place predicate. It takes an agent (*Ana*, the subject) and a theme (the embedded object complement). Simultaneously, the embedded verb *to be* takes an agent (PRO, the null subject which is co-indexed with *Ana*) and a theme (the complement). *Ana* is, therefore, the 'semantic subject' of both verbs, but at the same time *Ana* and PRO receive only one theta role each in accordance with the Theta Criterion (Chomsky 1981). Conversely, the verb *seem*

[46] The sentences in (73) are accompanied with common linguistic notation that helps identify some of the structural differences that Government and Binding accounts claim to exist between the two grammatical phenomena. The arrow indicates the movement operation.

in (73b) is a one-place predicate which does not have an agent role to assign. The verb *seem* does not have a 'semantic subject' inasmuch as a situation in which someone 'performs the seeming' is inconceivable. Instead, *Ana* receives the agent role from the embedded verb *to be*, and it is then moved (or raised) to the subject position of *seem*. Moving *Ana* from the subject position of the embedded clause into the subject position of the main clause leaves a trace (*t*) in its original place, which in turn, fulfills the EPP (Haegeman 1991: 287). In the words of Landau (2013: 9):

> In a raising construction, one observes a mismatch between the semantic (or thematic) role of an argument and its syntactic location. Specifically, a DP[47] that receives a Θ-role from an embedded (usually nonfinite) predicate appears in a syntactic position that is part of the matrix clause. On a hierarchical view of syntactic organization, it is natural to say that the DP has raised from the embedded to the matrix clause. Importantly, the "original" and the "ultimate" positions are associated with a single notional argument […]. In a control construction, one also observes a mismatch, but of a different kind. Here we have a single visible argument that appears to be associated with two semantic roles. While its syntactic position corresponds to the matrix Θ-role, the interpretation of the sentence indicates that there is an additional, invisible argument in the embedded clause, which is co-referential with (bound/controlled by) the overt DP. Importantly, the two positions are associated with two notional arguments; the relation between them is more akin to anaphora than to structure sharing.

Even though the distinction between control and raising is deeply rooted in semantics, there is a considerable body of syntactic evidence supporting interesting contrasts between the two structures (see Landau 2013: 8–28 for a comparative review). The case of pleonastic subjects is an illuminating example. As it was already explained, control and raising predicates differ in thematic role assignment. Whereas control predicates assign a thematic role to the controller, rising predicates do not assign a thematic role to the corresponding argument. The availability of pleonastic subjects, also known as expletives or dummy elements, provides a further diagnostic in this regard. Pleonastic elements include the pronoun *it* –as used in impersonal

[47] Note that DP (determiner phrase) corresponds to what we have been calling so far NP (noun phrase); *Ana* in the case of (73). Traditionally, the noun has been considered as the head of the phrase, as in *car* in *the car*. Nonetheless, from the 1980s onwards, Generative theory has embraced the view that the determiner is the head of the phrase.

meteorological expressions such as *it rains*– and existential *there.* These elements cannot be assigned a thematic role because they are semantically empty. Consequently, raising verbs allow pleonastic subjects, whereas control verbs do not. This is demonstrated by the grammaticality contrast between *try* and *seem* exemplified (74) and (75), which paraphrase the examples in (73).

(74) *It tried that Ana was careful with the documents.

(75) It seemed that Ana was careful with the documents.

An interesting parallelism that can be made is that both control and raising verbs come in two versions, depending on whether the matrix NP that is coindexed with the empty element is the subject or the object. The difference between subject and object control verbs was introduced at the very beginning of the chapter, and it is illustrated again in (76): in (76a), PRO corresponds to *Ana*, and in (76b), PRO corresponds to John. Both *Ana* and *John* receive their theta role from the matrix predicates, *promise* and *order* respectively. Similarly, in (77a), the NP-trace corresponds to *Ana*, and in (77b) to *John*. However, neither Ana in (77a), nor John in (77b) receive their theta role from the matrix predicates (*seem* or *believed*). Instead, they originate as the agent of the embedded verb and then raise to the subject or the object position of the matrix clause. This is why (77a) is also known as an example of subject-to-subject raising, and (77b) as subject-to-object raising.

(76) a. Ana$_i$ **promised** John$_j$ [PRO$_i$ to be careful with the documents]. *Subject control*

b. Ana$_i$ **ordered** John$_j$ [PRO$_j$ to be careful with the documents]. *Object control*

(77) a. Ana$_i$ **seemed** John$_j$ [t_i to be careful with the documents]. *Raising to subject*

b. Ana$_i$ **believed** John$_j$ [t_j to be careful with the documents]. *Raising to object*

In his seminal work on raising, which is possibly the most detailed examination of the phenomenon, Postal (1974) describes a wide range of elements that can induce raising, including transitive and intransitive predicates, adjectives and auxiliary verbs. For reasons of space, this sketch review on control and raising is far from exhaustive and, admittedly, it does

not do justice to the complicated issues that surround it.[48] We hope, nonetheless, to have conveyed the basic ideas that motivated the distinction between control and raising structures, as this issue will be revisited when discussing the Movement Theory of Control (Hornstein 1999; Hornstein & Polinsky 2010) in §4.1.3.2.

4.1.2 Control phenomena

Even though the experiments presented in Chapter 5 focus specifically on lexically guided verbal complement control, control relations go beyond these structures. This section is devoted to providing an overview of the variety of phenomena understood under the realm of Control Theory. First, we will focus on the fundamental contrast between obligatory and non-obligatory control and the subtypes of relations that are found between PRO and its referent. Then, we will review the most representative syntactic configurations of control and the control-inducing elements that have been described in the literature.

4.1.2.1 Obligatory and non-obligatory control

In §4.1.1, devoted to the notion of PRO, we introduced the idea that in some configurations PRO must have an antecedent within the sentence containing it (e.g. (78)), but it did not need to, as the antecedent could also be understood from the context (e.g. (79)). This idea capitalizes on the distinction between obligatory control (OC) and non-obligatory control (NOC), which is a fundamental matter in the study of control relations. Different definitions of OC and NOC draw the line between the two concepts at different points, but it is globally accepted that sentences like (78) and (79) are representative cases of OC and NOC respectively.

(78) Ana$_i$ tried [PRO$_i$ to be careful with the documents].

(79) It is unacceptable [PRO$_{arb}$ to abandon the investigation].

In early works, the general tendency was to observe OC only in cases in which the antecedent of PRO was uniquely determined by a fixed NP in the matrix clause (e.g. Bresnan 1982a; Bouchard 1984; Williams 1980), and NOC in cases in which "elsewhere strategies" were

[48] For extensive up-to-date surveys, we recommend the works of Davies & Dubinsky (2004), Kirby et al. (2010) or Polinsky (2013).

necessary (Stiebels 2007: 11). One of the most influential early characterizations of OC comes from Williams (1980: 209) which states the following requisites for OC:

- A lexical NP cannot replace PRO.
- The controller must c-command the controlled structure.
- The controller must precede the controlled structure.
- The controller must be thematically or grammatically unique.
- The controller must be overt.

These rather strict requirements reduce the scope of OC to what is commonly known as *exhaustive control*, in which the controller and PRO are identical and overlap completely. For instance, in (78), PRO is exclusively controlled by *Ana.* This is the type of control relation that we will be studying in Chapter 5. Yet, Williams' definition excludes many configurations of control from the domain of OC. Notably, cases of *split* and *partial control*, in which the reference of PRO is not exhausted by a unique antecedent. These are illustrated in (80) and (81) respectively.

(80) Ana$_i$ persuaded John$_j$ [PRO$_{i+j}$ to live together].

(81) Ana$_i$ wanted [PRO$_{i+j}$ to meet at noon].

In *split control* the reference of PRO is not exhausted by a single referent, but it is split between the matrix arguments in subject and object position: in (80), *Ana* and *John* together control the interpretation of the null subject. *Split control* requires, thus, the presence of a subject and an object in the matrix clause, and it often arises in the context of verbs of proposal or communication such as *persuade*, *propose* or *ask* (Landau 2013: 172). Similarly, in cases of *partial control*, the antecedent does not exhaustively control the interpretation of PRO. In this case, PRO "refers to an entity that includes the referent of an argument of the matrix verb and a further participant not included in the referents of the arguments of the matrix predicate" (Stiebels 2007: 6). For instance, in (81), the verb *meet* is a collective predicate which requires a (semantically) plural subject: the antecedent of PRO certainly includes *Ana*, but it also includes some additional participants that are not arguments of the matrix clause. In this example, the additional participants are understood as the rest of the people that she wants to

meet with. Landau (2000; 2013) analyzes *exhaustive*, *split* and *partial control* as instances of OC, and proposes the following definition, which he names *the OC signature.*

> The OC signature:
> In a control construction […X_i…[$_S$ PRO_i…]…], where X controls the PRO subject of the clause S:
> a. The controller(s) X must be (a) co-dependent(s) of S.
> b. PRO (or part of it) must be interpreted as a bound variable.
>
> (Landau 2013: 29)

Landau's definition maintains the link between OC and matrix clause antecedents, but it is more flexible in that a single controller does not need to exhaust the reference of PRO, including cases of *split* and *partial control*. In addition, Landau's assumption that a "dependent of S" is either an argument or an adjunct alludes both to complement OC and adjunct OC.[49] Furthermore, the fact that Landau's *OC signature* terms the controller as X and not as NP/DP deliberately allows for the inclusion of cases of *implicit control* within OC. The term *implicit control* is used to describe cases in which PRO is controlled by a non-realized (implicit, not syntactically represented) argument of the matrix clause. This is exemplified in (82), extracted from Landau (2000: 155). In this example, even when the object argument is not present, it can still control the interpretation of PRO.

(82) Louise gestured/said/signaled (to Tom_i) [PRO_i to follow her].

From the picture presented so far, one can see that there are differing criteria that place certain control relations either under OC or NOC. The clearest and most studied instance of OC is *exhaustive control*. These structures are the focus of our experiments. NOC structures have, however, received much less attention in the literature. When it comes to instances in which PRO lacks an overt antecedent, the label NOC is invoked to describe cases in which the controller of PRO is rather free. In the words of Landau, "while OC is of a kind with strictly grammatical processes […], NOC is of a kind with pragmatic phenomena" (Landau 2013: 230).

[49] Adjunct control will be dealt with in the next section.

NOC structures can be defined negatively with respect to Landau's *OC signature* by saying that i) the controller does not need not be a grammatical element/co-dependent of S, and ii) it does not need to be interpreted as a bound variable. In NOC structures PRO can still have an overt referent, but this is not compulsory. Interestingly, it has also been observed that NOC configurations require PRO to have a human referent (Landau 2013: 231–232). In NOC structures, the null subject often receives an arbitrary or generic interpretation and hence they are often referred to as *arbitrary control*. Arbitrary control readings are blocked from OC structures. This is the standard situation in non-finite subject clauses such as (83) and extraposed subjects as (84). These statements refer to actions, but they are valid for anybody as no specific indication is given on who is performing them. PRO can be interpreted as any individual. Arbitrary control constructions are treated as generic expressions in which PRO has an arbitrary reference. Nonetheless, this arbitrary reference is often biased towards salient or common interpretations fostered by the context, and the specific readings are typically associated with the speaker (Lyngfelt 2009).

(83) [PRO_{arb} to smoke around babies] is a bad idea.

(84) It is very difficult [PRO_{arb} to pass the driving exam].

So far, the focus has been on distinguishing OC and NOC in terms of the relation between PRO and its referent. Nonetheless, syntactic factors play an important role when it comes to predicting whether a particular structure displays OC or NOC. As noted above, OC has been often understood as a syntactic constraint on reference, while NOC is placed in the realm of pragmatics. In OC, PRO establishes a syntactic dependency with a c-commanding antecedent in a way that is similar to reflexive binding. In NOC, instead, the reference of PRO is interpreted in a way that is similar to overt pronouns (Chomsky 1981; Hornstein 2001; Manzini 1983). Some authors such as Manzini (1983) have argued that the distribution of OC and NOC is grammatically complementary, and more recent theories of control like the Movement Theory of Control also accept the idea that "NOC is only licit where OC is not" (Boeckx & Hornstein 2007: 252). That is, a specific structure will allow NOC only in cases in which OC is not available. Although the existence of configurations like adjunct control or subject clauses has been slightly advanced in the presentation, the vast majority of constructions discussed until

now were examples of complement control. The next section deals with different syntactic configurations of control. Special attention will be paid to the configurational effects on OC/NOC and the elements that induce control relations.

4.1.2.2 Syntactic configurations of control and control inducing elements

The empirical picture of control constructions targets many different syntactic configurations. What is subsumed under the realm of Control Theory is constantly under revision, and, although a large number of works deal exclusively with English examples, existing cross-linguistic studies come to reinforce the importance of understanding control phenomena at the interface between syntax and semantics (Stiebels 2007). This section provides a sketch overview of the most representative syntactic configurations that exhibit control properties (be they OC or NOC) and some of the lexical elements that can induce control relations.

Complement control has been privileged as the core phenomenon within Control Theory and as the canonical example of OC. It occurs with verbs that take a non-finite complement clause, in which the subject of the non-finite clause is identified (at least partially) with an argument of the matrix clause. The simpler configuration of complement control occurs when there is only one argument in the matrix clause that can function as a controller, as in (85). When the matrix clause contains more than one nominal argument (namely, subject and object), the picture becomes more complicated and the lexical properties of verbs come into play. We have already introduced the idea that certain verbs foster subject or object control relations, and that OC structures can display exhaustive, split or partial control. In addition, some other verbs, such as *ask* in (86), allow for more than one coreferential possibility. In (86), either *Ana*, *John* or both can control the interpretation of the null subject. These verbs *shift* in their control readings. Regardless of the type of predicate, complement control constructions are OC structures, which means that (at least part of) the antecedent of PRO must be an argument of the matrix verb. The lexical specification of verbs plays a central role in complement control relations. A more detailed explanation of these constructions and the different theories and types of predicates that have been discussed in this regard will be given in the next section.

(85) Ana_i wanted [PRO_i to read the documents].

(86) Ana_i asked John_j [$\text{PRO}_{i/j}$ to read the documents].

Nonetheless, control properties are not only determined by predicates, as nominals can also induce control relations into their complements. Control by nominals is less frequent and has received less attention than control induced by verbs. Lyngfelt (2009) describes the interpretive pattern of non-finite clauses modifying nouns as *possessive control*, because PRO is controlled by whoever is "in possession" of the noun (e.g. (87)). When these nominals denote the same event as their verbal counterparts, they mimic their OC properties (Culicover & Jackendoff 2001; Landau 2013). For instance, in (88) it can be observed that the noun *order* determines *John* as the antecedent of PRO, forming an object control relation as a consequence of the event reading of the noun. Control by nominals is generally observed as OC, but one can also find cases of arbitrary control –hence NOC– as in (89), adapted from Williams (1980; but cf. Landau 2013: 214–220 for a discussion).

(87) The professor$_i$ assigned Ana$_j$ another essay [PRO$_j$ to write].

(88) Ana's$_i$ order to John$_j$ [PRO$_j$ to be careful with the documents] was sent by email.

(89) Any attempt [PRO$_{arb}$ to leave] is inadmissible.

Control relations can also be induced by adjectives. Here, again, two patterns are found: OC and NOC. These two patterns are generally discussed in relation with the adjectives *easy* and *eager*, shown in (90). In the majority of cases, control in adjective phrases is an OC relation in which the experiencer argument (i.e. *Ana* in (90a)) controls the null subject of the infinitival phrase (Landau 2000: 143). However, in cases like (90b), which are known as 'tough movement constructions',[50] the interpretation of PRO is arbitrary, thus NOC (Lyngfelt 2009).

(90) a. Ana$_i$ is eager [PRO$_i$ to please].

b. Ana$_i$ is easy [PRO$_{arb}$ to please].

[50] The term 'tough movement' was coined by Rosenbaum (1967), who analyzed them as object-to-subject raising. This is because the logical object of the embedded clause moves to the subject position of the main clause. They were named as such because a frequent example involves the adjective *tough*, as in *This problem is tough to solve* (vs. *It is tough to solve this problem*).

Control relations do not only entail complements but also adjuncts, in spite of the differences between the two type of constituents. In the context of control, it is important to remark that, unlike complements, adjuncts are not selected by the matrix clause predicate. Adjunct control is exemplified in (91). In adjunct control, the relation between PRO and its antecedent is syntactically determined –and thus observed as strict OC– because the subject of the matrix clause must be identified with the controller. This idea is assumed in theories that observe control as a syntactic phenomenon (e.g. Hornstein 1999) as well as in theories that observe control as a lexical/semantic phenomenon (e.g. Culicover & Jackendoff 2001). Nonetheless, several authors have shown that adjunct control in temporal (92a) or result clauses (92b) can display NOC (Green 2019; Landau 2017).[51]

(91) Ana_i called John_j [after $\text{PRO}_{i/j}$ leaving the office].

(92) a. All preparations were made [before PRO_{arb} inviting the senator to the hearing].

b. All preparations were made [in order PRO_{arb} to invite the senator to the hearing].

The last three syntactic configurations that will be presented are subject clauses, adjoined (extraposed) clauses –already mentioned in the previous section–, and interrogative infinitival complements. Landau (2013) establishes the following straightforward distributional distinction between OC and NOC: whereas complement clauses fall under OC, subject and extraposed clauses fall under NOC. He refers to this distinction as configurational effects on control, and correlates complements and subjects with OC and NOC respectively (see also Landau 2001; Manzini 1983). The sentences in (93), taken from Landau (2013: 38), make use of reflexive pronouns in order to illustrate the fact that subject clauses are more liberal than complement clauses in terms of the restrictions on controller choice. Remember that reflexive pronouns must be licensed by a local antecedent, and thus, their insertion provides a fundamental tool to track the reference of PRO. In (93a) the non-finite clause is an OC complement that displays the same characteristics described above: the antecedent of PRO must be found in the matrix clause containing it. Specifically, the object *Mary*. Conversely, in (93b)

[51] Note that (91) and (92a) display a gerundive clause instead of an infinitival clause. For ease of exposition, most of the examples in this presentation were infinitival clauses, but certainly, gerundive complements are also the object of control relations and behave similarly to the principles that have been outlined so far. See Wasow & Roeper (1972) for a detailed account of the phenomenon of control in gerundive clauses.

and (93c), the non-finite clause is the (extraposed) subject. These cases allow for coreference possibilities outside of the matrix clause (i.e. *we* in the examples). As shown in (83)-(84) above, subject clauses also allow arbitrary control.

(93) a. We$_i$ thought that [John would help Mary$_j$ [PRO$_{j/*i}$ to expose herself/*ourselves]].

b. We$_i$ thought that [[PRO$_{j/i}$ to expose herself/ourselves] would help Mary$_j$].

c. We$_i$ thought that [it would help Mary$_j$ [PRO$_{j/i}$ to expose herself/ourselves]].

Interrogative infinitival complements –also known as *wh*-infinitivals or embedded interrogatives– will be the last structure examined here. There is a discussion on whether *wh*-infinitivals should be understood as OC or NOC (Landau 2000; Rooryck 2007; Stiebels 2007). Early analyses (e.g. Chomsky 1981; Bresnan 1982a) assume that *wh*-infinitivals represent cases of NOC given that arbitrary control is allowed, as shown in (94). Nonetheless, Landau (2000) convincingly argues that control into *wh*-infinitivals does not always allow arbitrary control, and in fact, OC can be forced. In (95), the reference of PRO is necessarily *John*, as otherwise, the reflexive pronoun would not be licensed.

(94) John$_i$ knows [how PRO$_{arb}$ to introduce oneself].

(95) John$_i$ wondered [how PRO$_i$ to introduce himself].

In this and the previous section we have presented the most representative structures that display control relations. Some phenomena have been left out for reasons of space and conciseness (e.g. copy control, long-distance control, or control with prepositional verb complements).[52] Importantly, the presentation was restricted to cases of forward control. That is, cases in which the controlled structure was a non-finite subordinate clause whose subject argument is left unexpressed. However, some languages such as Japanese or Brazilian Portuguese allow backward control structures. In backward control, the silent element is an argument of the matrix clause, and its reference is determined by an overt embedded argument

[52] Landau's (2013) comprehensive book is a highly recommended reference in order to dig deeper into the variety of structures that exhibit control properties, even though it is difficult to apprehend the entire picture of control structures from a single work. Lyngfelt (2009) and Potsdam & Haddad (2017) are good concise introductions.

(Fukuda 2008). In the remainder of the chapter we will delve deeper on complement control and the different theories of controller choice.

4.1.3 Complement control: theories of controller choice

To recapitulate, we have explained that control refers to a pattern of argument identification between the understood subject of a non-finite clause and its (overt) referent. We have also seen that the non-finite clause can perform different syntactic functions, but very frequently it instantiates the complement of the matrix verb. When this is the case, we talk about verbal complement control. In verbal complement control, generally known simply as complement control, the controller and the non-finite clause are co-arguments of the control verb (i.e. the matrix verb). These structures exhibit OC, and the choice of controller seems to depend to a large extent on the properties of the control verb. Stiebels (2007) refers to such properties as 'control readings', and Lyngfelt (2009) as 'control orientation'. In its most strict realization, complement control is exhaustive, which means that a single antecedent is uniquely identified as the reference of PRO. Certain verbs allow complement control structures that display *split* or *partial* readings (cf. 4.1.2.1). For conciseness, here we will mainly focus on cases of exhaustive complement control, as this is the configuration that is the focus of the experimental agenda presented in Chapter 5.

Stiebels defines complement control as a construction that "occurs with verbs that take a state of affairs (SOA) argument and in which identification of an argument of the matrix predicate with an argument of the embedded predicate takes place" (2007: 1). A *state of affairs* argument refers to the semantic function that characterizes the argument realized by the non-finite complement (e.g. process, experience, action, etc.). This class of verbs is also known as complement-taking predicates (Noonan 1985). Let us consider once again the sentences in (96). In (96a), the matrix verb *try* is a dyadic verb which selects two arguments: subject (i.e. *Ana*) and object (i.e. the action denoted by the non-finite clause). In structures like (96a), the controller must necessarily be identified with the subject of the matrix clause because it is the only possible referent; that is, locality suffices to identify the controller of PRO. These cases always instantiate subject control. However, one will often find structures in which there are two arguments that are syntactically accessible controllers. This occurs with triadic (also known as ditransitive) verbs as in (96b) or (96c). In addition to the non-finite complement, ditransitive verbs select another object –be this direct, indirect or oblique– often called the intervening NP.

Consequently, these structures can display either subject or object control; and whether it is one or the other is far from arbitrary. In the same way that certain verbs allow *split* control but others do not, control verbs can be organized into semantic classes that predict whether they will display subject or object control (Landau 2013: 124–125). Only a few verbs like *ask* allow control to be variable between subject and object (i.e. control shift). Nonetheless, our interest lies in verbs that consistently have either subject or object control properties, like *promise* or *order*, illustrated in (96b) and (96c).

(96) a. Ana$_i$ tried [PRO$_i$ to be careful with the documents].

b. Ana$_i$ promised John$_j$ [PRO$_{i/*j}$ to be careful with the documents].

c. Ana$_i$ ordered John$_j$ [PRO$_{*i/j}$ to be careful with the documents].

Interestingly, the same classes of verbs seem to cluster very similarly with regard to control readings across languages, and most importantly, what was said about complement control so far applies to the equivalent translations in Spanish presented in (97). It is also important to note that in English and in Spanish, infinitives are characteristically non-inflected, although there exist languages like Galician or Portuguese that do allow inflected infinitives (Longa 1994).

(97) a. Ana$_i$ intentó [PRO$_i$ ser cuidadosa^{fem} con los documentos].

b. Ana$_i$ prometió a Juan$_j$ [PRO$_{i/*j}$ ser cuidadosa^{fem} con los documentos].

c. Ana$_i$ ordenó a Juan$_j$ [PRO$_{*i/j}$ ser cuidadoso^{masc} con los documentos].

English and Spanish behave similarly with regard to the general properties of complement control that have been presented (cf. Pérez-Tattam 2007). However, there are a couple of grammatical contrasts that must be noted. In Spanish, the object NP must be obligatorily case-marked with the preposition *a* (e.g. *a Pedro*), whereas in English, the object NP is not morphologically case-marked; it receives case from the verb. Another difference, which will be particularly relevant for us in Chapter 5, has to do with the use of clitic pronouns. In Spanish, objects can appear in different syntactic positions depending on whether they are realized by a

noun phrase or by a clitic pronoun.[53] When the indirect object is realized by a noun phrase, it takes a postverbal position (*Juan* in 97b/c). Yet, when it is realized by a clitic pronoun, it must appear in a preverbal position (*le* in 98a). Furthermore, Spanish also allows the clitic doubling of indirect objects (Zagona 2002). Clitic doubling, also known as *pronominal reduplication*, occurs in grammars that allow the simultaneous occurrence of the clitic pronoun and the noun phrase that it refers to, such as *le* and *Pedro* in (37b).

(98) a. Ana$_i$ **le** prometió [PRO$_i$ ser cuidadosa con los documentos].

Ana$_i$ him promised [PRO$_i$ to be careful with the documents].

b. Ana$_i$ **le** prometió **a Pedro** [PRO$_i$ ser cuidadosa con los documentos].

Ana$_i$ him promised Pedro [PRO$_i$ to be careful with the documents]. (him=Pedro)

As it was noted at several points in the text, ditransitive verbs can allow either subject or object control. Nonetheless, it is generally observed that object control dependencies are more frequent than subject control ones. As we will see in the next section, this has led some authors to propose that object control is the default configuration and that subject control is an exception. Another important observation is that in object control dependencies, the object must generally be overt, while in subject control dependencies the object can generally be omitted, see (99). In addition, as shown in (100), it has been noted that many object control predicates have passive counterparts, while subject control predicates do not (Pollard 2011).

(99) a. *Ana persuaded [PRO$_?$ to be kind].

b. Ana$_i$ promised [PRO$_i$ to be kind].

(100) a. Ana$_i$ was persuaded [PRO$_i$ to be kind].

b. *Ana$_i$ was promised [PRO$_i$ to be kind].

[53] Direct object clitic pronouns: *lo/la/los/las.* Indirect object clitic pronouns: *le/les.*

These two facts are condensed by Bresnan (1982a) in what she termed Bach's and Visser's generalizations.[54] The former states that object control verbs cannot be detransitivized, while the latter states that subject control verbs cannot be passivized. Ultimately, the generalizations entail that controllers in OC configurations cannot be omitted. Even though these two generalizations may seem appropriate to describe many standard cases of complement control, Landau (2013: 178–183) convincingly argues that they do not stand the empirical test when a broader range of configurations and languages is examined (e.g. cases of implicit control or impersonal passives). Nonetheless, the observation that object complements are often omitted in subject control dependencies will feature again in the experimental project presented in Chapter 5.

Control is a multidimensional phenomenon. It is generally accepted that a concise lexico-semantic description of the principles that guide the relation between controller and controlee is essential in the explanation of complement control. In spite of the fact that most scholars acknowledge the role of verb semantics in the interpretation of infinitival clauses, the different theories of controller choice can be grouped according to whether they place more or less explanatory relevance on syntactic or on lexico-semantic facts. There is a fundamental question that the existing proposals answer in different ways: what determines the interpretation of the null subject? The next two sections are devoted to exploring different accounts of control and controller choice. First, going back to where we left it in §4.1.1 (the notion of PRO), we will focus on theories that understand control as a syntactic phenomenon. Second, we will review theories that understand control as a lexico-semantic phenomenon, paying special attention to the different verb classifications that were used to explain controller choice. For clarity, we will focus on presenting the arguments with regard to the interpretation of complement control. Nonetheless, it is important to bear in mind that most proposals aim to account for control phenomena in general, not only complement control. These last two theoretical sections will pave our way into the psycholinguistic dimension of control, which is our concern.

4.1.3.1 Control relations as a syntactic phenomenon

The syntactic approaches that are summarized in this section draw from the Generative tradition and share two fundamental ideas: first, the phonologically empty position of the null subject in

[54] Based on the works of Bach (1979) and Visser (1963).

non-finite classes is occupied by a syntactic element. Second, and most relevant to us, its interpretation is derived from configurational principles. At the same time, the approaches differ in the nature attributed to such null element and how its existence is theoretically justified. The notion of PRO was advanced at the beginning of the chapter because it is a key concept in the literature on control. Presenting it beforehand also allowed us to introduce relevant insights from the syntactic tradition. Nonetheless, PRO is not the only empty element that syntactically-based approaches have invoked in their analyses of non-finite complement clauses.

The outset of Control Theory can be found in Rosenbaum's influential PhD dissertation (1967, originally 1965), which saw the light during the times of the Standard Theory (Chomsky 1965).[55] In this context, Rosenbaum proposed that control phenomena could be explained through the *Identity Erasure Transformation*, an operation that was later named *Equi-NP deletion*. The fundamental assumption behind Rosenbaum's analysis was that, in deep structure, sentences like (101) actually displayed an overt NP in the subject position of the embedded clause. Thus, example (101) was understood as the result of deleting the lower NP in accordance with the *Equi-NP deletion* transformation. Importantly, the *Equi-NP deletion* could only be applied if the two NPs were coreferential.

(101) Ana$_i$ tried [~~Ana~~$_i$ to be careful with the documents].

Furthermore, Rosenbaum proposed that the interpretation of the deleted NP (also known in the literature as *Equi*) was constrained by the Minimal Distance Principle (MDP). The MDP is a locality constraint which states, in short, that the controller of the deleted element must be the closest NP in the tree. Rosenbaum's MDP was able to capture the interpretation of sentences like (101), but it failed to predict many control configurations, and it soon started to be challenged.[56] The most obvious counter example to the MDP is represented by subject control dependencies in ditransitive structures such as (102). Indeed, Rosenbaum himself noted the conflict with the verb *promise,* although he treated it as a lexical exception.

[55] One of the main premises of Standard Theory was the distinction between *deep* and *surface structure*. They were conceived as two representational levels which were linked through transformational grammar. Meaning was determined in *deep structure*, and *surface structure* was the output of applying transformations (e.g. deletion, movement, pronominalization, etc.) to the elements of *deep structure*.

[56] See (Landau 2013: 1–8) for a critical summary of the problems with the *Equi-NP deletion* analysis.

(102) Ana$_i$ promised John$_j$ [PRO$_i$ to be careful with the documents].

Accounts of control within Government and Binding kept the idea that non-finite complement clauses contained a null subject. Yet, instead of appealing to a deletion operation, the notion of PRO was brought into the picture. Binding theories argue that PRO is a lexically inserted silent element (empty category) that behaves like a null anaphor in OC structures, and as a pronoun in NOC structures. The syntactic underpinnings of the Binding theory of control have already been explained, but little has been said about the interpretation of PRO in this framework. In spite of the fact that many challenges to the MDP were discussed by Rosenbaum's peers in the course of the development of Control Theory (e.g. Chomsky 1968; Postal 1970), its influence continued in different forms over the years, setting locality as a hegemonic idea in syntactocentric accounts of control, through Government and Binding and beyond. In the words of Chomsky (1980:33):

> I will assume that the basic principle of control is the "Minimal Distance Principle" of Rosenbaum (1967). That is, a verb with a complement assigns complement control and a verb lacking a complement assigns subject control. But certain verbs (e.g. *promise* or *ask* with an indirect question complement […]) are marked in the lexicon with the feature [+SC] indicating "assigns subject control".

In the decade of 1990s, Generative linguistics welcomed the Minimalist Program (Chomsky 1995) as an attempt to reduce the theoretical apparatus of grammatical description. Hornstein (1999; 2001) argued that the empty category PRO was redundant and too complex, given that it required a specific module in the grammar to be interpreted (i.e. Control Theory). The Movement Theory of Control (MTC) was proposed as an attempt to reduce the machinery of PRO-based theories of control (Hornstein 1999; Hornstein 2001; Hornstein & Polinsky 2010; Boeckx & Hornstein 2003; Boeckx & Hornstein 2004; Hornstein 2003). The fundamental idea behind the MTC is that control is derived by movement. This idea retains some flavor from Rosenbaum's initial proposal and it is highly influenced by the analysis of raising phenomena (introduced in §4.1.1.1). The MTC analyzes the null subject of non-finite clauses as a syntactic element, but it resorts to the use of different categories in OC and NOC structures. As represented in (103), in OC structures, *Ana* is thought to be moved from the subject position of

the lower clause into the subject position of the matrix clause. As a consequence, the position of the moved constituents is filled by a trace (*t*). This analysis coincides with that of NP-trace in raising constructions. By contrast, as shown in (104), the subject of NOC structures is identified with an empty pronoun like *pro.* The MTC radically blurs the contrast between control and raising, reducing the differences between the two phenomena to thematic role assignment. While the MTC disposed of the notion of PRO, other authors continued developing PRO-theories of control that kept the assumption that control constructions involve a coreferential relation between PRO and another argument (e.g Martin 1996; Landau 2000; 2004).

(103) Ana$_i$ tried [~~Ana~~ t_i to be careful with the documents].

(104) It is unacceptable [*pro* to abandon the investigation].

There have been several attempts to reconcile the behavior of *promise* with the MDP (e.g. Larson 1991; Manzini & Roussou 2000; Hornstein 1999). In the spirit of the MDP, minimalist approaches propose the Minimal Link Condition (MLC) on movement (Chomsky & Lasnik 1993). This condition captures the idea that each step in the derivation should be minimal and, thus, shorter derivations are preferred over longer ones. In this context, Hornstein (1999) analyzes deviations from the MDP/MLC (that is, subject control) as a marked option, arguing that such a phenomenon is attested in only a few cases such as *promise*, *vow* or *commit.* Another argument put forth in favor of the marked treatment of *promise* comes from the pioneering work on language acquisition by Carol Chomsky (1969), who found that children show a significant delay in the acquisition of the control properties of *promise.* Other attempts such as Boeckx and Hornstein (2003) or Hornstein & Polinsky (2010) propose to analyze the object argument of *promise* (e.g. *John* in (102)) as a prepositional phrase (PP) that is headed by a null preposition. This treatment would allow them to argue that the PP argument is not visible to the MLC, and thus, it does not count as an intervener. Landau (2013: 149–154) identifies several problems for the MTC and previous locality-based theories of control. Namely, the failure to naturally accommodate subject control dependencies and the phenomenon of control shift. Another problem for the MTC comes from languages like Korean, in which OC dependencies are determined by the use of a mood marker. This operationalization of control makes subject control structures as predictable and unmarked as object control ones (Madigan 2008). It is

undeniable that syntactic theories of control capture core structural facts such as the distribution of PRO, but, in the words of Landau, "these theories are unequipped to deal with the semantic aspects which are obviously implicated in controller choice" (2013: 154). Landau's work is an attempt to reconcile the Generative tradition with the semantic aspects of control, starting from the idea that a purely syntactic explanation of controller choice is not enough to capture the existing complexity.[57] In the next section we will review different accounts that draw from semantic generalizations.

4.1.3.2 Control relations as a lexico-semantic phenomenon

The works presented in this section arose as a reaction to the linguistic tradition that observed control as a purely syntactic phenomenon. It is sure that syntactic factors are essential to explain the distribution of control dependencies (i.e. the distribution of PRO). Nonetheless, lexical accounts of control put the focus on controller choice (i.e. the interpretation of PRO). Indeed, in spite of the existing theoretical disputes around syntactic representation, there is a general consensus on the fact that controller choice cannot be dissociated from the lexical specification of verbs. It is then assumed that the lexical representation of verbs includes information regarding control relations in addition to all the relevant information of the word such as its morphological characteristics, meaning(s), membership to syntactic category and argument structure information (Tanenhaus & Carlson 1989).

The accounts that emphasize the importance of lexico-semantic information take different standpoints regarding the representational reality of PRO: some adopted the syntactic machinery of the Chomskyan tradition (e.g. Rooryck 2000; 2007), others remained neutral to the notion of PRO (e.g. Culicover & Jackendoff 2006; Jackendoff & Culicover 2003), and others rejected the notion of empty subjects altogether (e.g. Sag & Pollard 1991). The idea that not all accounts of control rely on the postulation of an empty syntactic subject was already introduced §4.1.1. Monostratal theories such as Lexical Functional Grammar (Bresnan 1982b) and Head-Driven Phrase Structure Grammar (Pollard & Sag 1994) rejected the idea that the understood subject of infinitival clauses is a syntactic category, getting rid of phonetically empty PRO and syntactic binding relations. In these theories, controlled infinitival clauses are

[57] For instance, Landau's *Agree* model (2000), and his most recent proposal the Two-tiered Theory of control (2015), builds in part from a semantic classification of predicates and complements in order to distinguish OC and NOC, or exhaustive and partial control.

considered as subjectless VPs which are linked to a subject only in terms of semantic representation. For instance, in a sentence like (103) above, the complement of *try* is not a clause with a missing subject but simply the VP *to be careful with the documents*. These theories observe control relations as an interpretative dependency, not a syntactic dependency, and thus the relation between the implicit subject and its antecedent is argued to be established in different (non-syntactic) levels of linguistic representation. For instance, the level of argument structure in Head-Driven Phrase Structure Grammar, or *f*-structure in Lexical Functional Grammar.

For the sake of clarity in the exposition, the accounts introduced in this section will be presented by focusing on the lexical conception of controller choice while avoiding contextualizing each proposal within a specific theory of syntactic representation.[58] The main point of this section is to explore theories that operationalize controller choice in terms of verbs' lexical choices because these accounts pay particular attention to the contrast between subject and object control. What the proposals presented here have in common is that they explain controller choice based on lexico-semantic generalizations about the meaning structure of control verbs –those verbs that select the infinitival or gerundive complement. From this perspective, the problem of controller choice represents the problem of building the right semantic classification of control predicates. The lexical specification of verbs is the keystone of these accounts, and in particular, their argument structure or event semantics. Also, central to our research, lexico-semantic accounts of control swirl around the challenge of accounting for the behavior of both *promise*-type verbs (subject control) and *persuade*-type verbs (object control). In contrast with the accounts presented in the previous section, these proposals observe subject control as a predictable configuration rather than an exception.

The central place of lexical information in the study of control has been vindicated from, at least, as early as Jackendoff's PhD dissertation (1969: 127ff.). Subsequent works by Jackendoff (e.g. 1972; 1974) and other authors (e.g. Melvold 1985; Růžička 1983) developed the idea that controller choice involved a relation at the level of argument structure; the level at which the arguments of verbs can be couched as thematic roles. Thematic roles, also known as semantic roles or theta roles, represent a fundamental part of the study of verb meaning and argument structure. Jackendoff's pioneering work points to thematic roles as a means to define

[58] Featherston (2001) and Landau (2013) provide comprehensive reviews on this issue.

the conditions under which a particular verb determines the interpretation of the null subject in control structures. Instead of explaining controller choice on the basis of syntactic position such as subject/object, he argues that "networks of coreference are defined on thematic relations rather than grammatical relations" (Jackendoff 1972: 215). For instance, the behavior of a verb like *promise* would be better captured as control by the thematic role of SOURCE (the agent, initiator of the promise) rather than the syntactic function of subject. Under this conception, the parallelism between verbal and nominal control emerges easily, as shown in (105). In both cases *Ana* is the SOURCE of the promise, and thus, the controller. In the context of subject control verbs, the null subject is associated with the giver (SOURCE), and in object control verbs it is associated with the recipient.

(105) a. Ana$_i$ promised John$_j$ [PRO$_i$ to be careful with the documents].

b. The email was about Ana's$_i$ promise to John$_j$ [PRO$_i$ to be careful with the documents].

Many authors took up the proposal of modelling controller choice through thematic roles. Chierchia's PhD dissertation (1984) proposes a hierarchy of thematic roles of the sort THEME > SOURCE > GOAL in order to account for the task of controller selection. According to this hierarchy, the controller would be chosen to be the argument that holds the role that is highest in the hierarchy. This would explain why *persuade* exhibits control by the object (THEME) instead of by the subject (SOURCE); and *promise* control by the subject (SOURCE) instead of by the object (GOAL). Nonetheless, as noted by Farkas (1988), certain verbs that take a SOURCE and a GOAL, like *order* or *tell*, exhibit control by the GOAL argument (the object), not by the SOURCE (the subject). The fact that some verbs select the GOAL argument over the SOURCE argument presents a notable challenge to the generalizability of the hierarchy.

The fundamental aim of lexico-semantic analyses of control is to explain why certain verbs take subject control and others object control. Taking Jackendoff's ideas as a starting point, Sag and Pollard (1991) propose a classification of control verbs in three groups, according to the type of event denoted by the non-finite clause (i.e. the state-of-affairs argument, SOAs). As shown below, the three types of events identified in their work are *influence*, *commitment*, and *orientation*.

- **Influence, object control (influence-influenced-SOAs):** order, persuade, permit, command, direct, advise, convince, impel, induce, pressure, prompt, encourage, urge, cause, force, etc.
- **Commitment, subject control (committor-commisee-SOAs):** promise, swear, agree, contract, pledge, vow, try, intend, refuse, choose, decline, decide, demand, attempt, threaten, propose, offer, etc.
- **Orientation, subject control (experiencer-SOAs):** want, desire, wish, long, prefer, hope, need, expect, aspire, hate, be eager, be able, be easy (for), occur (to), be important (to), etc.

In the first class we find verbs like *order* or *persuade.* These verbs denote an event involving INFLUENCE to bring a SOAs, and thus, belong to the influence type. In these cases, "a certain participant (the referent of the object) is influenced by another participant (the reference of the subject) to perform an action (characterized in terms of the SOA denoted by the VP complement)" (Sag & Pollard 1991: 66). Influence type verbs select three semantic roles: the influence (the agentive influencer), the influenced (the animate participant that is influenced by the influencer) and the SOA argument (the action that the influenced participant should perform). The influenced participant is the controller. The same line of reasoning is used to describe the second group, which encompasses verbs like *promise* or *swear*. These predicates denote an event involving COMMITMENT to a SOAs, and include the associated roles of committor, a commisee and the SOAs that represents the action to which there is a commitment. This action is performed by the committor, which is the controller. The third class includes verbs that involve a psychological ORIENTATION to a given SOAs in terms of desire or other emotions. The associate roles are the experiencer and the SOAs to which there is an orientation. In these cases, the experiencer is the controller. In essence, the semantic category of influence is related to object control, while the categories of commitment and orientation are related to subject control. It is also important to note that the issues with controller choice only arise in the context of triadic verbs. In Sag & Pollard's classification, verbs of influence and commitment are triadic, while verbs of orientation are dyadic.[59]

[59] Note that verbs like *want* subcategorize for a single object complement, although a second NP can be introduced in cases like *Ana wanted John to be careful with the documents*. In this example, *John* is the one being *careful with the documents.* In spite of the superficial similarities, this structure differs from that of triadic control verbs like *promise,* which subcategorize for two complements (they semantically select the object as an argument). Structures like *Ana wanted John to be careful with* -»

The main advantage of Sag & Pollard's semantic generalizations[60] is that they dispose of syntactic notions such as subject and object control. For instance, in events of COMMITMENT, the committor will always be the controller, independently of the presence of other syntactic/semantic arguments (object, goal, commissee, etc.). In their words, "controller assignment principles are tied to the SOAs described by linguistic expressions rather than to linguistic expressions themselves". Consequently, subject control across the object is not seen as an exception or marked structure. In spite of the ease with which the work by Sag & Pollard is able to capture controller choice in a great variety of structures, Landau (2013) contests the idea that the three semantic classes proposed by the authors provide the right characterization of the predicates. As he argues, Sag & Pollard (1991) classify the verbs using intuitive criteria related to vague general notions, particularly in relation to verbs of *influence* and *commitment*, which are the ones that capitalize the subject/object control problem. If we compare the sentences in (106) (taken from Landau 2013: 130), we can see that the differences between verbs like *ask* (object control and assumed *influence*) and *agree* (subject control and assumed *commitment*) are not so straightforward. What does it really mean to influence somebody into something? It seems that there is more influence being generated by the fact that there is a previous agreement in (106b), than by the mere act of asking in (106a). The point is that ascribing specific predicates to the different semantic classes is not a trivial issue.

(106) a. John$_i$ asked Mary$_j$ [PRO$_j$ to help him].

b. Mary$_i$ agreed with John$_j$ [PRO$_i$ to help him].

Another account based on a semantic classification of verbs is developed in Rooryck (2000; 2007). This proposal is centered around the notion of transfer, and distinguishes four semantic categories, shown below. The author assumes that these verbs have a thematic structure comprised of SOURCE-GOAL-THEME, in which the two matrix arguments (subject and object) correspond to the thematic roles of SOURCE and GOAL respectively, and the infinitive clause is

the documents are known as *Exceptional Case Marking* (ECM) constructions, in which the matrix predicate behaves like a raising verb (cf. examples (15)-(16)). In ECM constructions, the surface object (e.g. *John*) is not an argument of the matrix verb (e.g. *want*), but it is the semantic subject of the embedded predicate. These type of constructions are allowed with a small number of verbs such as *want* and *believe*, which alternate from a control configuration (e.g. *John wants to be careful with the documents*) to a non-control configuration when they are used in ECM constructions (cf. Pérez-Tattam 2011).

[60] Other authors such as Farrell (1983) have also work on these generalizations.

the THEME. The THEME is thought to be transferred from the SOURCE to the GOAL. Actual transfer corresponds to actions that take place at the time of reference, while delayed/tentative transfer refers to an unspecified moment after the reference time (Rooryck 2007). In his view, which treats transfer as a quite metaphorical concept, the contrast between actual, delayed, and tentative transfer is crucial for the selection of possible controllers.

- **Actual transfer, strict object control:** force, grant, coerce, etc.
- **Delayed transfer, preferential subject control:** promise, guarantee, threaten, etc.
- **Delayed transfer, preferential object control:** ask, beg, request, etc.
- **Tentative transfer, variable control:** propose, offer, suggest, etc.

The syntactic and semantic apparatus deployed by Rooryk is too complex to be reviewed here, but his classification reveals several observations that are of particular importance to us. Actual transfer verbs only involve object control, while the other three categories are somewhat less robust in the control preferences. He refers to delayed and tentative transfer verbs as *variable but local control*. All *variable but local control* verbs allow split control. In his words, these verbs "belong to a coherent semantic class, namely verbs which express a commitment to, or a request for, the temporally unrealized future transfer of a theme" (Rooryck 2007: 282). Whereas verbs of actual transfer (e.g. *force*) are considered strict object control, verbs of delayed transfer display variation, in spite of having strong subject (e.g. *promise*) or object (e.g. *ask*) control preferences. Thirdly, verbs of tentative transfer (e.g. *propose*) can equally display subject, object, or split control. Rooryck's analysis equates verbs that have been traditionally considered as subject control (e.g. *promise*) with verbs that are normally analyzed as control shift (e.g. *ask*).

This classification could be surprising because it entails that, under some circumstances, *promise* can actually display object control, even though it is a preferential subject control verb. This can be easily shown in the context of embedded passives as in (107). These sentences represent some sort of controller shift operation. Control shift is forced when the preferred controller is not a possible choice. These cases were already advanced by Sag & Pollard, which describe them as an accommodation of interpretation, or coercion, that is triggered when "the complement's content does not (quite) satisfy the semantic demands of the relation it is an argument of" (1991: 82). Lyngfelt (2009) points out that such cases are surprising from a

syntactic perspective, but not from a semantic one. Even though there is a change with respect to the syntactic position that is usually occupied by the expected controller of a verb like *promise*, the subject of the main clause is still the person who is in control of the subordinate event. In other words, the control relation is not tied to the syntactic subject of the embedded clause but to the element that controls that the subordinate event takes place.[61] Even though such cases of control shift are not frequent, they are of great theoretical relevance as they provide additional arguments for a semantic approach to control.

(107) a. Ana$_i$ promised John$_j$ [PRO$_j$ to be allowed to give a talk].

b. Ana$_i$ promised John$_j$ [PRO$_j$ to get to play a few songs at the party].

Some of the examples used to sustain Rooryck's analysis have been criticized for exhibiting variation among speakers, and his notion of transfer is rather vague. Nonetheless, his account provides an important generalization: some verbs always have a single controller (actual transfer), while others allow control shift and split control. This brings about an interesting contrast between subject and object control verbs, as controller choice appears to be rigid only in cases of object control.

In more recent years, the analyses proposed in Jackendoff & Culicover (2001; 2003), and Culicover & Jackendoff (2005; 2006), have been established as one of the most acknowledged lexico-semantic theories of control. Instead of talking about SOAs complements, these authors refer to the type of non-finite complements that we are concerned with as *actional* complements –complements that express an action. In their words (2003: 524):

> Our claim […] is that the type of control a complement displays is a consequence of the semantic role it is assigned by the head that selects it, not a consequence of its syntactic position or that of its controller. […] Infinitival or gerundive complements that are selected by their head to be of the semantic type Action have unique control. The unique controller is the character to which the head assigns the role of Actor for that action –whatever its syntactic position.

[61] Farkas (1988) introduced the notion of RESP(onsibility) in order to account for this type of phenomena.

Thus, with a verb like *promise,* the giver (source, maker) of the promise is the controller of the action of the non-finite complement (i.e. the actor), while with verbs like *order*, the actor is the recipient. Jackendoff & Culicover follow previous authors, particularly Sag & Pollard (1991), in assuming that controller choice is rooted in semantics, and thus, that semantic generalizations operate across environments (e.g. nominal control, adjectival control, etc.). However, in this proposal, the source of control relations does not emanate from a three-way classification of verbs, but rather, Jackendoff & Culicover argue that controller choice operates at the level of conceptual structure. Conceptual structure is a level of linguistic representation defined by basic predicates and their thematic roles, in which verbs (and other concepts) are represented using conceptual primitives (Jackendoff 1983). In conceptual structure, control verbs are decomposed into more basic or primitive predicates, and their event participants are transparent and independent of their syntactic realization. The entity designated in conceptual structure as the actor of the action denoted by the complement is identified as the controller.

Along their work, the authors refer to several primitive conceptual predicates in the analysis of control relations, even though it is unclear whether it is intended as an exhaustive list. Two important subtypes of the relations they discuss are OBLIGATED and INTEND.[62] Let us put their account into practice by focusing on *promise* and *order,* two predicates that exhibit contrasting control relations. These two verbs are classified as unique control because the subject of the actional complement that they select must be controlled by one of the other arguments of the verb (i.e. OC). In their view, *promise* and *order* both incorporate the notion of OBLIGATED. Thus, they select the person under obligation as the actor of the actional complement. This generally corresponds to the subject in the case of *promise* and the object in the case of *order*, although structures in which this is not the case can be easily explained within this model. The view presented by Jackendoff & Culicover easily accommodates the facts related to the subject/object control contrast, including cases of controller shift like coercion with *promise*.[63] Other predicates grouped within the notion OBLIGATED are *instruct, pledge, vow*, or *guarantee*. Most of the so-called subject control predicates are grouped within this type. Regarding the basic notion INTEND, which assigns control to the intender, a typical control predicate is *persuade,* and also two-place predicates like *decide* or *intend*. In sum, the main

[62] Others are ABLE, SHOULD, REQUEST or CAUSE.
[63] They provide a discussion of these cases in Jackendoff & Culicover (2003: 541–547), which is an elaboration on Sag & Pollard (1991).

difference between this proposal and Sag & Pollard's is that the latter propose that control relations are explained by three types of semantic relations (influence, commitment and orientation), and Jackendoff & Culicover defend the view that control relations are linked to actional complements and their actors. Both proposals produce a set or classes of predicates, but with a different nature (lexical/conceptual) and different members. The existence of different semantic classifications of control verbs highlights the challenge of assigning control verbs to closed classes, while the ease with which semantic accounts incorporate many cases that were previously considered as exceptions to the MDP emphasizes the need for such semantic classifications.

An important shortcoming of the proposal by Jackendoff & Culicover (2001; 2003) and Culicover & Jackendoff (2005; 2006) is that it is restricted to English. The authors recognize this drawback, which is actually shared by most of the accounts presented in this chapter. Unfortunately, the main analyses of control are centered around English phenomena. Yet, in spite of the lack of sufficient crosslinguistic studies on control relations, the assumption in the literature is that semantically similar predicates impose similar restrictions on control relations across languages (e.g. Van Valin & LaPolla 1997; Stiebels 2007). Importantly, the linguistic examples and theoretical proposals presented in this section can be easily accommodated to equivalent OC structures in Spanish. Of course, there are unavoidable syntactic and semantic differences across the two languages that can have an impact on control relations, as predicates with similar meaning can be syntactically articulated in different ways. For instance, in Spanish the verb *obligar* (*force*) is a prepositional verb while in English it is not. Another good example is the verb *admitir* (*admit*), which can also mean *allow* when it is preceded by the clitic *le*, switching from subject to object control. In any case, the broad semantic generalizations seem to prevail (cf. Alba-Salas 2006; Pérez-Tattam 2007).

In this first part of the chapter we have seen that control relations are grammatically diverse and arise from a complex interaction of syntactic structure and lexical-semantic aspects. While syntactic theories privileged object control dependencies, lexico-semantic theories articulate control around thematic roles, which allow them to account for both types of dependencies as core control phenomena. It is our evaluation that no single linguistic theory can explain all aspects of control, which arises as a multidimensional phenomenon. Yet, ultimately, it is assumed that verbal control is a fundamentally lexically driven phenomenon that emanates from the control properties of complement taking heads, and thus, that verbs' lexical entries

incorporate information about their control readings. This theoretical introduction brings us to one of the main questions that this dissertation attempts to contribute to, which is: what kind of information (e.g. lexical or structural) is used in the online resolution of long-distance control dependencies? In spite of the prominence of control relations in linguistics, its theoretical interest has not motivated an equivalent amount of empirical psychological examination. The next part of this chapter presents the literature on the processing of control relations. As it is also the case of the present work, the majority of the existing works on control are concerned with OC verbal complement control.

4.2 THE PSYCHOLOGICAL REALITY OF LINGUISTICALLY DEFINED PRO GAPS

The title of this second part of the chapter, concerned with the psycholinguistics of control, makes a small nod to MacElree & Beaver's (1989) seminal work entitled *The psychological reality of linguistically defined gaps.* The processing of empty categories, known as gaps in the psycholinguistic literature, was a highly productive area of research during the 1980s and 1990s. Many of the works that appeared back then originated in the epicenter of the dispute between linguistic theories that postulated phonologically null elements in their syntactic analyses and theories that did not. Empty categories were one of the key notions that distinguished Generative theory from competing accounts such as Head-Driven Phrase Structure Grammar. Out of the four empty categories proposed by Government and Binding approaches (PRO, *pro, wh*-trace and NP-trace), *wh*-trace received much more attention in psycholinguistics in comparison with the other three, not only in early years but also up to present days (e.g. Clifton & Frazier 1986; Crain & Fodor 1985; Frazier et al. 1983; Lee 2004; Nicol & Swinney 1989; Phillips et al. 2005; Wagers & Phillips 2009; 2014, inter alia). In general terms, the empirical quest was to discern whether the antecedent of the trace was activated at the gap position, and whether that could be understood as evidence for the representational reality of phonologically empty elements (see Featherston 2001 for a thorough revision of the debate). In some respects, findings about *wh*-dependencies determined the angle from which the rest of empty elements were approached experimentally, often studied in comparison with *wh*-traces. We will briefly review the phenomenon of *wh*-traces because it will provide us with a starting point to delve into the psycholinguistic studies of control dependencies and the processing of PRO gaps.

At the beginning of this chapter, we saw that *wh*-traces were understood as the result of movement operations motivated by certain constructions such as *wh*-questions, relative clauses or indirect questions. A *wh*-trace is a null category that is postulated to occupy the original position in which the moved constituent is generated and from which it gets assigned its thematic role. The movement operation generates a linguistic dependency between the moved *wh*-phrase and the *wh*-trace. Thus, encountering a *wh*-phrase anticipates the presence of a trace gap, and locating the gap position is essential for the interpretation of the *wh*-phrase. This is exemplified in (108), taken from Wagers & Phillips (2009). In the example, the phrase *which CD* is represented as being moved from its original position as the complement of the verb *play*.

(108) The babysitter forgot which CD_i the toddler likes her mother to play $\boldsymbol{t}_i$.

The study of filler-gap dependencies has proven highly productive for psycholinguistic research due to the interesting online effects that have been uncovered.[64] Put very briefly, it has been shown that *wh*-gaps do not only activate their antecedents, but also, when the parser encounters a *wh*-element (a filler), it actively tries to anticipate the location of its corresponding trace (a gap). Evidence for this routine comes from attested efforts by the parser to locate a gap in positions that seem temporarily correct but are then proven to be erroneous. For instance, in (108), encountering the filler *which CD* would initiate an active search for a gap position, and it has been found that the parser tries to temporarily locate the gap position in the first available place in the structure that can accommodate it (e.g. after the verb *like* in (108)). What is interesting about this phenomenon is that illicit attempts to create a gap show the parser's zeal to solve filler-gap dependencies as soon as possible (Crain & Fodor 1985; Stowe 1986; Traxler & Pickering 1996; see Phillips & Wagers 2007 for a review). This and other findings have concentrated around theories such as the Most Recent Filler Strategy or Active Gap Filling (Crain & Fodor 1985; Fodor 1978; Frazier et al. 1983; Frazier & Flores d'Arcais 1989; Stowe 1986). In the next section we will discuss such theories to the extent that they make predictions about PRO dependencies.

Investigations on *wh*-dependencies focused on the kind of information that is used in order to anticipate the location of the gap and the time course of activation of the antecedent at the

[64] In the psycholinguistic jargon the *wh*-element is known as *filler*, and the trace is known as *gap*. This filler-gap distinction applies to the rest of empty category elements.

gap site. When it comes to PRO dependencies, the (somewhat scarce) evidence regarding antecedent reactivation is varied: different studies, comparisons, and methods show varying degrees of activation. Importantly, in contrast with *wh*-traces (and NP-traces), PRO is not a displaced constituent –it does not result from movement operations. Instead, it is a local category that is unannounced. This means that the presence of a PRO gap cannot be anticipated by the prior detection of a filler, as it is the case with trace gaps. In addition, PRO is a construct that is used in locally bounded dependencies, whereas *wh*-trace appears in unbounded dependences –in which there is no bound or limit on the depth of embedding of the gap in relation to the filler. Differences in the syntactic nature of the gaps and the structure-building operations that they entail must be taken into account when comparing the robustness of antecedent reactivation. In the words of McElree & Bever (1989):

> […] NP-movement gaps appear to activate their antecedent to a greater degree than PRO gaps. GB formally distinguishes between these type of gaps, and we have followed this analysis rather directly in suggesting that greater activation results from NP-movement gaps as a consequence of greater necessity of structure-building operations.

Control relations are an essential part of routine language use but our understanding of the information that guides the successful comprehension of these structures is still insufficient. In the next sections, we will review the existing psycholinguistic studies on the processing of control constructions, including the available studies in Spanish. These works deal with a wide range of structures in addition to the one that is the focus of this project (i.e. subject and object verbal complement control). Finally, we will focus on the very few studies that approach the issue of grammatical illusions in control dependencies. As it will become clear through the review, one of the main challenges that one encounters when analyzing the literature on the processing of PRO comes from the diverse motivations and contrasts established in the literature, which use different configurations of control and different experimental methods.

4.2.1 Processing control dependencies

The efforts to understand the psychological reality of PRO gaps concentrate on determining the process of antecedent selection. Given that early research on the topic was motivated by grammatical discussions on the existence of empty categories, the works often revolved around

comparing PRO with other gaps. Few studies examined control relations in isolation, much less the contrast between subject and object lexically-guided verbal control. The fundamental question regarding the processing of verbal control is expressed by Demestre et al. (1999: 295) as follows:

> The language processor, in order to coindex the implicit subject with its antecedent, must likewise access and use information specific to the verb's lexical entry. The availability of this information in the stimulus, however, does not necessarily imply that that information is immediately accessible to the processor. The debatable issue is not *if*, but *when* this verb-specific information is accessed and employed by the parser.

The existing empirical evidence on the processing of PRO gaps has shown mixed results: whereas some authors have argued that lexical control information is not accessed in early parsing stages, others have claimed that control information is accessed and used from very early on. The evidence in favor of each of these two opposing proposals will be examined in turn. The studies will be presented in a more or less chronological order, putting particular emphasis on the various experimental techniques and manipulations that have been used to tackle this question, from early cross-modal lexical priming studies to techniques such as eye-tracking or ERPs.

4.2.1.1 Late use of control information

One of the pioneering studies on the processing of empty categories is the work of Frazier et al. (1983; and also Clifton & Frazier 1986), who, in passing, examined the effects of control. The authors used a sentence comprehension task which measured participants' response time in determining whether they had correctly understood the meaning or not. Their manipulation compared sentences containing recent and distant fillers and, among the 16 experimental conditions tested, the authors included contrasts like those in (48). These examples contain two gaps: a PRO gap and and trace gap. The authors used verbs of 'ambiguous' control (as they call them), like *beg* in (109a), and verbs of 'unambiguous' control, like *force* in (109b).[65]

[65] Verbs like *beg* correspond to the notion of control shift and verbs like force correspond to the notion of obligatory exhaustive control (cf. §4.1.2.1)

(109) a. Everyone liked the woman$_i$ who the little child$_j$ **begged** t_i [PRO$_{i/j}$ to sing those stupid French songs].

b. Everyone liked the woman$_i$ who the little child$_j$ **forced** t_i [PRO$_i$ to sing those stupid French songs].

Their results showed that sentences with recent fillers were understood with more ease than sentences with distant fillers irrespective of control information, and thus, the authors concluded that control information did not constrain initial filler selection. In their words, "verb control information is used only after an initial heuristically guided assignment of fillers to gaps is made" (Clifton & Frazier 1986: 210). As most of the works from this early period, the focus of the study by Frazier and colleagues was put on verb control information, and importantly, they did not separate control from movement. Instead, the main objective was to provide empirical evidence for a parsing heuristic that was coined the Most Recent Filler Strategy (MRFS). The MRFS is defined as a parsing preference whereby "a detected gap is initially and quickly taken to be co-indexed with the most recent potential filler" (Frazier et al. 1983: 196). The recency preference established by the MRFS gives priority to object control dependencies –a proposal that correlates nicely with Rosenbaum's (1967) MDP and Chomsky & Lasnik's (1993) MLC (cf. §4.1.3.2). Therefore, the MRFS predicts object control dependencies to be facilitated, while some reanalysis or reprocessing is expected in subject control sentences after the initial assignment of PRO the most recent filler.

After the postulation of the MRFS, several studies were carried out to put it to the test. Using the cross-modal priming technique, Nicol & Osterhaut (1988; reported in Nicol & Swinney 1989; see also Nicol 1988) compared sentence pairs like the ones shown in (110). Their stimuli, which also included PRO and a trace gaps, manipulated recent/distant antecedents of PRO. In (110a), the predicate *invite* guides object control, and thus, PRO is coindexed with the object of *invite*, which in this case is the trace related to *the actress* –the distant filler.[66] In (110b), the predicate *plan* guides subject control as this verb does not take an object (it is a dyadic predicate). Thus, the antecedent of PRO is the RC subject *the dentist* –the recent filler. This design was aimed at testing the online application of the MRFS to PRO gaps.

[66] Even though *invite* also allows split control.

If it is assumed that control information is not available during the initial parsing stages, PRO should be initially coindexed with the most recent potential antecedent, *the dentist*, in both conditions.

(110) There is the actress$_i$ that the dentist$_j$ from the new medical center in town…

a. **#1** had **invited** t_i [PRO$_i$ to **#2** go to **#3** the party].

b. **#1** had **planned** [PRO$_j$ to **#2** go to **#3** the party with t_i].

In Nicol & Osterhaut's task, participants were presented auditorily with a recorded version of the sentences and, simultaneously, they were asked to make a lexical decision to some letter strings presented on a screen. These strings could be words or non-words, and the word targets could be related primes of one of the possible antecedents (either *actress* or *dentist*). The lexical decision task was probed at three positions in the sentence, as marked in the example. The position marked with #1 was used as an experimental control. No priming facilitation was observed for any of the potential antecedents at this point. The next two test points (#2 and #3) respectively tested antecedent reactivation at the PRO position and at a later point in the sentence. The results for #2 and #3 showed a facilitation for primes related to *actress* in both (110a) and (110b). Given that *actress* is a distant antecedent, these results initially contradicted the predictions of the MRFS. Nonetheless, Nicol & Osterhaut (1988; reported in Nicol & Swinney 1989) recognize that their results are possibly emerging from the activation of the *wh*-trace at the object position, rather than from the reactivation of the antecedent of PRO. The problem here, as in Frazier et al. (1983), is that PRO and trace gaps interacted in the structure. This is self-apparent in the case of (110a), as trace and PRO are contiguous and thus, *the actress* is actually the most recent antecedent –assuming that it is reactivated at the trace position. In addition, the authors acknowledge that a subset of verbs used in sentences of the type of (110b) also allowed an object trace, which could be prompting the reactivation of *actress* also in this condition. In order to overcome this confound, Osterhaut & Nicol (1988) carried out a follow up experiment in which they compared active and passive sentences that contained two potential antecedents for PRO, but no traces. A sample set is shown in (111). The active/passive manipulation varied the linear position of the antecedent such that *dentist* is the antecedent in

(111a) and *actress* in (111b). In this case the authors probed priming effects at 5 different points in the sentence.

(111) a. The actress$_i$ invited the dentist$_j$ from the new medical center [PRO$_j$ to **#1** go to the pa**#2**rty at the **#3** major's **#4** house **#5**].

b. The actress$_i$ was invited by the dentist$_j$ from the new medical center [PRO$_i$ to **#1** go to the pa**#2**rty at the **#3** major's **#4** house **#5**].

No significant priming facilitations were observed in positions #1 and #2, which were the earlier test points where the antecedent of PRO was predicted to be reactivated. The lack of effects at this point suggested that PRO does not behave like *wh*-trace, which had shown early effects in other studies using the cross-modal priming technique (e.g. Nicol 1988; Swinney et al. 1989; see Featherston 2001: 81–108 for a review; and Demestre & García-Albea 1996; and García-Albea & Meltzer 1996 for CMP works in Spanish). The lack of effects in the early test points challenges the idea that the MRFS is at place during the processing of null subjects because under such an account, the recent antecedent would be expected to show facilitation in #1 and #2. In #3, only the recent filler (*dentist*) was primed; in #4 only the correct antecedent was primed (*dentist* in (111a) and *actress* in the (111b)). Finally, in #5, only the distant filler was activated *(actress).* These results led Nicol & Swinney (1989) to conclude that PRO gaps do not immediately access their antecedents during parsing. Instead, the authors concluded that all potential antecedents were activated, and controller choice was relegated to a later point in time, when non-structural information is available. In this vein, authors like Cowart and Cairns (1987) and Nicol (1988) further suggested that PRO relations were computed in an independent linguistic module in which lexical information was accessible, given that the antecedents of PRO could not be exclusively restricted on the basis of syntactic information. The lack of strong priming evidence for PRO antecedents also served authors like Fodor (1989) or Sag & Fodor (1995) to conclude that PRO should not feature in syntactic trees, supporting grammatical analyses of control that get rid of PRO in their formalisms (i.e. Head Driven Phrase Structure Grammar or Lexical Functional Grammar).

Using a probe recognition task, McElree & Bever (1989) also report late activation of the antecedent of PRO in contrast with *wh*-trace and NP-trace. In one of their experiments, they

contrasted PRO gaps (112a) with subject traces (112b), object traces (112c), explicit pronouns (112d), and an experimental control without referential elements (112e). These dependencies were compared as a means to study the degree of activation of the different referential elements.

(112) The stern judge$_i$…

a. who met with the defense | adamantly refused **PRO$_i$** to | argue about the appeal.

b. who met with the defense | is sure ***t*$_i$** to | argue about the appeal.

c. was difficult for the defense | to argue with ***t*$_i$** about | the pending appeal.

d. who met with the defense | thought **he$_i$** should | argue about the appeal.

e. who met with the defense | flatly rejected the | arguments for an appeal.

In the probe recognition task, participants were asked to read the sentences using a self-paced reading procedure. The sentences were presented in four sections, as shown by the vertical lines in (112). At two points in the procedure, unknown to the participants, a probe word appeared in the middle of the screen (e.g. *stern*). For the experimental conditions, the test points always occurred after the section containing the gap and at the end of the sentence. The participants' job was to decide if the probe word had appeared in the sentence or not, and the assumption behind this procedure is that the degree of antecedent reactivation would correlate with the ease (latency and accuracy) with which the probe was judged as having appeared. Their results did not show any significant facilitation for any of the dependencies in the first test point, right after the presentation of the phrase containing the referential element. With regard to the testing point at the end of the sentence, the results for the four overt or covert reactivators in (112a-d) resulted in faster recognition latencies than the experimental control (112e). In addition, and most importantly, the authors observed a trend for PRO gaps to produce slower response times and higher error rates than the other elements. The authors concluded that "the absence of facilitation at the early testing point may suggest that readers do not immediately access the antecedent after processing the region containing the gap" (McElree & Bever 1989: 28). Nonetheless, other studies using the probe recognition method have obtained very different results. For instance, Featherston (2001, experiment 4) produced a quasi-replication of McElree & Bever (1989) in German that showed chiefly negative results: whereas McElree & Bever (1989) had found a facilitation for probes in sentences containing empty categories at later

points, Featherston (2001) found no evidence for facilitation at all. Yet, Featherston's results are at odds with a probe recognition study on NP-trace by Bever & Sanz (1997) in which they found early facilitation for trace-related probes.[67] In sum, the evidence regarding probe recognition is highly contradictory.

The works presented in this section all saw the light during the time in which the MRFS was being introduced in the psycholinguistic arena. Nonetheless, research around the MRFS has narrowed the proposal down to the Active Filler Strategy (Frazier & Flores d'Arcais 1989), which is concerned with gaps that can be anticipated by the parser (i.e. *wh*-traces). Thus, as noted by Betancort et al. (2006), there appears to be no current theory within the Garden Path model (Frazier & Clifton 1996) that accounts for filler-gap dependencies in cases like PRO, in which the gap cannot be anticipated by the presence of a filler. Following Betancort et al. (2006), we will assume that, in the absence of such theory, a recency facilitation is still invoked for the processing of unannounced PRO gaps, resting on the idea of computational economy. In the next section we will see how more modern investigations have operationalized this hypothesis.

4.2.1.2 Early use of control information

Evidence suggesting fast activation of PRO antecedents was soon introduced by works that followed up on the initial claims presented in the previous section. As we have seen, studies using the cross-modal priming technique and probe recognition tasks produced unclear evidence with regard to the activation of PRO antecedents, while Frazier et al.'s (1983) end-of-sentence comprehension task only produced indirect evidence. The variability in the results highlights the need for further research, and it also raises questions about the suitability of these methods as a means to measure the reactivation of PRO antecedents. For instance, Fodor (1989) has contended that no priming effects would be expected because the cross-modal priming technique is only sensitive to the syntactic level of linguistic representation. This view is aligned with the claim that PRO is a semantic category that is not present in the sentence representation.

In addition to cross-modal priming and probe recognition tasks, other early works made use of behavioral methods that focused on comprehension indexes. The influential work by Boland et al. (1990) tested structures containing trace and a PRO gaps similar to those used in

[67] For the case of cross-modal priming, early effects of NP-trace reactivation are also reported by Walenski (2002).

Frazier et al. (1983). Instead of using an end of sentence evaluation, Boland et al. (1990) put comprehenders to test using an online plausibility monitoring task. The comprehension task used by Frazier and colleagues could only provide very indirect evidence about the online integration of subject gaps because participants were simply asked to produce a judgement at the end of the sentence. This was not the case with the online plausibility monitoring task in Boland et al. (1990). In their work, the presentation of the stimuli was controlled by the participants, who read the sentences word by word by pressing a key. They were asked to keep pressing the same key as long as the sentence made sense, and to press a different key when the sentence stopped making sense. The critical manipulation occurred at the infinitival verb, the point at which PRO had to be recovered. As shown in example (113), implausibility would arise at the infinitive for sentences containing *horse* as an antecedent, in contrast with sentences containing *outlaw,* which were perfectly plausible.

(113) Which **outlaw$_i$/horse$_j$** did the cowboy signal $t_{i/j}$ [PRO$_{i/*j}$ to surrender to the authorities]?

The results showed immediate sensitivity to non-plausible continuations at the first point at which it could be detected (i.e. the infinitive verb), which led the authors to conclude that control information was used "very early, if not immediately" (Boland et al. 1990: 428). Using the same method, Mauner et al. (1995; see also Mauner & Koenig 1999; and Mauner et al. 2002) tested infinitival purpose clauses such as (114) and also found that anomaly detection effects arose as early as the infinitive verb. In their stimuli, implausibility arose when the antecedent of PRO was a non-agentive element (e.g. *wheel*). These results provide additional evidence for immediate use of control information.

(114) The **clown$_i$/wheel$_j$** spun around quickly [PRO$_{i/*j}$ to surprise the children at the birthday party].

Most of the studies presented so far concentrate on comparing dependencies that differ in having a recent/distant filler manipulating argument structure, mixing *wh*-dependencies and PRO-dependencies (direct/indirect questions, relative clauses, etc.) or contrasting active and passive sentences. Others focused on the plausibility of antecedents. Yet, no study concentrated

on manipulating the intrinsic lexical properties of predicates in order to study PRO dependencies.[68] After the relative interest that control relations received in the 80s and 90s, the studies that followed up on PRO control have been scarce, but the experimental methods used to tackle the issue produced more sophisticated measures such as eye movements and electrophysiological correlates. These later studies provide the basis for the kind of manipulation that we are interested in: the contrast between subject and object control predicates as a means to study the online use of lexical control information.

One of these studies is an ERP investigation carried out by Demestre et al. (1999) in Spanish. To our knowledge, this is the first electrophysiological investigation that directly tackles the issue of control.[69] In this work, the authors introduced a new paradigm to investigate control relations that uses agreement violations as a proxy for antecedent retrieval. Such manipulation is possible thanks to the morphological richness of Spanish, a language in which determiners, quantifiers, and adjectives carry overt gender (and number) morphology that displays the agreement values inherited from the noun they modify. As shown in (115), the transparent gender morphemes in Spanish are *–o* for masculine and *–a* for feminine. Of course, being an empty element, PRO lacks morphology, but it receives its agreement features from its antecedent. This is shown by the ungrammaticality of (115b), in which the masculine adjective *rico* does not agree with the feminine controller *María.* Demestre and colleagues recorded participants' electroencephalogram (EEG) while listening to sentences like (115), which only had one potential antecedent and thus, always displayed subject control. They also tested sentences like (116), which had two potential antecedents but always displayed object control –the authors only used object control verbs (e.g. *advice*, *force*, etc.)

(115) a. Pedro$_i$ quiere [PRO$_i$ ser **rico** en un futuro próximo].

Pedro$_i^{masc}$ wants [PRO$_i$ to be rich^{masc} in the near future].

b. *María$_i$ quiere [PRO$_i$ ser **rico** en un futuro próximo].

**María$_i^{fem}$ wants [PRO$_i$ to be rich^{masc} in the near future].*

[68] With the exception of the sentence comprehension study by Frazier et al. (1983) which only examined it in passing and mixed PRO dependencies with *wh*-traces.

[69] Featherston et al. (2000) produced another ERP investigation which contrasts control and raising structures in German. Their work provides evidence for different electrophysiological correlates related to the two structures in spite of the superficial similarities between them. The authors interpret these results as evidence that "the parser does indeed make use of grammatical categories and operations in on-line sentence processing" (2000: 153).

(116) a. Pedro$_i$ ha aconsejado a María$_j$ [PRO$_j$ ser más **educada** con los trabajadores].

Pedro$_i^{masc}$ has advised María$_j^{fem}$ [PRO$_j$ to be more polite^{fem} with the workers].

b. *María$_i$ ha aconsejado a Pedro$_j$ [PRO$_j$ ser más **educada** con los trabajadores].

**María$_i^{fem}$ has advised Pedro$_j$ [PRO$_j$ to be more polite^{fem} with the workers].*

The assumption behind this paradigm is that "the detection of the grammatical violation [at the adjective] would imply that the processor had established the coreference relation between the null subject of the lower clause and its antecedent, or controller, in the higher clause" (Demestre et al. 1999: 301). That is, a syntactic agreement violation would be expected to arise in ungrammatical dependencies compared to grammatical ones, in line with similar effects related to agreement and other syntactic anomalies discovered at the time (e.g. Coulson et al. 1998; Hagoort et al. 1993; Friederici et al. 1993). The results showed precisely that: agreement violations elicited an early negativity distributed over frontal and central sites with a peak amplitude at 200ms, followed by a centro-parietal positivity; a biphasic pattern that is similar to the LAN+P600 combination that is often identified in the agreement literature (cf. Molinaro et al. 2015). Sensitivity to grammatical violations surfaced equally in the two types of sentences studied: ungrammatical subject control sentences with one potential antecedent (115b) and ungrammatical object control sentences with two potential antecedents (116b). This result shows that the brain reacts immediately to agreement violations, and thus, it can be assumed that the parser had assigned a correct antecedent for PRO by then.[70] However, the manipulation used in this study cannot provide direct evidence on the process(es) whereby such antecedent is selected –specifically, the access and use of lexical control information– and neither did it allow the authors to test the predictions of the MRFS. This is because they used configurations in which the controller was always the most recent filler; the only NP in (115) and the object in (116). Thus, the same results would be expected in a situation in which the parser attaches PRO to the closer NP without accessing/using control information at all. This issue could be easily solved by introducing a subject control condition with two potential antecedents.

This obstacle was overcome in a more recent eye-tracking study conducted by Betancort et al. (2006). This study, also in Spanish, is of high importance to us because it provides the

[70] Unfortunately, the authors do not report any results for the infinitive region.

basis for the research agenda presented in Chapter 5. In this work, the authors manipulated the grammaticality of the sentences using adjectival agreement in the same way as Demestre et al. (1999). Yet, importantly, they compared sentences with subject (117a/b) and object (117c/d) control verbs.

(117) a. Lidia$_i^{fem}$ **prometió** a Francisco$_j^{masc}$ [PRO$_i$ ser bastante **cauta**^{fem} con los comentarios].

b. *Lidia$_i^{fem}$ **prometió** a Francisco$_j^{masc}$[PRO$_i$ ser bastante **cauto**^{masc} con los comentarios].

c. Lidia$_i^{fem}$ **exigió** a Francisco$_j^{masc}$ [PRO$_j$ ser bastante **cauto**^{masc} con los comentarios].

d. *Lidia$_i^{fem}$ **exigió** a Francisco$_j^{masc}$ [PRO$_j$ ser bastante **cauta**^{fem} con los comentarios].

Lidia promised/ordered Francisco [PRO to be quite cautious with the comments].

The starting point of this work was putting to test contrasting predictions about the processing of control constructions based on two existing sentence processing models. On the one hand, within the MRFS/Garden Path model (Frazier et al. 1983; Frazier & Clifton 1996) it is assumed that the most recent antecedent is initially chosen based exclusively on syntactic information, and that verb control information is consulted at later stages in which lexical information becomes available. This model predicts that subject and object control dependencies should be processes alike at first, given that in both cases the second NP would be chosen as a controller of PRO. Then, a reanalysis is expected to take place only for subject control dependencies, and the difficulties related to this reanalysis process would most possibly surface in late eye-tracking measures (e.g. re-reading measures or total reading times). On the other hand, constraint-based satisfaction models (e.g. MacDonald et al. 1994; Tanenhaus & Trueswell 1995) predict that all informative constraints (e.g. structural, lexical, thematic or even recency) would be evaluated simultaneously, and the result depends on the relative strength of the constraints under consideration. If control information alone guides antecedent selection from early parsing stages, no differences would be expected between subject and object control verbs, and no reanalysis would be expected for subject control grammatical sentences. Nonetheless, Betancort and colleagues also note that control information could be concurrently used with recency, in which case object control dependencies could be facilitated over subject control ones given that the antecedent for object control dependencies is the closer NP. The key

difference between these contrasting hypotheses is that whereas the MRFS predicts some form of reanalysis for subject control trials, constraint-based satisfaction models do not.

The eye-tracking results by Betancort and colleagues showed evidence for the detection of the grammatical violation, as participants took longer in reading ungrammatical sentences. This effect arose at the adjective and spillover regions, and the disruption surfaced equally in subject and object control sentences. This represents evidence that the correct antecedent was correctly selected in both types of dependences, although importantly, the grammaticality effect did not arise until late eye-tracking measurements including any re-reading of previous sentence regions.[71] In addition, an essential result in Betancort et al. (2006) was that they also found an effect of control at the second noun (e.g. *Francisco* in (117)). This effect showed that sentences with object control verbs were read faster than sentences with subject control verbs. Importantly, this effect arose as early as first-pass reading times (the earliest measure collected) and was carried into later measures (go-past and total time). It was initially surprising to observe such a contrast in the second NP, as no effects of antecedent selection would be hypothesized to occur before encountering bottom up evidence for the presence of PRO –that is, the infinitive verb marking the start of a non-finite clause. Yet, the authors argue that this effect could be reflecting pre-processing of the following region (the infinitive verb) due to a parafoveal preview benefit.[72] If this result captures the processing of the PRO gap, the main effect of control represents evidence for a processing facilitation for object control dependencies. Furthermore, even though object control sentences were read faster than subject control ones at the second noun, the authors did not find any evidence for reanalysis for subject control trials.

A careful interpretation of the observed facilitation for object control conditions is crucial in order to understand how it contributes to our understanding of antecedent selection processes. The fact that subject control sentences were harder to process than object control ones already in early eye-tracking measures seems to indicate that control information and recency interact from early parsing stages. Otherwise, if control information was the only constraint at place, no differences between the two types of dependencies would be expected. At the same time, this pattern of results is at odds with the predictions of the MRFS, which would hypothesize that subject and object control dependencies would be processed similarly at first, as PRO is

[71] Specifically, the authors observed a main effect of grammaticality in the total time measurement of the adjective region and in the go-past and total time measurements of the spillover region –although this later effect only reached statistical significance in the by-items analysis.
[72] This means that participants could be obtaining visual information of the subsequent region when fixating the second NP.

expected to be first linked to the closer antecedent, and then, some sort of reanalysis process would be expected to take place only in subject control sentences. This was not the case, and consequently, the authors interpret their results as evidence that "verb control information and recency (that is, proximity of antecent and PRO) are taken into account during the process of antecedent selection" (Betancort et al. 2006: 235).[73]

The recency effect for object control sentences obtained by Betancort et al. (2006) is supported by the results of a similar eye-tracking study carried out by Kwon & Sturt in English (2016). In their work, instead of manipulating verbal control, the authors use nominal control. The experimental conditions are illustrated in (118). Since English adjectives do not carry gender morphology, they introduce reflexive pronouns as a means to check comprehenders' sensitivity to grammatical violations.

(118) a. Naturally Luke$_i$'s **promise** to Sophia$_j$ [PRO$_{i/*j}$ to photograph **himself** in the barn …
b. *Naturally Luke$_i$'s **promise** to Sophia$_j$ [PRO$_{i/*j}$ to photograph **herself** in the barn …
c. Naturally Luke$_i$'s **plea** to Sophia$_j$ [PRO$_{*i/j}$ to photograph **herself** in the barn …
d. *Naturally Luke$_i$'s **plea** to Sophia$_j$ [PRO$_{*i/j}$ to photograph **himself** in the barn …
…amused everyone].

The recency effect obtained by Kwon & Sturt arose during the first-pass regressions out of the infinitive region, such that more regressions were launched in subject control conditions than in the object control conditions. It is important to note that this facilitation for object control dependencies occurs in later measurements (and in the next region) than the one obtained in Betancort et al. (2006), which arose during first pass reading times of the NP2. Furthermore, in the study by Kwon & Sturt (2016), the detection of grammatical violations at the reflexive pronoun arose –as in the work by Betancort et al. (2006)– in the analysis of late eye-tracking measurements.[74] Still, no differences were observed between subject and object control

[73] Betancort et al. (2006) present another eye-tracking experiment in which they study control in adjunct clauses in which subject and object control was manipulated via prepositions (e.g. *Esteban criticó a Marta para/por presumir ante todos y proclamarse dueñoo del club – Esteban criticized Marta in order to/for show/ing off to others and proclaiming himself/herself owner of the club*). The results from this experiment show no initial difference between the two types of clauses and clear reprocessing (i.e. reanalysis) effects for subject-oriented clauses. This indicates that in these type of sentences the parser opts for the most recent filler, and that control information from the preposition is only used at later stages. The authors conclude that lexical control information seems to be used and access from early parsing stages when obtained from verbs, but not when obtained from prepositions.

[74] Specifically, the authors report main effects of grammaticality in the total time measurement of the reflexive pronoun and in the go-past and total time measurements of the spillover region.

sentences with respect to the detection of ungrammaticalities. Kwon as Sturt go further in their interpretation of the recency effect observed for object control sentences, and argue that it can be used as a diagnostic test for the access and use of control information. In their words, "by definition, the processing facilitation for a recent controller of PRO (relative to a non-recent controller) could only be observed if the parser has already accessed the information that allows the relevant control properties to be identified" (Kwon & Sturt 2016: 5).

Yet, as the authors already acknowledge, the fact that the object control facilitation arose during the regressions out of the infinitive region is also compatible with an explanation based on the MRFS. This is because the regressions out of the inifinitive region observed for subject control sentences could be regarded a revision processes as a consequence of an initial assignment of PRO to the most recent NP that is soon after revised. But at the same time, such a revision process would still have to take place quite fast, immediately after the infinitive verb is fist fixated. As an alternative account for the presence of more regressions in subject control dependencies, the authors take side with an explanation that is similar to the proposal from constraint satisfaction models. The recency effect obtained in both Betancort et al. (2006) and Kwon & Sturt (2016) could be explained in terms of activation-based processing models that account for the integration cost of different constituents (e.g. the cue-based retrieval model, Lewis & Vasishth 2005). These models provide a simpler explanation than the MRFS: the contrast between subject and object control dependencies could be the result of differential activation costs for recent/distant antecedents while, simultaneously, control information can be assumed to be accessed and used from early on, accounting for the detection of violations in both studies. Still, ultimately, it is unclear whether the recency effect represents evidence for the early access of control information or a revision process in subject control dependencies.

The idea that control information is used by the parser at early stages of structure building seems to be supported by another study carried out by Kwon & Sturt (2014), which tested temporarily ambiguous garden path sentences containing control nominals. We will avoid going into the specific details of their manipulation because the main aim of the work was not the study of PRO-antecedent dependencies.[75] Still, importantly, the authors found that "garden

[75] The authors compared sentences like *Before Andrew's refusal/order to wash the kids came over to the house*, in which the attachment of the constituent *the kids* is temporarily ambiguous. They found that sentences with object control nominals elicited more processing difficulty. At first, this result may seem incompatible with the facilitation observed for object control dependencies in the studies reviewed in this section. Yet, it is essential to note that in the sentences from Kwon & Sturt (2014), the object control dependency is incomplete by the time comprehenders reach the infinitive verb, and this is what seems to -»

path difficulty was reduced when the lexical control information highlighted the globally correct analysis" (2014: 59), providing further eye-tracking evidence that control information is quickly at hand during structure building operations.

In sum, the eye-tracking studies reviewed here coincide in having found a facilitation for object control sentences at the infinitive region and a detection of grammatical violations in both subject and object control dependencies. Simultaneously, the evidence for reanalysis processes in subject control trials is inconsistent: while Betancort and colleagues found no trace for reanalysis in subject control trials, Kwon & Sturt found a significantly greater amount of regressions out of the infinitive region in subject control trials. This results could be indicating some form of reanalysis, even though such a process would have to occur quite fast given that it only surfaced in first past regressions out, a measure that covers the proportion of trials in which the first exit of the region was to the left. We hope to be able to clarify the existence of reanalysis processes in subject control dependencies with our experiments.

4.2.1.3 Summary and evaluation of the results

The works reviewed in the two previous sections (§§4.2.1.1-4.2.1.2) provide a contradictory panorama on the integration of control information during online sentence comprehension. On the one hand, studies arguing for the late use of control information interpret their evidence as either supporting the MRFS (Frazier et al. 1983) or the view that all antecedents are activated and antecedent selection is delayed (McElree & Bever 1989; Nicol 1988; Nicol & Osterhaut 1988; Nicol & Swinney 1989). The two proposals share the idea that control information is not accessed and/or used in early stages of structure building. These studies use indirect measures of sentence comprehension like cross-modal priming, probe recognition or end-of sentence comprehension judgements. On the other hand, subsequent studies using reading timing measures (e.g. online plausibility monitoring tasks, eye-tracking or EEG) analyze their results as providing evidence for fast access and use of control information during sentence processing (Boland et al. 1990; Betancort et al. 2006; Demestre et al. 1999; Kwon & Sturt 2016; Mauner et al. 1995; Mauner & Koenig 1999). Nonetheless, the contrast between the studies in these two groups does not simply lie in the experimental techniques used. The most important difference

cause the extra processing. Thus, these results do not contend the recency patterns presented so far, but simply provide evidence that the parser tries to account for control information as soon as it is encountered.

has to do with the heterogeneous ways in which the study of control has been operationalized in terms of the manipulations that have been used: some studies used *wh*-questions which crossed PRO and *wh*-gaps, others used active/passive transformations and others contrasted dyadic and triadic predicates. Furthermore, few studies focused on contrasting lexical control by verbs, which is, indeed, the concern of our research. All this variability illustrates the difficult challenge that represents studying PRO dependencies. Given that PRO is a linguistic element that is physically absent from the stimuli, its study can only be operationalized through indirect measurements such as comprehension indexes, the identification of related primes, garden path disambiguation, or the reading latencies at certain sentence regions.

The relevant issue is not if control information is used in sentence processing. All the studies presented in the previous sections provide evidence that it is indeed used. The fundamental question regarding the processing of lexical control information has to do with *when* that information is accessed and used and *how* it affects parsing decisions. In our view, the eye-tracking studies by Betancort et al. (2006) and Kwon & Sturt (2016) provide a promising paradigm to study the time-course of the use of lexical control, isolating control dependencies from other empty categories. The use of the eye-tracking technique allows the authors to study reading latencies at the infinitive region, which is the closest way of measuring PRO-antecedent dependency formation. In sum, these studies produced evidence that suggests that control information is used at the earliest point in the sentence in which the null anaphor PRO is signaled (i.e. the infinitive verb), and participants were equally sensitive to the agreement violations introduced in a downstream adjective or reflexive pronoun in the context of both subject and object control verbs, showing that antecedent selection has taken place. Nonetheless, the studies differed in the measurements and regions in which the reported recency effect appeared. The unclear evidence with regard to the presence of reanalysis processes in subject control trials calls for further research in order to clarify the recency preference observed in the two eye-tracking studies by Betancort et al. (2006) and Kwon & Sturt (2016). As noted above, the recency effect could be used as a diagnostic for the access of control information because dependencies with recent antecedents could only be facilitated if the information that guides the identification of such an antecedent is available to the parser. However, it can also be used to support the MRFS. The crucial point here is *where* (in which measure or sentence region) the recency effect appears. Our experiments will try to clarify this.

In addition, when examining the stimuli from Betancort et al. (2006), we detected what, in our view, is a possible confound. In this work, the facilitation for object control sentences occurs as early as first-pass reading times of the second noun (i.e. the object NP). The authors explained it as the result of parafoveal processing of the following region containing the infinitive verb. However, we noted that many of their second nouns in subject control conditions were adjuncts (i.e. *aceptó ante su amigo – accepted in front of his friend*),[76] whereas all of the NP2s in the object control conditions were verbal complements (i.e. *recriminó a su amigo – recriminated his friend*). Arguments and adjuncts are associated with a different cost of integration, as arguments are known to be processed faster than adjuncts (Clifton et al. 1991; Schütze & Gibson 1999). For this reason, this confound makes it virtually impossible to know the exact source of the facilitation observed at the NP2 region for object control sentences. In the next chapter (Chapter 5) we will present a series of experiments that take the work by Betancort et al. (2006) as a starting point and try to overcome this confound in an attempt to clarify the role of recency and lexical information in the processing of control dependencies. Our experiments also investigate the possible occurrence of grammatical illusions. The relevant evidence regarding grammatical illusions and control dependencies is reviewed in the next section.

4.2.2 Grammatical illusions in null subject-antecedent dependencies

If the processing of control structures has not received a lot of attention in the psycholinguistics literature, the study of grammatical illusions in null subject-antecedent dependencies is even more limited. As we will see in this section, this does not make it less interesting, but quite the opposite. This is because null subject-antecedent dependencies allow us to study the prevalence of interference effects in lexically driven anaphors, which can provide interesting insights for the general portrayal of grammatical illusions.

In Chapter 1 of this dissertation we briefly explained that grammatical illusion processes can arise in the context of linguistic dependencies that are subject to different structural and morphological constraints. The growing literature on grammatical illusions has revealed a mixed profile of fallibility: while some dependencies show strong interference effects from structurally inappropriate distractors (e.g. subject-verb agreement or NPIs), other dependencies

[76] Note that the use of the preposition *ante* also makes the NP2 region longer in subject control sentences.

seem to resist interference effects. The reasons for why this is the case are still poorly understood. Reflexive-antecedent dependencies (a syntactically driven anaphor) represent a highly relevant case of resistance to interference in dependency formation due to the superficial similarities that they exhibit with subject-verb agreement.

Both subject-verb agreement and reflexive-antecedent dependencies are constrained by agreement morphology, and both target the retrieval of the same structural position: the subject of the clause containing the verb or reflexive pronoun. Nonetheless, while many works have reported agreement illusion effects in subject-verb agreement dependencies (e.g. Lago et al. 2015; Pearlmutter et al. 1999; Staub 2009; Staub 2010; Wagers et al. 2009), several studies have gathered evidence showing that reflexive anaphors are immune to intrusion effects from feature-matching distractors (Dillon 2011; 2013; Jäger et al. 2015; Sturt 2003; Xiang et al. 2009). Dillon et al. (2013) used sentences like (119) in order to compare the processing of these two types of dependencies. The results showed that structurally illicit noun phrases (e.g. the plural NP *the middle managers* in (119)) facilitated the processing of ungrammatical agreement at the verb (e.g. *were* in (119a)), while the processing of ungrammatical direct object reflexives (e.g. *themselves* in (119b)) was not affected by the plurality of intervening nouns. For the case of reflexives, grammatical violations at the reflexive pronoun were immediately detected irrespectively of the presence of the structurally irrelevant but feature matching plural distractor.

(119) The new **executive** who oversaw the middle **manager(s)** apparently…

a. **was/*were** dishonest about the company's profits.

b. doubted **himself/*themselves** on most major decisions

The lack of interference effects in reflexive-antecedent dependencies has led researchers to hypothesize that the memory retrieval processes that are recruited during online dependency formation differ as a consequence of the type of dependency being parsed. Dillon et al. (2013) discuss several possibilities as for why reflexive-antecedent dependencies differ from subject-verb agreement. One possibility is that the processing of reflexives is somewhat more robust or conservative because, unlike agreement, it involves interpretive processes –the meaning of the reflexive depends entirely on the semantic reference of its antecedent. In addition, Dillon et al.

(2013) further conclude that, in contrast with subject-verb agreement, reflexive pronoun processing relies primarily on syntactic cues – initiating a search for the subject of the matrix clause –rather than morphological cues. In this context, Parker et al. (2015) devised a study that allowed them to test the hypothesis that all anaphors that rely on structural constraints are immune to facilitatory interference. This study is of particular relevance to us because the authors tested adjunct control dependencies such as those in (120), which were investigated using a self-paced reading task.[77]

(120) a. The **doctor**$_i$ that the **researcher**$_j$ described meticulously was certified…

b. The **doctor**$_i$ that the **report**$_j$ described meticulously was certified…

c. *The **discovery**$_i$ that the **researcher**$_j$ described meticulously was certified…

d. *The **discovery**$_i$ that the **report**$_j$ described meticulously was certified…

[after PRO$_i$ debunking the urban myth **himself** in the new scientific journal].

In the four experimental conditions in (120), the null subject PRO is controlled by the subject of the matrix clause,[78] and the embedded reflexive pronoun provides a way of tracking the interpretation of PRO in very much the same way as Kwon & Sturt's (2014) design (cf. example (118)). The critical condition here is the ungrammatical sentence in (120c), which contains a structurally inaccessible animate distractor (i.e. *researcher*) that could induce facilitatory interference. Their results revealed significant effects in two critical regions: the gerundive verb region and the region following reflexive pronoun (the spillover region). At the gerundive verb, which is where comprehenders receive the first bottom-up evidence for PRO, ungrammatical sentences with animate matching distractors (condition c) reflected faster reading times than ungrammatical sentences without distractors (condition d). A similar effect was found at the region following the reflexive pronoun. These results represent evidence for a facilitatory interference effect (i.e. an illusion of grammaticality). But also critically, the fact that the

[77] The authors also included another set of matched sentences that contained a subject-verb agreement manipulation following the design in Dillon et al. (2013). Their results provide an additional confirmation for the widely attested agreement attraction effects.

[78] As we saw in §4.1.2.2, adjunct control dependencies are subject to a syntactic constraint in that the interpretation of the null subject is controlled by the subject of the matrix clause. In this regard, the licensing of PRO in adjunct control dependencies is expected to mirror that of reflexive anaphors.

gerundive verb is the first point in which the authors found control-related effects provides further evidence that antecedent search is initiated at that point –a result that is comparable to the recency facilitation observed in Betancort et al. (2006) and Kwon & Sturt (2014) and the plausibility effects observed in Boland et al. (1990) and Mauner et al. (1995).

The interesting results by Parker and colleagues provide evidence that adjunct control dependencies exhibit grammatical illusions, directly challenging the hypothesis that all anaphoric dependencies that are subject to syntactic constraints are immune to interference effects (see also Parker & Phillips 2017). On the one hand, this makes it even more interesting that the behavior of the null subject anaphors in Parker. et al. (2015) differs from the reflexive pronouns in Dillon et al. (2013). Yet, on the other hand, it is difficult to translate Parker et al.'s evidence to the study of lexically guided verbal control –the type of structures that we are interested in– because, in these structures, antecedent retrieval is guided by a lexical constraint, instead of a syntactic one. To our knowledge, the only published work that investigates grammatical illusions in lexically guided control dependencies is an eye-tracking experiment conducted in English by Sturt & Kwon (2015). In one of their tasks (Experiment 3), the authors compare the incidence of interference effects in reflexive-antecedent dependencies mediated by control nominals. The authors examine the processing of sentences like (121) which only include subject control nominals. Thus, as in Parker et al. (2015), the antecedent of PRO is always the subject of the matrix clause.

(121) a. **John**$_i$'s agreement with **Tom**$_j$ [PRO$_i$ to be kind to **himself**]…

b. **John**$_i$'s agreement with **Amy**$_j$ [PRO$_i$ to be kind to **himself**]…

c. ***Mary**$_i$'s agreement with **Tom**$_j$ [PRO$_i$ to be kind to **himself**]…

d. ***Mary**$_i$'s agreement with **Amy**$_j$ [PRO$_i$ to be kind to **himself**]…

…was surprising to everyone.

Their results showed that comprehenders are sensitive to grammatical violations in sentences like (121c/d) when they reach reflexive pronouns that mismatched in gender with the correct lexically determined antecedent of PRO. In addition, their results point to the existence of an interference generated by the presence of inaccessible but feature matching antecedents in ungrammatical sentences. That is, at the reflexive pronoun, sentences like (121c) were read

faster than sentences like (121d), although this effect was only significant in the by-subjects analysis of the second-pass reading times. A marginal effect in the same direction also arose in the go-past measure of the spillover region (e.g. *was surprising* in the example). These results are taken as (weak) evidence for the existence of interference in controlled null subject-antecedent dependencies. In the same work, the authors produce a similar experiment using raising constructions (Experiment 4), and they also found evidence for interference. This led them to conclude that it is not the case that "the involvement of lexically driven dependencies (i.e. control) leads to more interference than that of structurally-driven dependencies (i.e. raising)".[79]

The studies reviewed in this and the previous section present evidence pointing that null subject-antecedent dependencies are initiated when the first bottom-up evidence for the null subject is encountered. This evidence appeared in several forms: a) plausibility effects at the infinitive region (Boland et al. 1990; Mauner et al. 1995), b) a facilitation for object control dependencies at the infinitive region when compared to subject control ones (Betancort et al. 2006; Kwon & Sturt 2016), c) sensitivity to animacy mismatches at a gerundive verb in adjunct control dependencies (Parker et al. 2015).[80] The key point in these works is that the effects arise at the infinitival or gerundive verbs which indicate the initiation of dependency formation but in addition, these studies also show the immediate detection of violations introduced in downstream adjectives or reflexive pronouns. The grammaticality effects observed provide further evidence that the antecedent of PRO has been selected. Nonetheless, it is essential to discuss how the interference effects at these embedded elements are interpreted with regard to grammatical illusions.

When the sentences introduce a further manipulation in the form of a matching/mismatching reflexive pronoun, these elements are assumed to initiate a dependency with PRO, which has been previously assigned an antecedent. In other words, they generate a dependency that is mediated by PRO: the first retrieval event occurs when the null subject is

[79] On a related note, there is a production experiment conducted by Sanchez et al. (2016) that deserves mentioning. The authors use an oral completion task in Spanish in which participants were asked to read out loud and complete control and raising sentences using an adjective (e.g. *Sorprentendemente eligió/parecía el cuñado del verdulero anoche estar…- Last night, the greengrocer's brother-in-law surprisingly chose/seemed to be…*). The aim of their work was to compare control and raising constructions in an elicited error paradigm by manipulating the gender an number of the antecedent NPs. Their results show that the two types of dependencies elicit agreement attraction errors. That is, in a proportion of trials, participants produced adjectives that agreed in gender with an intervening but irrelevant noun (*greengrocer*), instead of the appropriate controller (*brother-in-law*).

[80] Note that the animacy mismatch used in Parker et al. in adjunct control sentences is similar to the one used by Boland et al. (1990) and Mauner et al. (1995) in complement control sentences.

signaled by the presence of a non-finite verb, and then, the effects observed at the reflexive pronoun, are assumed to be the result of a second retrieval event that is mediated by PRO. Sturt & Kwon explain it as follows when discussing the interference effects found in sentences like (60) (2015: 14):

> We assume that, following the initial retrieval event at *to be kind*, the null element [PRO] is associated with information about its antecedent *Mary*, including the fact that the antecedent is female. At *himself*, the null element [PRO] is retrieved, and the gender incompatibility with the reflexive is registered, causing processing difficulty, and triggering a repair process. During the repair process, a new retrieval process is launched for [PRO] to find its antecedent. This now includes a male gender cue due to the fact that *himself* is male. It is at this point that *Tom* can be misretrieved as the antecedent of [PRO], leading to processing facilitation.

Nonetheless, how can we be sure that the effects observed for reflexive pronouns directly track the interpretation of PRO rather than a direct linking to one of the NPs in the matrix clause? Both Parker et al. (2015) and Sturt & Kwon (2015) tackle this question and manage to provide evidence suggesting that the embedded reflexive tracks the interpretation of PRO. In order to demonstrate this, the authors put to the test the presence of interference effects for an embedded reflexive pronoun which does not depend on the interpretation of PRO. Their results show that, in accordance with Dillon et al. (2013), reflexive pronouns by themselves are not subject to facilitatory interference.[81] This provides indirect evidence that the reflexive pronouns used in their experiments must be tracking the interpretation of PRO, and thus, that the grammatical illusions observed in their studies actually reflect interference in PRO-antecedent dependencies. Consequently, the results by Parker et al. and Sturt & Kwon provide evidence that reflexive pronouns and PRO gaps behave differently with respect to grammatical illusions, challenging the hypothesis that all anaphoric dependencies resist facilitatory interference from structurally inaccessible items.

In sum, there is evidence pointing to the presence of interference effects in the processing of null subject-antecedent dependencies. These effects arose in dependencies that are resolved on the basis of syntactic (adjunct control) and lexical (nominal control) information. Even

[81] For instance, Sturt & Kwon tested illusion-like sentences such as **Mary didn't trust Tom but was kind to himself appropriately and very sincerely*.

though none of the studies reviewed have reported offline ratings of their stimuli, these results are taken as examples of grammatical illusions. An important point that must be emphasized is that neither Parker et al. (2015) nor Sturt & Kwon (2015) have found effects for intrusion effects in grammatical sentences (i.e. inhibitory interference), a phenomenon which could be considered an illusion of ungrammaticality. The fact that both studies find evidence for facilitatory interference, but no inhibitory interference, coincides with other studies on subject-verb agreement which only found interference in ungrammatical sentences (e.g. Wagers et al. 2009). Nonetheless, there are several issues that remain open. The statistical evidence presented by Sturt & Kwon is not very robust, and unfortunately, their study only tested subject control dependencies using nominals. Therefore, little is still known about interference in verbal complement control, and most importantly, about the comparison between subject and object control dependencies. Studying grammatical illusions at the interface of subject and object control dependencies provides the perfect environment to test whether linearly intervening and non-linearly intervening distractors can exert similar interference effects. The study of illusions of (un)grammaticality in subject and object verbal complement control dependencies is an experimental gap that we hope to –at least start to– fill with the experiments presented in Chapter 5.

4.3 CONCLUSIONS

The aim of this chapter was to provide the necessary linguistic and psycholinguistic background for the experimental agenda that is laid out in Chapter 5. The first half of the chapter was dedicated to revising the main concepts and theoretical proposals from Control Theory. This project focuses on a specific type of control configuration, namely, lexically-guided verbal complement control. We are aware of the fact that we have presented a wider theoretical linguistic background than needed in order to understand verbal complement control, but our intention in doing so was to provide a faithful depiction of the complexity of control phenomena and the theoretical machinery that has been deployed to study it. We hope to have conveyed the idea that control relations are grammatically diverse and should be looked at from a multidimensional perspective.

The second part of this chapter was concerned with the psycholinguistic evidence on the processing of control constructions and grammatical illusions in null subject-antecedent dependencies. Although the huge interest of control in linguistics has not translated into an

equivalent amount of experimental research, the existing works provide an interesting picture. The fundamental issue in the processing of complement control is a timing question; namely, when is lexical control information accessed and used in online processing? The works that have tried to produce an answer to this question used a broad range of methods and manipulations, producing comparisons among different empty categories (e.g. PRO and *wh*-trace, PRO and NP-trace, etc.), control configurations (e.g. complement and adjunct control, lexically and syntactically-guided control, etc.) and syntactic contexts (e.g. declarative sentences, questions, active/passive manipulations, etc.). Hopefully, the extensive linguistic background presented in the first part of the chapter has facilitated the understanding of the various manipulations presented in the second half.

In essence, the understanding of the online comprehension of null subject-antecedent dependencies is still limited. Some early works have argued that control information was not used during initial parsing stages (e.g. Frazier et al. 1983; Nicol & Swinney 1989). Nonetheless, these works barely looked at the contrast between lexically induced subject and object control relations. In this regard, more recent eye-tracking investigations have produced results that could be interpreted as evidence that lexical control information is used from early parsing stages (e.g. Betancort et al. 2006; Kwon & Sturt 2016). In our view, the eye-tracking technique provides an ideal method to address timing questions about sentence processing. Yet, the existing eye-tracking works have left some open questions. In Chapter 5, we take these works as a starting point in order to further investigate the role of recency and lexical information in the processing of subject and object complement control dependencies. Furthermore, in an attempt to fill an existing gap in the literature, we will study the fallibility of these dependencies to facilitatory and inhibitory interference. The experiments presented in Chapter 5 represent, to the best of our knowledge, the first experimental attempt to study the presence of grammatical illusions in lexically guided verbal control dependencies.

5 CONTROL DEPENDENCIES: EXPERIMENTAL EVIDENCE

In this chapter we present the results from 6 experiments conducted in Spanish aimed at contributing to two fundamental objectives: first, we will attempt to clarify the use of verbal lexical control information and the role of recency during the resolution of null subject-antecedent dependencies. Second, we will try to ascertain whether these type of anaphoric dependencies are subject to illusions of (un)grammaticality (i.e. inhibitory or facilitatory interference). To this end, we will study sentences like (122), already introduced in the previous chapter. These constructions display controlled complement clauses in the form of a copulative structure (i.e. copulative verb + predicative adjective[82]). The use of these structures, together with the rich agreement properties of Spanish, will allow us to build different experimental conditions in order to fulfill our two main research goals. Before moving on to the experiments and their concrete contextualization, let us first sketch the basic points of departure with respect to the two objectives of this work.

(122) a. Ana$_i$ prometió a Juan$_j$ [PRO$_i$ ser más cuidadosa$_i$ con los documentos].
Ana$_i^{fem}$ promised Juan$_j^{masc}$ [PRO$_i$ to be more careful$_i^{fem}$ with the documents].

b. Ana$_i$ ordenó a Juan$_j$ [PRO$_j$ ser más cuidadoso$_j$ con los documentos].
Ana$_i^{fem}$ ordered Juan$_j^{masc}$ [PRO$_j$ to be more careful$_j^{masc}$ with the documents].

Regarding the first objective, this work aims at specifically contributing to a line of research on the processing of lexical control information set out by two previous eye-tracking works: Betancort et al. (2006) and Kwon & Sturt (2016). The literature reviewed in Chapter 4 provides a conflicting picture on the resolution of PRO-antecedent dependencies. Some scholars have contended that PRO antecedents are not activated during initial stages of structure building (Frazier et al. 1983; Nicol 1988; McElree & Bever 1989; Nicol & Osterhaut 1988; Osterhaut &

[82]The adjective acts as the subject complement of PRO.

Nicol 1988) while others have argued that the correct antecedent is activated as soon as bottom up evidence for PRO is encountered (Betancort et al. 2006; Boland et al. 1990; Demestre et al. 1999; Kwon & Sturt 2016; Mauner et al. 1995; Parker et al. 2015). From the latter, only the works by Betancort and colleagues and Kwon & Sturt focused specifically on the contrast between lexically guided subject and object control dependencies. These two studies coincide in having found a facilitation for object control relations at the point of PRO-antecedent dependency formation (a recency effect) and the detection of grammatical violations introduced in a downstream adjective or reflexive pronoun. Yet, these studies differ in some respects, including the target language used (Spanish and English), the way control information is manipulated (verbal and nominal control) and most importantly, the eye-tracking measurements and regions in which the object control facilitation effect arises. This last point, which we will try to clarify, is essential in order to uncover whether object control dependencies are actually facilitated, and whether subject control dependencies engage in reanalysis processes – as it is contended by the MRFS (Frazier et al. 1983). In addition, we have identified an important confound in the materials by Betancort et al. (2006) that questions their interpretation of the reported object control facilitation with respect to the parser's use of control information. For this reason, we take the Spanish work by Betancort et al. (2006) as a starting point in a quest to replicate their results using highly controlled materials. In addition, we will include a further manipulation by fully crossing the gender of the NPs in the matrix clause. This takes us to the second objective.

Regarding the second objective, this project aims at investigating the interference profile of PRO-antecedent dependencies. To our knowledge, this issue has only been tackled by two previous studies: Parker et al. (2015) and Sturt & Kwon (2015). Both studies have reported the presence of illusions of grammaticality during the integration of an embedded reflexive pronoun that is coindexed with the null subject PRO. That is, these works found that the processing of ungrammatical reflexives was facilitated in sentences with inaccessible but feature matching distractors (i.e. facilitatory interference). None of these works found any presence of illusory processing in the integration of reflexive pronouns in grammatical sentences (i.e. no inhibitory interference). However, there are several important differences between the structures manipulated in these previous studies and the ones manipulated here. On the one hand, Parker et al. (2015) investigated adjunct control structures, which are resolved exclusively on the basis of syntactic information. On the other hand, Sturt & Kwon (2015)

investigated lexical control by nominals, and unfortunately, their study only included subject control nominals. Thus, no previous study had investigated the prevalence of illusions of grammaticality in lexically guided verbal control dependencies that focus on the two possible types of lexically-driven OC: subject and object. The studies presented here aim at filling this existing gap. By manipulating the grammaticality of the adjectives and the gender of the matrix clause antecedents, we attempt to investigate the presence of interference effects in subject control sentences, in which the distractor NP (i.e. the object) intervenes in the dependency, and in object control sentences, in which the distractor NP (i.e. the subject) precedes the dependency.

The 6 experiments presented in this chapter use different offline and online techniques as a means to contribute to these two fundamental objectives. Conceptually, the experiments are divided into two groups or stages. Experiments 1-3 represent the first empirical approximation to the questions at hand. In Experiment 1 we present the results from a completion task conducted in order to evaluate the control preferences of a group of verbs. Using a carefully selected set of verbs from Experiment 1, we created the sentence stimuli for the next two experiments: an offline acceptability rating (Experiment 2) and an eye-tracking task (Experiment 3). The findings from Experiments 2 and 3 motivated the creation of a new set of stimuli which is then put to test in Experiments 4-6. In Experiment 4, we evaluate the new sentences using an offline acceptability rating, and Experiment 5 presents the results from a self-paced reading task. Finally, Experiment 6 is an eye-tracking task that is conceived as a close replication of the work by Betancort et al. (2006). The experiments are described in the order they were conducted.

5.1 EXPERIMENT 1: CLOZE TASK

This experiment uses a sentence completion task as a means to investigate the robustness of the control properties of a number of verbs that have been used in previous studies as having subject and object control readings. To this end, a group of Spanish native speakers will be presented with sentences that contain a controlled complement clause, and will be asked to complete an empty slot in the complement clause using an adjective (e.g. *John* ***promised*** *Mary to be* ___). The gender of the adjective used to complete the sentences will allow us to check the readings associated with the control verb in the matrix clause.

We adopt the assumption that, as explained in §4.1.3.3, the control properties of verbs emanate from their argument structure and are, thus, codified in their lexical specifications. Verbs like *promise* and *order* consistently subcategorize for subject or object control because the actor performing the promised or ordered act generally appears as the subject of *promise* and the object of *order*. Following previous studies in Spanish (e.g. Demestre et al. 1999; Betancort et al. 2006), the materials that will be created for Experiments 2-6 use sentences in which the controlled complement displays a copulative structure, with the infinitive form of the Spanish copulative verbs *ser* and *estar* followed by a descriptive predicative adjective (e.g. *to be careful*).[83] The control readings that are found in this configuration correspond to the canonical assumptions of subject and object control. Nonetheless, there are several reasons that make it essential to check whether the verbs selected exhibit robust control properties. This is because the prototypical mapping of semantics to syntax regarding the control readings of verbs can be 'reverted' in certain contexts. Even though this phenomenon has not been investigated in depth, some authors (e.g. Dowty 1985; Rooryck 2000; Lyngfelt 2009) have noted that subject control verbs can coerce readings in which the canonical control relations are reverted, as exemplified in (123). In addition, passive constructions have been identified as one of the structures that allow to revert control readings because they manipulate the association between thematic roles and syntactic arguments. This issue is important for the materials in our experiments, because the adjective slot can also be filled by a participle (e.g. *to be hired*), giving rise to a passive structure. In these cases, the control readings can be reverted with both subject and object control verbs, as exemplified in (124).[84]

(123) ?Juan$_i$ **prometió** a Ana$_j$ [PRO$_j$ estar tranquila].

?Juan$_i^{masc}$ promised Ana$_j^{fem}$ [PRO$_j$ to be calm^{fem}].

(124) a. ?Juan$_i$ **prometió** a Ana$_j$ [PRO$_j$ ser contratada en cuanto hubiera una plaza libre].

?Juan$_i^{masc}$ promised Ana$_j^{fem}$ [PRO$_j$ to be hired^{fem} as soon as there was a free spot].

b. ?Juan$_i$ **ordenó** a Ana$_j$ [PRO$_i$ ser contratado en cuanto hubiera una plaza libre].

[83] *Ser* and *estar* are copulative verbs that mean *to be*. Simplifying a lot, *ser* is used to describe permanent properties, while *estar* is used to describe temporary ones (cf. Zagona 2002: 47-ff.).

[84] It is difficult to judge the grammaticality of these sentences in the absence of proper ratings, but we believe that they sound (at least marginally) acceptable in Spanish. Nonetheless, it must be noted that in the two Spanish examples in (124), the use of a subordinate *that*-clause is a more appropriate way of expressing the meaning (e.g. *Juan prometió a Ana <u>que</u> sería contratada en cuanto hubiera una plaza libre – John promised Ana <u>that</u> she would be hired as soon as there was a free spot*).

?*Juan$_i^{masc}$ ordered Ana$_j^{fem}$ [PRO$_i$ to be hired^{masc} as soon as there was a free spot]*.

In light of the above, the fundamental aim of this completion task is to study whether native speakers naturally produce examples in which the prototypical control readings are reverted. The results obtained in this task will provide an 'index of control preferences' that will allow us to ensure that the control verbs selected for Experiments 2-6 exhibit robust control properties so that we can create a homogeneous group of subject and object control verbs. To our knowledge, this is the first experimental attempt aimed at investigating the control readings of verbs.

With the exception of Betancort et al. (2006), none of the psycholinguistic investigations of lexical control reviewed in the previous chapter report having evaluated the control readings of the verbs (or nominals) that are used in their materials. The closer attempt to tackle this issue is provided in a norming study produced by Betancort et al. (2006) in which a group of native speakers were presented with the stimuli that would be later used in the eye-tracking task and were asked to underline the controller of PRO – one of the two nouns in the main clause.[85] Their results confirmed that the materials displayed unambiguous control properties, as the preferred noun was chosen in the majority of cases: 87% in subject control sentences and 80% in object control ones, with no statistical differences between the two groups. The norming study validates their stimuli, but it does not provide an independent measure of the control preferences of the verbs used. This is because participants were presented with the entire sentence, and the sentence contexts that are built in their materials provided the ground for an unequivocal control interpretation. Their sentences (like ours in Experiments 2-6) displayed complement clauses with descriptive predicative adjectives in which reversed control readings would be unacceptable or implausible. For this reason, their results do not inform on whether control readings can be reverted in other scenarios. The completion task presented here will allow us to investigate the control properties of the verbs in a more neutral context in order to check whether native speakers naturally produce continuations that point to 'non-standard' control readings.

[85] For the norming task they only presented the grammatical version of the sentences and always used nouns of the same gender (e.g. *Luís prometió a Francisco ser bastante cauto con los comentarios*; *Luís promised Francisco to be quite careful with the comments*).

5.1.1 Participants

104 native speakers of Spanish (76 female, mean age= 32 y/o) recruited in the Basque Country participated in this experiment. Their participation was voluntary. All of them reported having completed high school education and 88.46% had undergone university-level studies (n=96). Furthermore, the majority of participants (92.3%, n=96) reported knowing other languages apart from Spanish, these being primarily Basque and English. All the participants in this and the following experiments provided informed consent and were naïve to the purpose of the experiment. For all the experiments presented in this chapter, none of the subjects that took part in a given task were allowed to participate in any other experiment.

5.1.2 Materials

The experimental materials used in this task consisted of 28 sentences like (125). These were formed by a main clause containing a control verb and an embedded infinitival complement clause. The complement clause displayed a copulative verb and an empty slot to be completed with an adjective. The experimental sentences were created using 14 verbs that had been reported in previous investigations to display subject control properties and another 14 verbs that had been reported to display object control properties. The materials can be consulted in Appendix C.1.

(125) Juan$_i$ le **prometió/aconsejó** a María$_j$ PRO$_{i/j}$ ser/estar …

Juan$_i$ ***promised/advised*** *María$_j$ PRO$_{i/j}$ to be …*

Every participant saw only one sentence containing each of the 28 different verbs. The subject and the object positions were always filled by proper names of different gender. This way, the control properties assigned to the main clause verb could be tracked by the gender of the adjective used to complete the sentences. In order to include some variation, the gender of the target controller (i.e. the subject or the object) and the type of copulative verb (i.e. *ser* or *estar*) were counterbalanced so that each control verb appeared in a version with a different combination of target gender and copulative verb. The manipulation of target gender and copulative verb gave rise to four versions of each item. The four versions were distributed across four lists using a Latin Square design. The 28 experimental items in each list were pseudo-randomized together with 14 filler sentences which were superficially similar to the

experimental items in terms of structure and complexity but did not contain a control verb (e.g. *Pedro le dijo a Diego que estaba…/ Pedro told Diego that he was…*). The fillers also had proper nouns in subject and object position but these were of the same gender in order to include some variability. The use of *ser* and *estar* was balanced in the fillers.

The 28 control verbs selected were searched in the ADESSE[86] database (García-Miguel et al. 2010) to study their argument structure in order to ensure that all verbs allowed both direct and indirect object subcategorization frames, and hence, that sentences with an infinitival complement clause as in (125) were grammatically possible. All the verbs used in this study were identified in ADESSE as allowing for both direct and indirect objects. The frequency of the verbs was measured using the EsPal[87] database (Duchon et al. 2013). No statistical differences were observed between the two groups (*subject control*: log. freq. mean[88]= 1.23, SD=0.44; *object control*: log. freq. mean= 1.01, SD= 0.39; $t(26)$=1.44, p=0.16). Finally, the proper names used in this task were controlled for frequency using the 2017 census from the Spanish National Institute for Statistics (INE 2017). No statistical differences were observed between feminine and masculine nouns (*feminine:* log. freq. mean= 5.17, SD= 0.24; *masculine:* log. freq. mean= 5.29, SD= 0.28; t(54)= -1.73, p=0.09).

5.1.3 Procedure

The cloze task was implemented and distributed online using the open source survey tool LimeSurvey.[89] Participants were asked to complete the sentences using the first word that came to their minds. In order to maximize the control information obtained, the instructions simulated that the study was directed at measuring how many gendered adjectives the participants knew. Thus, participants were asked to complete the sentences using words that ended in *–a* or *–o* while avoiding repetitions of the same word. Participants were only able to see one sentence at a time and they could only move forward by providing an answer. The experiment lasted less than 10 minutes.

[86]The ADESSE database (http://adesse.uvigo.es/) is an online resource that contains information on Spanish verbs and constructions based on a syntactic and semantic analysis of the ARTHUS corpus (1.5 million words). ADESSE offers a complete characterization of each verb, including subcategorization frames and frequencies for the different forms of complementation attested in the corpus.
[87]https://www.bcbl.eu/databases/espal/
[88]This corresponds to the logarithmic frequencies for the inflected form used in the task (i.e. 3rd person-singular, past tense).
[89]https://www.limesurvey.org/es/

5.1.4 Analysis

The 2912 responses used to complete the experimental sentences were coded using three categories: preferred control (when the gender of the response word matched the preferred controller), reversed control (when the gender of the response word matched the other noun in the sentence), and non-informative (for the case opaque adjectives, invariable nouns and other irrelevant responses). All the responses comprising transparent gendered words (e.g. participles and nouns) were included in the analysis because they provided information about control preferences. Non-informative responses –which amounted to 407– were not included in the analysis.

The preferred/reversed responses were analyzed using a generalized linear mixed model with logistic link function and binomial variance (Jaeger 2008). The model included as fixed effects the main effects and interactions of the three manipulated factors: the type of CONTROL (subject/object), the TARGET GENDER of the preferred controller (masculine/feminine) and the type of COPULA (*ser*/*estar*). A maximal model was initially built (see Barr et al. 2013). This model included random intercepts and slopes for the fixed effects and their interaction by participant and by item.[90] Due to convergence problems, the random structure was simplified, dropping the interaction terms. Consequently, the final model only included random slopes for the sum of the effects. All the analyses reported for this and the following experiments in this chapter were carried out using R, an open-source programming environment for statistical computing (R Development Core Team 2014). Specifically, the models were estimated using the package *lme4* for linear mixed effects models (Bates et al. 2015). *P*-values were computed using the Satterthwaite's approximation for denominator degrees of freedom using the *lmerTest* package (Kuznetsova et al. 2017). For all the post hoc comparisons equal or below .05, the *p*-values were adjusted using the Hochberg's method via the *lsmeans* package (Lenth 2016). These packages were interfaced through the ULL Toolbox (Hernández-Cabrera 2011)

Instead of reporting the model coefficients from the model summary as it was done for the experiments in the first part of the thesis (Chapter 3), the modelling results in this chapter will be inspected using the Anova type III table of the model. This is done in order to avoid the intricate sum coding structures that would be necessary to examine all the main effects and interactions of interest, as well as to control for all the effects present at once. The model

[90]Note that the factor *control* does not vary by item.

summary is sequential, but estimates based on type III Sums of Squares calculate the residual variability that can be accounted for by each factor and interaction after having accounted for the all the other effects also present in the model. For all the experiments reported in this chapter, the significance level (α) is set to 0.05.

5.1.5 Results

We collected 2505 informative responses (1273 in subject control trials and 1232 in object control trials). Figure 9 (left panel) shows the percentage of preferred control responses used to complete sentences with subject and object control verbs. Both groups of verbs received a majority of preferred responses (*subject control:* mean across all verbs= 93.80%, SD= 4.63%; *object control:* mean across all verbs= 93.46%, SD= 7.38%). In addition, Figure 9 (right panels) shows a more detailed distribution of the percentage of preferred control responses for each verb.



Figure 9. <u>Left panel:</u> mean percentage of preferred responses (aggregated by verb) for the subject and object control groups. <u>Right panels:</u> percentage of preferred responses for each subject and object control verb (the horizontal black line indicates the group mean).

The model results do not show any significant main effect of CONTROL ($X^2_{(1)}$ = 0.14, p=0.71), as subject and object control trials received a very similar proportion of preferred responses. This was the primary variable of interest in this study. The proportion of dispreferred control responses was residual in subject and object control verbs. Interestingly, out of the 161 dispreferred responses, there were only two cases of passive constructions (*to be hired* and *to be praised*). The rest of the dispreferred responses took place with predicative adjectives.

Furthermore, no main effects were observed for the factors COPULA and TARGET GENDER ($X^2_{(1)}$=1.48, p=0.22 and $X^2_{(1)}$=1.05, p=0.30 respectively). These two factors were counterbalanced in order to include some variation in the sentences, but including them in the model also allowed us to observe any possible effects they could have on the answers provided by the participants. In this regard, the model revealed a significant three-way interaction between the three factors manipulated, CONTROL, COPULA and TARGET GENDER ($X^2_{(1)}$ = 4.04, p=0.04). Post hoc tests signal that this interaction is driven by the presence of more dispreferred responses for sentences with *estar* as copula when compared to *ser*, only in object control trials with masculine targets (estimate: -2.146, SE=0.68, z.ratio=-3.14, p=0.001). Closer inspection of the results revealed that the majority of the instances of dispreferred control occurred with the verb *sugerir* (*suggest*, i.e. item 27d in Appendix C.1). Unsurprisingly, this is the verb that displays the lower proportion of preferred responses overall (see Figure 9 right panels).

5.1.6 Discussion

The fundamental aim of this experiment was to study the robustness of the control properties of a set of verbs taken from previous investigations in order to select a balanced group of subject and object control verbs for our experiments. The results reveal that participants strongly converge in completing the sentences with adjectives that agree in gender with the preferred controller, both in subject and object control sentences. When presented with sentence prompts like (125) above, the first idea that came to participants' minds was to complete them with descriptive predicative adjectives. The number of trials in which participants completed the sentences with adjectives that agreed in gender with the dispreferred controller was marginal in both subject and object control sentences. This result is taken to mean that the control preferences of these verbs are robust.

To the best of our knowledge, this study is the first work that provides an independent index of the control preferences of these verbs. Importantly, the pattern of results obtained here does not indicate that reversed control configurations are ruled out by the grammar of Spanish, but simply that preferred control readings are predominant, favored in more than 90% of the cases. In spite of this, it is important to emphasize that the results from this task only tell us that the control readings of these verbs are robust when used with complements that display copulative structures. That is, when the adjective is the subject complement of PRO. Naturally, we focused on copulative structures because they are the configuration that will be used in our

experiments, but non-finite complement clauses can also display other verbs (e.g. action verbs) about which this completion task cannot inform.

Notwithstanding the above, there is an important caveat that must be made regarding the task's procedure. The instructions guided participants to complete the sentences using as many different gendered adjectives as they could in order to maximize the amount of control information obtained. If the completion task was open, we would be risking the possibility that participants used structures that would provide no indication of the control readings assigned the matrix verbs. Asking participants to complete the sentences with words ending in –a and –o made it impossible to check for the availability of split control readings, as these could only be expressed using plural adjectives. In addition, it was notable that the presence of passive structures attested in the reverted control readings was almost non-existent, with only two examples, and the majority of reversed control responses took place with descriptive adjectives. It is possible that the instruction given to the participants to use gendered adjectives has played a role in reducing the number of participles used to complete the sentences. Nonetheless, speakers without linguistic training are not expected to be able to easily distinguish between adjectives and participles as both types of words have the same superficial form. Therefore, the almost inexistent use of participles is interpreted as evidence that native speakers do not naturally produce examples in which the prototypical control readings are reverted using passive structures.

In spite of the fact that the percentage of preferred control responses is overwhelming, a closer inspection of the profile for each specific verb calls for caution. By looking at Figure 9 (right panels), one can easily observe that the proportion of preferred responses for the verb *sugerir* (*suggest*) is substantially lower than for the rest of verbs. This data point is crucial in order to understand the higher order interaction found among the three experimental factors CONTROL, COPULA and TARGET GENDER. The interaction showed that there were more dispreferred responses in the context of sentences with *estar* as copula when compared to *ser*, only in object control trials with masculine targets. That is, when feminine adjectives were used to complete sentences that would be expected to be masculine under a preferred control interpretation. In particular, the item number (27d), shown in (126a), which was originally conceived as an object control item, was more often completed with feminine adjectives (e.g. *enamorada* (*in love*), *molesta* (*bothered*)) than the same sentence with the copula *ser* and a feminine target –that is, item (27a), shown in (126b).

(126) a. Sonia le sugirió a Julio PRO estar _____.

Sonia him suggested Julio PRO to be (temporary state)

b. Julio le sugirió a Sonia PRO ser _____.

Julio her suggested Sonia PRO to be (permanent state)

The fact that the vast majority of reversed control examples took place in the context of the verb *sugerir* (*suggest*) points to the fact that this verb displays variable control properties rather than strict object control. Yet, why would there be more reversed responses in masculine trials with the copula *estar*? We believe there are two reasons that can explain this result. First, it seems easier to manipulate the control readings of verbs in the context of the copula *estar* because it describes temporary properties or states, while *ser* describes permanent properties or states. Second, gender roles may be responsible for the fact most reversed examples occurred when feminine adjectives were used instead of masculine ones, as it is possible that female characters are more prone to suggest things about themselves to male characters, than the other way around. In either case, in the majority of examples of reversed control with verbs other than *sugerir* (*suggest*) it is difficult to evaluate whether the responses were simple mistakes or actual instances of non-conventional control readings.

The starting prediction of this experiment was that, if control preferences are robust in the grammar of Spanish speakers, the gender of the adjectives used to complete the sentences should agree with the gender of the preferred controller. This was borne out in the results. The fundamental objective of the task was making sure that the control verbs selected for the rest of the experiments actually displayed robust control readings. To this end, we took a conservative standpoint and discarded the verbs with the lowest proportion of preferred responses. In Figure 9 (right panel), there are two verbs that stand out: *negar* (*negate)* in the subject control group and *sugerir* (*suggest*) in the object control group. These two verbs will not be used in Experiments 2-6. In order to keep an even number of predicates, we excluded two more verbs: *admitir* (*admit*) from the subject control group and *proponer* (*propose*) from the object control group. The verb *admitir* was discarded because it is polisemous – it can mean *to admit* or *to allow,* which display opposite control readings – and *proponer* was deleted in order to equate the number of items in each group. The remaining 24 verbs –12 subject control and 12 object control– will be used in the following experiments.

5.2. EXPERIMENT 2: OFFLINE ACCEPTABILITY

This experiment was conducted in order to investigate the offline acceptability status of the experimental materials that will be then used in the eye-tracking task (Experiment 3). The results from the completion task (Experiment 1) confirmed that the control readings that native speakers assigned to the verbs selected are robust and coincide with the subject and object preferences assumed in previous studies. The primary goal of this acceptability task is to determine whether native speakers of Spanish are able to detect agreement violations that do not conform with these control preferences. In spite of the fact that previous studies on control dependencies do not report ratings of their stimuli, we believe it is essential to corroborate native speakers' offline sensitivity to the different control manipulations that will be then tested in the online eye-tracking task. This is of particular importance in order to determine whether there exists a contrast between offline and online results (i.e. a grammatical illusion pattern).

5.2.1 Participants

41 native speakers of Spanish recruited at the University of Santiago de Compostela (29 female, mean age: 28 y/o) participated in this experiment. Their participation was voluntary and all of them provided informed consent. All the participants were pursuing (or had finished) university-level studies and reported speaking other languages apart from Spanish with different levels of proficiency; these being primarily Galician and English.

5.2.2 Materials

The experimental materials consisted of 96 items that were formed by a matrix clause with two proper nouns (in subject and object positions), and a subordinate infinitival clause that displayed a copulative structure. Each item had 8 different versions that were created by manipulating the type of control verb and the gender of the matrix clause nouns, while keeping the gender of the adjective constant[91]. An example set of the experimental conditions is provided in Table 9 and the entire list of experimental materials, including an English version of Table 9, can be found in Appendix C.2.

[91] Note that Betancort et al. (2006), instead, kept the NP1 and NP2 constant and manipulated the gender of the adjective. We did not follow this strategy for two reasons: first, our design forced us to also manipulate the names in order to create the distractor match/mismatch conditions. Second, keeping the adjective constant is a better strategy in order to avoid differences in frequency or number of characters between masculine and feminine adjectives. Demestre et al. (1999) and Sturt & Kwon (2015) also adopted the strategy of keeping the critical region constant (i.e. the adjective or the reflexive pronoun).

Table 9. Experimental materials for Experiment 2.

Subject control		
Gram.	**D. Match**	María$_i$ prometió a Cristina$_j$ PRO$_i$ ser mucho más **ordenada** con los apuntes del instituto.
	D. Mismatch	María$_i$ prometió a Francisco$_j$ PRO$_i$ ser mucho más **ordenada** con los apuntes del instituto.
Ungr.	**D. Match**	Antonio$_i$ prometió a Cristina$_j$ PRO$_i$ ser mucho más **ordenada** con los apuntes del instituto.
	D. Mismatch	Antonio$_i$ prometió a Francisco$_j$ PRO$_i$ ser mucho más **ordenada** con los apuntes del instituto.
Object control		
Gram.	**D. Match**	María$_i$ aconsejó a Cristina$_j$ PRO$_j$ ser mucho más **ordenada** con los apuntes del instituto.
	D. Mismatch	Antonio$_i$ aconsejó a Cristina$_j$ PRO$_j$ ser mucho más **ordenada** con los apuntes del instituto.
Ungr.	**D. Match**	María$_i$ aconsejó a Francisco$_j$ PRO$_j$ ser mucho más **ordenada** con los apuntes del instituto.
	D. Mismatch	Antonio$_i$ aconsejó a Francisco$_j$ PRO$_j$ ser mucho más **ordenada** con los apuntes del instituto.

It is a 2x2x2 design that fully crosses the factors CONTROL (subject/object), GRAMMATICALITY (grammatical/ungrammatical) and DISTRACTOR (match/mismatch). A sentence is ungrammatical when the target controller (i.e. the subject noun in subject control sentences and the object noun in object control sentences) differs in gender with the adjective. The term distractor is used to refer to the non-controlling noun in the sentence (i.e. the object noun in subject control trials, and the subject noun in object control trials). A distractor was considered a match when the non-controlling noun matched in gender with the adjective. Given that the adjective was kept constant for all the conditions in a given set, 50% of the items had feminine adjectives and the other 50% had masculine adjectives. Similarly, the use of the copulative verbs *ser* and *estar* was counterbalanced across the items.

The 8 minimally different conditions were distributed in 8 lists using a Latin Square design together with 96 filler sentences of similar structure and complexity (=192 sentences in total). The filler sentences were the same in each list. 48 fillers contained ungrammaticalities in order to achieve a 1:1 grammatical-to-ungrammatical ratio across the task. The grammatical violations included preposition usage, person and number agreement and verbal morphology. In order to create the control conditions, 12 subject and 12 object control verbs were selected from the group of verbs investigated in Experiment 1.

- Subject control: *asegurar* (*ensure*), *confesar* (*confess*), *confirmar* (*confirm*), *declarar* (*declare*), *desmentir* (*deny*), *expresar* (*express*), *garantizar* (*guarantee*), *jurar* (*swear*), *manifestar* (*manifest*), *prometer* (*promise*), *reconocer* (*acknowledge*) and *revelar* (*reveal*).

- Object control: *aconsejar* (*advise*), *consentir* (*allow*), *encargar* (*task*), *exigir* (*demand*), *impedir* (*prevent*), *mandar* (*direct*), *ordenar* (*order*), *permitir* (*allow*), *prohibir* (*prohibit*), *recomendar* (*recommend*), *recriminar* (*recriminate*), and *reprochar* (*reproach*).

It is important to note that the 24 control verbs selected had to be used 4 times per list in order to create the 96 different experimental sentences. Special care was placed so that each repetition occurred in a different condition (i.e. a different combination of the factors GRAMMATICALITY and DISTRACTOR). Moreover, the materials were divided into 4 blocks in order to ensure that each verb repetition occurred in a different block. Each block contained 24 experimental items and 24 fillers.

The materials of this acceptability judgement are the same sentences that were used in the eye-tracking experiment that is presented afterwards (Experiment 3). For this reason, they were built respecting a number of psycholinguistic properties that are known to impact reading latencies (e.g. number of characters, frequency, etc.). Inasmuch as this information is specifically relevant for the requirements of the eye-tracking method, it will be detailed in the materials section of the eye-tracking task.

5.2.3 Procedure

The stimuli were delivered using Ibex (Drummond 2013). Participants were presented with the entire sentence in the middle of the screen along with a rating scale. Each sentence was shown in an individual screen and participants could only move to the next one once they had emitted a rating by clicking on the scale numbers or, alternatively, using the numbers on their keyboard. Participants were instructed to rate the sentences according to their acceptability in a 7-point scale in terms of whether they came across as well-formed Spanish: 7 meaning totally acceptable and 1 totally unacceptable. In order to help them adjust to the scale, the experiment started with two practice items that were followed by feedback on "the rating that most people would give in that case" (1 or 2 for an ungrammatical example and 6 o 7 for a grammatical one). Participants were encouraged to take as much time as they needed and to use the entire range of the scale. Even though the experimental materials were divided in 4 blocks, no break was introduced between them. The order of presentation of the sentences in a given block was randomized for each participant. The task was completed by all participants in less than 30 minutes.

5.2.4 Analysis

The ratings collected were analyzed using a linear mixed-effects model that included the three experimental factors as fixed effects and participants and items crossed as random effects. A maximal model with a fully specified random effects structure was initially built. This model failed to converge and the random structure was simplified following Barr and colleagues (2013). The results reported in the next section correspond to the model with the maximal converging random effects structure, which included by-subject and by-item random intercepts and slopes but no interactions in the random effects structure.

5.2.5 Results

The rating for each experimental condition is presented in Figure 10. The statistical analysis revealed significant main effects of the three experimental factors: GRAMMATICALITY ($F(1,45.3)=321.57$, $p<.001$), DISTRACTOR ($F(1,42.9)=12.23$, $p=0.001$) and CONTROL ($F(1,51.6)=19.50$, $p<.001$). The main effect of GRAMMATICALITY revealed that grammatical sentences received much higher ratings than ungrammatical ones. The main effect of DISTRACTOR revealed that sentences containing a matching distractor were rated better than sentences with a non-matching distractor. Importantly, however, there was a significant interaction between the factors GRAMMATICALITY and DISTRACTOR ($F(1,3497.4)=14.37$, $p<.001$). Planned post-hoc comparisons showed that this interaction was driven by a significant effect of DISTRACTOR only in ungrammatical sentences, shown in higher ratings for the distractor match condition (ungrammatical match vs. ungrammatical mismatch: estimate= 0.38, SE=0.07, *z*.ratio=5.09, $p<.001$). This interaction represents evidence for facilitatory interference in ungrammatical sentences.

The main effect of CONTROL revealed that, overall, object control sentences received lower ratings than subject control sentences. In this regard, the model also showed a significant interaction between the factors CONTROL and GRAMMATICALITY ($F(1,3496.5)=13.36$, $p<.001$) and a three-way interaction between the experimental factors – GRAMMATICALITY, CONTROL and DISTRACTOR – also reached statistical significance ($F(1,3496.3)=5.86$, $p=0.015$). Post-hoc tests revealed significant differences between subject and object control sentences in all conditions with the exception of ungrammatical distractor mismatch sentences, in which there are no differences between subject and object control. The aforementioned facilitation for distractor match in ungrammatical sentences also reached statistical significance.

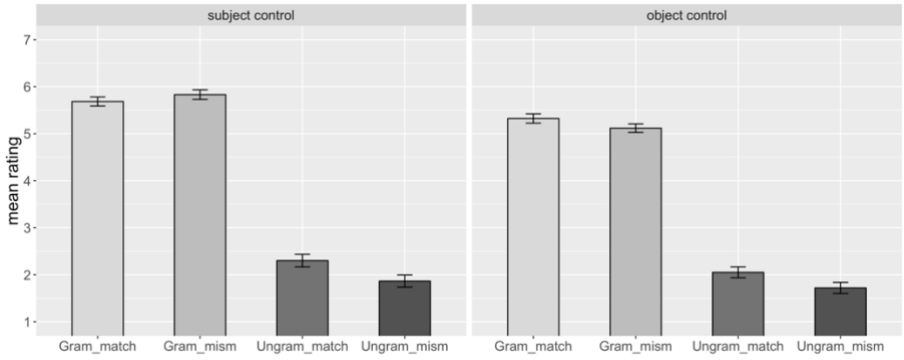


Figure 10. Mean ratings for the experimental conditions in Experiment 2. Error bars indicate the standard error of the mean.

5.2.6 Discussion

The main objective of this task was to confirm the grammatical status of the experimental materials. The results show that participants clearly detect agreement violations that arose when the adjective did not match in gender with the assigned antecedent of PRO in accordance with the control properties of the matrix clause predicates. This is shown by the huge drop in the ratings that participants gave to ungrammatical conditions compared to grammatical ones. In this regard, these results provide a further confirmation that native speakers' grammars are consistent in terms of the control properties assigned to these verbs and that our items display unequivocal control readings.

In addition, the findings from this experiment reveal an interesting illusion profile: in spite of the clear contrast between grammatical and ungrammatical sentences, ungrammatical sentences with a matching distractor received higher ratings than ungrammatical sentences with a mismatching distractor. This effect was somewhat unexpected given than the two types of sentences are equally ungrammatical. Still, it seems that the presence of a matching distractor leads participants to accept ungrammatical sentences in a (small) proportion of trials. Such result represents evidence for facilitatory interference or, in other words, an offline illusion of grammaticality. This finding is similar to the ones found in Chapter 3's acceptability tasks and, as indicated then, we will come back to it during Chapter 6 inasmuch as it provides evidence that grammatical illusions are also obtained in offline tasks. Importantly, no parallel effect was found in grammatical trials; grammatical sentences were rated equally high regardless of the presence of a matching distractor. The fact that grammatical sentences were not subject to inhibitory interference (or illusions of ungrammaticality) is an expectable result considering the offline nature of the task. In this rating task, participants only had to judge whether the sentence

was acceptable or not, and thus, the presence of two nouns that agreed in gender with the adjective would not be expected to hinder the correct identification of the sentences as grammatical. If anything, all the opposite, given that encountering two nouns of the same gender would ensure that the sentence was correct even without having to retrieve the correct antecedent, as any of the two nouns agree in gender with the adjective.

Last but not least, this rating task revealed several effects related to the factor CONTROL that are initially quite surprising. The results reveal a main effect of CONTROL (and two interactions with the factors GRAMMATICALITY and DISTRACTOR) which arise from the fact that object control sentences obtained lower mean ratings than subject control ones across all conditions, with the exception of ungrammatical sentences with a mismatching distractor. It is expectable that ungrammatical sentences with a mismatching distractor exhibit a floor effect as they are the most disturbing condition given that none of the nouns present in the sentence agree in gender with the adjective. The rest of the object control conditions exhibit lower ratings than the equivalent subject control conditions, and, as can be observed in Figure 10, the differences between subject and object control trials is more prominent in grammatical sentences. Even if the differences are quite small in terms of the rating scale, there is no initial motivation for the obtained contrasts. In order to understand this effect, we carefully inspected the ratings for each item and found that, in a small proportion of sentences, the continuations in the complement clause fitted slightly better in the subject control trials than in the object control ones. In this small group of sentences, some participants gave lower ratings to object control trials. The item number 50 – reproduced below as (127) – is an example of this: it is easier to conceive a situation in which someone *ensures someone to be quite calm* (subject control, 127a) than someone *allows someone to be quite calm* (object control, 127b).

(127). a. Alejando$_i$ **aseguró** a José Luís$_j$ PRO$_i$ estar bastante sosegado por el examen de física.

b. Alejando$_i$ **consintió** a José Luís$_j$ PRO$_j$ estar bastante sosegado por el examen de física.

In our view, it is highly possible that the lower ratings observed in object control sentences arise from small semantic nuances that prompted some participants to judge a small proportion of sentences as less acceptable even when they were perfectly grammatical. Nonetheless, such small semantic differences are difficult to bypass. This is because the experimental conditions only differ in terms of the control verb, and the control verbs have very different – and

sometimes opposite – meanings. Therefore, it is a huge challenge to create sentences that are fully matched. Indeed, after a closer examination of the stimuli by Betancort et al. (2006), who also built fully matched sentences, we believe that some of their items also suffered from this complication. Given that the contrast between subject and object control sentences is rather small and it only arose in a very small proportion of items, we have decided to proceed with this set of stimuli for the eye-tracking task.

In sum, the results from the acceptability rating confirm that our sentence stimuli exhibit unequivocal control properties and that native speakers accurately identify grammatical violations created by adjectives that do not agree in gender with the appropriate controller in both subject and object control sentences. The most relevant finding from this experimental is that it validates the experimental materials as having a clear grammatical status. In addition, our results provide evidence for the existence of facilitatory interference in an online task. This means that a grammatical illusion arose when ungrammatical sentences contained an inaccessible distractor that matched in gender with the adjective. We had not predicted to obtain this effect in an offline task, which makes it even more interesting to test the online time-course of these constructions using an online methodology such as eye-tracking. We turn to this below.

5.3. EXPERIMENT 3: EYE-TRACKING

Once we have established that the verbs selected have robust control properties (Experiment 1) and that our experimental items exhibit a clear grammatical status and unequivocal control readings (Experiment 2), this eye-tracking experiment was conducted as a means to delve into the two fundamental objectives of this work: to study the online use of lexical control information and the presence (or lack thereof) of illusions of grammaticality. Considering the general starting points stated at the outset of the chapter, we will now sketch our predictions in relation to the two critical sentence regions. These regions correspond to the words marking the two dependencies of interest: the infinitive verb – the point at which comprehenders receive evidence for the presence of a PRO anaphor – and the embedded adjective – the point at which the grammaticality manipulation takes place.

The infinitive verb is the key sentence region that will allow us to test the two existing hypotheses with regard to the recovery of PRO antecedents. On the one hand, if the structural simplicity route traced by the MRFS (Frazier et al. 1983) is in place, the antecedent of PRO would be initially linked to the most recent NP (the object) in both subject and object control

dependencies. Therefore, the infinitive verb is predicted to be processed alike during early eye-tracking measures (e.g. first-pass) regardless of the type of control verb. As a consequence of such an initial (and erroneous) attachment, subject control sentences are predicted to engage in some reanalysis process at a later point, which is expected to surface in later measures (e.g. regressions out or total times) at the infinitive or later regions. This is because under the MRFS, lexical control information is assumed to be available to the parser only in later parsing stages. On the other hand, if control information is available from early on, no reanalysis is expected for subject control sentences and any differences between the two dependencies (such as a recency effect) could be interpreted as a consequence of the differential activation of recent and distant antecedents, as argued in previous works. The two existing eye-tracking works that set out our starting point (i.e. Betancort et al. 2006; Kwon & Sturt 2016) have found that object control sentences were facilitated over subject control ones at the point of dependency formation. In the work by Betancort and colleagues, this facilitation appeared as early as first-pass reading times of the NP2 region, while in the work by Kwon & Sturt the facilitation appeared during the first-pass regressions out of the infinitive region. Both authors conclude that such facilitation is difficult to be related to a reanalysis process for subject control sentences because it would entail that such a reanalysis would have to occur quite fast. In addition, both studies found similar disruption effects in subject and object control conditions when the grammatical violation was encountered. For these reasons, they argue, the object control facilitation found in their studies is taken to mean that lexical control information is used concurrently with recency. In this respect, the recency effect can be used as a diagnostic for the use of control information, in that no facilitation for a recent antecedent is expected if the parser has not accessed the control information that allows it to initiate a search for an antecedent.

Here, we set out to replicate the findings from these two previous studies. There are several issues that make us believe that this experiment provides a better context to test the use of lexical control information and clarify the role of recency. On the one hand, our design included several improvements regarding the experimental materials in contrast with Betancort et al.'s (2006) investigation. Among other things (explained in detail in the materials section), we made sure that all our second NPs were complements of the matrix verb in both subject and object control sentences, circumventing the confound identified in the stimuli by Betancort and colleagues. On the other hand, in contrast with the work by Kwon & Sturt (2016), we manipulate lexical control using verbs, instead of nouns. There is a vast amount of experimental

evidence showing that verbs (and their lexical specifications) are one of the most valuable sources of information during parsing (e.g. MacDonald et al. 1994; Tanenhaus & Carlson 1989; Traxler et al. 2002; Snedeker & Trueswell 2004, to cite just a few). Then, if anything, verbal control information is expected to be more readily accessible than nominal control information during the resolution of PRO-antecedent anaphoric dependencies. In addition, our design has more power (more participants) than previous works, and our measurements are expected to be more stable as we also have more items per condition. Hence, we hope that this experiment will clarify whether there is a facilitation for object control dependencies, and particularly, at which point in the sentence and in which eye-tracking measure it surfaces.

With regard to the adjective region, if participants have correctly recovered the antecedent of PRO, we expect that some processing disruption will arise in conditions in which the gender of the adjective mismatches that of the appropriate controller. Here, the agreement violation is used as a proxy for the accuracy of antecedent retrieval processes. In accordance with the results of Betancort et al. (2006) and Kwon & Sturt (2016), a similar disruption is expected to appear in both subject and object control conditions. Nonetheless, it is important to emphasize that these studies did not manipulate the factor DISTRACTOR, and thus, the sentences that they used as ungrammatical baseline correspond to the condition in which we expect to find interference effects (i.e. ungrammatical sentences with a gender matching distractor such as (128)).

(128) a. *Antonio$_i$ **prometió** a Cristina$_j$ PRO$_i$ ser mucho más ordenada …

b. *Ana María$_i$ **aconsejó** a Francisco$_j$ PRO$_j$ ser mucho más ordenada…

…con los apuntes del instituto.

Based on previous works that investigated the presence of interference effects in the processing of PRO-antecedent dependencies (i.e. Parker et al. 2015; Sturt & Kwon 2015) and the offline ratings collected in Experiment 2, we expect to uncover a pattern of grammatical illusions in this eye-tracking task. Previous works have found facilitatory interference effects in ungrammatical sentences using adjunct control clauses and subject control nominals, but importantly, no inhibitory interference processes in grammatical sentences. In the same line, the results from Experiment 2 showed that subject and object control ungrammatical sentences with a gender matching distractor –like (128) above– received slightly higher ratings than similar ungrammatical sentences with no matching distractor, while grammatical conditions

received equally high ratings. We predict that the same could occur in the eye-tracking task, in which a grammatical illusion is expected to be observed at the adjective region if the disruption associated with ungrammatical sentences is reduced under the presence of a control-irrelevant but gender matching NP. If this interference process arises irrespectively of linear distance, we expect that subject and object control dependencies would behave similarly with respect to interference effects.

5.3.1 Participants

48 native speakers of Spanish (28 female, mean age: 24 y/o, age range:18-34) took part in this experiment. They were recruited through the BCBL participant database *Participa*.[92] Before an individual is included in *Participa*, s/he must first undergo a series of exhaustive tests conducted by the BCBL laboratory staff aimed at building a detailed linguistic and neuropsychological profile. This allows researchers to later filter the database to search for very controlled profiles to participate in the experiments. All the participants in this task reported having completed high school education and 81% of them (n=39) had undergone university-level or advanced professional training studies. The majority of participants (n=44) were right-handed. They all reported knowing other languages apart from Spanish with different levels of proficiency; these being primarily Basque and English. Due to the differences between Spanish and Basque regarding agreement morphology,[93] special care was placed so that all the participants in the experiment were highly dominant Spanish speakers. For this purpose, we only recruited participants who scored 5/5 in the Spanish language interview and 4/5 or less in the Basque language interview. A score of 5/5 corresponds to native speaker competence, while a score of 4/5 corresponds to high non-native proficiency. Furthermore, the sample only included participants who acquired Spanish from birth and whose parents spoke Spanish as their first and home language.

All the participants had normal or corrected-to-normal vision and none of them reported having reading impairments or mental/neurological disorders. In order to avoid calibration problems, participants that needed glasses in order to read were not allowed in the sample unless

[92] *https://www.bcbl.eu/participa/*
[93] Even though Basque has a rich inflectional morphology, neither nouns nor adjectives display grammatical gender agreement (Villasante 1978).

they could wear contact lenses during the task. All the participants in this experiment provided informed consent and were compensated with 12€ for their participation.

5.3.2 Materials

The experimental materials used in this experiment were exactly the same 96 items tested in the acceptability judgement (Experiment 2). The experimental conditions are formed by crossing the three experimental factors: CONTROL (subject/object), GRAMMATICALITY (grammatical/ungrammatical) and DISTRACTOR (match/mismatch). A distractor was considered a match when the non-controlling noun matched in gender with the embedded adjective, which was kept constant for all the conditions. This manipulation resulted in 8 minimally different versions of each item. An example set of the experimental conditions is repeated in Table 10, and the entire list of experimental materials, including an English version of Table 10, can be consulted in Appendix C.2.

Table 10: Experimental materials for Experiment 3.

Subject control		
Gram.	**D. Match**	María$_i$ prometió a Cristina$_j$ PRO$_i$ ser mucho más **ordenada** con los apuntes del instituto.
	D. Mismatch	María$_i$ prometió a Francisco$_j$ PRO$_i$ ser mucho más **ordenada** con los apuntes del instituto.
Ungr.	**D. Match**	Antonio$_i$ prometió a Cristina$_j$ PRO$_i$ ser mucho más **ordenada** con los apuntes del instituto.
	D. Mismatch	Antonio$_i$ prometió a Francisco$_j$ PRO$_i$ ser mucho más **ordenada** con los apuntes del instituto.
Object control		
Gram.	**D. Match**	María$_i$ aconsejó a Cristina$_j$ PRO$_j$ ser mucho más **ordenada** con los apuntes del instituto.
	D. Mismatch	Antonio$_i$ aconsejó a Cristina$_j$ PRO$_j$ ser mucho más **ordenada** con los apuntes del instituto.
Ungr.	**D. Match**	María$_i$ aconsejó a Francisco$_j$ PRO$_j$ ser mucho más **ordenada** con los apuntes del instituto.
	D. Mismatch	Antonio$_i$ aconsejó a Francisco$_j$ PRO$_j$ ser mucho más **ordenada** con los apuntes del instituto.

The 8 conditions were distributed in 8 lists using a Latin Square design together with 144 filler sentences of similar structure and complexity (=240 sentences in total). The filler sentences were the same in each list. Half of the fillers contained ungrammaticalities in order to achieve a 1:1 grammatical-to-ungrammatical ratio across the task. The grammatical violations included preposition usage, person and number agreement and verbal morphology. Given that the control verbs had to be repeated 4 times, the materials were divided into 4 blocks in order to ensure that each verb repetition occurred in a different block. Each block contained 60 sentences (24 experimental items and 36 fillers). In order to ensure that participants were reading for

comprehension, approximately 40% (n=100) of the sentences were followed by a *yes*/*no* question that should be answered pressing the designated keys with the index fingers (right hand for *yes*, left hand for *no*). The comprehension questions were equally distributed across experimental and filler items, and were balanced across conditions. They could refer to different parts of the sentence, although they never targeted information that was related to the grammatical violations in order to avoid alerting participants of the manipulation. No feedback was provided. Participants that did not answer at least 80% of the questions correctly were not included in the analysis. Details of participant exclusion are given in the results section.

Special care was taken in order to control the materials for different psycholinguistic properties that are known to impact reading times. We concentrated our efforts on the sentence regions that were crucial for the manipulation. These were: the control verbs, the proper nouns (NP1 and NP2), the adjectives, and the region following the adjective (the PP1 region).[94]

First, the two groups of control verbs selected –12 subject and 12 object control– did not differ in their frequency according to the EsPal database (Duchon et al. 2013) (*subject control*: log. freq. mean= 1.22, SD=0.47; *object control*: log. freq. mean= 0.98, SD= 0.40; $t(22)=1.34$, $p=0.19$) number of characters (*subject control*: mean= 8.33, SD=1.43; *object control*: mean= 8.08, SD=1.38 ; $t(22)=0.43$, $p=0.668$) and their proportion of preferred control responses in Experiment 1 (*subject control*: mean= 94.84%, SD=3.45%; *object control*: mean=94.84%, SD= 4%; $t(22)=-0.0008$, $p=0.99$). As it was noted in the materials section of the completion task (§5.2.2), all the verbs used in this study were identified in ADESSE database (García-Miguel et al. 2010) as allowing for both direct and indirect objects. No statistical differences were observed between the two groups of verbs in terms of the frequency with which they appear with direct objects (*subject control*: mean= 77.62%, SD=33.44%; *object control*: mean=86.4%, SD=18.98; $t(22)=-0.79$, $p=0.44$). However, indirect objects were more frequently attested with object control verbs than with subject control verbs (*subject control*: mean= 21.18%, SD=17.53%; *object control*: mean=56.9%, SD= 21.11%; $t(22)=-4.38$, $p<0.001$). The fact that object control verbs appear more often with overt indirect objects is an expectable and unavoidable difference. This means that the presence of an NP2 is possibly more predictable with object control verbs than with subject control verbs, which is an important factor to take into account when interpreting the results.

[94] The regions of interest are detailed in the next section.

With regard to the proper nouns used in the sentences, special care was taken in order to select masculine and feminine nouns of equal frequency[95] (*feminine:* log. freq. mean=4.38, SD= 0.52; *masculine:* log. freq. mean=4.21, SD=0.65; *t*(190)= -0.46, *p*=0.64) and number of characters (*feminine:* mean= 7.75, SD=1.02 ; *masculine:* mean=7.61, SD=0.97; *t*(190)=0.95, *p*=0.345). In order to ensure that the distribution of nouns in NP1 and NP2 position did not differ in frequency and number of characters, the nouns that appeared in NP1 position in the first half of the items were used in NP2 position in the second half, and vice-versa. In addition, all the nouns contained a minimum of 7 characters in order to avoid, to the extent possible, parafoveal preview effects.[96] This decision was motivated by the pattern of results reported in Betancort et al. (2006), as the authors claim to have found control effects at the NP2 region as a consequence of parafoveal preview of the infinitive. In other words, the authors argue that readers are processing the infinitive when reading the NP2 (cf. §4.2.1.2).

Given that the adjective is a determinant critical region, it was kept constant across conditions. Still, the different feminine and masculine adjectives were carefully selected so that they displayed similar frequency (*feminine:* log. freq. mean=0.64 , SD=0.42 ; *masculine:* log. freq. mean= 0.72, SD=0.5 ; *t*(94)= -0.78, *p*=0.438) and number of characters (*feminine:* mean=8.58 , SD=1.64 ; *masculine:*mean=8.79, SD=2.04; *t*(94)=-0.55, *p*=0.583). The region following the adjective (i.e. PP1 region) always displayed the same structure: a prepositional phrase (e.g. *con los apuntes/with the notes*), ranging from 9 to 21 characters including spaces.

These highly controlled materials represent a significant improvement in contrast with the materials of Betancort et al. (2006). In addition to the psycholinguistic variables described above, a critical difference is that we made sure that all our NP2s were complements of the matrix verb. Furthermore, thanks to the results of Experiment 1, we were able to carefully select a set of verbs with robust control readings, which entailed excluding some verbs that had been used in the study by Betancort and colleagues. Also related to the control verbs, we also controlled for verb repetition. In our study, all the control verbs were repeated 4 times (each

[95]According to the census from the Spanish National Institute for Statistics (INE, 2017).

[96]The parafovea is the region that surrounds the fovea, which is the central point of fixation and it comprises 2º of the visual field. The parafovea extends from the fovea up to 5º of visual angle from the fixation point. It is widely known that readers can obtain at least orthographic information about upcoming words from the parafovea but it is less clear whether syntactic or semantic information can be simultaneously processed (see Schotter et al. 2012 for a review). Although it is difficult to decide which word length will impede the visual identification of the infinitive from the NP2 region, the criterion of using nouns of at least 7 characters was motivated by the fact the letter identification span for reading is thought to be a maximum of 7-8 characters to the right of the fixation (Underwood & McConkie 1985).

repetition appearing in one of the different conditions and in a different block), while Betancort and colleagues repeated their verbs in an arbitrary way (some verbs were repeated 4 times while others were not repeated at all). With regard to the infinitive region, we counterbalanced the use of the copulative verbs *ser* and *estar*. Betancort et al. mainly used the verbs *ser* and *estar*, but also included reflexive verbs (e.g. *mantenerse*/*to keep onself*) and oblique complements (e.g. *amenazó con posar/ threatened to pose*) in a minority of cases. Oblique complements were excluded from our stimuli. Finally, it is important to note that all our NPs are proper nouns, while Betancort et al. intermixed proper nouns with full NPs (e.g. *judge*, *teacher*, etc.). The semantic content of full NPs can influence and reinforce control relations, while proper nouns are devoid of this semantic bias. In sum, it can be said that our stimuli are more homogeneous and psychometrically controlled.

5.3.3 Procedure

The eye-movements were monitored using a desktop mount SR Research Eye-Link 1000 plus eye-tracker, which sampled the signal every millisecond. Viewing was binocular, but only the right eye was tracked. The stimuli were presented on a 1900 CRT Viewsonic monitor, placed 60cm from participants' eyes, via Experiment Builder (SR Research 2017a). Before starting the session, participants were asked to place their head on a chinrest bar in order to minimize head movements. During the recording session, the room lights were slightly dimmed in order to provide a comfortable viewing environment. Once the participant was suitably seated, the experimental session started with the instructions on the screen. Participants were first exposed to a practice block so that they could familiarize themselves with the calibration and reading procedure. In order to calibrate the eye-tracker system, participants had to fixate a white point that moved to 9 positions on the screen. These positions were linearly distributed along the margins and the center of the screen. Calibration was automatic unless problems arose, in which case it was performed manually until stable values were reached. Generally, the calibration procedure took around 5 minutes. When an accurate calibration was obtained, the procedure was validated and the experiment started. This calibration procedure was performed at the beginning of the practice and before each of the 4 experimental blocks. Participants were forced to take a two-minute pause between blocks and were encouraged to move away from the chin-rest during this time. Additional calibrations were also performed when a bad fixation recording was observed from the experimenter display outside the recording cabin.

During the task, the sentence presentation rate was controlled by the participant. Every trial was structured as follows: first, participants had to fixate a red point that appeared on the left side of the screen and, simultaneously, press the space bar with the thumb. This red point was placed exactly where the first letters of the sentence would appear after pressing the space bar. This process, known as drift correction, serves the purpose of making sure that participants are gazing at the beginning of the sentence before it is displayed. Thus, the sentence was not presented until the drift-correct fixation was satisfactory. While the sentence was on the screen, participants were instructed to read naturally while trying to avoid blinking to the extent possible, making sure that they understood the meaning of the sentence. Once participants had finished reading the sentence, they had to press the space bar and the text disappeared. At this point, they were instructed to blink naturally for some seconds and then fixate the red point when they were ready for the next trial. If the sentence was followed by a question, the drift correction appeared once participants had provided an answer. Each sentence was presented on a single line at the center of the screen, in white Times New Roman (20 point) against a back background. The sentences were presented using lower case unless otherwise required (e.g. for proper nouns and on the first word). Together with instructions, setup and breaks, the experiment lasted approximately 1h.

5.3.4 Analysis

Before analyzing the eye-tracking results, trials were individually inspected to make sure that all the relevant fixations were included in the output. As a consequence of calibration inaccuracy, some fixations may be recorded at the upper or lower boundaries of the area of interest even if the participant was actually reading the text inside the pre-determined area. When all the fixations corresponding to an entire trial appeared recorded at the upper or lower limits outside the interest area, these were manually moved inside the area, exclusively on the vertical axis, so that they could be included in the analysis. Before calculating the different fixation measures (see below), blinks, artifacts, and individual fixations that were shorter than 80ms. and longer than 800ms. were removed using the automatic procedure provided by Data Viewer (SR Research 2017b), the software that accompanies the Eye-Link 1000 plus eye-tracker. The following paragraphs provide a detailed description of the regions of interest, the fixation measures and the statistical analyses.

Regions of interest

For the purpose of data collection, each sentence was segmented into 8 regions, shown in Table 11. In order to study the effects of the manipulation, 5 regions of interest (highlighted with black borders in the first row of Table 11) were selected based on the results by Betancort et al. (2006): the NP2 (the region in which the authors report differences between subject and control dependencies); the infinitive (the region in which comprehenders have the first evidence that an antecedent must be recovered); the adverb (which could capture delayed spillover effects from the infinitive region); the adjective (the region in which a grammatical violation can arise); and the first prepositional phrase (PP1, the region that follows the adjective, which captures any delayed spillover effects from the previous region). The reading measures described in the next section were calculated in these 5 regions of interest with the exception of the probability of *regressions in*. This measure captures the probability that a certain region was revisited. To study it, we selected a different set of regions, which are highlighted with black borders in the second row of Table 11: the NP1, the control verb, the NP2 and the adjective. Including the NP1 and the control verb can be more informative when it comes to study the effects of the manipulation in the proportion of *regressions in*. This is because the gender of the nouns and the type of control verb is what determines the gender of the adjective, and thus, we suspect that participants could go back to these regions when they experience problems.

Table 11. Region segmentation of the experimental sentences of Experiment 3 and regions of interest.

$NP1_1$	$C.VERB_2$	$NP2_3$	INF_4	$ADVERB_5$	$ADJECT_6$	$PP1_7$	$PP2_8$
Antonio	prometió	a Cristina	ser	mucho más	ordenado	con los apuntes	del instituto
Antonio	prometió	a Cristina	ser	mucho más	ordenado	con los apuntes	del instituto

Fixation measures analysis

For each of the critical regions described above, we computed the following standard eye-movement measures (see Rayner 1998):

- *First-pass time*: the sum of all the fixations in an area before the eyes move to another area to the left or to the right. It is also known as *gaze duration*.
- *Go-past time*: the time spent from the moment an area is first fixated until the eyes move to an area to the right. This measure includes the time spent re-reading earlier areas of the

sentence in addition to the critical region itself. It is also known as *regression path duration*.

- *Total time*: the sum of all fixations in an area during the entire trial. This measure includes the fixations made on a given region during *first-pass* plus any subsequent re-fixations.
- *First-pass regressions out*: the probability that a regression was made out of a particular area into earlier regions before the eyes move to the right. In other words, the proportion of trials in which the first exist of the region was to the left.
- *Regressions in*: the probability that a regression was made into a particular area during the whole trial.

These measures have been consistently used in previous eye-tracking experiments on sentence processing, including the existing studies on control dependencies. Each measure provides a range of information about the time-course of processing. First-pass time is considered an early reading measure, as it is thought to collect reading processes that accompany and immediately follow lexical access (Sturt 2003). Total time, on the other end, is considered a late reading measure, as it includes all the fixations made on a region during the entire trial. Furthermore, the occurrence of a regression reflects some difficulty in the integration of a word when it is fixated, and it is considered an early effect, particularly, when the measurement only collects the first-pass regressions out. The go-past time measure is sometimes considered an early latency and other times a late latency. As Clifton et al. (2007: 349) note:

> The occurrence of a regression reflects some difficulty in integrating a word when it is fixated, arguably an early effect. The go-past measure reflects this effect, and also the cost of overcoming this difficulty, which may well occur late in processing. The terms "early" and "late" may be misleading, if they are taken to line up directly with first-stage vs second-stage processes […]. Nonetheless, careful examination of when effects appear may be able to shed some light on the underlying processes.

Statistical modelling

In order to assess the statistical reliability of the experimental manipulation on the different eye-tracking measures, we conducted our analyses using linear mixed effects models. The statistical analyses were independently carried out in each measure and region of interest. The model structure for the fixed effects always contained the main effects and interactions of the

three experimental factors (CONTROL, GRAMMATICALITY and DISTRACTOR). Participants and items were crossed as random effects. For every region and measurement, we evaluated the inclusion of a fully specified random effects structure, with by-participant and by-item random intercepts and slopes for the experimental factors. This maximal model failed to converge in most cases and thus, the random structure was simplified following the recommendations in Barr and colleagues (2013). The results reported in the next section correspond to the model with the maximally converging random effects structure. The detailed structure of the model reported for each measurement and region of interest can be consulted in Appendix D.1.

All statistical analyses on the latency data (first-pass, go-past, and total time) were performed on the transformed RTs in order to ensure a normal-like distribution of the model residuals. The power transformation was determined using the Box-Cox procedure (Box & Cox 1964; see also Vasishth & Nicenboim 2016). This procedure evaluates the transformation that provides normally distributed residuals given the model structure. The power transformation applied for each model is also specified in Appendix D.1. It is important to note that, even though the analyses of the latency data were carried out over the transformed RTs, whenever estimates for post-hoc comparisons are reported, these are shown in milliseconds in order to increase transparency. Finally, the discrete measures of probability of first-pass regressions out and regressions in were analyzed using the same linear mixed model structure explained above, but with a binomial link function (see Jaeger 2008).

5.3.5 Results

One participant was deleted from the sample due to low accuracy in the comprehension questions (<80%). Furthermore, the data for another participant could not be saved due to an unexpected computer failure during data collection. For the remainder 46 participants that were included in the analysis, the mean accuracy in the comprehension questions was 95% (SD: 4.14%), indicating that participants understood the sentences at a high rate. The partial-credit unit scores of WMC had a mean of 0.85 (SD= 0.09; range= 0.59 – 0.98). The eye-tracking results for the different measures and regions are shown in Table 12. For ease of exposition, the results will be examined region by region respecting the sequential order of the eye-tracking measurements (i.e. first-pass, fist pass regressions out, go-past, and total time), with exception of the probability of regressions in, which will be presented at the end because it was calculated in a different set of regions.

Table 12. Means (and standard errors) of the eye-tracking measures of Experiment 3 in the regions of interest. The latency measures are expressed in milliseconds and the regressions in/out are expressed in 0-1 probabilities.

	NP2		*INFINITIVE*		*ADVERB*		*ADJECTIVE*		*PP1*	
First-pass										
	Subj.	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***
Gram-Match	311 (7)	304 (7)	237 (6)	237 (6)	295 (7)	296 (7)	321 (8)	315 (7)	426 (6)	410 (7)
Gram-Mism	326 (6)	308 (6)	231 (5)	236 (5)	303 (8)	297 (5)	311 (7)	325 (7)	418 (5)	419 (6)
Ungr-Match	316 (7)	320 (6)	240 (5)	236 (7)	296 (7)	295 (8)	319 (7)	324 (7)	411 (6)	419 (6)
Ungr-Mism	320 (6)	317 (8)	233 (5)	245 (6)	284 (6)	299 (7)	324 (8)	320 (7)	435 (5)	424 (6)
FP Reg. out										
	Subj.	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***
Gram-Match	.07(.03)	.06(.03)	.03(.02)	.04(.02)	.06(.03)	.08(.03)	.05(.03)	.06(.03)	.07(.02)	.08(.03)
Gram-Mism	.06(.02)	.07(.03)	.03(.02)	.03(.02)	.09(.03)	.07(.03)	.05(.03)	.05(.03)	.09(.03)	.07(.03)
Ungr-Match	.07(.02)	.08(.03)	.02(.02)	.04(.03)	.08(.03)	.07(.03)	.04(.02)	.04(.02)	.06(.03)	.08(.03)
Ungr-Mism	.08(.03)	.06(.02)	.04(.02)	.04(.02)	.08(.03)	.07(.03)	.05(.03)	.05(.03)	.09(.03)	.10(.03)
Go-past										
	Subj.	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***
Gram-Match	355 (12)	341 (12)	253 (10)	257 (11)	325 (13)	332 (16)	348 (15)	353 (26)	476 (18)	468 (18)
Gram-Mism	350 (10)	351 (16)	249 (14)	251 (10)	354 (30)	324 (11)	333 (13)	351 (14)	478 (20)	467 (19)
Ungr-Match	344 (10)	366 (14)	251 (9)	256 (11)	332 (13)	320 (9)	340 (10)	351 (15)	460 (17)	464 (11)
Ungr-Mism	362 (14)	356 (16)	258 (15)	269 (9)	319 (12)	323 (10)	351 (15)	346 (16)	505 (33)	491 (19)
Total time										
	Subj.	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***
Gram-Match	358 (11)	351 (12)	250 (8)	257 (9)	332 (11)	335 (10)	349 (8)	359 (11)	492 (9)	479 (12)
Gram-Mism	364 (13)	349 (9)	247 (10)	247 (7)	345 (13)	334 (9)	353 (11)	363 (8)	493 (10)	488 (9)
Ungr-Match	349 (11)	363 (10)	250 (7)	254 (9)	328 (12)	326 (9)	355 (12)	363 (9)	484 (11)	479 (8)
Ungr-Mism	372 (12)	364 (12)	248 (8)	258 (8)	327 (15)	340 (12)	364 (14)	365 (12)	505 (12)	498 (11)
	NP1		***CONTROL VB.***		***NP2***		***ADJECTIVE***			
Reg. in										
	Subj.	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***		
Gram-Match	.17(.02)	.16(.03)	.12(.03)	.12(.02)	.07(.03)	.08(.03)	.06(.02)	.09(.02)		
Gram-Mism	.15(.03)	.14(.03)	.11(.03)	.13(.03)	.06(.03)	.06(.02)	.09(.03)	.08(.03)		
Ungr-Match	.16(.02)	.14(.03)	.11(.03)	.12(.03)	.05(.02)	.07(.02)	.07(.03)	.09(.03)		
Ungr-Mism	.14(.03)	.15(.03)	.14(.03)	.13(.03)	.07(.02)	.07(.02)	.09(.02)	.10(.03)		

NP2 region

The results for first-pass time revealed a significant interaction between the factors CONTROL and GRAMMATICALITY ($F(1,4149.9)= 4.64$, $p=0.031$, Figure 11). This interaction is driven by faster reading times observed for the NP2s in grammatical object control sentences. Post-hoc contrasts showed significant differences between grammatical and ungrammatical conditions

in object control sentences (estimate=-12.72, *z*.ratio=-2.68, *p*=0.007) and between subject and object control conditions in grammatical sentences (estimate=12.62, *z*.ratio=2.83, *p*=0.005).

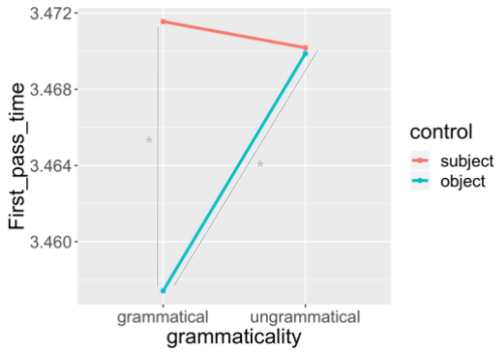


Figure 11. *Control* x *Grammaticality* interaction in first-pass times at the NP2 region.[97]

With regard to the first-pass regressions out of the NP2 region, the model results revealed a significant three-way interaction among the factors CONTROL, GRAMMATICALITY, and DISTRACTOR (X^2(1)=4.44, *p*=0.035, Figure 12).[98] Nonetheless, none of the post-hoc contrasts reached statistical significance.

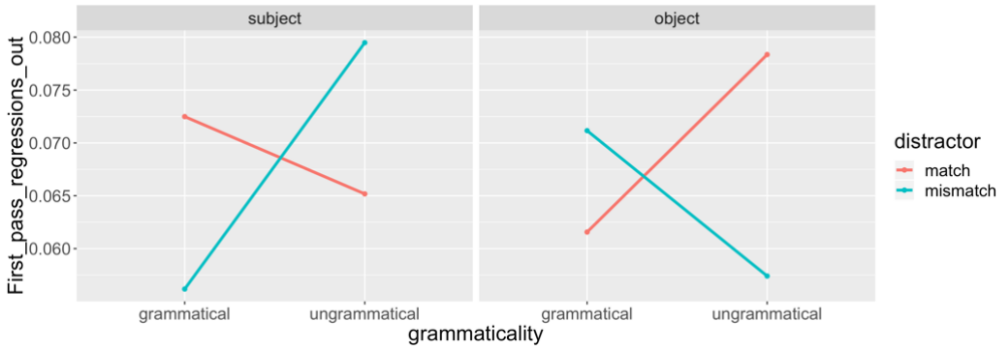


Figure 12. *Control* x *Grammaticality* x *Distractor* interaction in the first-pass regressions out of the NP2 region.

In the analysis of the go-past variable at the NP2 region there was a significant three-way interaction among the factors CONTROL, GRAMMATICALITY, and DISTRACTOR (F(1,4149.5)=4.07, *p*=0.043, Figure 13). As in the results for the first-pass measure (Figure 11), the three-way interaction found in go-past is driven by faster reading times for object control grammatical sentences, but specifically, along the level of distractor match. The only significant

[97] Note that reading times (y-axis) are expressed in the transformed values.
[98] Wald chi-square tests.

post-hoc contrast emerged between grammatical and ungrammatical conditions in object control distractor match sentences (estimate=-24.63, *z*.ratio=-3.21, *p*=0.001).

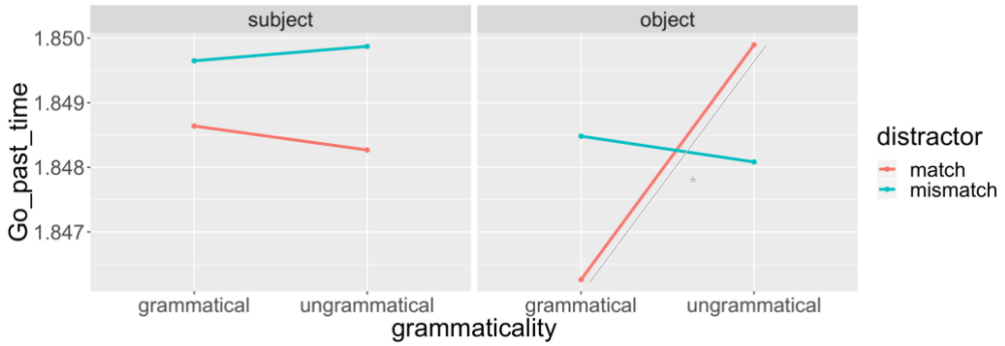


Figure 13. *Control* x *Grammaticality* x *Distractor* interaction in go-past times at the NP2 region.

It is quite puzzling to find effects associated to the factors GRAMMATICALITY and/or DISTRACTOR at the NP2 region in first-pass, first-pass regressions out and go-past, as the manipulations related to these two factors are not materialized until the adjective region and it is not possible that participants could read this region when gazing at the NP2. Crucially, no significant results emerged in the analysis of the total time measure at the NP2 region, which is the only eye-tracking measure that could have captured any reading time differences associated with these two factors –for instance, as a consequence of regressions into earlier regions after having encountered the adjective. As an attempt to understand the source of these effects, we run an additional set of exploratory models that included different co-variates that could help explain this pattern of results. First, we controlled for the number of characters in the NP2 region, and the frequency of the names, considering both the national frequency and the frequency in the Guipuzkoa province.[99] One thing to notice about proper names is that, regardless of its frequency in the census, a given name could happen to come across as unfamiliar or unpopular for younger speakers because it is generally associated to older age groups. In order to account for this factor, we co-variated the mean age of the people registered in the census with each of the names in NP2 position as a measure of familiarity. We also included the gender of the NP2, and the gender of both NP1 and NP2, as co-variates. Furthermore, for each of the control verbs used, we controlled the frequency of occurrence with an overt indirect complement. As it was examined in the materials' section (§5.3.2), subject

[99] Name frequencies can vary from province to province. and the majority of subjects from *Participa* are from the Guipuzkoa province, which is where the BCBL is located.

and object control verbs differ in the frequency with which they appear with overt indirect objects, and this could cause a facilitation for a portion of NP2s. We also tried using the different control verbs as co-variates, and the control preferences collected in Experiment 1. Last, we co-variated the ratings collected in Experiment 2. In all of the exploratory models, the intriguing interactions remained significant.

Infinitive region

The model results for first-pass, first-pass regressions out, go-past, and total time did not yield any significant contrast in this region.

Adverb region

In the analysis of the go-past variable of the adverb region there was a significant three-way interaction among the factors CONTROL, GRAMMATICALITY, and DISTRACTOR ($F(1,3985.9)=4.13$, $p=0.042$, Figure 14). As can be seen in Figure 14, this effect is driven by differences between grammatical and ungrammatical trials in subject control sentences with a mismatching distractor, which is the only post-hoc contrast which emerged significant (estimate=-24.63, *z*.ratio=-3.21, $p=0.001$).

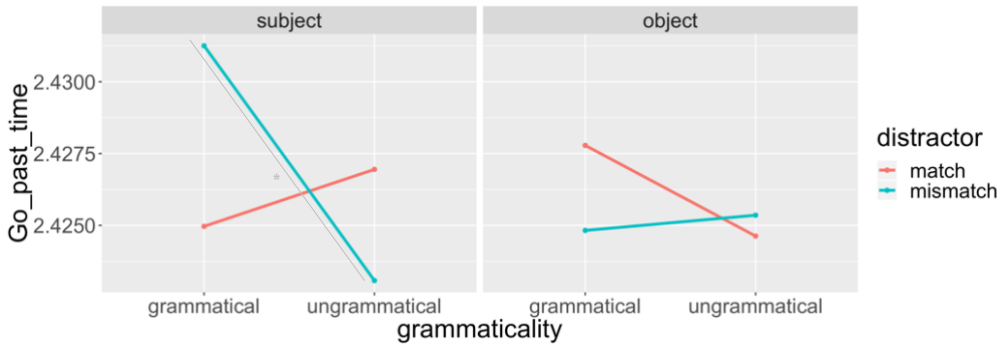


Figure 14. *Control* x *Grammaticality* x *Distractor* interaction in go-past times at the adverb region.

Similarly to the effects reported in the NP2 region, it is quite striking to find effects related to the grammaticality factor at the go-past measure of the adverb region because at this point comprehenders have not yet encountered the agreement violation. It could be speculated that this time it could be possible that participants were getting some parafoveal preview of the adjective region when gazing at the adverb, which is the preceding region. Nonetheless, there are several facts that make it unlikely that these results are driven by participants' perception

of the grammatical violations introduced at the adjective. First, there is a substantial number of characters between the two regions, given that the adverb region ranged between 7 and 14 characters and the adjective ranged between 6 and 13 characters. Considering that the gender violation is not materialized until the last letter of the adjective and that the letter identification span for reading is thought to be a maximum of 7-8 characters to the right of the fixation (Underwood & McConkie 1985), it would be almost impossible for participants to apprehend the ending of the adjective even in cases in which they were gazing at the very end of the adverb. Second, if this effect was driven by some parafoveal preview of the adjective's morphology, we would expect to find slower reading times for ungrammatical sentences, which is the exact opposite result of the one found here: comprehenders are slower in grammatical sentences. Following a similar procedure as in the NP2 region, we run an additional set of exploratory models that included different co-variates that could help explain this pattern of results (nº of characters, gender of NPs, rating from Experiment 2, etc.). Unfortunately, in all of the exploratory models, the reported interaction remained significant.

Adjective region

The results for first-pass time at the adjective region revealed a significant three-way interaction among the experimental factors –CONTROL, GRAMMATICALITY, and DISTRACTOR– ($F(1,4035.5)= 4.73$, $p=0.030$, Figure 15). This interaction seems to be driven by faster reading times for grammatical subject control sentences in the distractor mismatch condition. Post-hoc tests reveal two significant contrasts: first, the contrast between grammatical and ungrammatical sentences was significant only for subject control sentences with a mismatching distractor (estimate=-11.51, *z*.ratio=-2.33, $p=0.020$). Importantly, the grammaticality contrast is not present for distractor match sentences. Second, the reading times observed for grammatical subject control sentences with a mismatching distractor were significantly faster than those observed for object control sentences in the same configuration (estimate= 12.09, *z*.ratio= -2.01, $p=0.044$). None of the contrasts among object control conditions reached statistical significance.[100]

[100] In the analysis of this region, we also tried co-variating the ratings from Experiment 2 in order to check whether the small differences in acceptability observed between subject and object control sentences were affecting the results. Still, this follow-up model showed the same pattern of contrasts.

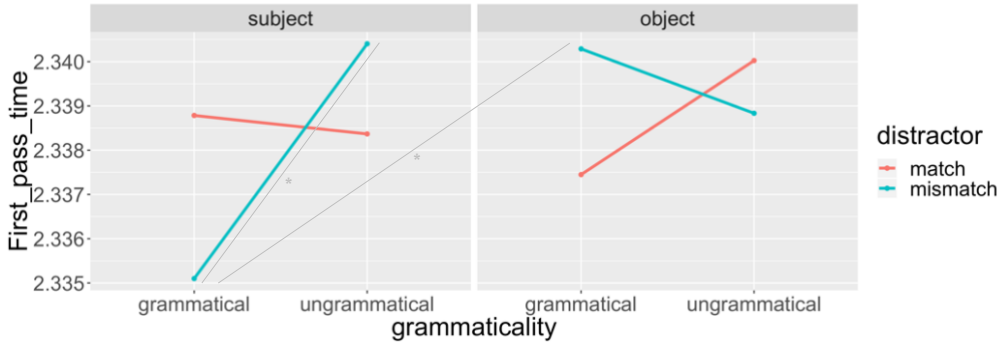


Figure 15. ***Control*** **x** ***Grammaticality*** **x** ***Distractor*** **interaction in first-pass times at the adjective region.**

PP1 region

The model results regarding first-pass reading times at the PP1 region revealed a main effect of DISTRACTOR (estimate=-7.65, $F(1,4007.6)=4.01$, $p=0.045$), showing faster reading times for sentences with a matching distractor compared to sentences with a mismatching distractor. The same eye-tracking measure showed a significant interaction between the factors GRAMMATICALITY and DISTRACTOR ($F(1,4004)=4.26$, $p=0.039$), displaying a facilitation for ungrammatical sentences with a matching distractor compared to ungrammatical sentences with a mismatching distractor. This effect indicates the existence of facilitatory interference in ungrammatical sentences. Nonetheless, the interpretation of these effects is dependent on a higher order interaction among the factors CONTROL, GRAMMATICALITY, and DISTRACTOR that also reached statistical significance in the first-pass measure of the PP1 region ($F(1,4004)=5.11$, $p=0.024$, Figure 16). This interaction is similar to the one found in the first-pass time of the adjective region (Figure 15 above). Post-hoc tests of the three-way interaction reveal interesting contrasts only present in subject control sentences: first, there is a significant grammaticality contrast in subject control sentences with a mismatching distractor (estimate=-18.62, *z*.ratio=-2.59, $p=0.010$). Second, ungrammatical sentences with a matching distractor were read significantly faster than ungrammatical sentences with a mismatching distractor (estimate=-24.83, *z*.ratio=-3.22, $p=0.001$). This result provides evidence for facilitatory interference effects in subject control conditions. Again, as in the adjective region, none of the contrasts among object control conditions reached statistical significance in the first-pass measure of the PP1 region, although there is a trend towards slower reading times for ungrammatical conditions.

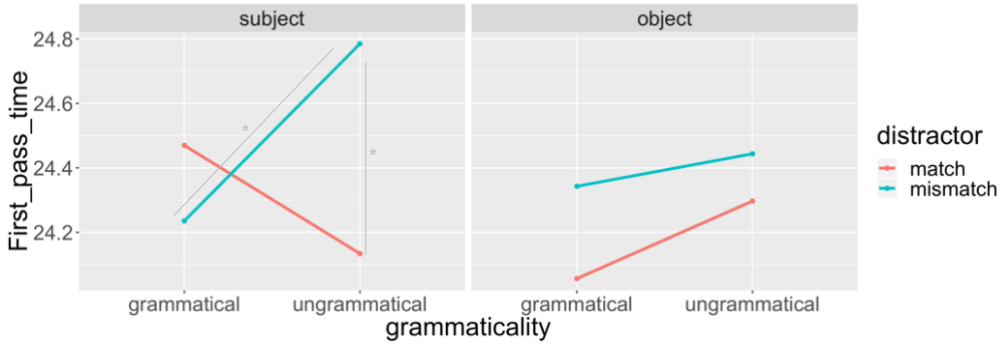


Figure 16. *Control* x *Grammaticality* x *Distractor* interaction in first-pass times at the PP1 region.

With regard to the go-past measure, the model results for the PP1 region showed significant main effects of GRAMMATICALITY (estimate=-8.21, $F(1,4003.6)=4.43$, $p=0.035$) –with grammatical sentences being faster than ungrammatical ones– and DISTRACTOR (estimate= -17.7, $F(1,4006.9)=9.84$, $p=0.002$) –with distractor match sentences being faster that distractor mismatch ones. These two main effects are dependent on a significant interaction between the factors GRAMMATICALITY and DISTRACTOR ($F(1.4003.8)=10.26$, $p=0.001$, Figure 17) that appeared in the same measure. This interaction is driven by a facilitation for ungrammatical sentences with a matching distractor. Post-hoc tests reveal significant differences between grammatical and ungrammatical conditions in distractor mismatch sentences (estimate=-27, z.ratio=-3.75, $p<0.001$) and between distractor match and mismatch conditions in ungrammatical sentences (estimate=-36.47, z.ratio=-4.49, $p<0.001$). This effect is similar to the one found in the first-pass time for this region but this time the facilitatory interference effect is clearly present in both subject and object control sentences.

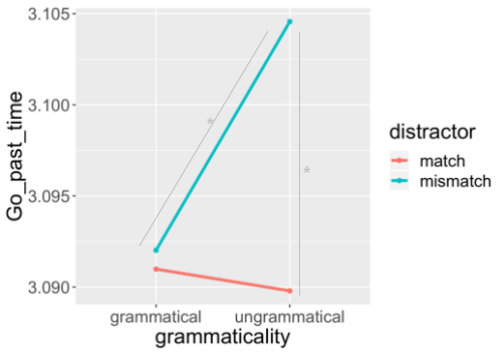


Figure 17. *Grammaticality* x *Distractor* interaction in the go-past times of the PP1 region.

In the analysis of the total time measure at the PP1 region only a main effect of DISTRACTOR (estimate=-11.8, $F(1,94)=4.34$, $p=0.040$) reached statistical significance. This effect, also

present in first-pass and go-past, shows that, overall, distractor match sentences were read faster than distractor mismatch ones.

Regressions in

The probability of regressions in was calculated in the following four regions: the NP1, the control verb, the NP2, and the adjective. The statistical analyses carried out in these regressions did not yield any significant contrasts.

5.3.5.1. Summary of results

Given the variety of statistical results obtained in this experiment, a summary of the significant contrasts is provided in Table 13. The results can be conceptually divided in two groups, signaled with different background colors in the table. One the one hand, we find the striking interactions identified at the NP2 and adverb regions involving the GRAMMATICALITY and DISTRACTOR factors before they have been materialized. On the other hand, we find the effects identified at the adjective and PP1 region, which provide different types of evidence for the existence of interference effects.

Table 13. Summary of statistically significant results from Experiment 3 (C = control, G = grammaticality, D = distractor, ME = main effect, INT = interaction, n.s. = non-significant).

MEASURE	REGION				
	NP2	*Infinitive*	*Adverb*	*Adjective*	*PP1*
First-pass	^{INT}CxG	n.s.	n.s.	^{INT}CxGxD	^{ME}D ^{INT}GxD ^{INT}CxGxD
FP regressions out	^{INT}CxGxD	n.s.	n.s.	n.s.	n.s.
Go-past	^{INT}CxGxD	n.s.	^{INT}CxGxD	n.s.	^{ME}G ^{ME}D ^{INT}GxD
Total time	n.s.	n.s.	n.s.	n.s.	^{ME}D
	NP1	*Control*	*NP2*	*Adjective*	
Regressions in	n.s.	n.s.	n.s.	n.s	

5.3.6 Discussion

The various results obtained in this experiment call for a careful interpretation with respect to the two main goals of this work. For clarity, we will first discuss the evidence regarding the early access and later use of lexical control information and, then, we will discuss the evidence regarding the presence of illusions of grammaticality. Even though these two points are discussed separately, it must be borne in mind that the results obtained at the adjective and PP1 regions simultaneously inform questions that have to do with the late use of control information and the prevalence of interference effects. For this reason, at the end of the discussion, we will try to conflate these points in a general account of how the findings from this experiment contribute to understand the online comprehension of these complex constructions.

5.3.6.1 The access and use of lexical control information

To recapitulate, the results from Betancort et al. (2006) and Kwon & Sturt (2016) coincide in three main findings: a) a facilitation for object control dependencies observed at the NP2 or infinitive regions, b) similar sensitivity in subject and object control sentences with respect to the grammatical introduced in a downstream adjective or reflexive pronoun and c) no straightforward evidence for reanalysis in subject control dependencies. These three data points have been interpreted as evidence that lexical control information is accessed as soon as PRO is encountered to retrieve its antecedent and it is later used in order to detect grammatical violations. In particular, Kwon & Sturt (2016) have argued that the facilitation for object control dependencies could be used as a diagnostic test for the early access of control information because recent antecedents would only be facilitated over non-recent ones if the relevant control information has been consulted by the parser. In our study, we set out to clarify the role of recency during antecedent selection for two main reasons: on the one hand, the works by Betancort et al. and Kwon & Sturt differed in the regions and measurements in which the recency effect appeared (first-pass at the NP2 and first-pass regressions out at the infinitive, respectively). On the other hand, we had identified a confound in the materials by Betancort et al. which could explain their findings on the basis of the differential activation of arguments and adjuncts. In this regard, the most relevant result from this experiment is that the reading patterns observed for the NP2 and infinitive regions do not coincide with previous works in that we have not found evidence pointing to a recency effect. That is, no effect of control was found in any measurement or region which could be interpreted as a general facilitation for object

control dependencies over subject control ones, and crucially, no differences between subject and object control sentences were observed at the infinitive region.

The failure to replicate the recency effect opens up the possibility that the faster reading times for object control dependencies observed in previous studies may not be the consequence of a facilitation for shorter dependencies (i.e. object control) over longer ones (i.e. subject control) in the application of lexical control information to resolve PRO-antecedent dependencies, as the authors claimed. In our stimuli, all the NP2s were complements of the matrix verb, circumventing the confound identified in Betancort et al. (2006). Thus, the failure to replicate the recency effect suggests that the object control facilitation found by Betancort and colleagues could have actually been the result of the differential processing cost of integrating adjuncts versus complements. In addition, there is a further factor that could have contributed to the object control facilitation observed in previous studies. As it was explained in the materials section, NP2s are more predictable in the context of object control verbs (and possibly also object control nominals) because these verbs appear more frequently with overt indirect objects. For this reason, such a frequency preference could also be behind the facilitation observed in the works by Betancort et al. (2006) and Kwon & Sturt (2016). This frequency preference could be surpassed by including the preverbal clitic *le* in the stimuli because its presence is expected to equally facilitate the integration of the NP2 in the context of both subject and object control verbs.[101] This modification will be included in Experiments 4-6 in an attempt to clarify our results and as means to provide a testing ground that allows us to isolate this confound from the possible presence of a recency effect.

It must be acknowledged that if it was the case that the object control facilitation reported in previous works was fostered by the higher predictability of the NP2 in object control dependencies, then, we should have seen a similar facilitation for the NP2s in object control conditions in our study. Nonetheless, it is possible that this frequency preference interacts with the integration of the main clause constituents in our stimuli in such a way that it generates the extraneous interactions found at the NP2 and adverb regions. These two critical regions have showed several intriguing results that involved the factors GRAMMATICALITY and DISTRACTOR. These effects are quite puzzling because it is not possible that participants could preview the

[101] The structures used in this investigation allow for the indirect object complement – the NP2 in our sentences – to be optionally doubled by the pronominal clitic *le* (Campos 1999), as in *Juan **le** prometió/ordenó **a Pedro** ser más cuidadoso*, in which *le* refers to *Pedro*. Importantly, the inclusion of the clitic pronoun does not have an impact on the control readings of the sentences.

gender of the adjective when fixating on these regions. Still, it is important to stress that if these effects were indicating a facilitation for object control sentences, we would expect to see that all four object control conditions exhibit faster reading times, something which is not the case. Thus, there is no obvious reason to believe that these interactions could be associated to the resolution of PRO-antecedent dependencies and the processing of lexical control information.

Unfortunately, we have not been able to narrow down the source of the intriguing interactions found at the NP2 and verb regions and, hence, we can only speculate on their origin. As advanced in the paragraph above, these effects may be reflecting an unidentified behavior related to the integration of the main clause constituents –namely, the NP1, the control verb and the NP2. One possibility is that they are the result of an artifact or an extraneous confound related to the proper names used in the study, although as noted in the results section, the inclusion of different covariates in the statistical models has not contributed to clarify this. Another possibility is that they reflect task-driven reading strategies developed by comprehenders. For instance, comprehenders could be going back to revise certain names when they realized that the names were crucial in order to detect the violations that could appear at the adjective in experimental materials. Alternatively, these results may simply be spurious effects. It is interesting to note that the works by Betancort et al. (2006) and Kwon & Sturt (2016) also report unexpected findings related to the grammaticality factor at the NP2 or infinitive regions. The authors interpret their results as spurious given that, as in our study, the grammaticality of the sentences was not manipulated until later regions. Experiments 5 and 6 will hopefully clarify this issue.

A critical aspect to study the online use of how lexical control has to do with the detection of grammatical violations. It is assumed that encountering an adjective that does not agree in gender with the features of PRO (that it inherits from its antecedent) should generate some processing disruption. The results from the experiments by Betancort et al. (2006) and Kwon & Sturt (2016) showed that participants were slower and made more regressions when they encountered an adjective or reflexive pronoun that mismatched in gender with PRO. This finding provided evidence that the PRO-antecedent dependency was correctly established on the basis of control information, and that this information was used to detect grammatical violations. However, these previous studies did not introduce a distractor match/mismatch manipulation, as they always used sentences with two nouns of different gender. This means that the ungrammatical baseline used by previous studies corresponded to our ungrammatical

sentences with a matching distractor. As we will discuss below, our results have provided clear evidence showing that this condition is subject to facilitatory interference effects, pointing to the presence of grammatical illusions in ungrammatical sentences. We believe that this pattern of facilitatory interference has mitigated the appearance of straightforward grammaticality contrasts. In consequence, the statistical evidence obtained in this task with regard to participants' sensitivity to grammatical violations is weaker than we had initially expected on the basis of previous works.

Notwithstanding the above, some results deserve mentioning with respect to participants' detection of grammatical violations. Comprehenders seem to easily detect ungrammatical adjectives in distractor mismatch conditions, which are the easiest configuration to detect a grammatical anomaly given that, in these cases, none of the NPs in the matrix clause agree in gender with the adjective. However, these effects appear in earlier measurements and regions for subject control dependencies than for object control ones. This is clearly shown by the three-way interaction that occurred as early as the first-pass measure of the adjective region, an effect which also appeared in the first-pass measure of the following region, the PP1. Specifically, this effect showed significant differences between grammatical and ungrammatical trials in subject control dependencies with a mismatching distractor; that is, between sentences like (129a) and (129b). Interestingly, the grammaticality contrast did not arise in subject control sentences with a matching distractor –that is, between sentences like (130a) and (130b) and what is more important, no differences were observed among object control conditions.

(129) a. María$_i$ **prometió** a Francisco$_j$ PRO$_i$ ser mucho más ordenada con los apuntes…

b.*Antonio$_i$ **prometió** a Francisco$_j$ PRO$_i$ ser mucho más ordenada con los apuntes…

(130) a. María$_i$ **prometió** a Cristina$_j$ PRO$_i$ ser mucho más ordenada con los apuntes...

b.*Antonio$_i$ **prometió** a Cristina$_j$ PRO$_i$ ser mucho más ordenada con los apuntes…

What is observed in these interactions is that comprehenders are able to quickly detect grammatical violations in ungrammatical sentences with a mismatching distractor, which represent the easiest context to detect grammatical violations, in contrast with grammatical sentences with mismatching distractor. What does this tell us about the online use of control information? The truth is that it is difficult to ascertain whether these results are driven by the

parser's reliance on control information or by simply linking the adjective to the only agreeing noun in the sentence in cases like (128a). Furthermore, the lack of differences between the sentences in (129) is indicative of the presence of interference effects–an issue to which we will return in the next discussion section. Another relevant fact is that these effects only appeared in subject control sentences. Evidence for sensitivity to grammatical violations irrespective of the type of control was only found in the go-past measure of the PP1 region, in which there was a significant main effect of GRAMMATICALITY. However, this main effect of GRAMMATICALITY occurs concurrently with an interaction between the factors GRAMMATICALITY and DISTRACTOR which entails that, once again, it is only ungrammatical sentences with a mismatching distractor that are being penalized.

A crucial finding regarding the access and use of control information is that none of the measures collected show any evidence for the presence of reanalysis processes in subject control dependencies, a behavior that is clearly predicted by the MRFS (Frazier et al. 1983). Under the assumptions of the MRFS, the implicit subject of the embedded clause is thought to be initially related to the most recent NP (i.e. the object) in both subject and object control dependencies. As a consequence of this initial attachment, subject control dependencies would be expected to engage in a reanalysis process that would presumably surface in later measures or points in the sentence. The empirical evidence collected in this experiment does not support this view, as there is no evidence that participants were slower or made more regressions in subject control sentences. Indeed, if anything, sensitivity to grammatical violations is clearer in subject control conditions, as shown by the interactions found in the first-pass measure at the adjective and PP1 regions discussed above. Even though this sensitivity is just partial, it is surprising that no similar contrasts arose for object control sentences at the same point, particularly based on previous findings.

There arise several possible explanations for the lack of early effects in object control dependencies. One possibility is that the parser initiates the integration of the adjective sooner in subject control dependencies, something which could be indicative of the so far unattained conjecture that it also computes PRO-antecedent dependencies in subject control sentences faster. This could be due to several factors which have not been taken into consideration in previous discussions of the topic: first, in subject control sentences, the controller of PRO is encountered earlier as it is the first word of the sentence, and this may have given comprehenders more time to compute the different structural relations before reaching the

adjective. There is an ample body of linguistic and psycholinguistic evidence showing that the accessibility of a referent is enhanced by its syntactic prominence (subject status), thematic prominence (agent status), discourse prominence (topic status) and linear order (first-mention) (e.g. Frederiksen 1981; Ariel 1988; Jackendoff 1990; Stevenson et al. 1994; Garnham 2001; Järvikivi et al. 2005; Kaiser 2011; Colonna et al. 2012; Rohde & Kehler 2014 inter alia). These four factors, which have been shown to facilitate the resolution of other anaphoric dependencies such as pronouns, converge in subject control dependencies: the antecedent of PRO is the subject of the matrix clause, which is the agent, topic, and first-mentioned NP, making it the most salient referent in the sentence. In addition, in subject control dependencies, the nominal referent in subject position (the NP1) holds the same semantic role in the matrix and in the embedded clause (it is the agent), while in object control dependencies, the nominal referent in object position (the NP2) is the patient of the matrix clause and the agent of the embedded clause. The consequence of this is that comprehenders must simultaneously compute two different roles in object control sentences, a fact that, either independently or concurrently with the previously mentioned factor, could account for the delayed effects in object control dependencies.

If these ideas are on the right track, instead of confirming a facilitation for the recent antecedent (as predicted by the MRFS), the early effects in subject control dependencies would be suggestive of a facilitation for the distant antecedent: the first-encountered and more salient subject NP. Nonetheless, an alternative explanation for the lack of effects in object control dependencies is to be found in the acceptability ratings from Experiment 2, in which object control sentences were rated slightly lower than subject control ones. This fact could be behind the delayed effects in object control dependencies even though, as noted in the results section, including the ratings in the analyses did not change the pattern of results. We hope to be able to clarify this issue with the new set of improved materials created for Experiments 4-6.

In sum, with respect to the early access of control information at the point of dependency formation, our results failed to replicate the facilitation for object control dependencies found in previous studies, while they aligned with previous works in the absence of evidence in favor of the existence of a reanalysis process in subject control dependencies. Crucially, subject and object control dependencies were processed similarly at the infinitive verb, the point in which comprehenders receive the first bottom-up evidence for the presence of a PRO anaphor. In addition, we have obtained several effects at the adjective and PPI regions that point to

sensitivity to grammatical violations, even though these effects are not as robust as initially predicted, as they only appear for sentences in which none of the antecedents in the matrix clause matched in gender with the adjective, and particularly in subject control dependencies. As we will see below, the lack of strong evidence for sensitivity to grammatical violations can be explained by the presence of interference effects. This indicates that lexical control is not the only source of information that is used to integrate the adjective in the embedded clause. It is necessary to evaluate the processes of interference affecting these structures before sketching a general account of how control information may be used to retrieve the antecedent of PRO and later used to integrate the embedded adjective. We turn to this below.

5.3.6.2 Interference effects in control dependencies

The eye-tracking results for the adjective and PPI regions revealed several interactions that point to the existence of interference effects in both subject and object control dependencies. The first effect of interest in this regard was found at the first-pass times of the adjective region in the form of an interaction among the factors CONTROL, GRAMMATICALITY, and DISTRACTOR which was driven by differences in subject control conditions. Specifically, post-hoc contrasts showed significant differences between grammatical and ungrammatical sentences with a mismatching distractor –shown in example (129) and repeated here as (131).

(131) a. María$_i$ **prometió** a Francisco$_j$ PRO$_i$ ser mucho más ordenada con los apuntes…

b.*Antonio$_i$ **prometió** a Francisco$_j$ PRO$_i$ ser mucho más ordenada con los apuntes…

Given that comprehenders were expected to detect grammatical violations, what is surprising is not the presence of significant differences between the sentences in (131) but, rather, the absence of differences between grammatical and ungrammatical sentences with a matching distractor –i.e. those in example (130) repeated below as (132). The pattern of contrasts (and lack thereof) obtained in the first-pass times of the adjective region is suggestive of inhibitory interference. Inhibitory interference effects are identified as an increased difficulty (i.e. processing slowdown) in dependency formation when the activation of the correct target licensor is hampered due to feature overlap with other items which make the target item less distinct in memory (cf. Chapter 1, §1.2). What is observed for subject control conditions is a facilitation for grammatical adjectives in which only the correct antecedent matches in gender

with the adjective (i.e. (131a)), leading to the grammaticality contrast. However, grammatical sentences in which both the correct antecedent (the NP1) and the distractor (the NP2) match in gender with the adjective (i.e. (132a)) are not read faster than their ungrammatical counterparts. Even though only the NP1 holds the appropriate semantic role to be taken as antecedent, the fact that there is another gender matching NP in the sentence could have led to competition, causing the slowdown that prevents the appearance of a grammaticality contrast. Nonetheless, such an interpretation must be taken with caution given that conclusive evidence in favor of this interpretation would be expected to arise as a significant contrast between grammatical sentences with matching and mismatching distractors (i.e. between (131a) and (132a)), a post-hoc contrast which did not reach statistical significance.

(132) a. María$_i$ **prometió** a Cristina$_j$ PRO$_i$ ser mucho más ordenada con los apuntes...

b.*Antonio$_i$ **prometió** a Cristina$_j$ PRO$_i$ ser mucho más ordenada con los apuntes…

The effects found in the first-pass times of the PP1 region depict a clear pattern of facilitatory interference such the reading times for ungrammatical sentences with matching distractor were as fast as those observed for grammatical sentences, and significantly different from those observed in ungrammatical sentences with a mismatching distractor. Yet, again, this effect is only present in subject control conditions –i.e. sentences like (132b). The presence of facilitatory interference regardless of the type of control is to be found in the go-past times of the PP1 region. The interaction between GRAMMATICALITY and DISTRACTOR clearly shows that the integration of ungrammatical sentences with a matching distractor is facilitated regardless of linear distance. That is, it similarly affects subject control dependencies (e.g. (132b)), in which the distractor is the closest NP, and object control dependencies (e.g. (133)), in which the distractor is the most distant NP. The ease of processing for sentences containing matching distractor is further confirmed by the main effect of DISTRACTOR found in total times of the same region.

(133) *María$_i$ **aconsejó** a Francisco$_j$ PRO$_j$ ser mucho más ordenada con los apuntes...

Together, the results found at the PP1 represent evidence for an illusion of grammaticality because the processing of the ungrammatical adjectives is facilitated by the presence of a

distractor that matches in gender with the adjective. While grammatical illusions appear first in subject control sentences, as shown in first-pass times, the effects found in the go-past and total time demonstrate that control-irrelevant antecedents are considered during the integration of ungrammatical adjectives. In sum, as initially predicted, this experiment provides multiple evidence for the presence of facilitatory interference effects in ungrammatical sentences. This finding coincides with the results of the ratings collected in Experiment 2 and with the results from previous works which investigated the presence of interference effects in adjunct control dependencies (Parker et al. 2015) and complement control by nominals in subject control dependencies (Sturt & Kwon 2015). Indeed, our results come to reinforce the findings by Sturt & Kwon, who only found marginal evidence for the presence of grammatical illusions in late measures in subject control sentences. In this respect, an important contribution of this experiment regarding the literature on interference in sentence processing is that the results provide evidence that both subject and object dependencies are affected by facilitatory interference, which is taken to mean that such illusory processes can occur regardless of the linear position of the distractor. The fact that interference effects arise irrespectively of linear distance coincides with previous findings on agreement dependencies collected by Wagers et al. (2009), who found that agreement attraction effects can arise from NPs that preceded that agreement dependency, as the plural *musicians* in (134).

(134) *The musicians who the reviewer **praise** so highly will probably win a Grammy.

Furthermore, as already discussed, the results observed in the first-pass times of the adjective region are indirectly suggestive of possible inhibitory interference effects in grammatical sentences. This finding, which must be taken with caution, was not predicted on the basis of previous works on the processing of control dependencies (i.e. Parker et al. (2015) or Sturt & Kwon (2015)). Further experiments may confirm or disprove the trend found here. The interpretation of the underlying processes that generate these interference effects is crucial not only to examine the parallelisms between our results and those of previous works, but also to understand the role of control information and the reliability of the features of PRO during the integration the embedded adjective. Below we provide a general account of how this experiment contributes to a better understanding of the online use of lexical control information and the presence of interference effects.

5.3.6.3 Conflating the use control information and the presence of interference effects

After having observed the empirical evidence, it is clear that the two questions that this study addresses are partially interrelated. This is because the processing routines identified at the adjective and PP1 regions, which are clear in showing interference effects, are simultaneously relevant for the study of issues that have to do with the later use of control information in order to integrate the embedded adjective.

Regarding the early access of control information, the fundamental result from this experiment is the failure to replicate the object control facilitation observed in previous studies. The lack of differences between subject and object control dependencies at the point of dependency formation is compatible with the proposal that lexical control information is accessed and used in order to retrieve the antecedent of PRO when the infinitive verb is encountered. If this is correct, our results indicate that the time-course of such a process is similar for subject and object control dependencies. A crucial finding that supports this interpretation is the lack of any sign of reanalysis in subject control dependencies. However, it was initially striking that the results at the adjective and PP1 regions have not shown very straightforward effects of sensitivity to grammatical violations, particularly because previous studies on the processing of control information have revealed evidence that ungrammatical dependencies generated slower reading times and a higher probability of regressions. As explained above, we attribute this result to the presence of strong interference effects, even though this idea may initially contrast with the findings obtained by Sturt & Kwon (2015), who found simultaneous evidence for grammatical sensitivity and interference effects. Yet, it must be pointed out that Sturt and Kwon only found marginally significant evidence for facilitatory interference in late measures (and regions), while our results have uncovered the presence of facilitatory interference effects from early measures (and regions). This appears to indicate that there is a tradeoff between grammatical sensitivity and facilitatory interference, such that the presence of grammatical illusions is the factor that has mitigated the lack of grammaticality effects in sentences with a matching distractor. In addition, a further factor that might have contributed to this issue has to do with the presence of a high proportion of ungrammatical sentences in the experiment. 50% of the sentences across the task had grammatical violations, and this could have prompted participants to develop more superficial reading strategies. Unfortunately, neither Betancort et al. (2006) nor Sturt & Kwon (2015) report the ratio of

grammatical-to-ungrammatical sentences in their study, even though it is a common practice to reduce the number of ungrammatical sentences in reading studies. In Experiments 5 and 6 we will reduce the number of ungrammatical sentences across the task in an attempt to further investigate the presence of grammaticality effects.

The lack of clear grammaticality effects, together with the strong evidence for interference effects indicates that control information is not the only source of information that is used to integrate the adjective in the embedded clause. Instead, our results show that control-irrelevant antecedents are accessed during the integration of the adjective. When it comes to interpreting the interference processes that affect the integration of the adjective it is important to remember that there are two dependencies –and thus two retrieval events– being established in the embedded clause. The first one is initiated when participants encounter the infinitive verb: the PRO-antecedent dependency. The dependency initiated at the infinitive verb does not include gender information because it is triggered by a null element (the null subject PRO), and therefore, the retrieval of an antecedent cannot be affected by the (similar or differing) gender of the nouns in the matrix clause. At this point, the antecedent of PRO can only be retrieved on the basis of lexical control information, which is the only source of information available. The second retrieval event takes place when comprehenders encounter the embedded adjective: the adjective-PRO dependency. Grammatical constraints impose that the adjective must be licensed on the basis of its compatibility with the gender features of the implicit subject PRO. This means that when comprehenders reach the embedded adjective, there are two sources of information available for the retrieval of a target: the features of the implicit subject activated at the infinitive verb on the basis of control information and the gender agreement morphology of the adjective itself. It is at the retrieval event initiated at the adjective where we found evidence for facilitatory interference (i.e. a grammatical illusion).

The fundamental question here has to do with the processes that give rise to these interference effects. Our results related to facilitatory interference coincide with previous works that studied interference effects in control dependencies (i.e. Parker et al. 2015; Sturt & Kwon 2015). In these works, instead of introducing an embedded adjective, the authors manipulated the gender of an embedded reflexive pronoun. These authors lay out two possible routes through which interference effects could occur. One possibility is that the effects found at the reflexive pronouns track the interpretation of PRO, and thus, result from a dependency that is mediated by PRO. In other words, the reflexive pronoun is thought to initiate a retrieval process through

which it is fistly linked to the implicit subject of the embedded clause. Then, in cases in which there is a mismatch between the features of the embedded reflexive and those of PRO, a second retrieval event is launched using the gender features of the reflexive, retrieving a partially matching antecedent from the matrix clause. Under this possibility, the effects found at the reflexive pronoun reflect an error-driven repair mechanisms for the PRO-antecedent dependency, which means that this second retrieval process entails a recalculation of the PRO-antecedent dependency. An alternative possibility is that the interference effects found at the reflexive pronouns are the result of a direct link to one of the NPs in the matrix clause, without being mediated by the null subject of the embedded clause.

The works by Parker et al. (2015) and Sturt & Kwon (2015) provide compelling evidence showing that the reflexive pronoun introduced in the embedded clause in their stimuli is quite possibly tracking the interpretation of PRO. This is because they show that reflexive pronouns by themselves do not induce interference effects (see also Dillon et al. 2013), and thus, this justifies the assumption that the integration of the reflexive is always mediated by the PRO-antecedent dependency. Even though there is no a priori reason to believe that the interference processes observed in our sentences should occur through a different process from the ones observed in the works by Parker et al. and Sturt & Kwon, a fundamental difference between our work and the two studies discussed above is that our distractor manipulation occurs in an adjective, not a reflexive pronoun. Adjectives have been found to generate interference effects in sentence processing investigations in Spanish (e.g. Acuña-Fariña et al. 2014) and thus, the results at our disposal so far do not allow us to directly arbitrate among the two possibilities sketched above using the same line of argumentation.

In the remaining experiments we will replicate this work using a new set of experimental materials which will hopefully clarify some of the (sometimes puzzling) results obtained in this task. Experiment 4 will present the results from an offline acceptability rating conducted on the new set of items, and Experiment 5 will put this new set of items to test using the self-paced reading technique. Finally, in Experiment 6 we will produce a close replication of the work by Betancort et al. (2006).

5.4. EXPERIMENT 4: OFFLINE ACCEPTABILITY

This experiment was conducted in order to investigate the offline acceptability status of a new set of experimental sentences that will be then tested using a self-paced reading task

(Experiment 5) and an eye-tracking task (Experiment 6). Based on the results from the previous offline rating (Experiment 2), our starting prediction is that native speakers of Spanish will be able to easily detect agreement violations that do not conform with the control readings of predicates.

This new set of materials was built in an attempt to overcome several problematic issues observed in the previous experiments. One of the primary worries regarding the results from Experiment 2 is that object control sentences received slightly lower ratings than subject control sentences. We believe that this unexpected result could have originated from the fact, in a small proportion of sentences, some of the continuations in the embedded clause fitted slightly better with the meaning of subject control verbs than with object control verbs. It is possible that this issue could have had an impact in the reading patterns observed in Experiment 3 (such as the delayed effects in object control conditions). In order to mitigate this problem, we made a special effort to ensure that the contents of the embedded clause provided an equally natural continuation for subject and object control verbs. This was a difficult challenge given that subject and object control verbs have very different (and in many cases opposite) meanings. The results from this task will confirm whether we have succeeded in doing so. Apart from this, one of the most important changes implemented in this new set of stimuli has to do with the inclusion of the preverbal clitic *le*. In Spanish, ditransitive constructions such as the ones used in this investigation allow for the indirect object complement –the NP2 in our sentences– to be optionally doubled by the pronominal clitic *le* (Campos 1999), as shown in (135):

(135) Juan **le** prometió/ordenó **a Pedro** ser más cuidadoso.

Even though the inclusion of the clitic pronoun does not have an impact on the control readings of the sentences, originally, we had avoided using it in order to keep as close as possible to the materials used in Betancort et al. (2006).[102] Yet, in our view, the inclusion of *le* has several advantages. First, it ensures that the presence of the indirect object (i.e. the NP2) can be anticipated regardless of whether it appears with subject or object control verbs because, in both cases, the pronoun announces the presence of an indirect object. Thus, including *le* serves the strategy of trying to surpass the frequency preference for indirect objects to be more frequently

[102] Even though Betancort et al.'s (2006) sentences did not include it the preverbal clitic *le*, an unpublished study by Demestre & García Albea (1996) conducted in Spanish makes use of this pronoun in the stimuli.

encountered with object control verbs than with subject control verbs. Consequently, its inclusion allows us to (at least partially) mitigate any frequency effects that could be confounded with control-related effects. Second, the inclusion of the clitic pronoun makes the sentences sound more natural and, by extension, easier to parse. In this regard, we have adopted two further measures that allowed us to reduce the complexity of the stimuli, making the sentences shorter while keeping the clausal relations of interest. We eliminated the second PP region in the embedded clause and used shorter and more frequent nouns in NP1 and NP2 positions. It must be noted that, in the first set of stimuli, we had selected nouns with a minimum number of 7 characters in an attempt to reduce parafoveal preview effects of the infinitive region from the NP2 region. This decision forced us to use complex long names which in some cases had low frequencies, an issue which has possibly made the sentences sound less natural. This time, we have decided to foster naturalness, and thus, we put particular care in selecting a highly frequent set of nouns to be used in NP1 and NP2 positions.

5.4.1 Participants

40 native speakers of Spanish recruited at the University of Santiago de Compostela (25 female, mean age: 30 y/o) participated in this experiment. Their participation was voluntary and all of them provided informed consent. All the participants were pursuing (or had finished) university-level studies and reported speaking other languages apart from Spanish with different levels of proficiency (mainly Galician and English).

5.4.2 Materials

The experimental materials consisted of 96 items that, albeit similar, were less complex in comparison with the items used in Experiments 2 and 3. As anticipated above, the most important modification had to do with the inclusion of the pre-verbal clitic *le* and the fact that these new sentences are considerably shorter. The experiment has a 2x2x2 design that fully crosses the factors CONTROL (subject/object), GRAMMATICALITY (grammatical/ungrammatical) and DISTRACTOR (match/mismatch). Each item had 8 different versions that were created by manipulating the type of control verb and the gender of the nouns, while keeping the gender of the adjective constant. The verbs used to create the stimuli were the same 24 control verbs used in Experiments 2 and 3. Also, 50% of the items had feminine adjectives and the other 50% had masculine adjectives, and the use of the copulative verbs *ser* and *estar* was counterbalanced

across the items. An example set of the experimental conditions is provided in Table 14 and the entire list of experimental materials, including an English version of Table 14, can be consulted in Appendix C.3.

Table 14. Experimental materials for Experiment 4.

Subject control		
Gram.	**D. Match**	María$_i$ le prometió$_j$ a Carmen$_j$ PRO$_i$ ser más **ordenada** con los apuntes.
	D. Mismatch	María$_i$ le prometió$_j$ a Manuel$_j$ PRO$_i$ ser más **ordenada** con los apuntes.
Ungr.	**D. Match**	José$_i$ le prometió$_j$ a Carmen$_j$ PRO$_i$ ser más **ordenada** con los apuntes.
	D. Mismatch	José$_i$ le prometió$_j$ a Manuel$_j$ PRO$_i$ ser más **ordenada** con los apuntes.
Object control		
Gram.	**D. Match**	María$_i$ le ordenó a Carmen$_j$ PRO$_j$ ser más **ordenada** con los apuntes.
	D. Mismatch	José$_i$ le ordenó a Carmen$_j$ PRO$_j$ ser más **ordenada** con los apuntes.
Ungr.	**D. Match**	María$_i$ le ordenó a Manuel$_j$ PRO$_j$ ser más **ordenada** con los apuntes.
	D. Mismatch	José$_i$ le ordenó a Manuel$_j$ PRO$_j$ ser más **ordenada** con los apuntes.

The 8 minimally different conditions were distributed in 8 lists using a Latin Square design together with 96 filler sentences of similar structure and complexity (=192 sentences in total). The filler sentences were the same in each list. 48 fillers contained ungrammaticalities in order to achieve a 1:1 grammatical-to-ungrammatical ratio across the task. The grammatical violations included preposition usage, person and number agreement and verbal morphology. Given that each control verb had to be repeated 4 times, special care was put so that each of the four verb repetitions occurred in a different condition (i.e. a different combination of the factors *grammaticality* and *distractor*). Moreover, the materials were divided into 4 blocks in order to ensure that each verb repetition occurred in a different block. Each block contained 24 experimental items and 24 fillers. The sentences from this acceptability judgement will also be tested in a self-paced reading and an eye-tracking task. For this reason, they were built respecting a number of psycholinguistic properties that are known to impact reading latencies (e.g. number of characters, frequency, etc.). Inasmuch as this information is specifically relevant for online sentence processing methods, it will be detailed in the materials section of the next experiment (§5.5.2).

5.4.3 Procedure

The procedure for this task was the same as in Experiment 2 of this chapter. The stimuli were delivered using Ibex (Drummond 2013). Participants were presented with the entire sentence in the middle of the screen along with a rating scale. Each sentence was presented in an individual screen and participants could only move to the next one once they had emitted a rating by clicking on the scale numbers or, alternatively, using the numbers on their keyboard. Participants were instructed to rate the sentences according to their acceptability in a 7-point scale in terms of whether they came across as well-formed Spanish: 7 meaning totally acceptable and 1 totally unacceptable. In order to help them adjust to the scale, the experiment started with two practice items that were followed by feedback on "the rating that most people would give in that case" (1 or 2 for an ungrammatical example and 6 o 7 for a grammatical one). Participants were encouraged to take as much time as they needed and to use the entire range of the scale. Even though the experimental materials were divided in 4 blocks, no break was introduced between them. The order of presentation of the sentences in a given block in each list was pseudo-randomized in order to ensure that two items of the same condition would not be presented adjacently. The task was completed by all participants in less than 30 minutes.

5.4.4 Analysis

The ratings collected were analyzed using a linear mixed-effects model that included the three experimental factors as fixed effects and a random structure that included by-participant and by-item intercepts and slopes for all fixed effects. Due to convergence problems, the interaction terms were dropped from the random effects structure.

5.4.5 Results

The rating for each condition is presented in Figure 18. The statistical analyses revealed significant main effects of GRAMMATICALITY ($F(1,43.4)=809.88$, $p<.001$) and DISTRACTOR ($F(1,40.4)=12.26$, $p=0.001$). As expected, grammatical sentences received much higher ratings than ungrammatical ones. Furthermore, sentences containing a matching distractor received better ratings than sentences with a non-matching distractor. Importantly, the model also revealed a significant interaction between the factors GRAMMATICALITY and DISTRACTOR ($F(1,3433.1)=5.29$, $p=0.021$). Planned comparisons showed that this interaction was driven by a significant effect of DISTRACTOR only in ungrammatical sentences. This is shown in

significant higher ratings for the distractor match condition in ungrammatical sentences (match vs. mismatch: estimate= 0.29, SE=0.07, *z*.ratio=4.17, *p*<.001) but not in grammatical sentences (match vs. mismatch: estimate= 0.09, SE=0.07, *z*.ratio=1.30, *p*=0.192).

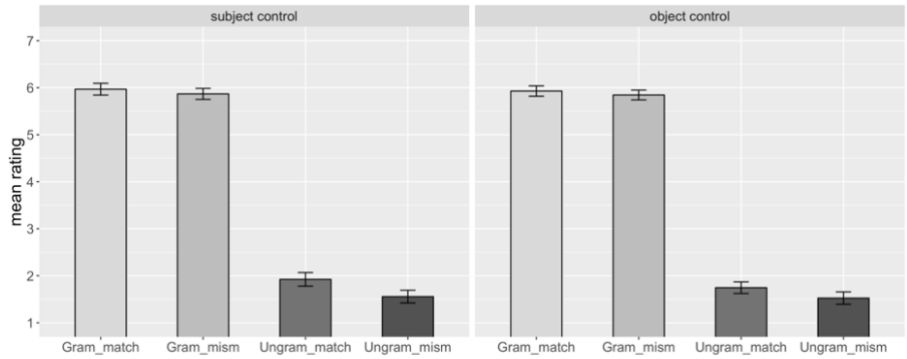


Figure 18. Mean ratings for the experimental conditions in Experiment 4. Error bars indicate the standard error of the mean.

5.4.6 Discussion

The results from this experiment clearly show that native speakers are able to detect agreement violations that arise when the adjective did not match in gender the appropriate antecedent. As in Experiment 2, grammatical conditions received much higher ratings than ungrammatical conditions, a result which also provides a confirmation that this new set of items displays unequivocal control readings. Crucially, subject and object control sentences were rated similarly across all four conditions, which means that these items successfully overcome the complication found in the previous set of items, in which object control sentences had received slightly lower ratings than subject control ones.

In addition to the clear contrast between grammatical and ungrammatical conditions, an important result from this experiment is that there is evidence for interference effects in ungrammatical sentences. That is, ungrammatical sentences with a matching distractor received slightly higher ratings than ungrammatical sentences with a mismatching distractor, an effect that is shown in the interaction between the factors GRAMMATICALITY and DISTRACTOR. This effect coincides with the findings from Experiment 2, and shows that even when participants are given unlimited time, the presence of a matching distractor leads them to accept ungrammatical sentences more often than when the distractor did not match in gender with the adjective. Crucially, this effect appeared equally in subject and object control conditions, and represents evidence for an offline illusion of grammaticality. Also, as in Experiment 2, there is

no evidence for a parallel effect in grammatical sentences, which were rated equally regardless of the presence of a matching distractor. The lack of interference effects in grammatical sentences was an expectable result, as there is no prior reason to believe that there could be inhibitory interference (or illusions of ungrammaticality) in an offline rating, in which participants only had to judge whether the sentence was acceptable or not. If anything, the presence of two nouns of the same gender would only ease the task of judging the correctness of the sentence, even though the results show that both types of grammatical sentences received equally high ratings. The fact that we have found offline evidence for the presence of interference effects questions the traditional restrictive definition of the concept of grammatical illusions, which is normally articulated on a clear-cut contrast between offline and online results. In the next experiment we will test the online processing of this new set of items using a self-paced reading procedure.

5.5 EXPERIMENT 5: SELF-PACED READING

Once Experiment 4 has proven that this new set of materials exhibit a clear grammaticality profile and unequivocal control readings, this experiment was carried out in order to test the online comprehension of the sentences using the self-paced reading method. This task will allow us to further inquire into the use of lexical control information and the presence of grammatical illusions and other interference effects using a different online method. Moreover, there are two particular issues from Experiment 3 that we hope to be able to clarify here.

The first issue that we want to narrow down is the possible existence of a facilitation for object control sentences over subject control ones at the point of PRO-antecedent dependency formation –i.e. the infinitive verb. The results from Experiment 3 have not replicated the object control facilitation observed in the works by Betancort et al. (2006) and Kwon & Sturt (2016). The lack of differences between subject and object control dependencies is compatible with the view that the null subject PRO is assigned an antecedent on the basis of verb control information as soon as the infinitive is encountered, and that this process takes place in the same fashion in both types of dependencies. Our results from Experiment 3 seem to point in that direction, given that subject and object control sentences showed similar reading times at the infinitive region and there was no evidence for reanalysis in subject control sentences. Notwithstanding the above, in Experiment 3 we have obtained some extraneous effects at the NP2 region whose origin we have not been able to trace. We believe that these effects cannot be tied to the use of

control information because they only affected a subset of the object control conditions. As we speculated, it is possible that such effects could have arisen from differences in the integration of some of the names used in the task, perhaps in conjunction with the fact that the integration of NP2s could have been facilitated in the context of object control verbs because these verbs appear more frequently with overt indirect objects. As already explained in Experiment 4, these new materials include two changes that will allow us to control for this. We hope that these changes will allow us to clarify whether there is a facilitation for object control sentences that could be related to the early access of verbs' lexical control information.

The second issue that we hope to clarify here has to do with comprehenders' sensitivity to grammatical violations. The results from Experiment 3 did not coincide with previous works in showing a straightforward pattern of grammatical sensitivity. As already discussed, we believe that the main reason behind the lack of straightforward grammaticality effects had to do with the presence of facilitatory interference effects in ungrammatical sentences with a matching distractor. Nonetheless, it was still surprising that evidence showing clear grammaticality effects did not appear at least in late eye-tracking measures, particularly because the offline rating results showed that native speakers could clearly detect the contrast between grammatical and ungrammatical sentences. It is possible that the high proportion of grammatical violations across the task –50% of the sentences contained ungrammaticalities– could have pushed participants to develop superficial reading strategies that would allow them to pay less attention to grammatical violations, prioritizing the comprehension of the overall meaning of the sentences. While the impact of the proportion of grammatical violations in experimental designs is an issue that has not been investigated in depth, it is a common procedure to reduce the proportion of ungrammatical sentences in reading studies, a strategy that has been used in many self-paced reading and eye-tracking experiments on the topic of grammatical illusions (e.g. Wagers et al. 2009; Dillon et al. 2013; Parker & Phillips 2016; Schlueter et al. 2018 inter alia). Following these works, we have reduced the ratio of grammatical to ungrammatical sentences by including only grammatical fillers. We hope that this modification will allow us to observe a clearer pattern of sensitivity to grammatical violations, while simultaneously, we expect that this experiment will provide further insights into the presence of interference effects, replicating the results from Experiment 3.

5.5.1 Participants

50 native speakers of Spanish recruited at the University of Santiago de Compostela (40 female, mean age: 19 y/o) participated in this experiment. Their participation was voluntary and all of them provided informed consent. All the participants were pursuing university-level studies and reported speaking other languages apart from Spanish with different levels of proficiency (mainly Galician and English).

5.5.2 Materials

The experimental materials for this self-paced reading task were exactly the same 96 items used in the previous acceptability judgement (Experiment 4). The experimental conditions were formed by crossing the three experimental factors: CONTROL (subject/object), GRAMMATICALITY (grammatical/ungrammatical) and DISTRACTOR (match/mismatch). An example set is repeated in Table 15 and the entire list of experimental materials, including an English version of Table 15, can be consulted in Appendix C.3.

Table 15. Experimental materials for Experiment 5.

Subject control		
Gram.	**D. Match**	María$_i$ le prometió$_j$ a Carmen$_j$ PRO$_i$ ser más **ordenada** con los apuntes.
	D. Mismatch	María$_i$ le prometió$_j$ a Manuel$_j$ PRO$_i$ ser más **ordenada** con los apuntes.
Ungr.	**D. Match**	José$_i$ le prometió$_j$ a Carmen$_j$ PRO$_i$ ser más **ordenada** con los apuntes.
	D. Mismatch	José$_i$ le prometió$_j$ a Manuel$_j$ PRO$_i$ ser más **ordenada** con los apuntes.
Object control		
Gram.	**D. Match**	María$_i$ le ordenó a Carmen$_j$ PRO$_j$ ser más **ordenada** con los apuntes.
	D. Mismatch	José$_i$ le ordenó a Carmen$_j$ PRO$_j$ ser más **ordenada** con los apuntes.
Ungr.	**D. Match**	María$_i$ le ordenó a Manuel$_j$ PRO$_j$ ser más **ordenada** con los apuntes.
	D. Mismatch	José$_i$ le ordenó a Manuel$_j$ PRO$_j$ ser más **ordenada** con los apuntes.

The experimental conditions were counterbalanced in 8 lists together with 96 grammatical filler sentences (=192 sentences in total). Only 25% of the sentences across the experiment were ungrammatical, and consequently, the ratio of ungrammatical-to-grammatical sentences was reduced in comparison with Experiment 3. The items were divided into 4 blocks ensuring that each verb repetition occurred in a different block. Each block contained 48 sentences (24 experimental items and 24 fillers).

The experimental materials were controlled for different psycholinguistic properties that are known to impact reading times. The two groups of control verbs selected –12 subject and 12 object control– were the same as in Experiments 2 and 3. Thus, the analyses discussed in §5.3.2 apply here too: the two groups of verbs did not differ in frequency, number of characters and the proportion of preferred control responses obtained in Experiment 1. The only remarkable difference between subject and object control verbs has to do with the probability of appearing with an over indirect object (i.e. the NP2), which is higher for object control verbs, although we hope that the inclusion of the preverbal clitic *le* will mitigate any possible differences that could arise from this frequency preference.

Special care was put in order to select proper names of high frequency. In order to achieve this, nouns with less than 7 characters were also used, in contrast with Experiments 2 and 3. The masculine and feminine nouns selected were of equal frequency[103] (*feminine:* log. freq. mean=4.85, SD= 0.31; *masculine:* log. freq. mean=4.85, SD=0.41; $t(190)= 0.03$, $p=0.97$) and number of characters (*feminine:* mean= 6, SD=1.32; *masculine:* mean=6, SD=1.32; $t(190)=0$, $p=1$). In order to ensure that the distribution of nouns in NP1 and NP2 position did not differ in frequency and number of characters, the nouns that appeared in NP1 position in the first half of the items were used in NP2 position in the second half, and vice-versa. The adjective was kept constant across conditions. A set of feminine and masculine adjectives was carefully selected so that they displayed similar frequency (*feminine:* log. freq. mean=0.70, SD=0.40 ; *masculine:* log. freq. mean= 0.63, SD=0.50; $t(94)= 0.65$, $p=0.51$) and number of characters (*feminine:* mean=8.62, SD=1.80; *masculine:* mean=8.66, SD=2; $t(94)=-0.10$, $p=0.91$). The region following the adjective (i.e. the PP1 region) always displayed the same structure: a prepositional phrase (e.g. *con los apuntes/with the notes*), ranging from 10 to 26 characters, including spaces.

In order to ensure that participants were reading for comprehension, 40% of the sentences were followed by a yes/no question. These comprehension questions addressed pieces of information located in different parts of the sentence so that participants were forced to pay equal attention to all the sentence regions. The questions were equally distributed across experimental and filler items. The probability of providing a positive or a negative answer was balanced. Participants that did not answer at least 80% of the questions correctly were not included in the analysis. Details of participant exclusion are given in the results section. During

[103]According to the census from the Spanish National Institute for Statistics (INE, 2017).

the delivery of the instructions, participants were asked to complete 2 practice items to ensure that they had understood the procedure.

5.5.3 Procedure

The self-paced reading task was implemented in Ibex (Drummond 2013) using the non-cumulative word-by-word moving window version of the self-paced reading procedure (Just et al. 1982). In this version of the task, participants are presented with the entire sentence on the screen with each word masked by dashes and separated by spaces. When the predefined key is pressed (the space bar in this case), the first word is revealed. When the space bar is pressed one more time, the second word appears and the first word is re-masked, and so on. By collecting the time elapsed between bar-presses, this task allows us to measure the time spent in each word. Participants were instructed to keep their fingers on the selected keys (i.e. the space bar and yes/no keys) for the entire session. This way, they could move forward easily at their own pace and answer the questions as accurately and as fast as possible. Even though the experimental materials were divided in 4 blocks, no break was introduced between them. The order of presentation of experimental and filler sentences in a given block in each list was pseudo-randomized in order to ensure that two items of the same condition would not be presented adjacently. All participants were tested using the same computer and all of them finished the task in less than 45 minutes.

5.5.4 Analysis

Prior to analysis, unrealistic reading times were first deleted following standard practices in the self-paced reading literature (see for example Hofmeister 2011; Nicenboim et al. 2016). These included RTs above 2500ms. and below 100 ms., which are possibly the product of spurious delays or erroneous button presses that might obscure the initial stages of model fitting (Baayen 2008). This procedure resulted in the exclusion of 0.16% of the data across all sentence regions and 0.18% of the data in the regions of interest. Mean RTs for the experimental conditions were then compared in the five regions of interest shown in Table 16: the second NP (region 5), the infinitive verb (region 6), the adverb (region 7) the adjective (region 8) and the following word, which in this case is always a preposition (region 9). Regions 5, 6 and 7 are relevant in order to track early effects of control information. Regions 8 and 9 allow us to track effects related to

the integration of the adjectives in terms of interference effects and sensitivity to grammatical violations.

Table 16. Regions of interest of the experimental sentences.

1	2	3	4	5	6	7	8	9	10	11
María	le	prometió	a	Carmen	ser	más	ordenada	con	los	apuntes

The reading times in these four regions were independently analyzed using a linear mixed effects model that included as fixed effects the main effects and interactions of the experimental factors (GRAMMATICALITY, CONTROL and DISTRACTOR). In addition, we included trial order as a covariate for all regions with the exception of region 6, where it could not be included due to convergence problems. When using the self-paced reading procedure, it is common that the effects shrink across the task (Prasad & Linzen 2019). Including trial order in the model allows us to control for task-adaptation effects. Participants and items were crossed as random effects. For each of the five regions of interest, we evaluated the inclusion of a fully specified random effects structure, with by-participant and by-item random intercepts and slopes for the experimental factors. This maximal model failed to converge in most cases and thus, the random structure was simplified following the recommendations in Barr and colleagues (2013). The results reported in the next section correspond to the model with the maximally converging random effects structure for each region. The detailed structure of the model reported can be consulted in Appendix D.2. The analyses were performed on a transformation of the RTs determined using the Box-Cox procedure (Box & Cox 1964; see also Vasishth & Nicenboim 2016) in order to ensure a normal-like distribution of the model residuals. The power transformation applied for each model is also specified in Appendix D.2. Although the analyses of the latency data were carried out over the transformed RTs, whenever estimates are reported, these are shown in milliseconds.

5.5.5 Results

The acceptance threshold for accuracy in the questions was set to 80% to ensure that the final sample only contained participants that were reading for comprehension. No participant had to be excluded from the analysis due to poor performance. The mean accuracy in the

comprehension questions was 95% (SD: 0.03%). The results for the reading latencies are shown in Figure 19.

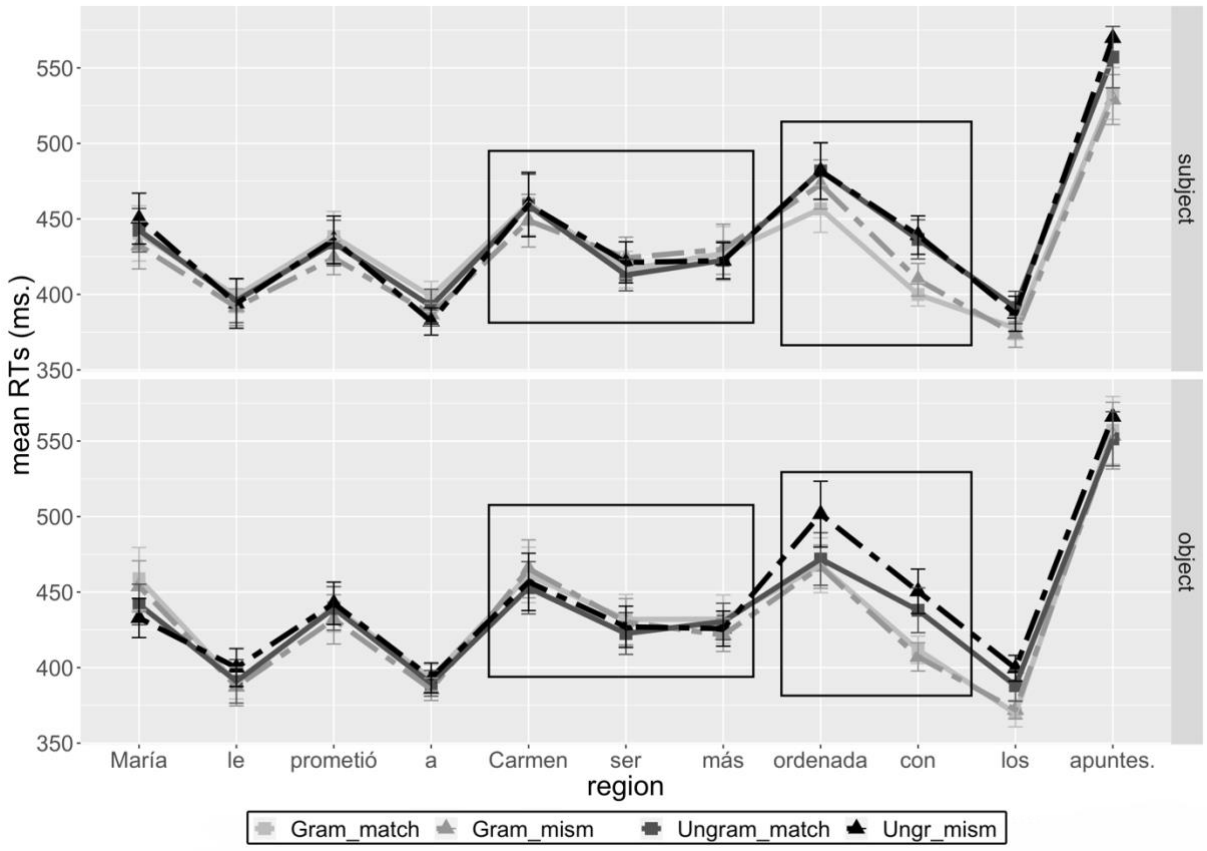


Figure 19. Word-by-word RTs for subject (top) and object (bottom) control sentences. The regions of interest are signaled inside a square.

No contrast reached statistical significance in the analyses of the NP2 (region 5), the infinitive (region 6) or the adverb (region 7). The model results for the adjective (region 8) showed a significant main effect of GRAMMATICALITY (estimate=-18.9, $F(1,170.1)=5.58$, $p=0.019$) –with ungrammatical sentences showing slower RTs– and a higher-order three-way interaction among the factors CONTROL, GRAMMATICALITY, and DISTRACTOR ($F(1,4585)=5.47$, $p=0.020$, Figure 20). Post-hoc tests revealed that this higher order interaction was driven by two significant contrasts that arose in subject control sentences. As shown in Figure 20 (left panel), the contrasts observed in subject control sentences are driven by the fact that grammatical sentences with a matching distractor were read faster than the other three conditions. Consequently, the planned comparisons showed two significant contrasts in subject control sentences: first, between grammatical and ungrammatical sentences along the level of distractor

match (estimate=-30.29, *z*.ratio=-2.80, *p*=0.005), and second, between distractor match and mismatch conditions in grammatical trials (estimate=-20.95, *z*.ratio=-2.59, *p*=0.009). In spite of the fact that the opposite pattern seems to be occurring in object control sentences (Figure 20, right panel), neither the contrast between grammatical and ungrammatical conditions along the level of distractor mismatch nor the contrast between distractor match and mismatch conditions in ungrammatical sentences survived Hochberg's correction for multiple comparisons.[104] Finally, the model results for the adjective's spillover region (region 9, the preposition) showed a significant effect of grammaticality (estimate= -34, $F(1,109.4)=66.8$, $p<0.001$) –with ungrammatical sentences displaying slower RTs.

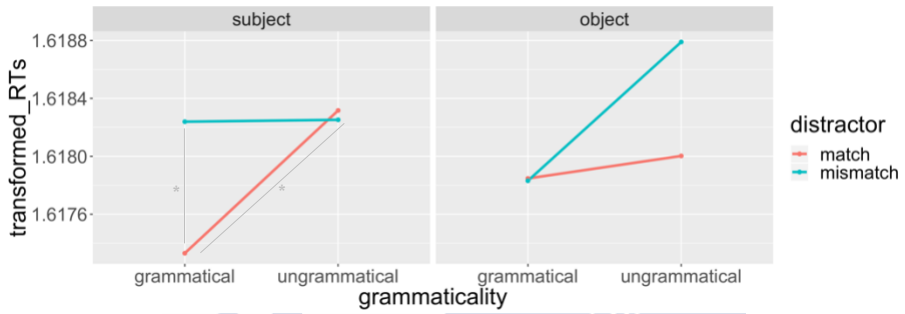


Figure 20. *Control* x *Grammaticality* x *Distractor* interaction at the adjective region.

5.5.6 Discussion

The results from this experiment can be summarized in three main points: first, no differences between subject and object control dependencies were obtained at the point of dependency formation. Second, the three-way interaction found at the adjective region is indicative of an interesting pattern of interference. Third, there is clear evidence for grammatical sensitivity in both subject and object control conditions. We will examine how these results inform the two main goals of this work: the use of verb control information in the online resolution of PRO-antecedent dependencies and the presence of grammatical illusions and other patterns of interference during the integration of the adjective.

With regard to the access and use of lexical control information, the results from this task coincide with the eye-tracking results from Experiment 3 in that there is no evidence pointing to a facilitation for object control dependencies. At the infinitive verb, the word that signals the PRO-antecedent dependency, subject and object control sentences were read at a similar pace.

[104] Grammatical vs ungrammatical in distractor mismatch: estimate=-32.41, z.ratio=-1.95, *p*=0.051; Match vs. mismatch in ungrammatical sentences: estimate=-29.17, z.ratio=-1.80, *p*=0.072.

The lack of differences between subject and object control dependencies contradicts, once again, the recency effect reported in the eye-tracking results obtained by Betancort et al. (2006) and Kwon & Sturt (2016). Even though the timing information provided by the self-paced reading method is notably less fine grained compared to eye-tracking, there is no a priori reason to believe that self-paced reading is not an appropriate methodology to uncover early effects related to the formation of PRO-antecedent dependencies. A good example of this is the work by Parker et al. (2015), who used the self-paced reading method as a means to investigate PRO-antecedent dependencies in adjunct control constructions using an animacy manipulation (cf. §4.2.2). Their work uncovered evidence of sensitivity to plausibility mismatches as soon as the gerundive verb was encountered. In their stimuli, the gerundive verb was the word which signaled the presence of PRO-antecedent dependency, and thus, it is the equivalent sentence region to the infinitive verb in our materials. Their results, then, prove that the self-paced reading method is sensitive enough to detect effects at the point of dependency formation.[105]

In addition, this experiment has not replicated the intriguing contrasts obtained in Experiment 3 at the NP2 and adverb regions. It is important to emphasize that the materials used in this task contained several changes in comparison with the ones used in Experiment 3. In particular, we made a special effort to use highly frequent names in both NP1 and NP2 positions in an attempt to facilitate the integration of the matrix clause constituents. Furthermore, the inclusion of the pre-verbal clitic *le* made the NP2s equally predictable under both types of verbs and provided a syntactic test that all the NP2s used in subject and object control sentences are complements of the matrix verb. The lack of effects in this task provides indirect evidence suggesting that the improvement of the experimental materials eliminated the appearance of such extraneous contrasts that could not be tied to processes of PRO-antecedent dependency resolution. Nonetheless, it is also possible that the self-paced reading method is simply unable to capture such effects. Hopefully, the results from the next eye-tracking experiment (Experiment 6) will confirm or disproof this interpretation.

[105] In spite of the differences in terms of the dependent variable examined, the online plausibility monitoring task used by Boland et al. (1990) and Mauner et al. (1995; see also Mauner & Koenig 1999; and Mauner et al. 2002) is also informative when it comes to evaluating the appropriateness of the self-paced reading procedure. In this task, the presentation procedure was very similar to one used in the self-paced reading task: participants were asked to press a key so that the words appeared on the screen, and to press a different key when the sentence stopped making sense. The results showed immediate sensitivity to non-plausible continuations when the infinitive verb was encountered (cf. §4.2.1.2). This provides additional evidence that effects related to PRO-antecedent dependency formation can be detected using a self-paced presentation paradigm.

One of the most relevant results from this task is the main effect of GRAMMATICALITY observed at the preposition (region 9, the word following the adjective), which shows that ungrammatical conditions were read slower than grammatical ones in both subject and object control trials. This finding demonstrates that comprehenders are able to detect the ungrammaticality of adjectives that do not agree in gender with PRO irrespectively of the presence of a gender matching distractor. This is critical for the study of how lexical control information is used to resolve PRO-antecedent dependencies: the lack of differences between subject and object control dependencies at the point of dependency formation together with the clear detection of the grammatical violations suggests that lexical control information is accessed in order to retrieve the antecedent of PRO and later used to detect grammatical violations. The presence of grammaticality effects irrespective of the distractor manipulation contrasts with the results of Experiment 3, which did not show such a straightforward pattern of grammatical sensitivity. Possibly, the improvement of the experimental materials, together with the reduced ratio of grammatical-to-ungrammatical sentences has contributed to provide a clearer scenario to observe these effects.

It is a well-known fact that, in the self-paced reading technique, the effects of the manipulation are highly likely to spill over the region following the critical word, a behavior that is generally understood as a consequence of the task procedure (McDonough & Trofimovich 2012; Mitchell 1984; Vasishth 2006). For this reason, it is unsurprising that the grammaticality effects manifest at the following preposition rather than at the adjective itself, and this does not (necessarily) entail that grammatical sensitivity is a delayed effect. In spite of that, the three-way interaction found at the adjective region reveals interesting effects which must be examined in detail in order to trace routes of retrieval events that are triggered during the integration of the adjective.

As shown by the post-hoc contrasts, the interaction observed at the adjective is driven by significant differences among subject control sentences which reveal an interesting pattern of interference. What these contrasts indicate is that the reading times in grammatical sentences with a matching distractor such as (136a) –those in which both the target and the distractor NPs matched in gender with the adjective– were read faster than the other three conditions. This result points to the existence of a gender familiarity effect by which the presence of two NPs that have the same gender as the adjective increases comprehenders' confidence that the adjective has the correct gender. Simultaneously, the reading times for grammatical sentences

with a mismatching distractor (e.g. (136b)) were read significantly slower than (136a). Indeed, the reading times for this type of sentences were as slow as those observed for the two ungrammatical conditions. This means that integration of the adjective *ordenada* (*tidy*) in sentences like (136b) is penalized even though it agrees in gender with the correct antecedent of PRO (i.e. *María*).

(136) a. María$_i$ le prometió$_j$ a Carmen PRO$_i$ ser más ordenada con los apuntes.

b. María$_i$ le prometió a Manuel$_j$ PRO$_i$ ser más ordenada con los apuntes.

The gender familiarity effect by which the presence of two NPs bearing the same gender features as the adjective facilitate its integration is the exact opposite process of what is defined as inhibitory interference. Such an effect is initially surprising considering the results of Experiment 3, in which it was actually sentences like (136b) the ones that were found to be read faster at the adjective region. Indeed, the results for this region in Experiment 3 were seen as suggestive of inhibitory interference in subject control conditions (see §5.3.6.2). In spite of the contrast between Experiments 3 and 5 in this regard, this is not the first experiment in which a gender familiarity effect is identified during the resolution of anaphoric dependencies. The work conducted by Parker et al. (2015, experiment 3), which focused on the resolution of reflexive anaphors, reports that the presence of multiple gender matched licensors in grammatical conditions equivalent to (136a) initially increased reading times at the gerundive verb (i.e. inhibitory interference) and later facilitated reading times in the same conditions at the reflexive (i.e. gender familiarity effect). The time-course of their findings then shows that, rather than being mutually exclusive, these two types of interference effects can go hand in hand. Furthermore, a contrast of the sort found here is also reported in two experiments carried out by Cunnings & Felser (2013). In this study, the authors analyze the impact of comprehenders' working memory capacity (WMC) during reflexive-antecedent dependency resolution.[106] As here, their study manipulated the gender of two preceding NPs with respect to the reflexive pronoun, and they found that participants in the low WMC group exhibited faster reading times in grammatical sentences with a matching distractor than in similarly

[106] To the best of our knowledge, this is the only investigation that uses WMC as a measure of individual-level differences in the study of interference processes in anaphoric dependencies.

grammatical sentences in which the target and the distractor were of different gender. In other words, a gender similarity effect.

Furthermore, the slow reading times observed at the adjective region in sentences like (136b) suggest that that control-irrelevant NPs interfere during the integration of the adjective in grammatical sentences. What is crucial here is that, in this condition, there is a closer NP that mismatches in gender with the adjective (i.e. the object NP *Manuel*). Thus, we believe that the presence of a closer NP that (albeit control-irrelevant) mismatches in gender with the adjective interferes in the correct integration of the adjective in early stages, generating as big a slow-down that it patterns with ungrammatical conditions. The interest of the results observed in subject control sentences at the adjective region lies in the fact that they reveal the presence of interference effects in grammatical sentences. Crucially, the uncovered pattern of interference goes in the opposite direction of what is described as inhibitory interference in the context of the cue-based retrieval model. That is, instead of finding a slow-down in grammatical sentences with two NPs that agree in gender with the adjective, the integration of the adjective is actually facilitated in these sentences. Simultaneously, an interference effect is observed in grammatical sentences in which the object distractor (the NP that is closer to the adjective) mismatches in gender with the adjective. This indicates that the proximity of the distractor with respect to the adjective appears to matter, as such an effect is only present in subject control conditions.

One issue that should be considered when examining the slow reading times observed for subject control grammatical sentences with a mismatching distractor (i.e. (136b)) has to do with the inclusion of the preverbal clitic *le*. One might speculate that the presence of the object clitic could have enhanced the saliency of the NP2 (the distractor), motivating the slow down interpreted as an interference effect. Nonetheless, if this idea was on the right track, it is quite surprising that there is no evidence for facilitatory interference (i.e. a grammatical illusion) in subject control ungrammatical sentences with a matching distractor. That is, for sentences like (137). This is because, in these cases, the partially matching distractor (e.g. *Carmen*) is not only the closer NP with respect to the adjective, but also, its saliency would also be enhanced by the presence of the clitic pronoun. Yet, in this task, the two subject control ungrammatical sentences exhibit similar reading times at the adjective region.

(137) *José$_i$ le prometió a Carmen$_j$ PRO$_i$ ser más ordenada con los apuntes.

There are several reasons why the lack of facilitatory interference effects in subject control sentences (e.g. (137)) is initially surprising. First, the offline ratings collected in Experiment 4 showed that the prevalence of grammatical illusions was similar in subject and object control dependencies. Second, Sturt & Kwon (2015) have reported facilitatory interference effects in subject control dependencies using eye-tracking. Third, the eye-tracking results from Experiment 3 provided evidence that both subject and object control dependencies were subject to grammatical illusions. Furthermore, the lack facilitatory interference in subject control dependencies in this self-paced reading task contrasts with the trends observed in object control dependencies. Even though post-hoc contrasts in object control conditions do not survive Hochberg's correction, the pattern is consistent with the phenomenon of facilitatory interference (i.e. grammatical illusions). In short, the different patterns of contrast observed at the adjective region show that whereas matching distractors facilitate the integration of grammatical adjectives in subject control sentences, similarly matching distractors seem to be facilitating the integration of ungrammatical adjectives in object control sentences. Considering the findings reported by Cunnings and Felser (2013) showing that high and low WMC readers resort to different strategies in reflexive-antecedent dependencies, there arises the speculation that individual differences in WMC could be playing a similar role in the effects observed here.

To conclude, the results from this task provide further support in favor of the route of retrieval events discussed in Experiment 3 in spite of the fact that the patterns of interference uncovered do not fully coincide. To begin with, the lack of differences between subject and object control sentences at the infinitive verb suggests that the antecedent of PRO is being retrieved similarly in these two types of dependencies. The lack of evidence for the existence of reanalysis processes in subject control conditions –as predicted by the MRFS– points to the conclusion that the antecedent of PRO must have been recovered on the basis of lexical control information. Indeed, the grammatical sensitivity obtained at the word following the adjective provides robust evidence that comprehenders ultimately identify the correct licensor of the adjective, which is the lexically guided controller of PRO. This shows that the parser had correctly established the correct coreference relation between PRO and its antecedent. However, both experiments have shown that when comprehenders reach the embedded adjective, different control-irrelevant antecedents are temporarily considered. The patterns of interference observed here cannot be fully captured by the cue-based memory retrieval model in terms of facilitatory/inhibitory interference: while object control dependencies exhibit a trend

towards facilitatory interference effects, subject control dependencies exhibit a gender familiarity effect. Further research is needed in order to clarify the factors that motivate the presence of interference effects in both grammatical and ungrammatical sentences. In particular, we suggest that psycholinguistic and computational studies digging deeper onto the type of dependency (subject or object), the distance and intervening material between the retrieval point and the target, and individual differences in WMC are likely to shed light on the forces that guide intermediate stages of the adjective's integration in this type of complex constructions.

5.6 EXPERIMENT 6: EYE-TRACKING

This last experiment of the project was carried out in an attempt to provide a further test of one of the crucial findings from the online experiments presented so far: the lack of evidence for the existence of an object control facilitation in the resolution of PRO-antecedent dependencies. Experiments 3 and 5 both failed to replicate the effects reported in Betancort et al. (2006) and Kwon & Sturt (2016). Nonetheless, the works by Betancort et al and Kwon & Sturt did not manipulate the gender of the distractor NP with respect to the adjective as it was done in Experiments 3 and 5. That is, their experimental materials always contained two nouns of different gender, in which the controller NP could agree or not in gender with the adjective (the grammaticality manipulation). This entails that their ungrammatical baseline corresponded to our ungrammatical sentences with a matching distractor. It is possible that the different configurations of distractor match/mismatch implemented in the previous experiments could have had an impact on the reading strategies developed by comprehenders, and these could be behind the differing results observed at the point of dependency formation. For this reason, in this sixth experiment, we will produce a close replication of the work carried out in Spanish by Betancort et al. (2006) on a last attempt to test the existence of a recency effect for object control dependencies in the resolution of null subject anaphors. To do so, we will get rid of the distractor manipulation.

The experimental materials used in this eye-tracking task have the same structure as those used in the work by Betancort and colleagues. Nevertheless, there are multiple factors that make us believe that this experiment contains significant improvements that provide a better context to study the use of lexical control information in the resolution of PRO-antecedent dependencies, and more specifically, the possible existence of a recency facilitation for object

control relations. As noted in several parts of this chapter, our experimental materials were highly controlled, making the sentences more homogeneous across conditions and items. Furthermore, and most importantly, all of our nouns in object position (i.e. the NP2s) are complements of the matrix verb, circumventing the confound detected in the materials by Betancort et al. (2006), in which a subset of subject control sentences was found to contain adjuncts instead of complements in this position. In this respect, the inclusion of the preverbal clitic *le* serves as a syntactic test for the complement status of the NP2, while it also contributes to equally announce the presence of an object NP in both subject and object control sentences. This is an important ingredient because overt indirect objects have been found to occur more frequently with object control verbs than with subject control ones (cf. §5.3.2). Mitigating this frequency preference is particularly relevant in order to test any possible control-related effects that could arise at the NP2, as this is the sentence region in which the authors report the effects that led them argue for the existence of a recency facilitation. Two further methodological issues support the suitability of this replication: first, a power analysis was conducted on the basis of Betancort et al.'s (2006) results in order to estimate the appropriate sample size to be recruited. Second, our experimental materials contained three times more items per condition than then materials used by Betancort and colleagues (8 versus 24), something which is expected to increase the stability of the measurements.

Consequently, if the recency effect reported by Betancort and colleagues is related to the resolution of the dependency initiated at the infinitive verb, we expect to replicate their object control facilitation in the form of faster reading times for object control dependencies when compared to subject control ones at the sentence regions tracking the null subject (i.e. the NP2, the infinitive verb or the adverb). Conversely, if the results from this task align with the findings from Experiments 3 and 5, no differences between subject and object control dependencies are expected to arise in these regions. Moreover, if comprehenders have correctly retrieved the antecedent of PRO at the point of dependency formation, slower reading times are predicted to appear when ungrammatical adjectives are encountered.

5.6.1 Participants

44 native speakers of Spanish (31 female, mean age: 26 y/o, age range: 20-40) took part in this experiment. The sample size was estimated through a power analysis calculated on the basis of the results by Betancort et al. (2006). In their work, the authors found a main effect of control

at the NP2 region that reached statistical significance in first-pass, go-past and total time measurements. This effect showed faster reading times for object control dependencies over subject control ones, and provided the basis to argue for a recency effect operating in the resolution of PRO-antecedent dependencies. Given that this contrast was not replicated in the experiments presented so far, a power analysis was run on their results as a means to estimate the appropriate number of participants for this replication. We first calculated the effect size (*F*) of the main effect of control reported by Betancort et al. (2006) in the three measures that showed significant effects: the effect size was 0.85 in first-pass, 0.61 in go-past, and 0.58 in total-time. All three effect sizes are considered relatively big. The power analysis was run using the G*Power software (Faul et al. 2009) based on the results from the first-pass measure.[107] This measure was chosen for two reasons: first, it is the measure that reflects earlier processing effects and, second, it is the measure that showed the biggest effect size. In order to take a conservative approach, we calculated our sample size assuming an effect size of 0.3, which is smaller effect than the one reported. The desired power was set to 0.95. The results from the power analysis indicate that a sample size of 39 participants would allow us to obtain the desired power. Given that 39 is not a multiple of 4, extra participants were added in order to equate the number of participants per list and, also, in case someone had to be excluded from the analysis.

The 44 participants were recruited through the BCBL participant database *Participa*. All the participants in this task reported having completed high school education and 82% of them (n=36) had undergone university-level or advanced professional training studies. The majority of participants (n=40) were right-handed. They all reported knowing other languages apart from Spanish with different levels of proficiency; these being primarily Basque and English. Special care was placed so that all the participants in the experiment were highly dominant Spanish speakers. For this purpose, we only recruited participants who scored 5/5 in the Spanish language interview and 3/5 or less in the Basque language interview. A score of 5/5 corresponds to native speaker competence, while a score of 3/5 corresponds to an intermediate non-native speaker. [108] Furthermore, the sample only included participants who acquired Spanish from birth and whose parents spoke Spanish as their first and home language. All the participants had normal or corrected-to-normal vision and none of them reported having reading

[107] In the first-pass measure of the NP2 region, Betancort et al. (2006) report the following statistics for the main effect of control: ANOVA: F1(1,31)=22.54, p<.001; F2(1,31)=21.71, p<.001. The power analysis used the F1 statistics (i.e. by-participants).
[108] Note that this is lower than the maximum Basque level allowed in experiment 3, which was 4/5.

impairments or mental/neurological disorders. In order to avoid calibration problems, participants that needed glasses in order to read were not allowed in the sample unless they could wear contact lenses during the task. All the participants provided informed consent and were compensated with 12€ for their participation.

5.6.2 Materials

The materials used in this eye-tracking task correspond to a subset of those used in Experiments 4-5. Given that the factor DISTRACTOR was dropped from the manipulation, this experiment has a 2x2 design which crosses the factors CONTROL and GRAMMATICALITY. The experimental materials were the same 96 items used in Experiments 4 and 5, but selecting only the conditions in which the two nouns were of different gender. A sample set is presented in Table 17 and the entire list of experimental materials, including an English version of Table 17, can be consulted in Appendix C.4.

Table 17. Experimental materials for Experiment 6.

Subject control	
Grammatical	María$_i$ le prometió a Manuel$_j$ PRO$_i$ ser más **ordenada** con los apuntes.
Ungrammatical	Manuel$_i$ le prometió a María$_j$ PRO$_i$ ser más **ordenada** con los apuntes.
Object control	
Grammatical	Manuel$_i$ le ordenó a María$_j$ PRO$_j$ ser más **ordenada** con los apuntes.
Ungrammatical	María$_i$ le ordenó a Manuel$_j$ PRO$_j$ ser más **ordenada** con los apuntes.

An immediate consequence of getting rid of the DISTRACTOR factor is that, for a given item set, two proper nouns are enough in order to fulfil the four conditions (compare Table 15 and Table 17). Therefore, the proper names from the items used in Experiments 4 and 5 had to be slightly re-arranged. Given that every name appeared as either NP1 or NP2 depending on the grammaticality of the sentence, it was not necessary to repeat them. In spite of this small change, the psycholinguistic variables that were controlled for the materials of experiments 4 and 5 also apply to this set of items (cf. §5.5.2 for a detailed description of the many issues that have been taken into account for the construction of the stimuli). As it has been emphasized in several parts of the text, the experimental materials used in this project provide a highly controlled context to study timing differences in the processing of these constructions. Among

other things, the sentences were built respecting a number of psycholinguistic variables, the verbs used were carefully selected making sure that they had robust control readings (cf. Experiment 1) and we also controlled for verb repetition and the structure of the complement clause (cf. §5.3.2 for a critical comparison with the materials of Betancort et al. (2006)).

The 96 experimental conditions were counterbalanced in 4 lists together with 144 grammatical filler sentences (=240 sentences in total). As in the self-paced reading task, only grammatical fillers were used to reduce the ratio of ungrammatical-to-grammatical sentences in order to prevent participants from developing unnatural reading strategies as a consequence of being exposed to many grammatical violations.[109] The items were divided in 4 blocks so that each verb repetition occurred in a different block. Each block contained 60 sentences (24 experimental items and 36 fillers). In order to ensure that participants were reading for comprehension, 40% of the sentences were followed by a yes/no question. The comprehension questions were equally distributed across experimental and filler items, and were balanced across conditions. Participants who did not answer at least 80% of the questions correctly were not included in the analysis. Details of participant exclusion are given in the results section. During the delivery of the instructions, participants were asked to complete 2 practice items to ensure that they had understood the procedure.

5.6.3. Procedure

The procedure for the eye-tracking –including calibration, drift correction, and recording– followed exactly the same steps detailed for experiment 3, described in §5.3.3.1. The task took place in the same room and with the same eye-tracking machine, the desktop mount SR Research Eye-Link 1000 plus eye-tracker. Participants were first exposed to a practice block so that they could familiarize with the calibration and reading procedure. The calibration was performed at the beginning of the practice, before each of the 4 experimental blocks, and when a bad fixation recording was observed from the experimenter display. Together with instructions, setup and breaks, the experiment lasted approximately 1h.

[109] Unfortunately, Betancort et al. (2006) do not report the grammatical status of the fillers used in their task.

5.6.4 Analysis

Prior to analysis, trials were first visually inspected in order to make sure that all the relevant fixations were included in the output. Blinks, artifacts, and individual fixations that were shorter than 80ms. and longer than 800ms. were removed using the automatic procedure provided by Data Viewer (SR Research 2017b). For the purpose of data collection, each sentence was segmented into 7 regions, shown in Table 18. For the regions of interest reported next, we computed the following standard eye-movement measures: first-pass time, first-pass regressions out, go-past time, total time, and regressions in. A detailed description of these measures is given in §5.3.4. Based on previous findings, 5 regions of interest were selected: the NP2, the infinitive, the adverb, the adjective and the PP region. These regions are highlighted inside a square in the first row of Table 18. The different reading measures were calculated in these five regions of interest with the exception of the probability of regressions in. This measure captures the probability that a certain region was revisited. As in Experiment 3, a different set of regions was selected: the NP1, the control verb, the NP2 and the adjective. These regions are highlighted inside a square in the second row of Table 18. In our view, these regions are more informative when it comes to study the effects of the manipulation in the proportion of regressions in.

Table 18. Region segmentation of the experimental sentences of Experiment 6.

NP1$_1$	C.VERB$_2$	NP2$_3$	INF$_4$	ADVERB$_5$	ADJECTIVE$_6$	PP$_7$
María	le prometió	a Carmen	ser	más	ordenada	con los apuntes.
María	le prometió	a Carmen	ser	más	ordenada	con los apuntes.

Statistical modelling

The statistical analyses were independently carried out in each measure and region of interest using linear mixed effects models. The model structure for the fixed effects always contained the main effects and interactions of the two experimental factors (GRAMMATICALITY and CONTROL). Participants and items were crossed as random effects. For every region and measurement, we evaluated the inclusion of a fully specified random effects structure, with by-participant and by-item random intercepts and slopes for the experimental factors. This maximal model failed to converge in most cases and thus, the random structure was simplified following the recommendations in Barr and colleagues (2013). The results reported in the next

section correspond to the model with the maximally converging random effects structure. The detailed model structure reported for each measurement and region of interest can be consulted in Appendix D.3.

All statistical analyses on the latency data (first-pass, go-past and total time) were performed on the transformed RTs in order to ensure a normal-like distribution of the model residuals. The power transformation for each model was determined using the Box-Cox procedure (Box & Cox 1964; see also Vasishth & Nicenboim 2016), and it is specified in Appendix D.3. It is important to note that, even though the analyses of the latency data were carried out over the transformed RTs, whenever estimates are reported, these are shown in milliseconds in order to increase transparency. Finally, the discrete measures of probability of (first-pass) regressions out/in were analyzed using the same linear mixed model structure explained above, but with a binomial link function (see Jaeger 2008).

5.6.5 Results

The mean accuracy in the comprehension questions was 93% (SD: 0.04%). No participants were excluded from the sample due to low accuracy. The results of the reading latencies (first-pass, go-past and total time) and eye-movement regressions (in and out) in the regions of interest are presented in Table 19. For ease of exposition, the results will be examined region by region respecting the sequential order of the eye-tracking measurements (i.e. first-pass, fist-pass regressions out, go-past, and total time), with exception of the probability of regressions in, which will be presented at the end because it was calculated in a different set of regions.

Table 19. Means (and standard errors) of the eye-tracking measures in the regions of interest. The latency measures are expressed in milliseconds and the (first-pass) regressions in/out in 0-1 probabilities.

	NP2		*INFINITIVE*		*ADVERB*		*ADJECTIVE*		*PP*	
First-pass										
	Subj.	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***
Gramm.	292(5)	287(5)	234(4)	236(5)	283(6)	283(5)	336(5)	322(5)	493(7)	510(6)
Ungramm.	286(5)	282(5)	241(4)	239(3)	271(4)	278(5)	333(6)	337(6)	504(7)	494(8)
FP Reg. out										
	Subj.	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***
Gramm.	.08(.02)	.09(.02)	.04(.02)	.05(.02)	.10(.02)	.10(.03)	.14(.02)	.13(.02)	.42(.02)	.41(.02)
Ungramm.	.08(.02)	.11(.02)	.03(.02)	.04(.02)	.09(.02)	.10(.03)	.16(.02)	.15(.02)	.40(.02)	.45(.02)
Go-past										
	Subj.	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***
Gramm.	334(11)	345(14)	268(16)	269(18)	326(17)	328(19)	458(39)	433(35)	880(55)	894(58)
Ungramm.	336(14)	343(15)	267(15)	267(16)	316(20)	325(18)	484(49)	486(57)	989(76)	1002(84)
Total time										
	Subj.	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***
Gramm.	360(13)	360(11)	258(7)	276(9)	340(13)	344(12)	419(10)	393(12)	585(13)	585(13)
Ungramm.	373(18)	372(15)	279(10)	280(12)	347(15)	360(16)	433(17)	444(21)	611(14)	608(14)
	NP1		***CONTROL VB.***		***NP2***		***ADJECTIVE***			
Reg. in										
	Subj.	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***	***Subj.***	***Obj.***		
Gramm.	.28(.02)	.27(.02)	.22(.03)	.26(.02)	.09(.03)	.10(.02)	.16(.02)	.13(.02)		
Ungramm.	.31(.02)	.28(.02)	.26(.02)	.30(.02)	.10(.02)	.11(.03)	.16(.02)	.18(.02)		

NP2 region

The model results for first-pass, first-pass regressions out, go-past and total time did not yield any significant contrast in this region.

Infinitive region

The results for first-pass regressions out at the infinitive region revealed a main effect of GRAMMATICALITY ($X^2(1)=7.08$, $p=0.008$) which showed that ungrammatical sentences elicited less regressions out than grammatical sentences. This result is quite striking for several reasons. First, the effect appeared before the eyes have moved to the right of the infinitive region. Given that the grammatical violation does not occur until the end of the adjective region (two words to the right), it is no possible that participants have seen the grammatical violation when gazing

at the infinitive region. Second, the direction of the results displays the opposite trend that would have been expected if it was related to the GRAMMATICALITY factor, as it was ungrammatical sentences the ones that elicited less regressions. We will return to this issue below.

The statistical analysis of the total time measure at the infinitive region revealed a main effect of GRAMMATICALITY ($F(1,2576.7)=4.07$, $p=0.044$), with ungrammatical sentences showing longer RTs than grammatical ones. This effect represents evidence for grammatical sensitivity, and it is likely to reflect differences in fixation times made during the regressions out of later regions after having encountered the grammatical violation.

Adverb region

The results for first-pass reading times at the adverb region revealed a main effect of GRAMMATICALITY ($F(1,439.1)=45.65$, $p=0.018$), an effect that also reached statistical significance in the go-past measure ($F(1,35.8)=4.51$, $p=0.041$). In both cases, the main effect of grammaticality indicates faster reading times for ungrammatical sentences than for grammatical ones. There two effects appear in the same way as the main effect of GRAMMATICALITY found in the first-pass regressions out at the infinitive region. Finding these results at the adverb region is surprising because it is very unlikely that participants could see the end of the adjective region (which is where the grammaticality manipulation occurs) when gazing at the adverb. Indeed, even in the highly unlikely case that the grammatical violation could be perceived due to parafovear preview benefits when gazing at the infinitive region, the direction of the effects displays the opposite trend that would have been expected if they were related to the GRAMMATICALITY factor. In order to explore the source of these puzzling results, and following the same steps reported in Experiment 3, we run an additional set of exploratory models that included different co-variates that could affect comprehenders' reading behavior (e.g. type of infinitive verb, nº of characters, ratings, etc.). Unfortunately, the main effect of GRAMMATICALITY remained significant in all cases.

Adjective region

The analysis of the go-past measure revealed a main effect of GRAMMATICALITY ($F(1,3900.4)=4.59$, $p=0.032$), with ungrammatical sentences showing slower RTs. This effect indexes participants' sensitivity to grammatical violations in both subject and object control

dependencies. The main effect of GRAMMATICALITY also reached statistical significance in the analysis of total time (F(1,3899.9)=12.59, p<0.001). Nonetheless, this effect is dependent on a significant interaction among the factors CONTROL and GRAMMATICALITY (F(1,3899.8)=9.79, p=0.002, Figure 21). As can be observed in Figure 21, only object control sentences exhibit a clear grammaticality contrast. Post-hoc contrasts confirm significant differences between grammatical and ungrammatical sentences in object control trials (estimate= -52.5, z.ratio=-4.71, p<0.001), and also, differences between subject and object control sentences in grammatical trials (estimate= 26.4, z.ratio=3.13, p=0.002), as subject control sentences were read significantly slower than object control ones. As we will be below, the interaction observed in the total time measure is likely the result of differences in the probability of regressions made into the adjective region (cf. Figure 24).

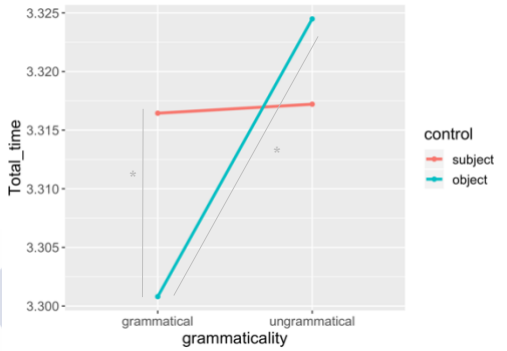


Figure 21. *Control x Grammaticality* interaction in total time at the adjective region.

PP region

The model results for the first-pass measure at the PP region revealed a significant interaction among the factors CONTROL and GRAMMATICALITY (F(1,2881.2)=3.89, p=0.048, Figure 22). As shown in Figure 22, subject and object control sentences display opposite trends: while subject control grammatical sentences are read faster than grammatical ones, object control ungrammatical sentences are read faster than grammatical ones. Nonetheless, none of the post-hoc contrasts reached statistical significance after applying Hochberg's correction.

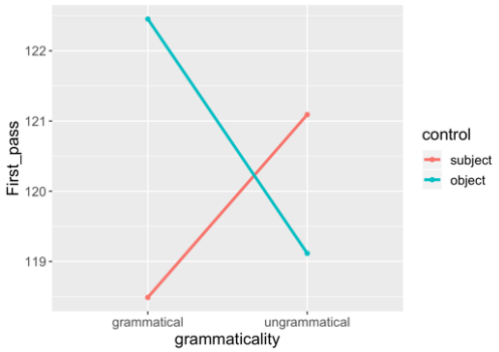


Figure 22. *Control x Grammaticality* interaction in first-pass at the PP region.

With regard to the first-pass regressions out, the model results revealed a significant interaction among the factors CONTROL and GRAMMATICALITY ($X^2(1)=4.11$, $p=0.042$, Figure 23). As shown in Figure 23, comprehenders made more regressions out of the PP region in object control ungrammatical sentences than in the other three conditions. Consequently, post-hoc contrasts reveal significant differences between grammatical and ungrammatical sentences in object control conditions (estimate= -0.29, *z*.ratio=-2.06, $p=0.040$), and also, significant differences between subject and object control sentences in ungrammatical trials (estimate= -0.26, *z*.ratio=-2.06, $p=0.040$).

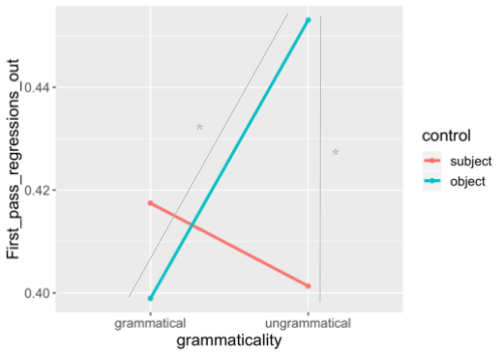


Figure 23. *Control x Grammaticality* interaction in the first-pass regressions out of the PP region.

The analysis of the go-past measure revealed a main effect of GRAMMATICALITY ($F(1,2887)=11.90$, $p=<.001$), with ungrammatical sentences showing slower RTs and thus, indicating sensitivity to grammatical violations in both subject and object control dependencies at the PP region.

Regressions in

The results for the regressions in were analyzed in a different set of regions. These were the NP1, the control verb, the NP2, and the adjective. In the control verb region, the model revealed a significant main effect of GRAMMATICALITY ($X^2(1)=4.50$, $p=0.034$), which showed that more regressions were made into this region in ungrammatical trials. At the adjective region, the model results for the regressions in revealed an interaction among the factors CONTROL and GRAMMATICALITY ($X^2(1)=5.52$, $p=0.019$, Figure 24). Post-hoc contrasts only showed significant differences between grammatical and ungrammatical sentences in object control conditions (estimate= -0.50, z.ratio=-3.26 $p=0.001$). This interaction is similar to the one observed for analysis of total times at the adjective region (Figure 21).

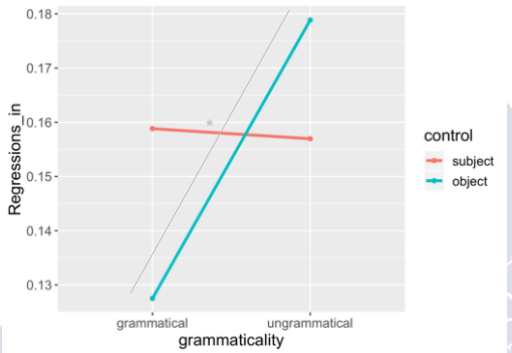


Figure 24. *Control* x *Grammaticality* interaction in the regressions into the adjective region.

5.6.5.1 Summary of results

Given the variety of statistical results obtained in this experiment, a summary of the significant contrasts is provided in Table 20. The results can be conceptualized in three groups (indicated with different background colors). First, we find the striking main effects of GRAMMATICALITY at the infinitive and adverb regions involving. Second, we find the predicted main effects of GRAMMATICALITY at the adjective, PP, infinitive verb, and control verb regions. Thirdly, we find the interactions between CONTROL and GRAMMATICALITY at the adjective and PP regions which provide different types of evidence for the existence of interference effects.

Table 20. Summary of statistically significant results from Experiment 6 (C = control, G = grammaticality, ME = main effect, INT = interaction, n.s. = non-significant).

MEASURE	REGION				
	NP2	*Infinitive*	*Adverb*	*Adjective*	*PP*
First-pass	n.s.	n.s.	^{ME}G	n.s.	^{INT}CxG
FP regressions out	n.s.	^{ME}G	n.s.	n.s.	^{INT}CxG
Go-past	n.s.	n.s.	^{ME}G	^{ME}G	^{ME}G
Total time	n.s.	^{ME}G	n.s.	^{ME}G ^{INT}CxG	n.s.
	NP1	*Control*	*NP2*	*Adjective*	
Regressions in	n.s.	^{ME}G	n.s	^{INT}CxG	

5.6.6 Discussion

The fundamental motivation for this experiment was to replicate the work of Betancort et al. (2006) in a quest to reproduce the facilitation for object control dependencies reported in their work. By contrast, and in line with the results from Experiments 3 and 5, the statistical evidence obtained in this eye-tracking task has not showed any indication that object control sentences were read faster than subject control ones –neither at the NP2, nor at the infinitive or adverb regions. The failure to replicate Betancort et al.'s (2006) findings reinforces the conclusion that the facilitation observed at the NP2 in their work is most possibly not related to the resolution of the null subject's dependency, as the authors argued. Instead, we contend that it is more likely that their results reflect the differential integration cost of arguments versus adjuncts. As already exposed in several sections of this chapter, a subpart of the subject control conditions in their materials contained adjuncts in the NP2 position (e.g. *ante la jueza/in front of the judge*), while all of their object control conditions contained arguments in the same position (e.g. *a la jueza/to the judge*). This is precisely the sentence region in which the authors report the object control facilitation, which they claim to be the result of a parafoveal preview benefit of the infinitive verb when gazing at the NP2. Yet, since arguments are known to be integrated more rapidly than adjuncts (Clifton et al. 1991; Schütze & Gibson 1999), we believe that the faster reading times observed at the NP2 region in object control sentences actually reflect the system's ease to integrate argumental phrases (i.e. complements) in contrast with optional ones (i.e. adjuncts). In consequence, the evidence collected in this and previous experiments supports

the alternative view that lexically driven subject and object control dependencies are processed similarly at the point of PRO-antecedent dependency formation.

Notwithstanding the above, we must not ignore the presence of some intriguing effects at the infinitive and adverb region that are related and involve the factor GRAMMATICALITY. These effects are quite puzzling because it is not possible that participants could preview the grammaticality manipulation when fixating the infinitive verb and also because the effects actually appear in the opposite direction of what would be expected if they reflected grammatical sensitivity. In spite of the fact that these extraneous results do not seem to be related to the resolution of the PRO-antecedent dependency, they are worrying for several reasons. On the one hand, in our previous eye-tracking experiment (Experiment 3), we had already obtained some puzzling results at the NP2 region that, albeit different, could not be explained on the basis of the experimental manipulation. On the other hand, the works by Betancort et al. (2006) and Kwon & Sturt (2016) also report effects related to the grammaticality factor at the NP2 or infinitive regions. The authors simply take them as spurious because, as here, the grammaticality of the sentences was not manipulated until later regions. Still, the fact that similar intriguing effects are showing up repeatedly in multiple studies makes it difficult to argue that they are the consequence of a statistical fluke. This issue is admittedly problematic because the extraneous effects show up in sentence regions that are critical for the study of the experimental manipulation. Even though, unfortunately, we have not been able to narrow down the exact source of such effects, this is an obstacle that should be overcome in future research that attempts to study similar structures. This could be achieved by including extra material between the object of the matrix clause and the beginning of the embedded clause.[110] In this way, the parser is given more time to complete the computation of the main clause constituents before the infinitive verb is reached.

Moving into the grammaticality manipulation introduced at the adjective region, the fundamental assumption in this respect is that if the antecedent of PRO has been correctly retrieved on the basis of lexical control information, ungrammatical adjectives should generate some processing disruption. This was borne out in the results, which reveal several grammaticality contrasts confirming that ungrammatical adjectives are associated with slower reading times. Attention should be drawn to the fact that the earliest evidence for grammatical

[110] For instance, in the form of an adjunct phrase as in *Juan le prometió a María el otro día ser más cuidadoso con los documentos/ Juan promised María the other day to be more careful with the documents*)

sensitivity appeared in the go-past measure of the adjective region. This is a critical finding for two main reasons. First, it confirms that comprehenders identify grammatical violations at a similar rate in subject and in object control dependencies. Second, the appearance of grammaticality effects in the go-past measure –i.e. before the eyes move beyond the adjective region– represents evidence for early sensitivity to grammatical violations. This points to the conclusion that the that the parser had established the correct coreference relation between PRO and its antecedent. Otherwise, it would not be expectable to observe such a rapid reaction to the presence of gender mismatching adjectives.

The occurrence of this early effect contrasts slightly with the eye-tracking findings by Betancort et al. (2006) and Kwon & Sturt (2016), who found the first evidence for grammatical sensitivity in later measurements (i.e. total times) or later regions (e.g. the spillover region). The use of a bigger sample size –and hence more power– and three times more items per condition –and hence more stable measurements– could have contributed to capturing this result. But in any case, this is not the only evidence that confirms comprehenders' detection of grammatical violations in both subject and object control sentences. Further significant contrasts between grammatical and ungrammatical conditions appeared in the go-past and total times at the PP region, the total times at the infinitive verb, and the regressions in at the control verb. The latter is of particular relevance because the fact that comprehenders regress more often to the control verb in ungrammatical sentences indicates their reliance on lexical control information to compute the dependencies. Together, these effects clearly show that adjectives that do not agree in gender with the features of the correct antecedent of PRO generate processing disruptions irrespectively of the type of control. Nonetheless, the results from this task also revealed some interaction effects between the factors CONTROL and GRAMMATICALITY that point to differences between subject and object control sentences. We discuss these effects in turn.

Regarding the relevant interactions between the factors CONTROL and GRAMMATICALITY, the first effect appeared in the first-pass regressions out of the PP region. This effect showed opposite trends for subject and object control dependencies with respect to grammatical sensitivity: while subject control grammatical sentences are read faster than grammatical ones, object control ungrammatical sentences are read faster than grammatical ones. Unfortunately, given that none of the post-hoc contrasts survived Hochberg's correction, it is not possible to ascertain the reliability of this effect. The remaining three interactions of interest between the

factors CONTROL and GRAMMATICALITY represent cases in which the two subject control conditions (i.e. grammatical and ungrammatical) displayed a similar trend, while object control conditions displayed a clear grammaticality contrast.

First, we should concentrate on the first-pass regressions out of the PP region. At this point, the two subject control conditions (i.e. grammatical (138a) and ungrammatical (138b)) elicited a similar proportion of regressions, and crucially, it was as low as the proportion of regressions observed for object control grammatical conditions. This result suggests that the processing of subject control ungrammatical sentences is being facilitated, which indicates that ungrammatical adjectives are (at least temporarily) perceived as if they were correct. The low proportion of regressions observed in subject control ungrammatical sentences could be explained through a process of interference generated by the NP2. This is because in ungrammatical sentences like (138b), there is a closer NP (*María*) that agrees in gender with the adjective (*ordenada/tidy*). This closer NP, the NP2, seems to be acting as a lure, causing the temporary (and erroneous) perception that the ill-formed adjective is actually licensed, and therefore, eliciting less regressions out.

(138) a. María$_i$ le prometió a Manuel$_j$ PRO$_i$ ser más ordenada con los apuntes.

b. *Manuel$_i$ le prometió a María$_j$ PRO$_i$ ser más ordenada con los apuntes.

The other two interactions between CONTROL and GRAMMATICALITY that expose differences between subject and object control conditions involve the regressions in and the total times at the adjective region. It is highly probable that these two effects are interrelated such that the reading times observed in the total time measure are a consequence of the regressions made into the adjective region. Again, these effects indicate that grammatical and ungrammatical sentences in subject control conditions are processed similarly, while object control conditions exhibit a clear grammaticality contrast. Nonetheless, this pattern of results appears to be different from the effect discussed above regarding first-pass regressions out of the PP region. This is because, this time, it is subject control grammatical conditions (e.g. 138a) which seem to be penalized. What is observed, particularly in the total time measure, is that subject control grammatical sentences are read significantly slower than similarly grammatical object control sentences. In other words, these effects seem to reflect some difficulty in the integration of grammatical adjectives in subject control sentences. This finding could also be explained

through a process of interference generated by the NP2, but this time, in the opposite direction. What seems to be happening is that in grammatical sentences like (138a), the presence of a closer NP (*Manuel*) that does not agree in gender with the adjective (*ordenada/tidy*) is causing the temporary (and erroneous) perception that the adjective could be unlicensed.

The interaction effects discussed show a contrast between subject and object control sentences in terms of grammatical sensitivity. As already discussed above, we believe that the lack of grammatical sensitivity for subject control sentences can be best explained as a consequence of interference effects generated by the matching or mismatching between the gender of the control-irrelevant but linearly closer NP2 and the gender of the adjective. In the first case (first-pass regressions out at the PP region), the gender matching between the NP2 and the adjective facilitates the integration of ungrammatical adjectives (e.g. 138b). In the second case (regressions in and total times at the adjective region), the gender mismatching between the NP2 and the adjective initially hampers the integration of grammatical adjectives (e.g. 138a). These results could be described as a 'recency-based interference effect' operating during intermediate stages of the integration of the adjective.[111] On the one hand, in subject control sentences, the correct antecedent is the NP1, which is further away from the adjective. In this case, we observe interference from the NP2, which is the closer NP. On the other hand, in object control dependencies, the correct antecedent is the NP2, which is the closer NP with respect to the adjective. Therefore, the proximity between the NP2 and the adjective seems to ease the verification of the grammaticality of the adjective, accounting for the lack of interference effects in object control sentences.

It must be noted that the work by Betancort et al. (2006) did not expose any effects of this sort. Possibly, because the smaller sample size recruited for their task lacked the necessary power to uncover such interactions. Yet, interestingly, Kwon & Sturt (2016) do report a similar result in the first-pass regressions out of the region following the grammatical violation. Just like in our study, the authors found that the contrast between grammatical and ungrammatical sentences was only significant in object control conditions –thus, suggesting that the verification of grammaticality was more precise in the context of object control sentences.

[111] Note that our conception of this 'recency-based interference effect' is different from what was referred to as 'recency effect' in the work by Betancort et al. (2006), described as a facilitation for object control dependencies during the resolution of PRO-antecedent relations.

In sum, this experiment has uncovered two types of results with respect to the processing of the grammatical manipulation introduced at the embedded adjective. The first group of results showed a clear grammaticality contrast in both subject and object control sentences, providing evidence that comprehenders detect gender violations that occur when the adjective does not agree with the features of the null subject PRO. The second group of results showed that subject control sentences are more prone to interference effects, which, moreover, appear in different directions and at different points in the sentence. First, as shown in the first-pass regressions out at the PP**,** the processing of ungrammatical adjectives appeared to be eased by the presence of a control-irrelevant but linearly closer gender matching NP2. Then, as shown in the regressions in and total times at the adjective region, the processing of grammatical adjectives appeared to be hindered by the presence of a control-irrelevant but linearly closer gender mismatching NP2.

We have avoided referring to these two types of effects as 'facilitatory' and 'inhibitory' interference because these labels are most commonly used to describe contrasts between minimally different pairs of grammatical or ungrammatical conditions (respectively). Unlike Experiments 2-5, this task lacks the critical distractor manipulation that would allow us to draw the relevant contrasts to probe for processes of facilitatory (or inhibitory) interference. It is for this reason that it is difficult to compare the results from this experiment to those of Experiments 3 and, particularly, 5. Nonetheless, the lack of differences between grammatical and ungrammatical sentences in subject control conditions closely resembles the self-paced reading results obtained at the adjective region in Experiment 5, in which these two conditions showed similar reading times. Furthermore, the possible presence for interference effects in object control is only marginal in both Experiments 5 and 6, and it appears in later measurements and regions in Experiment 3. This suggests that interference effects are more robust in the context of subject control dependencies, something that shows that the proximity between the distractor and the adjective is an important factor for the emergence of such processes –which is why the pattern of results found for subject control sentences here was described as 'recency-based interference' effect.

Another important issue to be taken into account has to do with the time course of the results. In this respect, what is observed is that, first, comprehenders experienced a grammaticality contrast –as shown by the main effect of grammaticality in the go-past measure of the adjective region. Then, comprehenders experienced interference effects –as shown by

the multiple interactions discussed above. Yet, ultimately, comprehenders experience, again, a grammaticality contrast –as shown by the main effects of GRAMMATICALITY in the go-past and total time measurements of the PP region. The chronology of events points to the fact that, even though lexical control information is crucial for the integration of the adjective, its integration does not only take place on the basis of its compatibility with the gender of the null subject PRO, as dictated by grammatical theory. The processing routines deployed during intermediate stages of the integration of the adjective show that the parser also considers the compatibility of the adjective's gender with respect to the NPs in the matrix clause, and more specifically, with the linearly closest NP.

The evidence obtained in this close replication of the work by Betancort et al. (2006) reveals two remarkable differences in contrast with their work. In the first place, one of the most relevant findings is the failure to reproduce the facilitation for object control sentences observed by the authors at the NP2 region, which was interpreted as evidence for a recency facilitation in the resolution of PRO-antecedent dependencies. In this work, we have not found any evidence pointing to a recency effect operating during the resolution of PRO-antecedent dependencies since we have not found differences between subject and object control dependencies at the NP2 or infinitive regions. This, together with the early grammatical sensitivity at the adjective region, points to the fact that lexical control information is similarly accessed in subject and object control sentences to retrieve the antecedent of PRO, and later used to detect gender anomalies at the adjective. Secondly, even though, as in their work, we have obtained several results showing comprehenders sensitivity to grammatical violations in both subject and object control dependencies, this study has also revealed that subject control dependencies are more prone to interference. All in all, these effects suggest that the features of PRO (retrieved as a consequence of lexical control) are not the only source of information used to integrate the embedded adjective, an account that goes in line with the interpretation of the results from previous experiments. In the next (and last) section, we will try to put into perspective the results from the six experiments that conform this chapter.

5.7. GENERAL DISCUSSION

In this chapter we have presented the results from 6 experiments aimed at studying the processing of PRO-antecedent dependencies and the emergence of interference effects in the resolution of adjective-PRO agreement dependencies. This project was motivated by the

presence of several gaps identified in the existing psycholinguistic literature on verbal control phenomena, revised in Chapter 4. One of the main innovations of this work is the orthogonal comparison of lexically determined subject and object verbal complement control dependencies with a fully crossed manipulation of the gender of the target and the distractor NPs. This design allowed us to simultaneously compare the resolution of PRO-antecedent dependencies in the context of subject and object control verbs and to study the integration of an embedded adjective in four different configurations: the adjective it could either agree in gender only with the appropriate controller of PRO, with both the controller and the distractor, only with the distractor, or with none of the NPs in the matrix clause. This manipulation provided the ground to investigate whether the processing of the embedded adjective was affected by different interference effects grammatical and ungrammatical configurations and whether such effects had a similar prevalence in the context of subject and object control dependencies.

Before discussing the implications of our findings, it is pertinent to stress some of the most relevant methodological contributions of this project. These include, inter alia, the contrast between online and offline experimental techniques, the use of carefully built materials attending to detailed grammatical and psychometric considerations, and the testing of larger sample sizes and item sets than those used in previous investigations. Control phenomena represent an intricate area of grammar because they must be understood at the interface between lexical semantics and syntax. The cloze task presented in Experiment 1 is, to the best of our knowledge, the first experimental attempt to directly tap into the control readings of verbs. This was a necessary step in order to carry out the online experiments with the certainty that we were using a sample of verbs with robust control readings. In addition, the offline tasks (Experiments 2 and 4) provide acceptability ratings of the experimental materials used in the online tasks (Experiments 3, 5 and 6). Besides the theoretical interest of some of the results obtained in the offline ratings, Experiments 2 and 4 verify that the materials used in this investigation hold the appropriate grammatical status and, thus, demonstrate that native speakers of Spanish are perfectly able to detect control-related violations when given ample time. This validation of the stimuli also constitutes an additional improvement with respect to previous investigations. The theoretical contributions of this project with respect to the two starting goals are discussed in turn.

Regarding the online resolution of PRO-antecedent dependencies, the results collected here coincide in one essential finding: subject and object control dependencies are processed

similarly at the point of dependency formation. In addition, we have uncovered evidence that comprehenders detect the presence of ill-formed adjectives when these do not agree in gender with the appropriate controller of PRO –although with important reservations to which we will return shortly. The landscape of hypotheses with respect to the online use of lexical control information can be classified in two groups: one set of works have claimed that control information is not available during early stages of dependency formation (Frazier et al. 1983; McElree & Bever 1989; Nicol 1988; Nicol & Osterhaut 1988; Nicol & Swinney 1989), while other set of works have claimed that control information is accessed and used to retrieve an antecedent as soon as bottom-up evidence for PRO is encountered (Boland et al. 1990; Betancort et al. 2006; Demestre et al. 1999; Kwon & Sturt 2016; Mauner et al. 1995; Mauner & Koenig 1999). Together, the findings uncovered in this project align with the second group of works, as they support the conclusion that lexical control information is accessed to retrieve the antecedent of PRO at the point of dependency formation and later used to assess the gender compatibility of the embedded adjective.

Our findings are incompatible with the reading patterns predicted by the MRFS, early proposed by Frazier and colleagues (1983). Under this hypothesis, the null subject PRO is assumed to be first linked to the most recent filler –the object NP– in both subject and object control dependencies and only in later stages the use of control information would cause subject control dependencies to be reanalyzed in search for the correct antecedent. This account makes two inalienable predictions: first, similar reading times for the two types of dependencies are expected at the point of dependency formation, and second, there must be evidence for reanalysis in subject control dependencies. Our results are in accordance with the first prediction given that subject and object control sentences have been found to be processed very similarly. Yet, we have not found any indication of reprocessing in subject control sentences in any of the experiments. This is the critical finding that disconfirms the MRFS.

Even though this investigation was not designed to arbitrate among linguistic theories, the psycholinguistic proposal of the MRFS bears significant similarities with the notions of the MDP (Rosenbaum 1967) or the MLC (Chomsky & Lasnik 1993) promoted by syntactic-based accounts of control (cf. §4.1.3.2). These accounts treated object control as the standard configuration, and subject control as a lexical exception. As we see it, linguistic theories that derive the interpretation of PRO from configurational principles lead to the prediction that structure building operations should be more efficient when computing object control

dependencies. Nonetheless, the fact that lexical control information appears to have a similar impact in the context of both subject and object control verbs provides support for lexico-semantic accounts that argue that control is a lexical phenomenon that emanates from specific thematic/conceptual properties of verbs (cf. §4.1.3.3). These accounts put the focus on the idea that the interpretation of PRO is derived from the type of information that is codified in verbs' lexical representations. Under such an assumption, it is expected that the parser behaves similarly in the context of subject and object control verbs. Furthermore, the results from the cloze task (Experiment 1) also provide support in favor of lexico-semantic accounts on the interpretation of PRO inasmuch as native speakers of Spanish exhibit equally robust control readings for the two types of verbs.

In addition, the evidence collected in this project goes against proposals which argued for a delayed strategy in the assignment of PRO antecedents. Guided by the results of experiments using the cross-modal priming technique, some early works claimed that no antecedent was recovered at all at the PRO site, and that this decision was deferred to be later resolved by an independent linguistic module that had access to lexical information (Cowart & Cairns 1987; Nicol 1988; Osterhaut & Nicol 1988). Such a view is not only difficult to reconcile with the current general consensus about the immediacy of parsing decisions and comprehension processes, but most importantly, with the fact that our results suggest that the process of antecedent assignment is actually a fast one. The attested sensitivity to agreement violations demonstrates that when comprehenders reach the adjective, they have already assigned an antecedent for PRO, for otherwise we should not expect to observe early grammaticality effects at the adjective. One could argue that control information may not be accessed until encountering the adjective, as its gender information forces the system to recover an antecedent for PRO that satisfies the agreement dependency. If this was the case, the early effects of grammatical sensitivity observed in Experiment 6 are particularly surprising, while at the same time it is difficult to extrapolate such an account to similar examples in which the adjective does not provide gender information (e.g. opaque adjectives like *feliz/happy*) or other sentence continuations that would not force any type of linguistic relation with the null subject.

Moreover, even clearer evidence against such a delayed strategy comes from studies manipulating the plausibility of the antecedent instead of its gender. This is because such a design permitted the authors to observe immediate sensitivity to plausibility mismatches at the PRO region (Boland et al. 1990; Mauner et al. 1995; Mauner & Koenig 1999; Parker et al.

2015). Thus, regardless of whether PRO is ultimately seen as a syntactic or simply an interpretive dependency, it appears to be the case that the language processing system has immediate access to the kind of lexical (or syntactic) information that allows it to make fast decisions about the null subject's antecedent.

Moving down to more specific aspects, this project addressed the claims made in two previous eye-tracking works that investigated the same (or similar) control constructions as the ones used here: Betancort et al. (2006) and Kwon and Sturt (2016) –the most recent and relevant investigations on lexical control. These works take side with the view that lexical control information is immediately accessed and used to resolve PRO-antecedent dependencies as soon as bottom-up evidence for PRO is encountered. But, additionally, the authors proposed that the distance between PRO and its antecedent (i.e. the recency factor) also influences antecedent selection processes. This assertion was supported by the fact that object control dependencies appeared to be facilitated over subject control ones during initial stages of dependency formation, a result which showed up in the form of faster reading times for object control dependencies at the NP2 region (Betancort et al. 2006) and more regressions out of the infinitive region for subject control dependencies (Kwon & Sturt 2016). None of the experiments carried out here have replicated the reported facilitation for object control dependencies, casting doubt on the authors' interpretation of such findings. As argued in detail in several parts of the text, it is one of our main contends that the object control facilitation reported by Betancort and colleagues was not indexing antecedent selection processes. Instead, in our view, their results are most possibly the product of a confound in their materials, which, in some cases, compared arguments and adjuncts. The highly powered replication presented in Experiment 6 represents the most compelling evidence in favor of this alternative explanation. Our results disconfirm the existence of a recency preference, and rather point that lexical control information alone constraints initial PRO-antecedent assignment.

Nonetheless, we are still faced with a puzzle. How can we account for the object control facilitation reported by Kwon & Sturt (2016)? It is unlikely that language differences are the source of the contrasting results. To unravel this conflict, it is necessary to look closely into the way control information is manipulated. Kwon & Sturt (2016) manipulated control using nominals, rather than verbs.[112] Control by nominals has not received as much attention as

[112] Their stimuli used a different syntactic mold and comprised sentences such as the following: *Naturally Luke's* ***promise/plea*** *to Sophia to photograph* ***himself/herself*** *in the barn amused everyone.* In cases of subject control (giver control) like *promise,*

control by verbs, but semantic accounts such as Culicover and Jackendoff (2001) treat nominal control on a pair with verbal control in that its interpretation similarly requires the computation of relations at the level of conceptual structure. In both cases, control readings are rigidly determined. Yet, in spite of the undeniable similarities at the level of conceptual structure, it is possible that verbal control information is more readily accessible than nominal control information to guide parsing decision during the resolution of PRO-antecedent anaphoric dependencies. This is because verbs (and their lexical specifications) are known to be one of the most valuable sources of information during parsing (e.g. MacDonald et al. 1994; Tanenhaus & Carlson 1989; Traxler et al. 2002; Snedeker & Trueswell 2004, to cite just a few).

Thus, verbal control information may be more deeply entrenched than nominal control information, such that when the infinitive verb is encountered, the control specifications of the matrix verb are more rapidly accessed in order to initiate a search for the antecedent of the implicit subject. This brings the alternative possibility –recognized by the authors themselves– of interpreting the higher number of regressions made out of the infinitive verb in subject control sentences reported by Kwon & Sturt as a reanalysis process. That is, in light of the MRFS, it is possible that in nominal control sentences the parser initially attaches PRO to the most recent NP and then, reorients this decision when nominal control information is available. This alternative interpretation of Kwon & Sturt's findings bears significant parallelisms with another experiment conducted by Betancort et al. (2006, Experiment 2), in which control is manipulated using prepositions. Their findings support the interpretation that, in contrast with control dictated by verbs, control readings induced by prepositions did not initially constraint antecedent selection but rather, the MRFS seemed to be in place in these cases. In their words, "verb control is sufficiently powerful for a parser to feel it will never lead it down a garden path" (2006: 250). Although possibly to a lesser extent, a similar contrast could be occurring between verbal and nominal control. This speculation provides a tentative explanation of the lack of differences between subject and object control dependencies in our experiments and the object control facilitation reported in Kwon & Sturt, while it also opens new and interesting paths of inquire. Further research comparing verbal and nominal control is necessary to confirm this conjecture.

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the controller is the NP receiving the giver theta role from the control nominal (i.e. *Luke*). In cases of object control (recipient control), the controller is the NP receiving the recipient theta role (i.e. *Sophia*).

The second goal of this project was to examine the possible presence of interference effects during the integration of the embedded adjective –the second dependency of interest. We have mentioned above that the experiments from this project provide sufficient evidence that comprehenders identify the presence of adjectives that do not conform with the gender features of the appropriate antecedent of PRO. Yet, this consideration comes with important and interesting caveats. Several effects found in the offline and online experiments suggest that the integration of the adjective is fallible to interference effects of different nature. One of our main concerns with respect to the presence of interference effects was the susceptibility to processes of grammatical illusions (i.e. facilitatory interference effects, as described within the cue-based retrieval model). Our experiments have uncovered several patterns of contrast that are consistent with the phenomenon of grammatical illusions. In other words, the processing of ill-formed adjectives has been found to be eased by the presence of control-irrelevant but gender matching NPs. In the first eye-tracking task (Experiment 3) we observed evidence of facilitatory interference effects in both subject and object control sentences, while in the self-paced reading task (Experiment 5) we only detected marginal effects of facilitatory interference in object control sentences. Finally, in the second eye-tracking task (Experiment 6) we also found reading patterns that are consistent with what would be expected in a context of faciliatory interference although the lack of a distractor manipulation in this task means that we cannot talk about the existence of a proper phenomenon of grammatical illusions.

There are two important conclusions to be extracted with respect to grammatical illusions. First, the three online tasks presented in this project show that there is variability on when and whether grammatical illusions surface in subject or in object control dependencies. Second, it is remarkable that the presence of equal grammatical illusion effects in subject and object control sentences is clearly observed in offline ratings. The two acceptability ratings conducted here (Experiments 2 and 4) establish that the offline perception of ungrammatical sentences with a matching distractor is improved when compared to similarly ungrammatical sentences with no matching distractor, regardless of the type of control. The fact that we have found offline evidence for the presence of facilitatory interference effects questions the traditional restrictive definition of the concept of grammatical illusions, which is normally articulated on a clear-cut contrast between offline and online results. Along this thesis, we have observed several examples that could be considered ‘offline grammatical illusions’, both in the context of NPIs and control dependencies. We will return to this issue in the concluding remarks of the

work (Chapter 6), in which we will propose to widen the space of grammatical illusions in order to include more cases of misalignment between grammar and parsing.

The results discussed so far go in line with the findings from Sturt & Kwon (2015), which is the only existent study examining interference effects in lexically driven control dependencies, although it only considers subject control dictated by nominals. In this regard, the results presented in this project expand Sturt & Kwon's work in two interesting ways. First, by showing that facilitatory interference effects can be obtained in verbal control constructions, and second (and more interesting), by showing that interference effects can also be obtained in object control sentences, in which the distractor NP does not linearly intervene in the dependency. Moreover, the results from this investigation have also uncovered other types of interference effects of that had not been reported in Sturt & Kwon (2015). What is interesting about these additional instances of interference is that they appeared in grammatical sentences. In Experiment 3, there is indirect evidence suggestive of inhibitory interference effects, as described by the cue-based retrieval model. That is, the adjective was harder to integrate in subject control grammatical sentences with two NPs of the same gender when compared to sentences in which only the correct antecedent of PRO agreed in gender with the adjective. The exact opposite effect was found in Experiment 5, in which it was actually grammatical sentences with two NPs of the same gender which were facilitated. This latter type of interference effect, which was described as a gender familiarity effect (or a penalty for grammatical sentences with a mismatching distractor), cannot be predicted under the workings of a cue-based retrieval system –at least as it has been outlined so far.

The presence of a gender familiarity effect interestingly coincides with a previous finding reported in Cunnings and Felser (2013). Even though their study tackled a dependency that is subject to different constraints (reflexive binding) and they used a different design, the authors similarly manipulated the gender of two preceding NPs with respect to the reflexive pronoun, and they also collected WMC scores. They observed that the low memory span group showed longer reading times in grammatical sentences in which the two antecedent NPs matched in gender with the reflexive pronoun compared to sentences in which only the target matched in gender with the pronoun. Their findings show suggests that high and low WMC readers resort to different strategies during the resolution of anaphoric dependencies and consequently, similar processes could be underlying the variable patterns of interference found in this project such that high and low WMC readers are differently affected by the presence of gender

matching or mismatching control-irrelevant antecedents. Although thought-provoking, this proposal is admittedly speculative and further research is paramount to ascertain the role of WMC in the processing of control dependencies and dependency resolution in general. As noted in Vasishth et al. (2019), the standard practice in most works on interference processes is to simply focus on whether a given effect is present or absent in the average mean, ignoring differences at the individual-level which can be of theoretical importance for the understanding of sentence processing mechanisms. Incorporating this variable in studies such as the ones presented here is likely to provide valuable insights as memory-based models (such as the cue-based retrieval one) should be able to incorporate predictions about WMC as an individual source of variability in terms of processing difficulty.

Few studies have examined the retrieval processes deployed in the resolution of linguistic dependencies that hinge on lexical constraints. In this work we have demonstrated that the integration of an adjective that must agree with the implicit subject PRO is subject to interference effects, but one important question still remains unsolved: what are the processes whereby these interference effects arise? Or, to put it differently, do the interference effects entail the recalculation of the PRO-antecedent dependency or are they simply the result of a direct link between the adjective and one of the NPs in the matrix clause? We believe that the different patterns of interference observed indicate that the anaphoric dependency that was initially established at the infinitive verb is being reactivated when comprehenders reach the adjective, and re-evaluated on the basis of the gender compatibility of the adjective with both the null subject PRO and the matrix clause antecedents.[113] Evidence in favor of this interpretation comes from the presence of interference effects in grammatical sentences. If interference effects had only appeared in ungrammatical contexts, these could have been accounted for appealing to error-driven repair mechanisms. Nonetheless, an explanation based on error-driven repair mechanisms is not sufficient to account for the entire pattern of results observed.

[113] This proposal bears some similarities with the phenomenon of Reversed Agree dubbed in Mancini et al. (2011; 2013). This idea was conceived in order to account for the phenomenon of 'unagreement', an agreement mismatch which occurs in sentences like *Los lingüistas escribimos artículos interesantes (We the linguists write interesting articles)*. The Spanish agreement system allows for the use of the 1st person plural of the verb (e.g. escribimos) to be used with a noun in the 3rd person plural NP (e.g. *los lingüistas*). This generates an agreement mismatch that is, nonetheless, perfectly grammatical. Mancini and colleagues argue that such a phenomenon is the result of an agreement dependency operating in a reversed fashion such that the verbal person is superimposed onto the nominal one. That is, a procedure that operates from the verb to the subject, in which the verb is the controller of the dependency, overwriting the first person value of the verbal morphology onto the subject.

Instead, it is likely that when comprehenders reach the adjective, its agreement cues may be given more weight than the lexical cues previously used to compute the PRO-antecedent dependency. Thus, the retrieval event triggered by the adjective would simultaneously target the features of the null subject and those of previous potential antecedents in the matrix clause. In this process, control-irrelevant nouns appear to be temporarily taken as the antecedent of the anaphoric dependency. The fact that the size of the morphological component of agreement is larger and more functionally relevant in Spanish than in English could also help explain why we observe evidence for interference processes in both ungrammatical and grammatical sentences in contrast with the lack of interference effects in grammatical sentences observed in Sturt & Kwon (2015). In other words, Spanish native speakers may initially give more weight to agreement morphology cues than lexical cues when computing the dependency established at the adjective. Indeed, the existence of language variability in terms of comprehenders' reliance on morphological markers is not a new idea. For instance, previous studies investigating agreement violations and the presence of the ERP component known as Left Anterior Negativity (LAN) –which is thought to reflect feature error detection– have shown that its spectra and amplitude is sensitive to the size of the morphological component of the language under study (e.g. Caffarra et al. 2019; Tanner & Van Hell 2014).

Moreover, as can be extracted from the fact that interference effects were more pervasive and robust in subject control sentences, it also seems that the proximity of the NPs with respect to the adjective plays a role in the adjective's integration. The chronology of events points to the fact that, even though lexical control information is crucial for the integration of the adjective, this process does not only take place on the basis of its compatibility with the gender of the null subject PRO, as dictated by grammatical theory. The onset of the grammaticality effect and the temporal order of this effect with respect to processes of interference varies across experiments. In Experiment 3 there is only clear evidence for sensitivity to grammatical violations in ungrammatical sentences with a mismatching distractor. In Experiment 5 the interference effects seem to precede the grammaticality effects –although self-paced reading is not the best technique to evaluate the temporal order of the effects. And in Experiment 6, there is first evidence for grammatical sensitivity that is followed by effects of interference, and then later evidence for grammatical sensitivity. It is possible that the presence of multiple distractor configurations in Experiments 3 and 5 may have had an impact on the onset of the

grammaticality effect in contrast with Experiment 6. Further research is necessary to confirm this.

We must admit that the processing information at our disposal is not enough to determine the impact of interference processes in the interpretation of the PRO-antecedent dependency. One possible way of testing whether interference effects affect interpretative processes would be to ask more direct comprehension questions after participants have read the sentences (e.g. *who was careful with the documents?*) Still, providing that our proposal is on the right track, the findings from this project represent evidence that lexically-based anaphoric dependencies are subject to interference effects. In this respect, on top of Parker et al.'s (2015) finding that not all anaphors that rely on structural constraints are immune to interference effects, this research adds the contribution that neither are those that rely on lexical constraints. This picture contradicts the idea that the processing of dependencies that involve interpretive processes may be more robust or conservative, as pointed in previous works (e.g. Dillon et al. 2013).

Evidently, this project by no means exhausts the scope of questions on the puzzle raised by control constructions. By way of conclusion we want to sketch some brief notes on interesting further paths of inquiry. These suggestions for future research follow immediately from several issues that are left unresolved. In the first place, taking into account the evidence accumulated in this project, it appears to us that a crucial next step would be to produce a high-powered eye-tracking replication of Experiment 3 using the improved set of materials from Experiments 4-6. Generally speaking, this would allow us to confirm the broad range of results reported here, and in particular, the robustness of the different types of interference effects found. In addition, such a task would allow us to observe whether or not there is ultimately sensitivity to grammatical violations in illusion-like sentences (as it was found in Experiment 5), and what is the temporal onset of those effects. One issue that remains unanswered has to do with the extraneous effects found in Experiments 3 and 6. As it was already suggested, this issue could be avoided by including a temporal adjunct between the NP2 and the infinitive verb, and we believe that any future experiment that studies similar structures should either dig deeper on the source of such effects of or take the measure of including extra material. Further experiments using common nouns instead of proper names could also help circumventing this problem.

With respect to the use of lexical control information, the experiments that conform this project suggest that lexical control information is used in online structure building operations. The lack of a recency effect and the detection of ill-formed adjectives supports the conclusion

that the antecedent of PRO is initially recovered on the basis of control information. In this investigation, the presence of sensitivity to agreement violations is conceived as a proxy for antecedent retrieval. This is because comprehenders can only recognize incorrect adjectives if they have retrieved an antecedent for PRO. Nonetheless, the most straightforward way of demonstrating that control information guides the resolution of PRO-antecedent dependencies when the first bottom-up evidence for a null subject is encountered would require using a manipulation that simultaneously probes for effects of lexical control and grammaticality at the infinitive verb itself. Previous studies that focused on different types of control constructions have used an animacy manipulation to test comprehenders' sensitivity to plausibility effects. Yet, such a design could not be implemented using lexical control verbs because their semantic nature generally requires that both the subject and the object are animate nouns. One possible way of creating a similar design could be to manipulate plausibility using common nouns and pronominal infinitives as a means to compare subject and object control sentences like (139) and (140) respectively. Even though the formulation of such materials would be much more complicated than the type of sentences used here, it would allow us to observe whether plausibility effects that follow from agreement operations emerge at the infinitive region. This would represent the best proof that lexical control information was immediately used to recover PRO's antecedent.

(139) a. La enfermera$_i$ le prometió al paciente$_j$ PRO$_i$ vacunarlo con cuidado.
The nurse^{fem} promised the patient^{masc} to vaccinate him with caution.
b. *La enfermera$_i$ le prometió al paciente$_j$ PRO$_i$ vacunarla con cuidado.
The nurse^{fem} promised the patient^{masc} to vaccinate her with caution.

(140) a. La enfermera$_i$ le ordeno al paciente$_j$ PRO$_j$ tratarla con cuidado.
The nurse^{fem} ordered the patient^{masc} to treat her with caution.
b. *La enfermera$_i$ le ordeno al paciente$_j$ PRO$_j$ tratarlo con cuidado.
The nurse^{fem} ordered the patient^{masc} to treat him with caution.

Furthermore, testing sentences like (139) and (140) would also allow us to investigate whether subject and object control dependencies are also processed similarly at the point of dependency formation when the infinitive verb is a lexical verb instead of a copulative verb. The use of

copulative verbs, which are devoid of complex semantic content, may have facilitated the integration and the resolution of the null subject-antecedent dependency.

As a last note, it is essential to remark that much remains to be discovered on the processing of control structures as it is a widely underexplored area in psycholinguistics. Studies on different types of control (e.g. nominal or prepositional) and comparisons among them are likely to bring to light exciting discoveries.

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6 CONCLUDING REMARKS

This dissertation was concerned with two dependencies of very different nature in terms of the specific grammatical constraints involved and the languages in which the experiments were carried out. This motivated the separate treatment given to them, as conforming two distinctive research agendas. Certainly, the various results obtained in Part I and II of the thesis provide interesting insights for the understanding of each phenomenon separately, but when these are looked at from a broader perspective, they also provide common and interesting insights for the understanding of misalignment phenomena and the conception of grammatical illusions.

More than six decades ago, Penrose & Penrose described the interest of the famous structure depicted in Figure 25 as due to the fact that "each individual part is acceptable as a representation […] and yet, owing to false connections of the parts. Acceptance of the whole on this basis leads to the illusory effect of an impossible structure" (1958: 31). Interestingly enough, such a statement could be used to describe the linguistic structures studied in this dissertation. Visual illusions (i.e. discrepancies between distal/real and proximal/perceived stimuli) have been and still are incredibly useful tools for the study of visual cognition –and the human mind at large– because they reveal the inner workings of the perceptual system in a way that normal perception cannot (Seckel 2000). Similarly, we hope that this dissertation also contributes to advocate for grammatical illusions as a valuable tool to investigate the mechanisms that grant routine and successful language comprehension. Much remains to be discovered about the common profile of illusory phenomena given that, just as with visual illusions, the language comprehension system does not experience linguistic illusions all over the place. Their occurrence is restricted to very specific configurations and contexts.

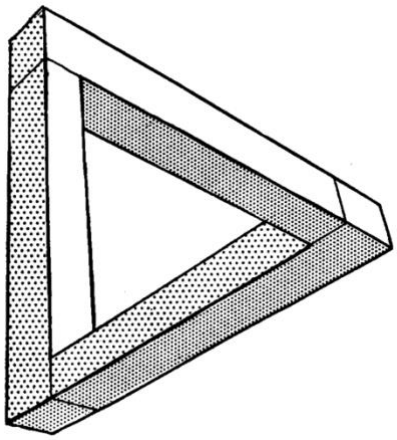


Figure 25. Perspective drawing of an impossible structure (Penrose & Penrose 1958).

By way of conclusion, we will start by summarizing the main contributions of the ample empirical evidence collected in this work. Then, we will try to integrate our findings in the broader context of misalignments and parser-grammar relations. Last, we will point to some areas to which the phenomenon of linguistic illusions can open promising pathways.

6.1 SUMMARY OF MAIN CONTRIBUTIONS

Part I of this dissertation provides robust empirical evidence that radically narrows down the landscape of hypotheses on NPI illusions. In fact, none of the four accounts introduced in Chapter 2 (i.e. the *memory-based hypothesis*, the *pragmatic rescuing hypothesis*, *the changing encodings hypothesis*, and the *ever-never confusability hypothesis*) are compatible with the findings reported in Chapter 3. In a nutshell: first, similar illusion-like sentences containing *never* instead of *ever* incurred in an increased processing cost (Experiments 1 and 2) and were perceived as less acceptable (Experiment 3). Second, similar illusion-like sentences containing verbal negation instead of quantificational negation do not produce interference effects (Experiments 4-6). In light of these experiments and the corpus data analyzed, we propose two alternative accounts: the *scalar alternatives hypothesis* and *scope miscalculation hypothesis*. Further empirical evidence involving a wide-ranging and detailed study of licensor types must be pursued in order to arbitrate among these two alternatives.

Moreover, the results from Experiments 1-3 from Part I on multiple negation sentences represent a hitherto unknown case of misalignment that opposes grammatical knowledge with

online/offline responses. Conceptualizing it as an illusion of ungrammaticality invites a reflection on the definition and scope of the concept of grammatical illusions, an issue to which we will return in the next section. Nonetheless, further research is necessary in order to clarify the relationship between multiple negation sentences and classic NPI illusion sentences. In addition, these experiments represent, to the best of our knowledge, the first psycholinguistic study that uses time-sensitive measures to investigate double negative dependencies. Our results confirmed the existent intuitions about the complexity of double negation and provided further evidence for its grammatical conception at the interface of syntax and pragmatics.

Regarding Part II of this dissertation, one of the most relevant empirical results is the lack of a facilitation for object control dependencies at the point of PRO-antecedent dependency formation. The similar reading times observed for subject and object control dependencies, together with the absence of evidence for reanalysis processes, and sensitivity to grammatical violations at the embedded adjective, indicates that control information is most possibly used from early stages of sentence processing. Nonetheless, the results from Chapter 5 also provide evidence for the existence of interesting interference effects. Both subject and object control dependencies were found to be affected by facilitatory interference (illusions of grammaticality) in Experiment 3, which is taken to mean that such illusory processes can occur regardless of the linear position of the distractor. However, not all the findings obtained here could be accounted for on the basis of current proposals within cue-based memory retrieval models. In this respect, Experiment 5 revealed that subject control dependencies exhibited gender familiarity effects, and the results from Experiment 6 revealed recency-based interference effects also in subject control dependencies. The fact that intrusion effects were more pervasive and robust in subject control sentences suggests that the proximity of the NPs with respect to the adjective plays an important role in their emergence. Simultaneously, we speculated that individual differences in WMC could be a factor that could help explain the (sometimes opposite) patterns of interference effects observed. All in all, what these experiments show is that the integration of the adjective does not take place by exclusively relying on control information. Further research should dig deeper on the forces that guide this process.

Apart from the complex online results from Experiments 3, 5 and 6, Chapter 5 also presented offline data on native speakers' readings of control verbs (Experiment 1) and the acceptability

perception of the sentences under investigation (Experiments 2 and 4). These are two types of tasks which, to our knowledge, had not been carried out before in this context. This, together with a detailed linguistic and psychometric study of the materials, has made us gain a deeper knowledge of the multiple factors that can affect the processing of control constructions.

In addition to these experimental, theoretical and methodological contributions, the background information collected in Chapters 2 and 4 provides an up-to-date critical review of the main works, issues, and hypotheses on the different topics tackled: from the grammar of NPIs to the existent empirical works on NPI illusions (Chapter 2), and from Control Theory and lexical control to the processing of null subject gaps (Chapter 4). Given the lack of comprehensive works on some of these issues, such an overview constitutes a helpful starting point for future researchers who want to carry out similar investigations.

6.2 WIDENING THE GRAMMATICAL ILLUSIONS LANDSCAPE

In the introductory chapter of this thesis, agreement attraction and the spurious licensing of NPIs were presented as paradigmatic examples of linguistic illusions. In this context, the concept of grammatical illusions was generally reserved to describe cases in which grammatical violations do not seem to be perceived in online measures but are then perfectly identified when comprehenders are given ample time. This characterization of grammatical illusions comes with two important assumptions: first, that illusory processes do not affect offline ratings, and second, that comprehenders are not expected to experience the opposite phenomenon (i.e. illusions of ungrammaticality). Even though subject-verb agreement and NPI illusions often fit into this narrow definition, careful examination of the existing evidence does not always support such a neat characterization.

With regard to the first assumption, this thesis has provided evidence that grammatical illusions do sometimes affect offline tasks. This is clearly shown in the acceptability ratings of the project –namely, Experiment 4 from Part I and Experiments 2 and 4 from Part II. In the three cases, the perception of ungrammatical sentences was shown to be improved when they contained structurally irrelevant but feature matching elements. Nonetheless, this was not the first time that such findings were identified in the literature. Previous studies have also reported an improved perception for NPI illusion sentences in acceptability judgments, even when the amelioration

effects are much weaker than those obtained in online tasks (e.g. Yanilmaz & Drury 2018a; Xiang et al. 2006; Yanilmaz & Drury 2018b). In addition, comparative illusions (Wellwood et al. 2018) and the presence of agreement attraction effects in production tasks (Bock et al. 2012; Bock & Miller 1991) are other examples that grammatical illusions do not always surface as neat differences between online and offline responses.

With regard to the second assumption, we have argued that several findings from this work could be characterized as cases of illusions of ungrammaticality. The effects observed for double negation sentences in Part I of the thesis are, in our view, consistent with such a configuration. Similarly, some of interference effects observed in Part II of the thesis which showed comprehenders difficulties in the context of grammatical dependencies were also classified as an illusion of ungrammaticality. On top of the evidence collected in this project, there are other examples in the literature that could be classified as such. For instance, in the study of agreement dependencies, some researchers have reported that attraction effects also affect agreement relations in grammatical sentences (e.g. Acuña-Fariña et al. 2014; Lago et al. 2015; Laurinavichyute & von-der-Malsburg 2019). Along the same lines, it has been shown that the perception of perfectly grammatical unagreement dependencies is degraded in online measures (Mancini et al. 2014; Mancini 2018).

This varied pattern of misalignments challenges the narrow definition of grammatical illusions because it leaves out many interesting effects, limiting the characterization of the existing evidence and our understanding of the connections among different phenomena. If linguistic illusions are understood as mismatches between grammatical knowledge and the outcomes of language comprehension, a wider illusory space should include misalignments that affect both grammatical and ungrammatical sentences as well as permanent (i.e. online and offline) and temporary (i.e. online) effects. Such a broader conceptualization of illusion-like phenomena would not need to capitalize on black and white distinctions between online and offline responses, while it should still delve deeper on the reasons why different types of dependencies yield different patterns of misalignment in online and offline tasks, and whether these can be turned off. By studying why certain visual illusions can be turned off when minimal changes are introduced into de stimuli, visual cognition has solved great puzzles on how the human mind perceives color, shape, size etc. –see the so-called *Ebbinghaus illusion* (Ebbinghaus 1902), to cite just a classic. Returning to

language, specific linguistic configurations should not only be investigated in order to understand them in isolation; but mostly, to ultimately understand their connections and integrate them into a theory of how misalignments emerge.

6.3 PARSER-GRAMMAR RELATIONS

In Chapter 1 we introduced the idea that there were two main ways of conceptualizing misalignments between grammar and parsing: either by resorting to a dualistic architecture for the language comprehension system or to a single system architecture. The views presented in this work align with the latter, in which grammar (i.e. lexicon and syntax) is conceptualized as a unitary structure building system whose computations are implemented using limited domain-general resources such as memory access, cognitive control, etc. (Lewis & Phillips 2015; Parker 2019). In this vein, mismatches between online and offline responses (or between grammar and parsing) reflect different snapshots of these computations at different points in time. These two different snapshots are those captured using online and offline techniques. Considering this, how can we integrate the offline evidence showing that comprehenders also exhibit illusory behaviors when given ample time? That is, is an alignment between online and offline responses and a discrepancy with the grammatical constraints compatible with this view?

Parker (2019) demonstrates both experimentally and computationally how a particular instance of online/offline mismatches –namely, agreement illusions– can be captured by a single structure-building system. In doing so, he argues that "mismatches between timed and untimed judgments about a sentence reflect extended re-processing to minimize the signal-to-noise ratio in grammatical processing over time" (Parker 2019: 23). If mapping, or moving from, online to offline responses involves re-processing in order to reduce signal-to-noise (e.g. multiple retrievals), it is then likely that not every participant manages to do this re-processing successfully at every trial, promoting the emergence of illusion-like contrasts in offline tasks. In the two parts of this thesis, offline judgements were a great predictor of online processes. In this respect, the fact that the impact of error-prone mechanisms spills over to comprehenders' offline behavior represents a further argument in favor of the idea that the two tasks tap into representations that result from the same system, even when these are captured at different points in time. Furthermore, the wealth of grammatical information that determines the emergence of illusory processes makes it difficult to

analyze and explain them by simply appealing to rough-and-ready representations or simple heuristics in the absence of detailed linguistic considerations (syntactic, semantic, pragmatic, etc.), or by exclusively appealing to memory retrieval processes.

6.4 PROMISING PATHWAYS

As it should be clear at this point, the reasons and consequences of parser-grammar misalignments in the broader sense and linguistic illusions in particular still remain poorly understood. As already noted, a promising way to go about these is to study the degree to which different dependencies are subject to interference effects, whether these are temporary or permanent and whether they can be turned off. With respect to the specific dependencies studied here, much work must be carried out. Some ideas for further research are pointed out in the discussion sections of Chapters 3 and 5. Nonetheless, we want to finish by pointing to new areas in which the study of linguistic illusions is emerging as a useful tool to approach linguistic cognition in areas other than 'traditional' sentence comprehension studies focusing on adult first language processing.

One of such domains is second language processing and acquisition. Here, a modest but growing body of works concerned with different types of linguistic illusions is showing interesting ways in which native and non-native speakers can differ or coincide with respect to the online mechanisms deployed and the information used during processing (e.g. Arslan et al. 2019; Felser 2019; Jacob et al. 2017; Lago & Felser 2018; Patterson et al. 2014). For instance, research on agreement illusions carried out by Schlueter et al. (Schlueter et al. 2017) have shown that advanced Chinese learners of English do not experience grammatical illusions because they do not use the number information at the verb to retrieve the target in the same way as native speakers do. This provides evidence that even though learners are able to successfully acquire and implement features that are not present in their L1, they implement these constraints using different strategies.

Another interesting domain is bilingualism. It has recently been claimed that linguistic illusions can be used to explore the so-called bilingual advantage. In general terms, it has been argued by some scholars that bilingualism endows individuals with better executive control or cognitive reserve. Nonetheless, the evidence in favor of this proposal has shown mixed results (cf. Duñabeitia & Carreiras 2015; van den Noort et al. 2019). Recent work by Leivada (2020, also Leivada et al. 2020) moves away from executive functions and proposes to explore, instead, the

effects of bilingualism in the online use of grammatical information by comparing the prevalence of grammatical illusions in monolinguals and bilinguals. Interestingly, her results show an enhanced ability for bilinguals to spot illusions. Even though several factors are identified as possible sources of such a result, the author hypothesizes that "code-switching [in bilinguals] may facilitate the setting of a higher processing threshold through sharpened top-down control processes, something that would entail decreased fallibility to grammatical illusions" (2020: 15). That is, bilinguals would be able to better match the input to the existent retrieval cues, "together with a superior ability to attend selectively to various aspects of the stimuli, (dis)engaging attentional resources accordingly" (2020: 16).

The last domain that we want to bring into the picture has do to with individual differences in sentence processing. When it comes to individual differences, interesting parallelisms with the area of visual perception emerge once again. In 2015 a picture of a dress became viral as it split the population in two: those who saw a black and blue dress, and those who saw a white and golden dress. This viral behemoth came to be known as the 'dress illusion', and it has shown the general public and the scientific community how dramatic individual differences can be (cf. Brainard & Hurlbert 2015). Even though it is unlikely that individual differences in language processing go as far as the dramatic differences in color perception from the 'dress illusion', introducing measures of individual differences in the study of illusory phenomena can bring us to very interesting places. Unfortunately, the study of individual differences in dependency formation has not received much attention in the literature (although cf. Nicenboim et al. 2015; Tan et al. 2017). In Chapter 5 we already emphasized the importance of WMC in this respect, particularly for studies that are framed within cue-based retrieval models. Nonetheless, interesting areas of inquiry at the interface of grammatical illusions and individual differences go beyond WMC. As experimental psycholinguists, we often assume that there is one population from which we sample, hoping that the individuals that we 'randomly' select for our experiments are representative of that population. Still, there are more and more datapoints showing that this may not be the correct assumption. Perhaps, this issue has been most clearly addressed by the ERP literature through the discussion regarding (sometimes) contrasting emergence of the N400 and P600 components. It has been found that different individuals exhibit different types of electrophysiological responses to the same manipulation, forming some sort of 'subpopulations' (e.g. Tanner & Van Hell 2014). If such

differences can be attributed to the fact that the weight given to syntactic and semantic information varies across individuals, differences at this level could, in turn, foster different patterns of interference depending on the cues that are relevant in order to retrieve a target. Exciting avenues could be opened in this direction.

In short, we hope to have conveyed the idea that illusory phenomena are not only a pivotal gateway into how the parser navigates linguistic dependencies but they can potentially serve as a versatile tool in other areas of inquiry.

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APPENDICES

APPENDIX A: Experimental materials for Chapter 3 (Part I-NPI illusions)

A.1 Experiments 1 (speeded acceptability), 2 (self-paced reading) and 3 (acceptability judgement)

1A. The authors that the critics recommended have never received acknowledgment for a best-selling novel.
1B. The authors that no critics recommended have never received acknowledgment for a best-selling novel.
1C. No authors that the critics recommended have never received acknowledgment for a best-selling novel.

2A. The soldiers that the diplomats supported have never shown bravery in the controversial war.
2B. The soldiers that no diplomats supported have never shown bravery in the controversial war.
2C. No soldiers that the diplomats supported have never shown bravery in the controversial war.

3A. The ambassadors that the diplomats consulted have never seen brutality in the foreign war.
3B. The ambassadors that no diplomats consulted have never seen brutality in the foreign war.
3C. No ambassadors that the diplomats consulted have never seen brutality in the foreign war.

4A. The professors that the students respected have never wanted negativity in a class debate.
4B. The professors that no students respected have never wanted negativity in a class debate.
4C. No professors that the students respected have never wanted negativity in a class debate.

5A. The customers that the salesmen assisted have never expressed optimism for a full refund.
5B. The customers that no salesmen assisted have never expressed optimism for a full refund.
5C. No customers that the salesmen assisted have never expressed optimism for a full refund.

6A. The comments that the politicians ignored have never caused bitterness toward the liberal newspapers.
6B. The comments that no politicians ignored have never caused bitterness toward the liberal newspapers.
6C. No comments that the politicians ignored have never caused bitterness toward the liberal newspapers.

7A. The detergents that the housewives used have never caused damage to the delicate clothing.
7B. The detergents that no housewives used have never caused damage to the delicate clothing.
7C. No detergents that the housewives used have never caused damage to the delicate clothing.

8A. The lawyers that the businessmen respected have never received criticism for a bad trial.
8B. The lawyers that no businessmen respected have never received criticism for a bad trial.
8C. No lawyers that the businessmen respected have never received criticism for a bad trial.

9A. The students that the teachers punished have never expected friendliness from the strict principal.
9B. The students that no teachers punished have never expected friendliness from the strict principal.
9C. No students that the teachers punished have never expected friendliness from the strict principal.

10A. The babysitters that the children obeyed have never expected gratitude from the disappointed parents.
10B. The babysitters that no children obeyed have never expected gratitude from the disappointed parents.
10C. No babysitters that the children obeyed have never expected gratitude from the disappointed parents.

11A. The actors that the fans recognized have never experienced soreness after a dangerous stunt.
11B. The actors that no fans recognized have never experienced soreness after a dangerous stunt.
11C. No actors that the fans recognized have never experienced soreness after a dangerous stunt.

12A. The teachers that the parents recommended have never caused problems for the new students.
12B. The teachers that no parents recommended have never caused problems for the new students.
12C. No teachers that the parents recommended have never caused problems for the new students.

13A. The students that the librarians helped have never made progress on the difficult assignment.
13B. The students that no librarians helped have never made progress on the difficult assignment.
13C. No students that the librarians helped have never made progress on the difficult assignment.

14A. The nurses that the doctors appreciated have never shown patience in the operating room.
14B. The nurses that no doctors appreciated have never shown patience in the operating room.
14C. No nurses that the doctors appreciated have never shown patience in the operating room.

15A. The criminals that the policemen caught have never felt satisfaction from a petty crime.
15B. The criminals that no policemen caught have never felt satisfaction from a petty crime.

15C. No criminals that the policemen caught have never felt satisfaction from a petty crime.

16A. The employees that the managers recommended have never wanted kindness from the rude customers.
16B. The employees that no managers recommended have never wanted kindness from the rude customers.
16C. No employees that the managers recommended have never wanted kindness from the rude customers.

17A. The accountants that the managers trusted have never seen rises in the quarterly profits.
17B. The accountants that no managers trusted have never seen rises in the quarterly profits.
17C. No accountants that the managers trusted have never seen rises in the quarterly profits.

18A. The candidates that the voters supported have never shown friendliness to the rude journalists.
18B. The candidates that no voters supported have never shown friendliness to the rude journalists.
18C. No candidates that the voters supported have never shown friendliness to the rude journalists.

19A. The surgeons that the patients trusted have never seen appreciation from the hospital staff.
19B. The surgeons that no patients trusted have never seen appreciation from the hospital staff.
19C. No surgeons that the patients trusted have never seen appreciation from the hospital staff.

20A. The suspects that the witnesses identified have never shown nervousness in the court room.
20B. The suspects that no witnesses identified have never shown nervousness in the court room.
20C. No suspects that the witnesses identified have never shown nervousness in the court room.

21A. The actresses that the housewives admired have never caused excitement at a film festival.
21B. The actresses that no housewives admired have never caused excitement at a film festival.
21C. No actresses that the housewives admired have never caused excitement at a film festival.

22A. The ambassadors that the government consulted have never received hostility from the liberal media.
22B. The ambassadors that no government consulted have never received hostility from the liberal media.
22C. No ambassadors that the government consulted have never received hostility from the liberal media.

23A. The politicians that the journalists endorsed have never earned trust from the rural communities.
23B. The politicians that no journalists endorsed have never earned trust from the rural communities.
23C. No politicians that the journalists endorsed have never earned trust from the rural communities.

24A. The teenagers that the parents trusted have never expressed kindness to a younger sibling.
24B. The teenagers that no parents trusted have never expressed kindness to a younger sibling.
24C. No teenagers that the parents trusted have never expressed kindness to a younger sibling.

25A. The survivors that the medics treated have never felt courage during the extreme emergency.
25B. The survivors that no medics treated have never felt courage during the extreme emergency.
25C. No survivors that the medics treated have never felt courage during the extreme emergency.

26A. The players that the coaches drafted have never felt nervousness before a championship game.
26B. The players that no coaches drafted have never felt nervousness before a championship game.
26C. No players that the coaches drafted have never felt nervousness before a championship game.

27A. The dictators that the citizens trusted have never caused chaos at a public event.
27B. The dictators that no citizens trusted have never caused chaos at a public event.
27C. No dictators that the citizens trusted have never caused chaos at a public event.

28A. The professors that the students understood have never experienced tiredness after a long lecture.
28B. The professors that no students understood have never experienced tiredness after a long lecture.
28C. No professors that the students understood have never experienced tiredness after a long lecture.

29A. The actors that the judges nominated have never had luck at the award ceremonies.
29B. The actors that no judges nominated have never had luck at the award ceremonies.
29C. No actors that the judges nominated have never had luck at the award ceremonies.

30A. The actresses that the directors auditioned have never shown elegance on a large stage.
30B. The actresses that no directors auditioned have never shown elegance on a large stage.
30C. No actresses that the directors auditioned have never shown elegance on a large stage.

31A. The champions that the competitors defeated have never shown humility after a big game.
31B. The champions that no competitors defeated have never shown humility after a big game.
31C. No champions that the competitors defeated have never shown humility after a big game.

32A. The paintings that the collectors liked have never depicted tranquility with very bright colors.
32B. The paintings that no collectors liked have never depicted tranquility with very bright colors.
32C. No paintings that the collectors liked have never depicted tranquility with very bright colors.

33A. The editors that the journalists respected have never had patience for a missed deadline.
33B. The editors that no journalists respected have never had patience for a missed deadline.
33C. No editors that the journalists respected have never had patience for a missed deadline.

34A. The teenagers that the teachers motivated have never experienced loneliness in the large class.
34B. The teenagers that no teachers motivated have never experienced loneliness in the large class.
34C. No teenagers that the teachers motivated have never experienced loneliness in the large class.

35A. The students that the professors tutored have never had trouble in a math class.
35B. The students that no professors tutored have never had trouble in a math class.
35C. No students that the professors tutored have never had trouble in a math class.

36A. The movies that the children watched have never depicted gore during a fight scene.
36B. The movies that no children watched have never depicted gore during a fight scene.
36C. No movies that the children watched have never depicted gore during a fight scene.

A.2 Experiments 4 (acceptability judgement) and 5 (speeded acceptability)

1A. No authors that the critics recommended have ever received acknowledgment for a best-selling novel.
1B. The authors that no critics recommended have ever received acknowledgment for a best-selling novel.
1C. The authors that the critics did not recommend have ever received acknowledgment for a best-selling novel.
1D. The authors that the critics recommended have ever received acknowledgment for a best-selling novel.

2A. No soldiers that the diplomats supported have ever shown bravery in the controversial war.
2B. The soldiers that no diplomats supported have ever shown bravery in the controversial war.
2C. The soldiers that the diplomats did not support have ever shown bravery in the controversial war.
2D. The soldiers that the diplomats supported have ever shown bravery in the controversial war.

3A. No ambassadors that the diplomats consulted have ever seen brutality in the foreign war.
3B. The ambassadors that no diplomats consulted have ever seen brutality in the foreign war.
3C. The ambassadors that the diplomats did not consult have ever seen brutality in the foreign war.
3D. The ambassadors that the diplomats consulted have ever seen brutality in the foreign war.

4A. No professors that the students respected have ever wanted negativity in a class debate.
4B. The professors that no students respected have ever wanted negativity in a class debate.
4C. The professors that the students did not respect have ever wanted negativity in a class debate.
4D. The professors that the students respected have ever wanted negativity in a class debate.

5A. No customers that the salesmen assisted have ever expressed optimism for a full refund.
5B. The customers that no salesmen assisted have ever expressed optimism for a full refund.
5C. The customers that the salesmen did not assist have ever expressed optimism for a full refund.
5D. The customers that the salesmen assisted have ever expressed optimism for a full refund.

6A. No comments that the politicians ignored have ever caused bitterness toward the liberal newspapers.
6B. The comments that no politicians ignored have ever caused bitterness toward the liberal newspapers.
6C. The comments that the politicians did not ignore have ever caused bitterness toward the liberal newspapers.
6D. The comments that the politicians ignored have ever caused bitterness toward the liberal newspapers.

7A. No detergents that the housewives used have ever caused damage to the delicate clothing.
7B. The detergents that no housewives used have ever caused damage to the delicate clothing.
7C. The detergents that the housewives did not use have ever caused damage to the delicate clothing.
7D. The detergents that the housewives used have ever caused damage to the delicate clothing.

8A. No lawyers that the businessmen respected have ever received criticism for a bad trial.
8B. The lawyers that no businessmen respected have ever received criticism for a bad trial.
8C. The lawyers that the businessmen did not respect have ever received criticism for a bad trial.
8D. The lawyers that the businessmen respected have ever received criticism for a bad trial.

9A. No students that the teachers punished have ever expected friendliness from the strict principal.
9B. The students that no teachers punished have ever expected friendliness from the strict principal.
9C. The students that the teachers did not punish have ever expected friendliness from the strict principal.
9D. The students that the teachers punished have ever expected friendliness from the strict principal.

10A. No babysitters that the children obeyed have ever expected gratitude from the disappointed parents.
10B. The babysitters that no children obeyed have ever expected gratitude from the disappointed parents.
10C. The babysitters that the children did not obey have ever expected gratitude from the disappointed parents.
10D. The babysitters that the children obeyed have ever expected gratitude from the disappointed parents.

11A. No actors that the fans recognized have ever experienced soreness after a dangerous stunt.
11B. The actors that no fans recognized have ever experienced soreness after a dangerous stunt.
11C. The actors that the fans did not recognize have ever experienced soreness after a dangerous stunt.
11D. The actors that the fans recognized have ever experienced soreness after a dangerous stunt.

12A. No teachers that the parents recommended have ever caused problems for the new students.

12B. The teachers that no parents recommended have ever caused problems for the new students.
12C. The teachers that the parents did not recommend have ever caused problems for the new students.
12D. The teachers that the parents recommended have ever caused problems for the new students.

13A. No students that the librarians helped have ever made progress on the difficult assignment.
13B. The students that no librarians helped have ever made progress on the difficult assignment.
13C. The students that the librarians did not help have ever made progress on the difficult assignment.
13D. The students that the librarians helped have ever made progress on the difficult assignment.

14A. No nurses that the doctors appreciated have ever shown patience in the operating room.
14B. The nurses that no doctors appreciated have ever shown patience in the operating room.
14C. The nurses that the doctors did not appreciate have ever shown patience in the operating room.
14D. The nurses that the doctors appreciated have ever shown patience in the operating room.

15A. No criminals that the policemen caught have ever felt satisfaction from a petty crime.
15B. The criminals that no policemen caught have ever felt satisfaction from a petty crime.
15C. The criminals that the policemen did not catch have ever felt satisfaction from a petty crime.
15D. The criminals that the policemen caught have ever felt satisfaction from a petty crime.

16A. No employees that the managers recommended have ever wanted kindness from the rude customers.
16B. The employees that no managers recommended have ever wanted kindness from the rude customers.
16C. The employees that the managers did not recommend have ever wanted kindness from the rude customers.
16D. The employees that the managers recommended have ever wanted kindness from the rude customers.

17A. No accountants that the managers trusted have ever seen rises in the quarterly profits.
17B. The accountants that no managers trusted have ever seen rises in the quarterly profits.
17C. The accountants that the managers did not trust have ever seen rises in the quarterly profits.
17D. The accountants that the managers trusted have ever seen rises in the quarterly profits.

18A. No candidates that the voters supported have ever shown friendliness to the rude journalists.
18B. The candidates that no voters supported have ever shown friendliness to the rude journalists.
18C. The candidates that the voters did not support have ever shown friendliness to the rude journalists.
18D. The candidates that the voters supported have ever shown friendliness to the rude journalists.

19A. No surgeons that the patients trusted have ever seen appreciation from the hospital staff.
19B. The surgeons that no patients trusted have ever seen appreciation from the hospital staff.
19C. The surgeons that the patients did not trust have ever seen appreciation from the hospital staff.
19D. The surgeons that the patients trusted have ever seen appreciation from the hospital staff.

20A. No suspects that the witnesses identified have ever shown nervousness in the court room.
20B. The suspects that no witnesses identified have ever shown nervousness in the court room.
20C. The suspects that the witnesses did not identify have ever shown nervousness in the court room.
20D. The suspects that the witnesses identified have ever shown nervousness in the court room.

21A. No actresses that the housewives admired have ever caused excitement at a film festival.
21B. The actresses that no housewives admired have ever caused excitement at a film festival.
21C. The actresses that the housewives did not admire have ever caused excitement at a film festival.
21D. The actresses that the housewives admired have ever caused excitement at a film festival.

22A. No ambassadors that the government consulted have ever received hostility from the liberal media.
22B. The ambassadors that no government consulted have ever received hostility from the liberal media.
22C. The ambassadors that the government did not consult have ever received hostility from the liberal media.
22D. The ambassadors that the government consulted have ever received hostility from the liberal media.

23A. No politicians that the journalists endorsed have ever earned trust from the rural communities.
23B. The politicians that no journalists endorsed have ever earned trust from the rural communities.
23C. The politicians that the journalists did not endorse have ever earned trust from the rural communities.
23D. The politicians that the journalists endorsed have ever earned trust from the rural communities.

24A. No teenagers that the parents trusted have ever expressed kindness to a younger sibling.
24B. The teenagers that no parents trusted have ever expressed kindness to a younger sibling.
24C. The teenagers that the parents did not trust have ever expressed kindness to a younger sibling.
24D. The teenagers that the parents trusted have ever expressed kindness to a younger sibling.

25A. No survivors that the medics treated have ever felt courage during the extreme emergency.
25B. The survivors that no medics treated have ever felt courage during the extreme emergency.
25C. The survivors that the medics did not treat have ever felt courage during the extreme emergency.
25D. The survivors that the medics treated have ever felt courage during the extreme emergency.

26A. No players that the coaches drafted have ever felt nervousness before a championship game.
26B. The players that no coaches drafted have ever felt nervousness before a championship game.
26C. The players that the coaches did not draft have ever felt nervousness before a championship game.
26D. The players that the coaches drafted have ever felt nervousness before a championship game.

27A. No dictators that the citizens trusted have ever caused chaos at a public event.
27B. The dictators that no citizens trusted have ever caused chaos at a public event.
27C. The dictators that the citizens did not trust have ever caused chaos at a public event.
27D. The dictators that the citizens trusted have ever caused chaos at a public event.

28A. No professors that the students understood have ever experienced tiredness after a long lecture.
28B. The professors that no students understood have ever experienced tiredness after a long lecture.
28C. The professors that the students did not understand have ever experienced tiredness after a long lecture.
28D. The professors that the students understood have ever experienced tiredness after a long lecture.

29A. No actors that the judges nominated have ever had luck at the award ceremonies.
29B. The actors that no judges nominated have ever had luck at the award ceremonies.
29C. The actors that the judges did not nominate have ever had luck at the award ceremonies.
29D. The actors that the judges nominated have ever had luck at the award ceremonies.

30A. No actresses that the directors auditioned have ever shown elegance on a large stage.
30B. The actresses that no directors auditioned have ever shown elegance on a large stage.
30C. The actresses that the directors did not audition have ever shown elegance on a large stage.
30D. The actresses that the directors auditioned have ever shown elegance on a large stage.

31A. No champions that the competitors defeated have ever shown humility after a big game.
31B. The champions that no competitors defeated have ever shown humility after a big game.
31C. The champions that the competitors did not defeat have ever shown humility after a big game.
31D. The champions that the competitors defeated have ever shown humility after a big game.

32A. No paintings that the collectors liked have ever depicted tranquility with very bright colors.
32B. The paintings that no collectors liked have ever depicted tranquility with very bright colors.
32C. The paintings that the collectors did not like have ever depicted tranquility with very bright colors.
32D. The paintings that the collectors liked have ever depicted tranquility with very bright colors.

33A. No editors that the journalists respected have ever had patience for a missed deadline.
33B. The editors that no journalists respected have ever had patience for a missed deadline.
33C. The editors that the journalists did not respect have ever had patience for a missed deadline.
33D. The editors that the journalists respected have ever had patience for a missed deadline.

34A. No teenagers that the teachers motivated have ever experienced loneliness in the large class.
34B. The teenagers that no teachers motivated have ever experienced loneliness in the large class.
34C. The teenagers that the teachers did not motivate have ever experienced loneliness in the large class.
34D. The teenagers that the teachers motivated have ever experienced loneliness in the large class.

35A. No students that the professors tutored have ever had trouble in a math class.
35B. The students that no professors tutored have ever had trouble in a math class.
35C. The students that the professors did not tutor have ever had trouble in a math class.
35D. The students that the professors tutored have ever had trouble in a math class.

36A. No movies that the children watched have ever depicted gore during a fight scene.
36B. The movies that no children watched have ever depicted gore during a fight scene.
36C. The movies that the children did not watch have ever depicted gore during a fight scene.
36D. The movies that the children watched have ever depicted gore during a fight scene.

A.3 Experiment 6 (speeded acceptability)

1A. No authors that the critics have recommended in their reviews have ever received acknowledgment for a best-selling novel.
1B. The authors that no critics have recommended in their reviews have ever received acknowledgment for a best-selling novel.
1C. The authors that the critics haven't recommended in their reviews have ever received acknowledgment for a best-selling novel.
1D. The authors that the critics have recommended in their reviews have ever received acknowledgment for a best-selling novel.

2A. No soldiers that the diplomats have supported in the trial have ever shown respect to the war victims.
2B. The soldiers that no diplomats have supported in the trial have ever shown respect to the war victims.
2C. The soldiers that the diplomats haven't supported in the trial have ever shown respect to the war victims.
2D. The soldiers that the diplomats have supported in the trial have ever shown respect to the war victims.

3A. No ambassadors that the diplomats have consulted about the treaty have ever seen brutality in the foreign war.
3B. The ambassadors that no diplomats have consulted about the treaty have ever seen brutality in the foreign war.
3C. The ambassadors that the diplomats haven't consulted about the treaty have ever seen brutality in the foreign war.
3D. The ambassadors that the diplomats have consulted about the treaty have ever seen brutality in the foreign war.

4A. No professors that the students have challenged over low grades have ever wanted negativity in a class debate.
4B. The professors that no students have challenged over low grades have ever wanted negativity in a class debate.
4C. The professors that the students haven't challenged over low grades have ever wanted negativity in a class debate.
4D. The professors that the students have challenged over low grades have ever wanted negativity in a class debate.

5A. No customers that the salesmen have assisted in the outlet have ever expressed optimism for a full refund.
5B. The customers that no salesmen have assisted in the outlet have ever expressed optimism for a full refund.
5C. The customers that the salesmen haven't assisted in the outlet have ever expressed optimism for a full refund.
5D. The customers that the salesmen have assisted in the outlet have ever expressed optimism for a full refund.

6A. No diplomats that the politicians have informed of recent policies have ever caused controversy in the liberal newspapers.
6B. The diplomats that no politicians have informed of recent policies have ever caused controversy in the liberal newspapers.
6C. The diplomats that the politicians haven't informed of recent policies have ever caused controversy in the liberal newspapers.
6D. The diplomats that the politicians have informed of recent policies have ever caused controversy in the liberal newspapers.

7A. No maids that the housewives have thanked for their work have ever caused damage to the delicate clothing.
7B. The maids that no housewives have thanked for their work have ever caused damage to the delicate clothing.
7C. The maids that the housewives haven't thanked for their work have ever caused damage to the delicate clothing.
7D. The maids that the housewives have thanked for their work have ever caused damage to the delicate clothing.

8A. No lawyers that the businessmen have hired for legal advice have ever received criticism for lost fraud trials.
8B. The lawyers that no businessmen have hired for legal advice have ever received criticism for lost fraud trials.
8C. The lawyers that the businessmen haven't hired for legal advice have ever received criticism for lost fraud trials.
8D. The lawyers that the businessmen have hired for legal advice have ever received criticism for lost fraud trials.

9A. No students that the teachers have punished for bad behavior have ever expected friendliness from the strict principal.
9B. The students that no teachers have punished for bad behavior have ever expected friendliness from the strict principal.
9C. The students that the teachers haven't punished for bad behavior have ever expected friendliness from the strict principal.
9D. The students that the teachers have punished for bad behavior have ever expected friendliness from the strict principal.

10A. No babysitters that the children have disobeyed during an outing have ever expected gratitude from the disappointed parents.
10B. The babysitters that no children have disobeyed during an outing have ever expected gratitude from the disappointed parents.
10C. The babysitters that the children haven't disobeyed during an outing have ever expected gratitude from the disappointed parents.
10D. The babysitters that the children have disobeyed during an outing have ever expected gratitude from the disappointed parents.

11A. No actors that the producers have solicited for their films have ever experienced injuries from a dangerous stunt.
11B. The actors that no producers have solicited for their films have ever experienced injuries from a dangerous stunt.
11C. The actors that the producers haven't solicited for their films have ever experienced injuries from a dangerous stunt.
11D. The actors that the producers have solicited for their films have ever experienced injuries from a dangerous stunt.

12A. No teachers that the parents have commended in PTA meetings have ever caused problems with the school administrators.
12B. The teachers that no parents have commended in PTA meetings have ever caused problems with the school administrators.
12C. The teachers that the parents haven't commended in PTA meetings have ever caused problems with the school administrators.
12D. The teachers that the parents have commended in PTA meetings have ever caused problems with the school administrators.

13A. No students that the librarians have helped with book reports have ever made progress on the difficult assignment.
13B. The students that no librarians have helped with book reports have ever made progress on the difficult assignment.
13C. The students that the librarians haven't helped with book reports have ever made progress on the difficult assignment.
13D. The students that the librarians have helped with book reports have ever made progress on the difficult assignment.

14A. No nurses that the doctors have requested for the surgery have ever shown clumsiness in the operating room.
14B. The nurses that no doctors have requested for the surgery have ever shown clumsiness in the operating room.
14C. The nurses that the doctors haven't requested for the surgery have ever shown clumsiness in the operating room.
14D. The nurses that the doctors have requested for the surgery have ever shown clumsiness in the operating room.

15A. No criminals that the policemen have caught in drug raids have ever felt satisfaction from a petty crime.
15B. The criminals that no policemen have caught in drug raids have ever felt satisfaction from a petty crime.
15C. The criminals that the policemen haven't caught in drug raids have ever felt satisfaction from a petty crime.
15D. The criminals that the policemen have caught in drug raids have ever felt satisfaction from a petty crime.

16A. No employees that the managers have recommended for a raise have ever expressed frustration with the rude customers.
16B. The employees that no managers have recommended for a raise have ever expressed frustration with the rude customers.
16C. The employees that the managers haven't recommended for a raise have ever expressed frustration with the rude customers.
16D. The employees that the managers have recommended for a raise have ever expressed frustration with the rude customers.

17A. No accountants that the managers have blamed for company losses have ever seen rises in the quarterly profits.
17B. The accountants that no managers have blamed for company losses have ever seen rises in the quarterly profits.
17C. The accountants that the managers haven't blamed for company losses have ever seen rises in the quarterly profits.
17D. The accountants that the managers have blamed for company losses have ever seen rises in the quarterly profits.

18A. No candidates that the voters have supported during the election have ever shown friendliness to the rude journalists.
18B. The candidates that no voters have supported during the election have ever shown friendliness to the rude journalists.
18C. The candidates that the voters haven't supported during the election have ever shown friendliness to the rude journalists.
18D. The candidates that the voters have supported during the election have ever shown friendliness to the rude journalists.

19A. No surgeons that the patients have consulted about the operation have ever expressed dissatisfaction with the hospital staff.
19B. The surgeons that no patients have consulted about the operation have ever expressed dissatisfaction with the hospital staff.

19C. The surgeons that the patients haven't consulted about the operation have ever expressed dissatisfaction with the hospital staff.
19D. The surgeons that the patients have consulted about the operation have ever expressed dissatisfaction with the hospital staff.

20A. No suspects that the witnesses have identified in photo line-ups have ever shown nervousness in the court room.
20B. The suspects that no witnesses have identified in photo line-ups have ever shown nervousness in the court room.
20C. The suspects that the witnesses haven't identified in photo line-ups have ever shown nervousness in the court room.
20D. The suspects that the witnesses have identified in photo line-ups have ever shown nervousness in the court room.

21A. No actresses that the moviegoers have praised for their performance have ever caused excitement at a film festival.
21B. The actresses that no moviegoers have praised for their performance have ever caused excitement at a film festival.
21C. The actresses that the moviegoers haven't praised for their performance have ever caused excitement at a film festival.
21D. The actresses that the moviegoers have praised for their performance have ever caused excitement at a film festival.

22A. No senators that the billionaires have supported with campaign donations have ever received hostility from online news media.
22B. The senators that no billionaires have supported with campaign donations have ever received hostility from online news media.
22C. The senators that the billionaires haven't supported with campaign donations have ever received hostility from online news media.
22D. The senators that the billionaires have supported with campaign donations have ever received hostility from online news media.

23A. No politicians that the journalists have endorsed in the media have ever earned trust from the rural communities.
23B. The politicians that no journalists have endorsed in the media have ever earned trust from the rural communities.
23C. The politicians that the journalists haven't endorsed in the media have ever earned trust from the rural communities.
23D. The politicians that the journalists haven endorsed in the media have ever earned trust from the rural communities.

24A. No teenagers that the parents have trusted with a car have ever expressed impatience with their rambunctious siblings.
24B. The teenagers that no parents have trusted with a car have ever expressed impatience with their rambunctious siblings.
24C. The teenagers that the parents haven't trusted with a car have ever expressed impatience with their rambunctious siblings.
24D. The teenagers that the parents have trusted with a car have ever expressed impatience with their rambunctious siblings.

25A. No survivors that the medics have cured of their injuries have ever felt regret for their military service
25B. The survivors that no medics have cured of their injuries have ever felt regret for their military service
25C. The survivors that the medics haven't cured of their injuries have ever felt regret for their military service
25D. The survivors that the medics have cured of their injuries have ever felt regret for their military service

26A. No players that the coaches have drafted for the team have ever felt nervousness before a championship game.
26B. The players that no coaches have drafted for the team have ever felt nervousness before a championship game.
26C. The players that the coaches haven't drafted for the team have ever felt nervousness before a championship game.
26D. The players that the coaches have drafted for the team have ever felt nervousness before a championship game.

27A. No voters that the senators have courted at campaign rallies have ever caused controversy in a major election
27B. The voters that no senators have courted at campaign rallies have ever caused controversy in a major election
27C. The voters that the senators haven't courted at campaign rallies have ever caused controversy in a major election
27D. The voters that the senators have courted at campaign rallies have ever caused controversy in a major election

28A. No professors that the students have visited during office hours have ever experienced tiredness after a long lecture.
28B. The professors that no students have visited during office hours have ever experienced tiredness after a long lecture.
28C. The professors that the students haven't visited during office hours have ever experienced tiredness after a long lecture.
28D. The professors that the students have visited during office hours have ever experienced tiredness after a long lecture.

29A. No actors that the judges have nominated for an award have ever experienced derision from the tabloid gossip.
29B. The actors that no judges have nominated for an award have ever experienced derision from the tabloid gossip.
29C. The actors that the judges haven't nominated for an award have ever experienced derision from the tabloid gossip.
29D. The actors that the judges have nominated for an award have ever experienced derision from the tabloid gossip.

30A. No actresses that the directors have auditioned for the role have ever shown nervousness on a large stage.
30B. The actresses that no directors have auditioned for the role have ever shown nervousness on a large stage.
30C. The actresses that the directors haven't auditioned for the role have ever shown nervousness on a large stage.
30D. The actresses that the directors have auditioned for the role have ever shown nervousness on a large stage.

31A. No champions that the competitors have defeated in important races have ever shown humility after a big win.
31B. The champions that no competitors have defeated in important races have ever shown humility after a big win.
31C. The champions that the competitors haven't defeated in important races have ever shown humility after a big win.
31D. The champions that the competitors have defeated in important races have ever shown humility after a big win.

32A. No painters that the collectors have favored at prestigious exhibitions have ever depicted tranquility with very bright colors.
32B. The painters that no collectors have favored at prestigious exhibitions have ever depicted tranquility with very bright colors.
32C. The painters that the collectors haven't favored at prestigious exhibitions have ever depicted tranquility with very bright colors.
32D. The painters that the collectors have favored at prestigious exhibitions have ever depicted tranquility with very bright colors.

33A. No editors that the journalists have insulted in stressful meetings have ever had patience for a missed deadline.
33B. The editors that no journalists have insulted in stressful meetings have ever had patience for a missed deadline.
33C. The editors that the journalists haven't insulted in stressful meetings have ever had patience for a missed deadline.
33D. The editors that the journalists have insulted in stressful meetings have ever had patience for a missed deadline.

34A. No teenagers that the teachers have scolded for their chattiness have ever experienced loneliness in the large class.
34B. The teenagers that no teachers have scolded for their chattiness have ever experienced loneliness in the large class.
34C. The teenagers that the teachers haven't scolded for their chattiness have ever experienced loneliness in the large class.
34D. The teenagers that the teachers have scolded for their chattiness have ever experienced loneliness in the large class.

35A. No students that the professors have tutored on the weekends have ever had trouble in a math class.
35B. The students that no professors have tutored on the weekends have ever had trouble in a math class.
35C. The students that the professors haven't tutored on the weekends have ever had trouble in a math class.
35D. The students that the professors have tutored on the weekends have ever had trouble in a math class.

36A. No actors that the children have seen in family films have ever shown gore during a fight scene.
36B. The actors that no children have seen in family films have ever shown gore during a fight scene.
36C. The actors that the children haven't seen in family films have ever shown gore during a fight scene.
36D. The actors that the children have seen in family films have ever shown gore during a fight scene.

Appendix B: Native English speaker qualification test

Q1: Which of the following sentences is acceptable? Select ALL that apply.

a. There seems to be someone at the door. ←
b. It seems to be someone is at the door.
c. There seems that someone is at the door.
d. It seems that someone is at the door. ←

Q2: Which of the following continuations is acceptable? Select ALL that apply.

Ethan reads more books…

a. … than Mary. ←
b. … than Mary ever did. ←
c. … than Mary reads some newspapers.
d. … than Mary likes authors who wrote.
e. None of the above.

Q3: Which of the following sentences is acceptable? Select ALL that apply.

a. Which restaurant did you review without visiting? ←
b. Which restaurant did you review without visiting the website? ←
c. Which restaurant did you review the website without visiting?
d. None of the above.

Q4: Which of the following continuations is acceptable? Select ALL that apply.

I was talking to Susan about John. She said…

a. … she understood why he wanted some time alone this week. ←
b. … she understood why he wanted any time alone this week.
c. … she understood why did he want some time alone this week.
d. … she understood why he wants some time alone this week. ←
e. None of the above.

Q5: Which of the following sentences is acceptable? Select ALL that apply.

a. Sally asked Megan to buy beer for her 18-year-old friend. ←
b. Sally asked Megan to buy a beer for her 18-year-old friend. ←
c. Sally asked Megan to buy some beer for her 18-year-old friend. ←
d. None of the above.

Q6: Which of the following continuations is acceptable? Select ALL that apply.

If you walk barefoot on the beach, …

a. … you get sand between your toes. ←
b. … you got sand between your toes.
c. … you'll get sand between your toes. ←
d. None of the above.

Q7: Which of the following continuations is acceptable? Select ALL that apply.

I talked to Tom, and he said…

a. … that he wanted one more drink before he danced with that girl. ←
b. … that he wants one more drink before he danced with that girl.
c. … that he wants one more drink before he danced with that girl. ←
d. None of the above.

Q8: Which of the following would be an acceptable answer to the following question? Select ALL that apply.

Did Steven take out the trash this morning?

a. He might have done.
b. He might have. ←
c. He did. ←
d. He might.

Q9: Fill in the blank:

The girl who lived in the house on the corner asked ___ father to mow the lawn.

a. his
b. her ←

APPENDIX C: Experimental materials for Chapter 5 (Part II-Control dependencies)

C.1 Experiment 1 (Cloze task)

Subject control verbs	Object control verbs
1A. Jose le prometió a María ser	15A. Antonio le aconsejó a Carmen ser
1B. Jose le prometió a María estar	15B. Antonio le aconsejó a Carmen estar
1C. María le prometió a Jose ser	15C. Carmen le aconsejó a Antonio ser
1D. María le prometió a Jose estar	15D. Carmen le aconsejó a Antonio estar
2A. Juan le reveló a Ana ser	16A. Manuel le reprochó a Isabel ser
3A. Luis le juró a Pilar ser	17A. Javier le recomendó a Teresa ser
4A. Ángel le confesó a Rosa ser	18A. Carlos le exigió a Cristina ser
5A. Pedro le reconoció a Laura ser	19A. Daniel le encargó a Marta ser
6A. Pablo le aseguró a Lucía ser	20A. Diego le recriminó a Sara ser
7A. Jorge le confirmó a Paula ser	21A. Sergio le mandó a Raquel ser
8A. Andrés le manifestó a Elena ser	22A. Víctor le impidió a Eva ser
9A. Raúl le garantizó a Silvia ser	23A. Iván le ordenó a Belén ser
10A. Óscar le declaró a Julia ser	24A. Rubén le permitió a Andrea ser
11A. Jaime le expresó a Nuria ser	25A. David le prohibió a Alba ser
12A. Marcos le desmintió a Sandra ser	26A. Mario le consintió a Rocío ser
13A. Tomás le negó a Irene ser	27A. Julio le sugirió a Sonia ser
14A. Jesús le admitió a Beatriz ser	28A. Rafael le propuso a Alicia ser

C.2 Experiments 2 (acceptability judgement) and 3 (eye-tracking)

English translation of Tables 9 and 10.

Subject control		
Gram.	**D. Match**	María$_i$*fem* promised Cristina$_j$*fem* PRO$_i$ to be **tidier*fem*** with the notes from high school.
	D. Mismatch	María$_i$*fem* promised Francisco$_j$*masc* PRO$_i$ to be **tidier*fem*** with the notes from high school.
Ungr.	**D. Match**	Antonio$_i$*masc* promised Cristina$_j$*fem* PRO$_i$ to be **tidier*fem*** with the notes from high school.
	D. Mismatch	Antonio$_i$*masc* promised Francisco$_j$*masc* PRO$_i$ to be **tidier*fem*** with the notes from high school.
Object control		
Gram.	**D. Match**	María$_i$*fem* advised Cristina$_j$*fem* PRO$_j$ to be **tidier*fem*** with the notes from high school.
	D. Mismatch	Antonio$_i$*masc* advised Cristina$_j$*fem* PRO$_j$ to be **tidier*fem*** with the notes from high school.
Ungr.	**D. Match**	María$_i$*fem* advised Francisco$_j$*masc* PRO$_j$ to be **tidier*fem*** with the notes from high school.
	D. Mismatch	Antonio$_i$*masc* advised Francisco$_j$*masc* PRO$_j$ to be **tidier*fem*** with the notes from high school.

1A. Ana María prometió a Cristina ser mucho más ordenada con los apuntes del instituto.
1B. Ana María prometió a Francisco ser mucho más ordenada con los apuntes del instituto.
1C. Antonio prometió a Cristina ser mucho más ordenada con los apuntes del instituto.
1D. Antonio prometió a Francisco ser mucho más ordenada con los apuntes del instituto.
1E. Ana María aconsejó a Cristina ser mucho más ordenada con los apuntes del instituto.
1F. Antonio aconsejó a Cristina ser mucho más ordenada con los apuntes del instituto.
1G. Ana María aconsejó a Francisco ser mucho más ordenada con los apuntes del instituto.
1H. Antonio aconsejó a Francisco ser mucho más ordenada con los apuntes del instituto.

2A. Jose Luís reconoció a Alejandro ser sumamente escrupuloso con la comida del trabajo.
2B. Jose Luís reconoció a Dolores ser sumamente escrupuloso con la comida del trabajo.
2C. Antonia reconoció a Alejandro ser sumamente escrupuloso con la comida del trabajo.
2D. Antonia reconoció a Dolores ser sumamente escrupuloso con la comida del trabajo.
2E. Jose Luís recriminó a Alejandro ser sumamente escrupuloso con la comida del trabajo.
2F. Antonia recriminó a Alejandro ser sumamente escrupuloso con la comida del trabajo.
2G. Jose Luís recriminó a Dolores ser sumamente escrupuloso con la comida del trabajo.
2H. Antonia recriminó a Dolores ser sumamente escrupuloso con la comida del trabajo.

3A. María José reveló a Manuela ser totalmente temerosa durante las tormentas de verano.
3B. María José reveló a Fernando ser totalmente temerosa durante las tormentas de verano.
3C. Miguel Ángel reveló a Manuela ser totalmente temerosa durante las tormentas de verano.
3D. Miguel Ángel reveló a Fernando ser totalmente temerosa durante las tormentas de verano.
3E. María José reprochó a Manuela ser totalmente temerosa durante las tormentas de verano.
3F. Miguel Ángel reprochó a Manuela ser totalmente temerosa durante las tormentas de verano.
3G. María José reprochó a Fernando ser totalmente temerosa durante las tormentas de verano.
3H. Miguel Ángel reprochó a Fernando ser totalmente temerosa durante las tormentas de verano.

4A. Juan Carlos garantizó a Alberto ser siempre afectuoso en el trato con los clientes.
4B. Juan Carlos garantizó a Rosario ser siempre afectuoso en el trato con los clientes.
4C. Mercedes garantizó a Alberto ser siempre afectuoso en el trato con los clientes.
4D. Mercedes garantizó a Rosario ser siempre afectuoso en el trato con los clientes.
4E. Juan Carlos recomendó a Alberto ser siempre afectuoso en el trato con los clientes.
4F. Mercedes recomendó a Alberto ser siempre afectuoso en el trato con los clientes.
4G. Juan Carlos recomendó a Rosario ser siempre afectuoso en el trato con los clientes.
4H. Mercedes recomendó a Rosario ser siempre afectuoso en el trato con los clientes.

5A. Beatriz confirmó a Encarnación ser siempre tan bondadosa con la gente desconocida.
5B. Beatriz confirmó a Vicente ser siempre tan bondadosa con la gente desconocida.
5C. Enrique confirmó a Encarnación ser siempre tan bondadosa con la gente desconocida.
5D. Enrique confirmó a Vicente ser siempre tan bondadosa con la gente desconocida.
5E. Beatriz impidió a Encarnación ser siempre tan bondadosa con la gente desconocida.
5F. Enrique impidió a Encarnación ser siempre tan bondadosa con la gente desconocida.
5G. Beatriz impidió a Vicente ser siempre tan bondadosa con la gente desconocida.
5H. Enrique impidió a Vicente ser siempre tan bondadosa con la gente desconocida.

6A. Eduardo desmintió a Santiago ser un poco codicioso con la herencia familiar.
6B. Eduardo desmintió a Patricia ser un poco codicioso con la herencia familiar.
6C. Margarita desmintió a Santiago ser un poco codicioso con la herencia familiar.
6D. Margarita desmintió a Patricia ser un poco codicioso con la herencia familiar.
6E. Eduardo prohibió a Santiago ser un poco codicioso con la herencia familiar.
6F. Margarita prohibió a Santiago ser un poco codicioso con la herencia familiar.
6G. Eduardo prohibió a Patricia ser un poco codicioso con la herencia familiar.
6H. Margarita prohibió a Patricia ser un poco codicioso con la herencia familiar.

7A. Montserrat juró a Yolanda ser absolutamente honesta en la declaración ante el juez.
7B. Montserrat juró a Roberto ser absolutamente honesta en la declaración ante el juez.
7C. Joaquín juró a Yolanda ser absolutamente honesta en la declaración ante el juez.
7D. Joaquín juró a Roberto ser absolutamente honesta en la declaración ante el juez.
7E. Montserrat exigió a Yolanda ser absolutamente honesta en la declaración ante el juez.
7F. Joaquín exigió a Yolanda ser absolutamente honesta en la declaración ante el juez.
7G. Montserrat exigió a Roberto ser absolutamente honesta en la declaración ante el juez.
7H. Joaquín exigió a Roberto ser absolutamente honesta en la declaración ante el juez.

8A. Ignacio aseguró a Alfonso ser sumamente sincero sobre lo ocurrido en el viaje.
8B. Ignacio aseguró a Inmaculada ser sumamente sincero sobre lo ocurrido en el viaje.
8C. Natalia aseguró a Alfonso ser sumamente sincero sobre lo ocurrido en el viaje.
8D. Natalia aseguró a Inmaculada ser sumamente sincero sobre lo ocurrido en el viaje.
8E. Ignacio ordenó a Alfonso ser sumamente sincero sobre lo ocurrido en el viaje.
8F. Natalia ordenó a Alfonso ser sumamente sincero sobre lo ocurrido en el viaje.
8G. Ignacio ordenó a Inmaculada ser sumamente sincero sobre lo ocurrido en el viaje.
8H. Natalia ordenó a Inmaculada ser sumamente sincero sobre lo ocurrido en el viaje.

9A. Claudia confesó a Ángeles ser un poco despistada con el teléfono el fin de semana.
9B. Claudia confesó a Ricardo ser un poco despistada con el teléfono el fin de semana.
9C. Salvador confesó a Ángeles ser un poco despistada con el teléfono el fin de semana.
9D. Salvador confesó a Ricardo ser un poco despistada con el teléfono el fin de semana.
9E. Claudia permitió a Ángeles ser un poco despistada con el teléfono el fin de semana.
9F. Salvador permitió a Ángeles ser un poco despistada con el teléfono el fin de semana.
9G. Claudia permitió a Ricardo ser un poco despistada con el teléfono el fin de semana.
9H. Salvador permitió a Ricardo ser un poco despistada con el teléfono el fin de semana.

10A. Guillermo expresó a Gabriel ser un poco escéptico con los resultados del estudio.
10B. Guillermo expresó a Carolina ser un poco escéptico con los resultados del estudio.
10C. Verónica expresó a Gabriel ser un poco escéptico con los resultados del estudio.
10D. Verónica expresó a Carolina ser un poco escéptico con los resultados del estudio.
10E. Guillermo encargó a Gabriel ser un poco escéptico con los resultados del estudio.
10F. Verónica encargó a Gabriel ser un poco escéptico con los resultados del estudio.
10G. Guillermo encargó a Carolina ser un poco escéptico con los resultados del estudio.
10H. Verónica encargó a Carolina ser un poco escéptico con los resultados del estudio.

11A. Eva María declaró a Victoria ser absolutamente privada con los temas de la familia.
11B. Eva María declaró a Mohamed ser absolutamente privada con los temas de la familia.
11C. Agustín declaró a Victoria ser absolutamente privada con los temas de la familia.
11D. Agustín declaró a Mohamed ser absolutamente privada con los temas de la familia.
11E. Eva María mandó a Victoria ser absolutamente privada con los temas de la familia.
11F. Agustín mandó a Victoria ser absolutamente privada con los temas de la familia.
11G. Eva María mandó a Mohamed ser absolutamente privada con los temas de la familia.
11H. Agustín mandó a Mohamed ser absolutamente privada con los temas de la familia.

12A. Gonzalo manifestó a Nicolás ser abiertamente desconfiado de la directiva de la fábrica.
12B. Gonzalo manifestó a Catalina ser abiertamente desconfiado de la directiva de la fábrica.
12C. Ana Belén manifestó a Nicolás ser abiertamente desconfiado de la directiva de la fábrica.
12D. Ana Belén manifestó a Catalina ser abiertamente desconfiado de la directiva de la fábrica.
12E. Gonzalo consintió a Nicolás ser abiertamente desconfiado de la directiva de la fábrica.
12F. Ana Belén consintió a Nicolás ser abiertamente desconfiado de la directiva de la fábrica.
12G. Gonzalo consintió a Catalina ser abiertamente desconfiado de la directiva de la fábrica.
12H. Ana Belén consintió a Catalina ser abiertamente desconfiado de la directiva de la fábrica.

13A. Cristian prometió a Alfredo estar totalmente espabilado durante el viaje en coche.
13B. Cristian prometió a Daniela estar totalmente espabilado durante el viaje en coche.
13C. Consuelo prometió a Alfredo estar totalmente espabilado durante el viaje en coche.
13D. Consuelo prometió a Daniela estar totalmente espabilado durante el viaje en coche.
13E. Cristian aconsejó a Alfredo estar totalmente espabilado durante el viaje en coche.
13F. Consuelo aconsejó a Alfredo estar totalmente espabilado durante el viaje en coche.
13G. Cristian aconsejó a Daniela estar totalmente espabilado durante el viaje en coche.
13H. Consuelo aconsejó a Daniela estar totalmente espabilado durante el viaje en coche.

14A. Alejandra reconoció a Esperanza estar un tanto confundida sobre los temas de actualidad.
14B. Alejandra reconoció a Gregorio estar un tanto confundida sobre los temas de actualidad.
14C. Sebastián reconoció a Esperanza estar un tanto confundida sobre los temas de actualidad.
14D. Sebastián reconoció a Gregorio estar un tanto confundida sobre los temas de actualidad.
14E. Alejandra recriminó a Esperanza estar un tanto confundida sobre los temas de actualidad.
14F. Sebastián recriminó a Esperanza estar un tanto confundida sobre los temas de actualidad.
14G. Alejandra recriminó a Gregorio estar un tanto confundida sobre los temas de actualidad.
14H. Sebastián recriminó a Gregorio estar un tanto confundida sobre los temas de actualidad.

15A. Rodrigo reveló a Luís Miguel estar continuamente inquieto por la salud de sus hijos.
15B. Rodrigo reveló a Purificación estar continuamente inquieto por la salud de sus hijos.
15C. Milagros reveló a Luís Miguel estar continuamente inquieto por la salud de sus hijos.
15D. Milagros reveló a Purificación estar continuamente inquieto por la salud de sus hijos.
15E. Rodrigo reprochó a Luís Miguel estar continuamente inquieto por la salud de sus hijos.
15F. Milagros reprochó a Luís Miguel estar continuamente inquieto por la salud de sus hijos.
15G. Rodrigo reprochó a Purificación estar continuamente inquieto por la salud de sus hijos.
15H. Milagros reprochó a Purificación estar continuamente inquieto por la salud de sus hijos.

16A. Virginia garantizó a Josefina estar fuertemente inclinada a la negociación del convenio.
16B. Virginia garantizó a Esteban estar fuertemente inclinada a la negociación del convenio.
16C. Lorenzo garantizó a Josefina estar fuertemente inclinada a la negociación del convenio.
16D. Lorenzo garantizó a Esteban estar fuertemente inclinada a la negociación del convenio.
16E. Virginia recomendó a Josefina estar fuertemente inclinada a la negociación del convenio.
16F. Lorenzo recomendó a Josefina estar fuertemente inclinada a la negociación del convenio.
16G. Virginia recomendó a Esteban estar fuertemente inclinada a la negociación del convenio.
16H. Lorenzo recomendó a Esteban estar fuertemente inclinada a la negociación del convenio.

17A. Cristóbal confirmó a Eugenio estar todavía disgustado por las decisiones de la junta.
17B. Cristóbal confirmó a Lourdes estar todavía disgustado por las decisiones de la junta.
17C. Martina confirmó a Eugenio estar todavía disgustado por las decisiones de la junta.
17D. Martina confirmó a Lourdes estar todavía disgustado por las decisiones de la junta.
17E. Cristóbal impidió a Eugenio estar todavía disgustado por las decisiones de la junta.
17F. Martina impidió a Eugenio estar todavía disgustado por las decisiones de la junta.
17G. Cristóbal impidió a Lourdes estar todavía disgustado por las decisiones de la junta.
17H. Martina impidió a Lourdes estar todavía disgustado por las decisiones de la junta.

18A. Adriana desmintió a Estefanía estar todavía enfadada con la secretaria del despacho.
18B. Adriana desmintió a Jonathan estar todavía enfadada con la secretaria del despacho.
18C. Valentín desmintió a Estefanía estar todavía enfadada con la secretaria del despacho.
18D. Valentín desmintió a Jonathan estar todavía enfadada con la secretaria del despacho.
18E. Adriana prohibió a Estefanía estar todavía enfadada con la secretaria del despacho.
18F. Valentín prohibió a Estefanía estar todavía enfadada con la secretaria del despacho.
18G. Adriana prohibió a Jonathan estar todavía enfadada con la secretaria del despacho.
18H. Valentín prohibió a Jonathan estar todavía enfadada con la secretaria del despacho.

19A. Ernesto juró a Bernardo estar mucho más involucrado en las actividades del equipo.
19B. Ernesto juró a Araceli estar mucho más involucrado en las actividades del equipo.
19C. Asunción juró a Bernardo estar mucho más involucrado en las actividades del equipo.
19D. Asunción juró a Araceli estar mucho más involucrado en las actividades del equipo.
19E. Ernesto exigió a Bernardo estar mucho más involucrado en las actividades del equipo.
19F. Asunción exigió a Bernardo estar mucho más involucrado en las actividades del equipo.
19G. Ernesto exigió a Araceli estar mucho más involucrado en las actividades del equipo.
19H. Asunción exigió a Araceli estar mucho más involucrado en las actividades del equipo.

20A. Magdalena aseguró a Matilde estar totalmente convencida de la necesidad de ahorrar.
20B. Magdalena aseguró a Carmelo estar totalmente convencida de la necesidad de ahorrar.
20C. Gerardo aseguró a Matilde estar totalmente convencida de la necesidad de ahorrar.
20D. Gerardo aseguró a Carmelo estar totalmente convencida de la necesidad de ahorrar.
20E. Magdalena ordenó a Matilde estar totalmente convencida de la necesidad de ahorrar.
20F. Gerardo ordenó a Matilde estar totalmente convencida de la necesidad de ahorrar.
20G. Magdalena ordenó a Carmelo estar totalmente convencida de la necesidad de ahorrar.
20H. Gerardo ordenó a Carmelo estar totalmente convencida de la necesidad de ahorrar.

21A. Pascual confesó a Federico estar totalmente harto de los caprichos de los jefes.
21B. Pascual confesó a Trinidad estar totalmente harto de los caprichos de los jefes.
21C. Remedios confesó a Federico estar totalmente harto de los caprichos de los jefes.
21D. Remedios confesó a Trinidad estar totalmente harto de los caprichos de los jefes.
21E. Pascual permitió a Federico estar totalmente harto de los caprichos de los jefes.
21F. Remedios permitió a Federico estar totalmente harto de los caprichos de los jefes.
21G. Pascual permitió a Trinidad estar totalmente harto de los caprichos de los jefes.
21H. Remedios permitió a Trinidad estar totalmente harto de los caprichos de los jefes.

22A. Soledad expresó a Vanessa estar absolutamente volcada en la mejora de la convivencia.

22B. Soledad expresó a Benjamín estar absolutamente volcada en la mejora de la convivencia.
22C. Marcelino expresó a Vanessa estar absolutamente volcada en la mejora de la convivencia.
22D. Marcelino expresó a Benjamín estar absolutamente volcada en la mejora de la convivencia.
22E. Soledad encargó a Vanessa estar absolutamente volcada en la mejora de la convivencia.
22F. Marcelino encargó a Vanessa estar absolutamente volcada en la mejora de la convivencia.
22G. Soledad encargó a Benjamín estar absolutamente volcada en la mejora de la convivencia.
22H. Marcelino encargó a Benjamín estar absolutamente volcada en la mejora de la convivencia.

23A. Aurelio declaró a Jerónimo estar absolutamente comprometido con el cuidado del planeta.
23B. Aurelio declaró a Rafaela estar absolutamente comprometido con el cuidado del planeta.
23C. Leticia declaró a Jerónimo estar absolutamente comprometido con el cuidado del planeta.
23D. Leticia declaró a Rafaela estar absolutamente comprometido con el cuidado del planeta.
23E. Aurelio mandó a Jerónimo estar absolutamente comprometido con el cuidado del planeta.
23F. Leticia mandó a Jerónimo estar absolutamente comprometido con el cuidado del planeta.
23G. Aurelio mandó a Rafaela estar absolutamente comprometido con el cuidado del planeta.
23H. Leticia mandó a Rafaela estar absolutamente comprometido con el cuidado del planeta.

24A. Ariadna manifestó a Valeria estar ligeramente implicada en un caso de corrupción.
24B. Ariadna manifestó a Eusebio estar ligeramente implicada en un caso de corrupción.
24C. Jacinto manifestó a Valeria estar ligeramente implicada en un caso de corrupción.
24D. Jacinto manifestó a Eusebio estar ligeramente implicada en un caso de corrupción.
24E. Ariadna consintió a Valeria estar ligeramente implicada en un caso de corrupción.
24F. Jacinto consintió a Valeria estar ligeramente implicada en un caso de corrupción.
24G. Ariadna consintió a Eusebio estar ligeramente implicada en un caso de corrupción.
24H. Jacinto consintió a Eusebio estar ligeramente implicada en un caso de corrupción.

25A. Valentina prometió a Bárbara ser algo más cuidadosa con los libros de la biblioteca.
25B. Valentina prometió a Teodoro ser algo más cuidadosa con los libros de la biblioteca.
25C. Isidoro prometió a Bárbara ser algo más cuidadosa con los libros de la biblioteca.
25D. Isidoro prometió a Teodoro ser algo más cuidadosa con los libros de la biblioteca.
25E. Valentina aconsejó a Bárbara ser algo más cuidadosa con los libros de la biblioteca.
25F. Isidoro aconsejó a Bárbara ser algo más cuidadosa con los libros de la biblioteca.
25G. Valentina aconsejó a Teodoro ser algo más cuidadosa con los libros de la biblioteca.
25H. Isidoro aconsejó a Teodoro ser algo más cuidadosa con los libros de la biblioteca.

26A. Abraham reconoció a Gustavo ser bastante descuidado en las relaciones sociales.
26B. Abraham reconoció a Carlota ser bastante descuidado en las relaciones sociales.
26C. Jessica reconoció a Gustavo ser bastante descuidado en las relaciones sociales.
26D. Jessica reconoció a Carlota ser bastante descuidado en las relaciones sociales.
26E. Abraham recriminó a Gustavo ser bastante descuidado en las relaciones sociales.
26F. Jessica recriminó a Gustavo ser bastante descuidado en las relaciones sociales.
26G. Abraham recriminó a Carlota ser bastante descuidado en las relaciones sociales.
26H. Jessica recriminó a Carlota ser bastante descuidado en las relaciones sociales.
27A. Mariana reveló a Cecilia ser todavía adicta a los fármacos antidepresivos.
27B. Mariana reveló a Cándido ser todavía adicta a los fármacos antidepresivos.
27C. Armando reveló a Cecilia ser todavía adicta a los fármacos antidepresivos.
27D. Armando reveló a Cándido ser todavía adicta a los fármacos antidepresivos.
27E. Mariana reprochó a Cecilia ser todavía adicta a los fármacos antidepresivos.
27F. Armando reprochó a Cecilia ser todavía adicta a los fármacos antidepresivos.
27G. Mariana reprochó a Cándido ser todavía adicta a los fármacos antidepresivos.
27H. Armando reprochó a Cándido ser todavía adicta a los fármacos antidepresivos.

28A. Dionisio garantizó a Pedro Luís ser absolutamente meticuloso con el sistema de registro.
28B. Dionisio garantizó a Guadalupe ser absolutamente meticuloso con el sistema de registro.
28C. Almudena garantizó a Pedro Luís ser absolutamente meticuloso con el sistema de registro.
28D. Almudena garantizó a Guadalupe ser absolutamente meticuloso con el sistema de registro.
28E. Dionisio recomendó a Pedro Luís ser absolutamente meticuloso con el sistema de registro.
28F. Almudena recomendó a Pedro Luís ser absolutamente meticuloso con el sistema de registro.
28G. Dionisio recomendó a Guadalupe ser absolutamente meticuloso con el sistema de registro.
28H. Almudena recomendó a Guadalupe ser absolutamente meticuloso con el sistema de registro.

29A. Estrella confirmó a Gabriela ser abiertamente partidaria de las corridas de toros.
29B. Estrella confirmó a Claudio ser abiertamente partidaria de las corridas de toros.
29C. Serafín confirmó a Gabriela ser abiertamente partidaria de las corridas de toros.
29D. Serafín confirmó a Claudio ser abiertamente partidaria de las corridas de toros.
29E. Estrella impidió a Gabriela ser abiertamente partidaria de las corridas de toros.
29F. Serafín impidió a Gabriela ser abiertamente partidaria de las corridas de toros.
29G. Estrella impidió a Claudio ser abiertamente partidaria de las corridas de toros.
29H. Serafín impidió a Claudio ser abiertamente partidaria de las corridas de toros.

30A. Leonardo desmintió a Emiliano ser siempre irrespetuoso con las opiniones de los demás.
30B. Leonardo desmintió a Jennifer ser siempre irrespetuoso con las opiniones de los demás.
30C. Rosalía desmintió a Emiliano ser siempre irrespetuoso con las opiniones de los demás.

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30D. Rosalía desmintió a Jennifer ser siempre irrespetuoso con las opiniones de los demás.
30E. Leonardo prohibió a Emiliano ser siempre irrespetuoso con las opiniones de los demás.
30F. Rosalía prohibió a Emiliano ser siempre irrespetuoso con las opiniones de los demás.
30G. Leonardo prohibió a Jennifer ser siempre irrespetuoso con las opiniones de los demás.
30H. Rosalía prohibió a Jennifer ser siempre irrespetuoso con las opiniones de los demás.

31A. Eulalia juró a Elisabeth ser mucho más delicada con los pacientes de la clínica.
31B. Eulalia juró a Avelino ser mucho más delicada con los pacientes de la clínica.
31C. Paulino juró a Elisabeth ser mucho más delicada con los pacientes de la clínica.
31D. Paulino juró a Avelino ser mucho más delicada con los pacientes de la clínica.
31E. Eulalia exigió a Elisabeth ser mucho más delicada con los pacientes de la clínica.
31F. Paulino exigió a Elisabeth ser mucho más delicada con los pacientes de la clínica.
31G. Eulalia exigió a Avelino ser mucho más delicada con los pacientes de la clínica.
31H. Paulino exigió a Avelino ser mucho más delicada con los pacientes de la clínica.

32A. Rogelio aseguró a Ezequiel ser absolutamente pulcro en la cura de las heridas.
32B. Rogelio aseguró a Eugenia ser absolutamente pulcro en la cura de las heridas.
32C. Candela aseguró a Ezequiel ser absolutamente pulcro en la cura de las heridas.
32D. Candela aseguró a Eugenia ser absolutamente pulcro en la cura de las heridas.
32E. Rogelio ordenó a Ezequiel ser absolutamente pulcro en la cura de las heridas.
32F. Candela ordenó a Ezequiel ser absolutamente pulcro en la cura de las heridas.
32G. Rogelio ordenó a Eugenia ser absolutamente pulcro en la cura de las heridas.
32H. Candela ordenó a Eugenia ser absolutamente pulcro en la cura de las heridas.

33A. Tatiana confesó a Cándida ser bastante pausada en la vida desde la operación.
33B. Tatiana confesó a Raimundo ser bastante pausada en la vida desde la operación.
33C. Basilio confesó a Cándida ser bastante pausada en la vida desde la operación.
33D. Basilio confesó a Raimundo ser bastante pausada en la vida desde la operación.
33E. Tatiana permitió a Cándida ser bastante pausada en la vida desde la operación.
33F. Basilio permitió a Cándida ser bastante pausada en la vida desde la operación.
33G. Tatiana permitió a Raimundo ser bastante pausada en la vida desde la operación.
33H. Basilio permitió a Raimundo ser bastante pausada en la vida desde la operación.

34A. Cayetano expresó a Clemente ser totalmente pacífico ante los conflictos entre amigos.
34B. Cayetano expresó a Macarena ser totalmente pacífico ante los conflictos entre amigos.
34C. Enriqueta expresó a Clemente ser totalmente pacífico ante los conflictos entre amigos.
34D. Enriqueta expresó a Macarena ser totalmente pacífico ante los conflictos entre amigos.
34E. Cayetano encargó a Clemente ser totalmente pacífico ante los conflictos entre amigos.
34F. Enriqueta encargó a Clemente ser totalmente pacífico ante los conflictos entre amigos.
34G. Cayetano encargó a Macarena ser totalmente pacífico ante los conflictos entre amigos.
34H. Enriqueta encargó a Macarena ser totalmente pacífico ante los conflictos entre amigos.

35A. Desiree declaró a Adelina ser bastante positiva ante los problemas financieros.
35B. Desiree declaró a Demetrio ser bastante positiva ante los problemas financieros.
35C. Leopoldo declaró a Adelina ser bastante positiva ante los problemas financieros.
35D. Leopoldo declaró a Demetrio ser bastante positiva ante los problemas financieros.
35E. Desiree mandó a Adelina ser bastante positiva ante los problemas financieros.
35F. Leopoldo mandó a Adelina ser bastante positiva ante los problemas financieros.
35G. Desiree mandó a Demetrio ser bastante positiva ante los problemas financieros.
35H. Leopoldo mandó a Demetrio ser bastante positiva ante los problemas financieros.

36A. Hilario manifestó a Marcial ser totalmente devoto de la Virgen del Carmen.
36B. Hilario manifestó a Meritxell ser totalmente devoto de la Virgen del Carmen.
36C. Caridad manifestó a Marcial ser totalmente devoto de la Virgen del Carmen.
36D. Caridad manifestó a Meritxell ser totalmente devoto de la Virgen del Carmen.
36E. Hilario consintió a Marcial ser totalmente devoto de la Virgen del Carmen.
36F. Caridad consintió a Marcial ser totalmente devoto de la Virgen del Carmen.
36G. Hilario consintió a Meritxell ser totalmente devoto de la Virgen del Carmen.
36H. Caridad consintió a Meritxell ser totalmente devoto de la Virgen del Carmen.

37A. Mauricio prometió a Octavio estar algo más preocupado por las cuestiones de salud.
37B. Mauricio prometió a Filomena estar algo más preocupado por las cuestiones de salud.
37C. Violeta prometió a Octavio estar algo más preocupado por las cuestiones de salud.
37D. Violeta prometió a Filomena estar algo más preocupado por las cuestiones de salud.
37E. Mauricio aconsejó a Octavio estar algo más preocupado por las cuestiones de salud.
37F. Violeta aconsejó a Octavio estar algo más preocupado por las cuestiones de salud.
37G. Mauricio aconsejó a Filomena estar algo más preocupado por las cuestiones de salud.
37H. Violeta aconsejó a Filomena estar algo más preocupado por las cuestiones de salud.

38A. Azucena reconoció a Micaela estar muy poco interesada en la opinión de los expertos.
38B. Azucena reconoció a Anselmo estar muy poco interesada en la opinión de los expertos.
38C. Rodolfo reconoció a Micaela estar muy poco interesada en la opinión de los expertos.
38D. Rodolfo reconoció a Anselmo estar muy poco interesada en la opinión de los expertos.

38E. Azucena recriminó a Micaela estar muy poco interesada en la opinión de los expertos.
38F. Rodolfo recriminó a Micaela estar muy poco interesada en la opinión de los expertos.
38G. Azucena recriminó a Anselmo estar muy poco interesada en la opinión de los expertos.
38H. Rodolfo recriminó a Anselmo estar muy poco interesada en la opinión de los expertos.

39A. Ibrahim reveló a Hipólito estar bastante deprimido por la muerte de su padre.
39B. Ibrahim reveló a Paulina estar bastante deprimido por la muerte de su padre.
39C. Estíbaliz reveló a Hipólito estar bastante deprimido por la muerte de su padre.
39D. Estíbaliz reveló a Paulina estar bastante deprimido por la muerte de su padre.
39E. Ibrahim reprochó a Hipólito estar bastante deprimido por la muerte de su padre.
39F. Estíbaliz reprochó a Hipólito estar bastante deprimido por la muerte de su padre.
39G. Ibrahim reprochó a Paulina estar bastante deprimido por la muerte de su padre.
39H. Estíbaliz reprochó a Paulina estar bastante deprimido por la muerte de su padre.

40A. Arantxa garantizó a Fabiola estar mucho menos agresiva con los amigos del colegio.
40B. Arantxa garantizó a Rosendo estar mucho menos agresiva con los amigos de la clase.
40C. Melchor garantizó a Fabiola estar mucho menos agresiva con los amigos de la clase.
40D. Melchor garantizó a Rosendo estar mucho menos agresiva con los amigos de la clase.
40E. Arantxa recomendó a Fabiola estar mucho menos agresiva con los amigos de la clase.
40F. Melchor recomendó a Fabiola estar mucho menos agresiva con los amigos de la clase.
40G. Arantxa recomendó a Rosendo estar mucho menos agresiva con los amigos de la clase.
40H. Melchor recomendó a Rosendo estar mucho menos agresiva con los amigos de la clase.

41A. Virgilio confirmó a Severino estar totalmente desencantado con la política de empresa.
41B. Virgilio confirmó a Angélica estar totalmente desencantado con la política de empresa.
41C. Genoveva confirmó a Severino estar totalmente desencantado con la política de empresa.
41D. Genoveva confirmó a Angélica estar totalmente desencantado con la política de empresa.
41E. Virgilio impidió a Severino estar totalmente desencantado con la política de empresa.
41F. Genoveva impidió a Severino estar totalmente desencantado con la política de empresa.
41G. Virgilio impidió a Angélica estar totalmente desencantado con la política de empresa.
41H. Genoveva impidió a Angélica estar totalmente desencantado con la política de empresa.

42A. Marisol desmintió a Luz María estar siempre descontenta con la división de tareas.
42B. Marisol desmintió a Jon Ander estar siempre descontenta con la división de tareas.
42C. Abelardo desmintió a Luz María estar siempre descontenta con la división de tareas.
42D. Abelardo desmintió a Jon Ander estar siempre descontenta con la división de tareas.
42E. Marisol prohibió a Luz María estar siempre descontenta con la división de tareas.
42F. Abelardo prohibió a Luz María estar siempre descontenta con la división de tareas.
42G. Marisol prohibió a Jon Ander estar siempre descontenta con la división de tareas.
42H. Abelardo prohibió a Jon Ander estar siempre descontenta con la división de tareas.

43A. Nicanor juró a Beltrán estar mucho más concienciado con la importancia del deporte.
43B. Nicanor juró a Bibiana estar mucho más concienciado con la importancia del deporte.
43C. Liliana juró a Beltrán estar mucho más concienciado con la importancia del deporte.
43D. Liliana juró a Bibiana estar mucho más concienciado con la importancia del deporte.
43E. Nicanor exigió a Beltrán estar mucho más concienciado con la importancia del deporte.
43F. Liliana exigió a Beltrán estar mucho más concienciado con la importancia del deporte.
43G. Nicanor exigió a Bibiana estar mucho más concienciado con la importancia del deporte.
43H. Liliana exigió a Bibiana estar mucho más concienciado con la importancia del deporte.

44A. Melania aseguró a Cayetana estar totalmente despreocupada ante las críticas de la gente.
44B. Melania aseguró a Horacio estar totalmente despreocupada ante las críticas de la gente.
44C. Giovanni aseguró a Cayetana estar totalmente despreocupada ante las críticas de la gente.
44D. Giovanni aseguró a Horacio estar totalmente despreocupada ante las críticas de la gente.
44E. Melania ordenó a Cayetana estar totalmente despreocupada ante las críticas de la gente.
44F. Giovanni ordenó a Cayetana estar totalmente despreocupada ante las críticas de la gente.
44G. Melania ordenó a Horacio estar totalmente despreocupada ante las críticas de la gente.
44H. Giovanni ordenó a Horacio estar totalmente despreocupada ante las críticas de la gente.

45A. Silverio confesó a Amancio estar un poco ofendido con la actitud de los familiares.
45B. Silverio confesó a Belinda estar un poco ofendido con la actitud de los familiares.
45C. Carmela confesó a Amancio estar un poco ofendido con la actitud de los familiares.
45D. Carmela confesó a Belinda estar un poco ofendido con la actitud de los familiares.
45E. Silverio permitió a Amancio estar un poco ofendido con la actitud de los familiares.
45F. Carmela permitió a Amancio estar un poco ofendido con la actitud de los familiares.
45G. Silverio permitió a Belinda estar un poco ofendido con la actitud de los familiares.
45H. Carmela permitió a Belinda estar un poco ofendido con la actitud de los familiares.

46A. Lucrecia expresó a Julieta estar totalmente desligada de los partidos más radicales.
46B. Lucrecia expresó a Lisardo estar totalmente desligada de los partidos más radicales.
46C. Timoteo expresó a Julieta estar totalmente desligada de los partidos más radicales.
46D. Timoteo expresó a Lisardo estar totalmente desligada de los partidos más radicales.
46E. Lucrecia encargó a Julieta estar totalmente desligada de los partidos más radicales.

46F. Timoteo encargó a Julieta estar totalmente desligada de los partidos más radicales.
46G. Lucrecia encargó a Lisardo estar totalmente desligada de los partidos más radicales.
46H. Timoteo encargó a Lisardo estar totalmente desligada de los partidos más radicales.

47A. Tristán declaró a Asensio estar mucho menos nervioso con los apuros de la empresa.
47B. Tristán declaró a Mariela estar mucho menos nervioso con los apuros de la empresa.
47C. Melissa declaró a Asensio estar mucho menos nervioso con los apuros de la empresa.
47D. Melissa declaró a Mariela estar mucho menos nervioso con los apuros de la empresa.
47E. Tristán mandó a Asensio estar mucho menos nervioso con los apuros de la empresa.
47F. Melissa mandó a Asensio estar mucho menos nervioso con los apuros de la empresa.
47G. Tristán mandó a Mariela estar mucho menos nervioso con los apuros de la empresa.
47H. Melissa mandó a Mariela estar mucho menos nervioso con los apuros de la empresa.
48A. Miranda manifestó a Rosaura estar ligeramente molesta por la falta de comunicación.
48B. Miranda manifestó a Froilán estar ligeramente molesta por la falta de comunicación.
48C. Toribio manifestó a Rosaura estar ligeramente molesta por la falta de comunicación.
48D. Toribio manifestó a Froilán estar ligeramente molesta por la falta de comunicación.
48E. Miranda consintió a Rosaura estar ligeramente molesta por la falta de comunicación.
48F. Toribio consintió a Rosaura estar ligeramente molesta por la falta de comunicación.
48G. Miranda consintió a Froilán estar ligeramente molesta por la falta de comunicación.
48H. Toribio consintió a Froilán estar ligeramente molesta por la falta de comunicación.

49A. Yolanda reveló a Ana María estar algo menos concentrada por la discusión con el jefe.
49B. Yolanda reveló a Antonio estar algo menos concentrada por la discusión con el jefe.
49C. Roberto reveló a Ana María estar algo menos concentrada por la discusión con el jefe.
49D. Roberto reveló a Antonio estar algo menos concentrada por la discusión con el jefe.
49E. Yolanda impidió a Ana María estar algo menos concentrada por la discusión con el jefe.
49F. Roberto impidió a Ana María estar algo menos concentrada por la discusión con el jefe.
49G. Yolanda impidió a Antonio estar algo menos concentrada por la discusión con el jefe.
49H. Roberto impidió a Antonio estar algo menos concentrada por la discusión con el jefe.

50A. Alejandro aseguró a José Luís estar bastante sosegado por el examen de física.
50B. Alejandro aseguró a Antonia estar bastante sosegado por el examen de física.
50C. Dolores aseguró a José Luís estar bastante sosegado por el examen de física.
50D. Dolores aseguró a Antonia estar bastante sosegado por el examen de física.
50E. Alejandro consintió a José Luís estar bastante sosegado por el examen de física.
50F. Dolores consintió a José Luís estar bastante sosegado por el examen de física.
50G. Alejandro consintió a Antonia estar bastante sosegado por el examen de física.
50H. Dolores consintió a Antonia estar bastante sosegado por el examen de física.

51A. Manuela confesó a María José estar un tanto relajada con los asuntos económicos.
51B. Manuela confesó a Miguel Ángel estar un tanto relajada con los asuntos económicos.
51C. Fernando confesó a María José estar un tanto relajada con los asuntos económicos.
51D. Fernando confesó a Miguel Ángel estar un tanto relajada con los asuntos económicos.
51E. Manuela permitió a María José estar un tanto relajada con los asuntos económicos.
51F. Fernando permitió a María José estar un tanto relajada con los asuntos económicos.
51G. Manuela permitió a Miguel Ángel estar un tanto relajada con los asuntos económicos.
51H. Fernando permitió a Miguel Ángel estar un tanto relajada con los asuntos económicos.

52A. Francisco manifestó a Alberto estar bastante saturado de los trámites administrativos.
52B. Francisco manifestó a Mercedes estar bastante saturado de los trámites administrativos.
52C. Cristina manifestó a Alberto estar bastante saturado de los trámites administrativos.
52D. Cristina manifestó a Mercedes estar bastante saturado de los trámites administrativos.
52E. Francisco recriminó a Alberto estar bastante saturado de los trámites administrativos.
52F. Cristina recriminó a Alberto estar bastante saturado de los trámites administrativos.
52G. Francisco recriminó a Mercedes estar bastante saturado de los trámites administrativos.
52H. Cristina recriminó a Mercedes estar bastante saturado de los trámites administrativos.

53A. Rosario confirmó a Beatriz estar muy poco entusiasmada con la venta de la casa.
53B. Rosario confirmó a Enrique estar muy poco entusiasmada con la venta de la casa.
53C. Juan Carlos confirmó a Beatriz estar muy poco entusiasmada con la venta de la casa.
53D. Juan Carlos confirmó a Enrique estar muy poco entusiasmada con la venta de la casa.
53E. Rosario reprochó a Beatriz estar muy poco entusiasmada con la venta de la casa.
53F. Juan Carlos reprochó a Beatriz estar muy poco entusiasmada con la venta de la casa.
53G. Rosario reprochó a Enrique estar muy poco entusiasmada con la venta de la casa.
53H. Juan Carlos reprochó a Enrique estar muy poco entusiasmada con la venta de la casa.

54A. Vicente expresó a Joaquín estar algo más contento con los compañeros de piso.
54B. Vicente expresó a Margarita estar algo más contento con los compañeros de piso.
54C. Encarnación expresó a Joaquín estar algo más contento con los compañeros de piso.
54D. Encarnación expresó a Margarita estar algo más contento con los compañeros de piso.
54E. Vicente recomendó a Joaquín estar algo más contento con los compañeros de piso.
54F. Encarnación recomendó a Joaquín estar algo más contento con los compañeros de piso.
54G. Vicente recomendó a Margarita estar algo más contento con los compañeros de piso.

54H. Encarnación recomendó a Margarita estar algo más contento con los compañeros de piso.

55A. Patricia declaró a Montserrat estar totalmente segura de las acciones a emprender.
55B. Patricia declaró a Eduardo estar totalmente segura de las acciones a emprender.
55C. Santiago declaró a Montserrat estar totalmente segura de las acciones a emprender.
55D. Santiago declaró a Eduardo estar totalmente segura de las acciones a emprender.
55E. Patricia aconsejó a Montserrat estar totalmente segura de las acciones a emprender.
55F. Santiago aconsejó a Montserrat estar totalmente segura de las acciones a emprender.
55G. Patricia aconsejó a Eduardo estar totalmente segura de las acciones a emprender.
55H. Santiago aconsejó a Eduardo estar totalmente segura de las acciones a emprender.

56A. Alfonso desmintió a Ignacio estar todavía contrariado por lo ocurrido en verano.
56B. Alfonso desmintió a Natalia estar todavía contrariado por lo ocurrido en verano.
56C. Inmaculada desmintió a Ignacio estar todavía contrariado por lo ocurrido en verano.
56D. Inmaculada desmintió a Natalia estar todavía contrariado por lo ocurrido en verano.
56E. Alfonso prohibió a Ignacio estar todavía contrariado por lo ocurrido en verano.
56F. Inmaculada prohibió a Ignacio estar todavía contrariado por lo ocurrido en verano.
56G. Alfonso prohibió a Natalia estar todavía contrariado por lo ocurrido en verano.
56H. Inmaculada prohibió a Natalia estar todavía contrariado por lo ocurrido en verano.

57A. Ángeles prometió a Claudia estar mucho más agradecida por los lujos de su vida.
57B. Ángeles prometió a Salvador estar mucho más agradecida por los lujos de su vida.
57C. Ricardo prometió a Claudia estar mucho más agradecida por los lujos de su vida.
57D. Ricardo prometió a Salvador estar mucho más agradecida por los lujos de su vida.
57E. Ángeles mandó a Claudia estar mucho más agradecida por los lujos de su vida.
57F. Ricardo mandó a Claudia estar mucho más agradecida por los lujos de su vida.
57G. Ángeles mandó a Salvador estar mucho más agradecida por los lujos de su vida.
57H. Ricardo mandó a Salvador estar mucho más agradecida por los lujos de su vida.

58A. Gabriel garantizó a Guillermo estar algo menos dormido a primera hora de la mañana.
58B. Gabriel garantizó a Verónica estar algo menos dormido a primera hora de la mañana.
58C. Carolina garantizó a Guillermo estar algo menos dormido a primera hora de la mañana.
58D. Carolina garantizó a Verónica estar algo menos dormido a primera hora de la mañana.
58E. Gabriel ordenó a Guillermo estar algo menos dormido a primera hora de la mañana.
58F. Carolina ordenó a Guillermo estar algo menos dormido a primera hora de la mañana.
58G. Gabriel ordenó a Verónica estar algo menos dormido a primera hora de la mañana.
58H. Carolina ordenó a Verónica estar algo menos dormido a primera hora de la mañana.

59A. Ana Belén juró a Victoria estar mucho más tranquila antes del examen de conducir.
59B. Ana Belén juró a Mohamed estar mucho más tranquila antes del examen de conducir.
59C. Gonzalo juró a Victoria estar mucho más tranquila antes del examen de conducir.
59D. Gonzalo juró a Mohamed estar mucho más tranquila antes del examen de conducir.
59E. Ana Belén exigió a Victoria estar mucho más tranquila antes del examen de conducir.
59F. Gonzalo exigió a Victoria estar mucho más tranquila antes del examen de conducir.
59G. Ana Belén exigió a Mohamed estar mucho más tranquila antes del examen de conducir.
59H. Gonzalo exigió a Mohamed estar mucho más tranquila antes del examen de conducir.

60A. Nicolás reconoció a Agustín estar absolutamente motivado con el trabajo del equipo.
60B. Nicolás reconoció a Eva María estar absolutamente motivado con el trabajo del equipo.
60C. Catalina reconoció a Agustín estar absolutamente motivado con el trabajo del equipo.
60D. Catalina reconoció a Eva María estar absolutamente motivado con el trabajo del equipo.
60E. Nicolás encargó a Agustín estar absolutamente motivado con el trabajo del equipo.
60F. Catalina encargó a Agustín estar absolutamente motivado con el trabajo del equipo.
60G. Nicolás encargó a Eva María estar absolutamente motivado con el trabajo del equipo.
60H. Catalina encargó a Eva María estar absolutamente motivado con el trabajo del equipo.

61A. Alfredo reveló a Cristian ser abiertamente ateo en su filosofía de vida.
61B. Alfredo reveló a Consuelo ser abiertamente ateo en su filosofía de vida.
61C. Daniela reveló a Cristian ser abiertamente ateo en su filosofía de vida.
61D. Daniela reveló a Consuelo ser abiertamente ateo en su filosofía de vida.
61E. Alfredo impidió a Cristian ser abiertamente ateo en su filosofía de vida.
61F. Daniela impidió a Cristian ser abiertamente ateo en su filosofía de vida.
61G. Alfredo impidió a Consuelo ser abiertamente ateo en su filosofía de vida.
61H. Daniela impidió a Consuelo ser abiertamente ateo en su filosofía de vida.

62A. Esperanza aseguró a Alejandra ser siempre tan reflexiva en las decisiones importantes.
62B. Esperanza aseguró a Sebastián ser siempre tan reflexiva en las decisiones importantes.
62C. Luis Miguel aseguró a Alejandra ser siempre tan reflexiva en las decisiones importantes.
62D. Luis Miguel aseguró a Sebastián ser siempre tan reflexiva en las decisiones importantes.
62E. Esperanza consintió a Alejandra ser siempre tan reflexiva en las decisiones importantes.
62F. Luis Miguel consintió a Alejandra ser siempre tan reflexiva en las decisiones importantes.
62G. Esperanza consintió a Sebastián ser siempre tan reflexiva en las decisiones importantes.
62H. Luis Miguel consintió a Sebastián ser siempre tan reflexiva en las decisiones importantes.

63A. Gregorio confesó a Rodrigo ser bastante religioso en el ámbito privado.
63B. Gregorio confesó a Milagros ser bastante religioso en el ámbito privado.
63C. Josefina confesó a Rodrigo ser bastante religioso en el ámbito privado.
63D. Josefina confesó a Milagros ser bastante religioso en el ámbito privado.
63E. Gregorio permitió a Rodrigo ser bastante religioso en el ámbito privado.
63F. Josefina permitió a Rodrigo ser bastante religioso en el ámbito privado.
63G. Gregorio permitió a Milagros ser bastante religioso en el ámbito privado.
63H. Josefina permitió a Milagros ser bastante religioso en el ámbito privado.

64A. Purificación manifestó a Virginia ser abiertamente contraria a la reforma de la constitución.
64B. Purificación manifestó a Lorenzo ser abiertamente contraria a la reforma de la constitución.
64C. Esteban manifestó a Virginia ser abiertamente contraria a la reforma de la constitución.
64D. Esteban manifestó a Lorenzo ser abiertamente contraria a la reforma de la constitución.
64E. Purificación recriminó a Virginia ser abiertamente contraria a la reforma de la constitución.
64F. Esteban recriminó a Virginia ser abiertamente contraria a la reforma de la constitución.
64G. Purificación recriminó a Lorenzo ser abiertamente contraria a la reforma de la constitución.
64H. Esteban recriminó a Lorenzo ser abiertamente contraria a la reforma de la constitución.

65A. Eugenio confirmó a Cristóbal ser sumamente quisquilloso con la limpieza y el orden.
65B. Eugenio confirmó a Martina ser sumamente quisquilloso con la limpieza y el orden.
65C. Lourdes confirmó a Cristóbal ser sumamente quisquilloso con la limpieza y el orden.
65D. Lourdes confirmó a Martina ser sumamente quisquilloso con la limpieza y el orden.
65E. Eugenio reprochó a Cristóbal ser sumamente quisquilloso con la limpieza y el orden.
65F. Lourdes reprochó a Cristóbal ser sumamente quisquilloso con la limpieza y el orden.
65G. Eugenio reprochó a Martina ser sumamente quisquilloso con la limpieza y el orden.
65H. Lourdes reprochó a Martina ser sumamente quisquilloso con la limpieza y el orden.

66A. Estefanía expresó a Ariadna ser sumamente sistemática con el orden de las medicinas.
66B. Estefanía expresó a Valentín ser sumamente sistemática con el orden de las medicinas.
66C. Jonathan expresó a Ariadna ser sumamente sistemática con el orden de las medicinas.
66D. Jonathan expresó a Valentín ser sumamente sistemática con el orden de las medicinas.
66E. Estefanía recomendó a Ariadna ser sumamente sistemática con el orden de las medicinas.
66F. Jonathan recomendó a Ariadna ser sumamente sistemática con el orden de las medicinas.
66G. Estefanía recomendó a Valentín ser sumamente sistemática con el orden de las medicinas.
66H. Jonathan recomendó a Valentín ser sumamente sistemática con el orden de las medicinas.

67A. Bernardo declaró a Ernesto ser un poco más silencioso en su casa para no molestar.
67B. Bernardo declaró a Magdalena ser un poco más silencioso en su casa para no molestar.
67C. Araceli declaró a Ernesto ser un poco más silencioso en su casa para no molestar.
67D. Araceli declaró a Magdalena ser un poco más silencioso en su casa para no molestar.
67E. Bernardo aconsejó a Ernesto ser un poco más silencioso en su casa para no molestar.
67F. Araceli aconsejó a Ernesto ser un poco más silencioso en su casa para no molestar.
67G. Bernardo aconsejó a Magdalena ser un poco más silencioso en su casa para no molestar.
67H. Araceli aconsejó a Magdalena ser un poco más silencioso en su casa para no molestar.

68A. Matilde desmintió a Asunción ser siempre muy orgullosa a la hora de perder.
68B. Matilde desmintió a Gerardo ser siempre muy orgullosa a la hora de perder.
68C. Carmelo desmintió a Asunción ser siempre muy orgullosa a la hora de perder.
68D. Carmelo desmintió a Gerardo ser siempre muy orgullosa a la hora de perder.
68E. Matilde prohibió a Asunción ser siempre muy orgullosa a la hora de perder.
68F. Carmelo prohibió a Asunción ser siempre muy orgullosa a la hora de perder.
68G. Matilde prohibió a Gerardo ser siempre muy orgullosa a la hora de perder.
68H. Carmelo prohibió a Gerardo ser siempre muy orgullosa a la hora de perder.
69A. Federico prometió a Pascual ser mucho más precavido con el dinero desde el robo.
69B. Federico prometió a Remedios ser mucho más precavido con el dinero desde el robo.
69C. Trinidad prometió a Pascual ser mucho más precavido con el dinero desde el robo.
69D. Trinidad prometió a Remedios ser mucho más precavido con el dinero desde el robo.
69E. Federico mandó a Pascual ser mucho más precavido con el dinero desde el robo.
69F. Trinidad mandó a Pascual ser mucho más precavido con el dinero desde el robo.
69G. Federico mandó a Remedios ser mucho más precavido con el dinero desde el robo.
69H. Trinidad mandó a Remedios ser mucho más precavido con el dinero desde el robo.

70A. Vanessa garantizó a Soledad ser sumamente precisa en la redacción del contrato.
70B. Vanessa garantizó a Marcelino ser sumamente precisa en la redacción del contrato.
70C. Eusebio garantizó a Soledad ser sumamente precisa en la redacción del contrato.
70D. Eusebio garantizó a Marcelino ser sumamente precisa en la redacción del contrato.
70E. Vanessa ordenó a Soledad ser sumamente precisa en la redacción del contrato.
70F. Eusebio ordenó a Soledad ser sumamente precisa en la redacción del contrato.
70G. Vanessa ordenó a Marcelino ser sumamente precisa en la redacción del contrato.
70H. Eusebio ordenó a Marcelino ser sumamente precisa en la redacción del contrato.

71A. Benjamín juró a Aurelio ser siempre muy objetivo en la selección del personal.

71B. Benjamín juró a Almudena ser siempre muy objetivo en la selección del personal.
71C. Rafaela juró a Aurelio ser siempre muy objetivo en la selección del personal.
71D. Rafaela juró a Almudena ser siempre muy objetivo en la selección del personal.
71E. Benjamín exigió a Aurelio ser siempre muy objetivo en la selección del personal.
71F. Rafaela exigió a Aurelio ser siempre muy objetivo en la selección del personal.
71G. Benjamín exigió a Almudena ser siempre muy objetivo en la selección del personal.
71H. Rafaela exigió a Almudena ser siempre muy objetivo en la selección del personal.

72A. Valeria reconoció a Ariadna ser un poco rígida con los empleados del taller.
72B. Valeria reconoció a Jacinto ser un poco rígida con los empleados del taller.
72C. Jerónimo reconoció a Ariadna ser un poco rígida con los empleados del taller.
72D. Jerónimo reconoció a Jacinto ser un poco rígida con los empleados del taller.
72E. Valeria encargó a Ariadna ser un poco rígida con los empleados del taller.
72F. Jerónimo encargó a Ariadna ser un poco rígida con los empleados del taller.
72G. Valeria encargó a Jacinto ser un poco rígida con los empleados del taller.
72H. Jerónimo encargó a Jacinto ser un poco rígida con los empleados del taller.

73A. Carlota reveló a Jessica estar siempre aburrida en el parque con los niños.
73B. Carlota reveló a Abraham estar siempre aburrida en el parque con los niños.
73C. Gustavo reveló a Jessica estar siempre aburrida en el parque con los niños.
73D. Gustavo reveló a Abraham estar siempre aburrida en el parque con los niños.
73E. Carlota impidió a Jessica estar siempre aburrida en el parque con los niños.
73F. Gustavo impidió a Jessica estar siempre aburrida en el parque con los niños.
73G. Carlota impidió a Abraham estar siempre aburrida en el parque con los niños.
73H. Gustavo impidió a Abraham estar siempre aburrida en el parque con los niños.

74A. Teodoro aseguró a Isidoro estar un poco decepcionado con la postura del profesor.
74B. Teodoro aseguró a Valentina estar un poco decepcionado con la postura del profesor.
74C. Bárbara aseguró a Isidoro estar un poco decepcionado con la postura del profesor.
74D. Bárbara aseguró a Valentina estar un poco decepcionado con la postura del profesor.
74E. Teodoro consintió a Isidoro estar un poco decepcionado con la postura del profesor.
74F. Bárbara consintió a Isidoro estar un poco decepcionado con la postura del profesor.
74G. Teodoro consintió a Valentina estar un poco decepcionado con la postura del profesor.
74H. Bárbara consintió a Valentina estar un poco decepcionado con la postura del profesor.

75A. Guadalupe confesó a Leticia estar un poco celosa de los cochazos de sus compañeros.
75B. Guadalupe confesó a Dionisio estar un poco celosa de los cochazos de sus compañeros.
75C. Cándido confesó a Leticia estar un poco celosa de los cochazos de sus compañeros.
75D. Cándido confesó a Dionisio estar un poco celosa de los cochazos de sus compañeros.
75E. Guadalupe permitió a Leticia estar un poco celosa de los cochazos de sus compañeros.
75F. Cándido permitió a Leticia estar un poco celosa de los cochazos de sus compañeros.
75G. Guadalupe permitió a Dionisio estar un poco celosa de los cochazos de sus compañeros.
75H. Cándido permitió a Dionisio estar un poco celosa de los cochazos de sus compañeros.

76A. Pedro Luís manifestó a Armando estar todavía cabreado por los retrasos del bus.
76B. Pedro Luís manifestó a Mariana estar todavía cabreado por los retrasos del bus.
76C. Cecilia manifestó a Armando estar todavía cabreado por los retrasos del bus.
76D. Cecilia manifestó a Mariana estar todavía cabreado por los retrasos del bus.
76E. Pedro Luís recriminó a Armando estar todavía cabreado por los retrasos del bus.
76F. Cecilia recriminó a Armando estar todavía cabreado por los retrasos del bus.
76G. Pedro Luís recriminó a Mariana estar todavía cabreado por los retrasos del bus.
76H. Cecilia recriminó a Mariana estar todavía cabreado por los retrasos del bus.

77A. Jennifer confirmó a Rosalía estar totalmente defraudada por la ruptura con su pareja.
77B. Jennifer confirmó a Leonardo estar totalmente defraudada por la ruptura con su pareja.
77C. Emiliano confirmó a Rosalía estar totalmente defraudada por la ruptura con su pareja.
77D. Emiliano confirmó a Leonardo estar totalmente defraudada por la ruptura con su pareja.
77E. Jennifer reprochó a Rosalía estar totalmente defraudada por la ruptura con su pareja.
77F. Emiliano reprochó a Rosalía estar totalmente defraudada por la ruptura con su pareja.
77G. Jennifer reprochó a Leonardo estar totalmente defraudada por la ruptura con su pareja.
77H. Emiliano reprochó a Leonardo estar totalmente defraudada por la ruptura con su pareja.

78A. Claudio expresó a Serafín estar algo más animado con el resultado del tratamiento.
78B. Claudio expresó a Candela estar algo más animado con el resultado del tratamiento.
78C. Eugenia expresó a Serafín estar algo más animado con el resultado del tratamiento.
78D. Eugenia expresó a Candela estar algo más animado con el resultado del tratamiento.
78E. Claudio recomendó a Serafín estar algo más animado con el resultado del tratamiento.
78F. Eugenia recomendó a Serafín estar algo más animado con el resultado del tratamiento.
78G. Claudio recomendó a Candela estar algo más animado con el resultado del tratamiento.
78H. Eugenia recomendó a Candela estar algo más animado con el resultado del tratamiento.

79A. Elisabeth declaró a Estrella estar algo más confiada en el descenso del paro.
79B. Elisabeth declaró a Rogelio estar algo más confiada en el descenso del paro.

79C. Ezequiel declaró a Estrella estar algo más confiada en el descenso del paro.
79D. Ezequiel declaró a Rogelio estar algo más confiada en el descenso del paro.
79E. Elisabeth aconsejó a Estrella estar algo más confiada en el descenso del paro.
79F. Ezequiel aconsejó a Estrella estar algo más confiada en el descenso del paro.
79G. Elisabeth aconsejó a Rogelio estar algo más confiada en el descenso del paro.
79H. Ezequiel aconsejó a Rogelio estar algo más confiada en el descenso del paro.

80A. Avelino desmintió a Paulino estar continuamente ansioso por la llegada del bebé.
80B. Avelino desmintió a Eulalia estar continuamente ansioso por la llegada del bebé.
80C. Gabriela desmintió a Paulino estar continuamente ansioso por la llegada del bebé.
80D. Gabriela desmintió a Eulalia estar continuamente ansioso por la llegada del bebé.
80E. Avelino prohibió a Paulino estar continuamente ansioso por la llegada del bebé.
80F. Gabriela prohibió a Paulino estar continuamente ansioso por la llegada del bebé.
80G. Avelino prohibió a Eulalia estar continuamente ansioso por la llegada del bebé.
80H. Gabriela prohibió a Eulalia estar continuamente ansioso por la llegada del bebé.

81A. Macarena prometió a Enriqueta estar algo más atenta a los mensajes del email.
81B. Macarena prometió a Cayetano estar algo más atenta a los mensajes del email.
81C. Clemente prometió a Enriqueta estar algo más atenta a los mensajes del email.
81D. Clemente prometió a Cayetano estar algo más atenta a los mensajes del email.
81E. Macarena mandó a Enriqueta estar algo más atenta a los mensajes del email.
81F. Clemente mandó a Enriqueta estar algo más atenta a los mensajes del email.
81G. Macarena mandó a Cayetano estar algo más atenta a los mensajes del email.
81H. Clemente mandó a Cayetano estar algo más atenta a los mensajes del email.

82A. Raimundo garantizó a Basilio estar siempre abierto al diálogo con los empleados.
82B. Raimundo garantizó a Tatiana estar siempre abierto al diálogo con los empleados.
82C. Cándida garantizó a Basilio estar siempre abierto al diálogo con los empleados.
82D. Cándida garantizó a Tatiana estar siempre abierto al diálogo con los empleados.
82E. Raimundo ordenó a Basilio estar siempre abierto al diálogo con los empleados.
82F. Cándida ordenó a Basilio estar siempre abierto al diálogo con los empleados.
82G. Raimundo ordenó a Tatiana estar siempre abierto al diálogo con los empleados.
82H. Cándida ordenó a Tatiana estar siempre abierto al diálogo con los empleados.

83A. Meritxell juró a Caridad estar absolutamente dispuesta a cualquier cosa para ganar.
83B. Meritxell juró a Hilario estar absolutamente dispuesta a cualquier cosa para ganar.
83C. Marcial juró a Caridad estar absolutamente dispuesta a cualquier cosa para ganar.
83D. Marcial juró a Hilario estar absolutamente dispuesta a cualquier cosa para ganar.
83E. Meritxell exigió a Caridad estar absolutamente dispuesta a cualquier cosa para ganar.
83F. Marcial exigió a Caridad estar absolutamente dispuesta a cualquier cosa para ganar.
83G. Meritxell exigió a Hilario estar absolutamente dispuesta a cualquier cosa para ganar.
83H. Marcial exigió a Hilario estar absolutamente dispuesta a cualquier cosa para ganar.

84A. Demetrio reconoció a Leopoldo estar algo más satisfecho con las notas de sus hijos.
84B. Demetrio reconoció a Desiree estar algo más satisfecho con las notas de sus hijos.
84C. Adelina reconoció a Leopoldo estar algo más satisfecho con las notas de sus hijos.
84D. Adelina reconoció a Desiree estar algo más satisfecho con las notas de sus hijos.
84E. Demetrio encargó a Leopoldo estar algo más satisfecho con las notas de sus hijos.
84F. Adelina encargó a Leopoldo estar algo más satisfecho con las notas de sus hijos.
84G. Demetrio encargó a Desiree estar algo más satisfecho con las notas de sus hijos.
84H. Adelina encargó a Desiree estar algo más satisfecho con las notas de sus hijos.

85A. Octavio reveló a Mauricio ser absolutamente libertario sobre cuestiones ideológicas.
85B. Octavio reveló a Violeta ser absolutamente libertario sobre cuestiones ideológicas.
85C. Filomena reveló a Mauricio ser absolutamente libertario sobre cuestiones ideológicas.
85D. Filomena reveló a Violeta ser absolutamente libertario sobre cuestiones ideológicas.
85E. Octavio impidió a Mauricio ser absolutamente libertario sobre cuestiones ideológicas.
85F. Filomena impidió a Mauricio ser absolutamente libertario sobre cuestiones ideológicas.
85G. Octavio impidió a Violeta ser absolutamente libertario sobre cuestiones ideológicas.
85H. Filomena impidió a Violeta ser absolutamente libertario sobre cuestiones ideológicas.

86A. Micaela aseguró a Azucena ser totalmente reservada con la información del caso.
86B. Micaela aseguró a Rodolfo ser totalmente reservada con la información del caso.
86C. Anselmo aseguró a Azucena ser totalmente reservada con la información del caso.
86D. Anselmo aseguró a Rodolfo ser totalmente reservada con la información del caso.
86E. Micaela consintió a Azucena ser totalmente reservada con la información del caso.
86F. Anselmo consintió a Azucena ser totalmente reservada con la información del caso.
86G. Micaela consintió a Rodolfo ser totalmente reservada con la información del caso.
86H. Anselmo consintió a Rodolfo ser totalmente reservada con la información del caso.

87A. Hipólito confesó a Ibrahím ser bastante cercano con los alumnos más mayores.
87B. Hipólito confesó a Estíbaliz ser bastante cercano con los alumnos más mayores.
87C. Paulina confesó a Ibrahím ser bastante cercano con los alumnos más mayores.

87D. Paulina confesó a Estíbaliz ser bastante cercano con los alumnos más mayores.
87E. Hipólito permitió a Ibrahím ser bastante cercano con los alumnos más mayores.
87F. Paulina permitió a Ibrahím ser bastante cercano con los alumnos más mayores.
87G. Hipólito permitió a Estíbaliz ser bastante cercano con los alumnos más mayores.
87H. Paulina permitió a Estíbaliz ser bastante cercano con los alumnos más mayores.

88A. Fabiola manifestó a Arantxa ser muy poco permisiva con la hora de entrada.
88B. Fabiola manifestó a Melchor ser muy poco permisiva con la hora de entrada.
88C. Rosendo manifestó a Arantxa ser muy poco permisiva con la hora de entrada.
88D. Rosendo manifestó a Melchor ser muy poco permisiva con la hora de entrada.
88E. Fabiola recriminó a Arantxa ser muy poco permisiva con la hora de entrada.
88F. Rosendo recriminó a Arantxa ser muy poco permisiva con la hora de entrada.
88G. Fabiola recriminó a Melchor ser muy poco permisiva con la hora de entrada.
88H. Rosendo recriminó a Melchor ser muy poco permisiva con la hora de entrada.

89A. Severino confirmó a Virgilio ser absolutamente reacio al aumento de coches eléctricos.
89B. Severino confirmó a Genoveva ser absolutamente reacio al aumento de coches eléctricos.
89C. Angélica confirmó a Virgilio ser absolutamente reacio al aumento de coches eléctricos.
89D. Angélica confirmó a Genoveva ser absolutamente reacio al aumento de coches eléctricos.
89E. Severino reprochó a Virgilio ser absolutamente reacio al aumento de coches eléctricos.
89F. Angélica reprochó a Virgilio ser absolutamente reacio al aumento de coches eléctricos.
89G. Severino reprochó a Genoveva ser absolutamente reacio al aumento de coches eléctricos.
89H. Angélica reprochó a Genoveva ser absolutamente reacio al aumento de coches eléctricos.
90A. Luz María expresó a Marisol ser abiertamente adepta a las tesis nacionalistas.
90B. Luz María expresó a Abelardo ser abiertamente adepta a las tesis nacionalistas.
90C. Jon Ander expresó a Marisol ser abiertamente adepta a las tesis nacionalistas.
90D. Jon Ander expresó a Abelardo ser abiertamente adepta a las tesis nacionalistas.
90E. Luz María recomendó a Marisol ser abiertamente adepta a las tesis nacionalistas.
90F. Jon Ander recomendó a Marisol ser abiertamente adepta a las tesis nacionalistas.
90G. Luz María recomendó a Abelardo ser abiertamente adepta a las tesis nacionalistas.
90H. Jon Ander recomendó a Abelardo ser abiertamente adepta a las tesis nacionalistas.

91A. Beltrán declaró a Giovanni ser sumamente cauto con las primeras impresiones.
91B. Beltrán declaró a Liliana ser sumamente cauto con las primeras impresiones.
91C. Cayetana declaró a Giovanni ser sumamente cauto con las primeras impresiones.
91D. Cayetana declaró a Liliana ser sumamente cauto con las primeras impresiones.
91E. Beltrán aconsejó a Giovanni ser sumamente cauto con las primeras impresiones.
91F. Cayetana aconsejó a Giovanni ser sumamente cauto con las primeras impresiones.
91G. Beltrán aconsejó a Liliana ser sumamente cauto con las primeras impresiones.
91H. Cayetana aconsejó a Liliana ser sumamente cauto con las primeras impresiones.

92A. Bibiana desmintió a Melania ser bastante maleducada durante la visita del embajador.
92B. Bibiana desmintió a Nicanor ser bastante maleducada durante la visita del embajador.
92C. Horacio desmintió a Melania ser bastante maleducada durante la visita del embajador.
92D. Horacio desmintió a Nicanor ser bastante maleducada durante la visita del embajador.
92E. Bibiana prohibió a Melania ser bastante maleducada durante la visita del embajador.
92F. Horacio prohibió a Melania ser bastante maleducada durante la visita del embajador.
92G. Bibiana prohibió a Nicanor ser bastante maleducada durante la visita del embajador.
92H. Horacio prohibió a Nicanor ser bastante maleducada durante la visita del embajador.

93A. Amancio prometió a Silverio ser sumamente discreto con los secretos de la compañía.
93B. Amancio prometió a Carmela ser sumamente discreto con los secretos de la compañía.
93C. Belinda prometió a Silverio ser sumamente discreto con los secretos de la compañía.
93D. Belinda prometió a Carmela ser sumamente discreto con los secretos de la compañía.
93E. Amancio mandó a Silverio ser sumamente discreto con los secretos de la compañía.
93F. Belinda mandó a Silverio ser sumamente discreto con los secretos de la compañía.
93G. Amancio mandó a Carmela ser sumamente discreto con los secretos de la compañía.
93H. Belinda mandó a Carmela ser sumamente discreto con los secretos de la compañía.

94A. Julieta garantizó a Lucrecia ser sumamente sensata con el reparto de los regalos.
94B. Julieta garantizó a Timoteo ser sumamente sensata con el reparto de los regalos.
94C. Lisardo garantizó a Lucrecia ser sumamente sensata con el reparto de los regalos.
94D. Lisardo garantizó a Timoteo ser sumamente sensata con el reparto de los regalos.
94E. Julieta ordenó a Lucrecia ser sumamente sensata con el reparto de los regalos.
94F. Lisardo ordenó a Lucrecia ser sumamente sensata con el reparto de los regalos.
94G. Julieta ordenó a Timoteo ser sumamente sensata con el reparto de los regalos.
94H. Lisardo ordenó a Timoteo ser sumamente sensata con el reparto de los regalos.

95A. Asensio juró a Tristán ser totalmente equitativo en el reparto de los beneficios.
95B. Asensio juró a Melissa ser totalmente equitativo en el reparto de los beneficios.
95C. Mariela juró a Tristán ser totalmente equitativo en el reparto de los beneficios.
95D. Mariela juró a Melissa ser totalmente equitativo en el reparto de los beneficios.
95E. Asensio exigió a Tristán ser totalmente equitativo en el reparto de los beneficios.

95F. Mariela exigió a Tristán ser totalmente equitativo en el reparto de los beneficios.
95G. Asensio exigió a Melissa ser totalmente equitativo en el reparto de los beneficios.
95H. Mariela exigió a Melissa ser totalmente equitativo en el reparto de los beneficios.

96A. Rosaura reconoció a Miranda ser siempre tan cautelosa antes de salir de viaje.
96B. Rosaura reconoció a Toribio ser siempre tan cautelosa antes de salir de viaje.
96C. Froilán reconoció a Miranda ser siempre tan cautelosa antes de salir de viaje.
96D. Froilán reconoció a Toribio ser siempre tan cautelosa antes de salir de viaje.
96E. Rosaura encargó a Miranda ser siempre tan cautelosa antes de salir de viaje.
96F. Froilán encargó a Miranda ser siempre tan cautelosa antes de salir de viaje.
96G. Rosaura encargó a Toribio ser siempre tan cautelosa antes de salir de viaje.
96H. Froilán encargó a Toribio ser siempre tan cautelosa antes de salir de viaje.

C.3 Experiments 4 (acceptability judgement) and 5 (self-paced reading)

English translation of tables 14 and 15.

Subject control		
Gram.	**D. Match**	María$_{i}^{fem}$ le prometió$_{j}$ a Carmen$_{j}^{fem}$ PRO$_{i}$ to be **tidier**^{fem} with the notes.
	D. Mismatch	María$_{i}^{fem}$ le prometió$_{j}$ a Manuel$_{j}^{masc}$ PRO$_{i}$ to be **tidier**^{fem} with the notes.
Ungr.	**D. Match**	José$_{i}^{masc}$ le prometió$_{j}$ a Carmen$_{j}^{fem}$ PRO$_{i}$ to be **tidier**^{fem} with the notes.
	D. Mismatch	José$_{i}^{masc}$ le prometió$_{j}$ a Manuel$_{j}^{masc}$ PRO$_{i}$ to be **tidier**^{fem} with the notes.
Object control		
Gram.	**D. Match**	María$_{i}^{fem}$ le ordenó a Carmen$_{j}^{fem}$ PRO$_{j}$ to be **tidier**^{fem} with the notes.
	D. Mismatch	José$_{i}^{masc}$ le ordenó a Carmen$_{j}^{fem}$ PRO$_{j}$ to be **tidier**^{fem} with the notes.
Ungr.	**D. Match**	María$_{i}^{fem}$ le ordenó a Manuel$_{j}^{masc}$ PRO$_{j}$ to be **tidier**^{fem} with the notes.
	D. Mismatch	José$_{i}^{masc}$ le ordenó a Manuel$_{j}^{masc}$ PRO$_{j}$ to be **tidier**^{fem} with the notes.

1A. María le prometió a Carmen ser más ordenada con los apuntes.
1B. María le prometió a Manuel ser más ordenada con los apuntes.
1C. José le prometió a Carmen ser más ordenada con los apuntes.
1D. José le prometió a Manuel ser más ordenada con los apuntes.
1E. María le aconsejó a Carmen ser más ordenada con los apuntes.
1F. José le aconsejó a Carmen ser más ordenada con los apuntes.
1G. María le aconsejó a Manuel ser más ordenada con los apuntes.
1H. José le aconsejó a Manuel ser más ordenada con los apuntes.

2A. Francisco le reconoció a David ser demasiado escrupuloso con la comida.
2B. Francisco le reconoció a Laura ser demasiado escrupuloso con la comida.
2C. Isabel le reconoció a David ser demasiado escrupuloso con la comida.
2D. Isabel le reconoció a Laura ser demasiado escrupuloso con la comida.
2E. Francisco le recriminó a David ser demasiado escrupuloso con la comida.
2F. Isabel le recriminó a David ser demasiado escrupuloso con la comida.
2G. Francisco le recriminó a Laura ser demasiado escrupuloso con la comida.
2H. Isabel le recriminó a Laura ser demasiado escrupuloso con la comida.

3A. Ana le reveló a Cristina ser muy temerosa durante las tormentas.
3B. Ana le reveló a Javier ser muy temerosa durante las tormentas.
3C. Juan le reveló a Cristina ser muy temerosa durante las tormentas.
3D. Juan le reveló a Javier ser muy temerosa durante las tormentas.
3E. Ana le reprochó a Cristina ser muy temerosa durante las tormentas.
3F. Juan le reprochó a Cristina ser muy temerosa durante las tormentas.
3G. Ana le reprochó a Javier ser muy temerosa durante las tormentas.
3H. Juan le reprochó a Javier ser muy temerosa durante las tormentas.

4A. Daniel le garantizó a Jesús ser más afectuoso con los clientes.
4B. Daniel le garantizó a Antonia ser más afectuoso con los clientes.
4C. Marta le garantizó a Jesús ser más afectuoso con los clientes.
4D. Marta le garantizó a Antonia ser más afectuoso con los clientes.
4E. Daniel le recomendó a Jesús ser más afectuoso con los clientes.

4F. Marta le recomendó a Jesús ser más afectuoso con los clientes.
4G. Daniel le recomendó a Antonia ser más afectuoso con los clientes.
4H. Marta le recomendó a Antonia ser más afectuoso con los clientes.

5A. Dolores le confirmó a Lucía ser siempre tan competitiva en el trabajo.
5B. Dolores le confirmó a Alejandro ser siempre tan competitiva en el trabajo.
5C. Carlos le confirmó a Lucía ser siempre tan competitiva en el trabajo.
5D. Carlos le confirmó a Alejandro ser siempre tan competitiva en el trabajo.
5E. Dolores le impidió a Lucía ser siempre tan competitiva en el trabajo.
5F. Carlos le impidió a Lucía ser siempre tan competitiva en el trabajo.
5G. Dolores le impidió a Alejandro ser siempre tan competitiva en el trabajo.
5H. Carlos le impidió a Alejandro ser siempre tan competitiva en el trabajo.

6A. Miguel le desmintió a Rafael ser demasiado codicioso con los beneficios.
6B. Miguel le desmintió a Paula ser demasiado codicioso con los beneficios.
6C. Sara le desmintió a Rafael ser demasiado codicioso con los beneficios.
6D. Sara le desmintió a Paula ser demasiado codicioso con los beneficios.
6E. Miguel le prohibió a Rafael ser demasiado codicioso con los beneficios.
6F. Sara le prohibió a Rafael ser demasiado codicioso con los beneficios.
6G. Miguel le prohibió a Paula ser demasiado codicioso con los beneficios.
6H. Sara le prohibió a Paula ser demasiado codicioso con los beneficios.

7A. Elena le juró a Pilar ser absolutamente honesta en la declaración.
7B. Elena le juró a Ángel ser absolutamente honesta en la declaración.
7C. Pedro le juró a Pilar ser absolutamente honesta en la declaración.
7D. Pedro le juró a Ángel ser absolutamente honesta en la declaración.
7E. Elena le exigió a Pilar ser absolutamente honesta en la declaración.
7F. Pedro le exigió a Pilar ser absolutamente honesta en la declaración.
7G. Elena le exigió a Ángel ser absolutamente honesta en la declaración.
7H. Pedro le exigió a Ángel ser absolutamente honesta en la declaración.

8A. Pablo le aseguró a Fernando ser totalmente sincero sobre lo ocurrido.
8B. Pablo le aseguró a Manuela ser totalmente sincero sobre lo ocurrido.
8C. Raquel le aseguró a Fernando ser totalmente sincero sobre lo ocurrido.
8D. Raquel le aseguró a Manuela ser totalmente sincero sobre lo ocurrido.
8E. Pablo le ordenó a Fernando ser totalmente sincero sobre lo ocurrido.
8F. Raquel le ordenó a Fernando ser totalmente sincero sobre lo ocurrido.
8G. Pablo le ordenó a Manuela ser totalmente sincero sobre lo ocurrido.
8H. Raquel le ordenó a Manuela ser totalmente sincero sobre lo ocurrido.

9A. Mercedes le confesó a Juana ser un poco despreocupada con el papeleo.
9B. Mercedes le confesó a Luis ser un poco despreocupada con el papeleo.
9C. Sergio le confesó a Juana ser un poco despreocupada con el papeleo.
9D. Sergio le confesó a Luis ser un poco despreocupada con el papeleo.
9E. Mercedes le permitió a Juana ser un poco despreocupada con el papeleo.
9F. Sergio le permitió a Juana ser un poco despreocupada con el papeleo.
9G. Mercedes le permitió a Luis ser un poco despreocupada con el papeleo.
9H. Sergio le permitió a Luis ser un poco despreocupada con el papeleo.

10A. Jorge le expresó a Alberto ser muy comprensivo con las circunstancias.
10B. Jorge le expresó a Beatriz ser muy comprensivo con las circunstancias.
10C. Teresa le expresó a Alberto ser muy comprensivo con las circunstancias.
10D. Teresa le expresó a Beatriz ser muy comprensivo con las circunstancias.
10E. Jorge le encargó a Alberto ser muy comprensivo con las circunstancias.
10F. Teresa le encargó a Alberto ser muy comprensivo con las circunstancias.
10G. Jorge le encargó a Beatriz ser muy comprensivo con las circunstancias.
10H. Teresa le encargó a Beatriz ser muy comprensivo con las circunstancias.

11A. Nuria le declaró a Julia ser más productiva a última hora.
11B. Nuria le declaró a Diego ser más productiva a última hora.
11C. Álvaro le declaró a Julia ser más productiva a última hora.
11D. Álvaro le declaró a Diego ser más productiva a última hora.
11E. Nuria le mandó a Julia ser más productiva a última hora.
11F. Álvaro le mandó a Julia ser más productiva a última hora.
11G. Nuria le mandó a Diego ser más productiva a última hora.
11H. Álvaro le mandó a Diego ser más productiva a última hora.

12A. Adrián le manifestó a Raúl ser algo desconfiado con los compañeros.
12B. Adrián le manifestó a Irene ser algo desconfiado con los compañeros.
12C. Silvia le manifestó a Raúl ser algo desconfiado con los compañeros.
12D. Silvia le manifestó a Irene ser algo desconfiado con los compañeros.
12E. Adrián le consintió a Raúl ser algo desconfiado con los compañeros.
12F. Silvia le consintió a Raúl ser algo desconfiado con los compañeros.

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12G. Adrián le consintió a Irene ser algo desconfiado con los compañeros.
12H. Silvia le consintió a Irene ser algo desconfiado con los compañeros.

13A. Enrique le prometió a Iván estar mucho más espabilado antes de conducir.
13B. Enrique le prometió a Alba estar mucho más espabilado antes de conducir.
13C. Patricia le prometió a Iván estar mucho más espabilado antes de conducir.
13D. Patricia le prometió a Alba estar mucho más espabilado antes de conducir.
13E. Enrique le aconsejó a Iván estar mucho más espabilado antes de conducir.
13F. Patricia le aconsejó a Iván estar mucho más espabilado antes de conducir.
13G. Enrique le aconsejó a Alba estar mucho más espabilado antes de conducir.
13H. Patricia le aconsejó a Alba estar mucho más espabilado antes de conducir.

14A. Rosa le reconoció a Andrea estar muy confundida por los cambios.
14B. Rosa le reconoció a Rubén estar muy confundida por los cambios.
14C. Ramón le reconoció a Andrea estar muy confundida por los cambios.
14D. Ramón le reconoció a Rubén estar muy confundida por los cambios.
14E. Rosa le recriminó a Andrea estar muy confundida por los cambios.
14F. Ramón le recriminó a Andrea estar muy confundida por los cambios.
14G. Rosa le recriminó a Rubén estar muy confundida por los cambios.
14H. Ramón le recriminó a Rubén estar muy confundida por los cambios.

15A. Vicente le reveló a Óscar estar muy inquieto por el juicio.
15B. Vicente le reveló a Mónica estar muy inquieto por el juicio.
15C. Rocío le reveló a Óscar estar muy inquieto por el juicio.
15D. Rocío le reveló a Mónica estar muy inquieto por el juicio.
15E. Vicente le reprochó a Óscar estar muy inquieto por el juicio.
15F. Rocío le reprochó a Óscar estar muy inquieto por el juicio.
15G. Vicente le reprochó a Mónica estar muy inquieto por el juicio.
15H. Rocío le reprochó a Mónica estar muy inquieto por el juicio.

16A. Ángela le garantizó a Alicia estar menos seria durante la negociación.
16B. Ángela le garantizó a Joaquín estar menos seria durante la negociación.
16C. Andrés le garantizó a Alicia estar menos seria durante la negociación.
16D. Andrés le garantizó a Joaquín estar menos seria durante la negociación.
16E. Ángela le recomendó a Alicia estar menos seria durante la negociación.
16F. Andrés le recomendó a Alicia estar menos seria durante la negociación.
16G. Ángela le recomendó a Joaquín estar menos seria durante la negociación.
16H. Andrés le recomendó a Joaquín estar menos seria durante la negociación.

17A. Santiago le confirmó a Eduardo estar totalmente volcado en la investigación.
17B. Santiago le confirmó a Sandra estar totalmente volcado en la investigación.
17C. Sonia le confirmó a Eduardo estar totalmente volcado en la investigación.
17D. Sonia le confirmó a Sandra estar totalmente volcado en la investigación.
17E. Santiago le impidió a Eduardo estar totalmente volcado en la investigación.
17F. Sonia le impidió a Eduardo estar totalmente volcado en la investigación.
17G. Santiago le impidió a Sandra estar totalmente volcado en la investigación.
17H. Sonia le impidió a Sandra estar totalmente volcado en la investigación.

18A. Marina le desmintió a Susana estar siempre enfadada con los trabajadores.
18B. Marina le desmintió a Roberto estar siempre enfadada con los trabajadores.
18C. Víctor le desmintió a Susana estar siempre enfadada con los trabajadores.
18D. Víctor le desmintió a Roberto estar siempre enfadada con los trabajadores.
18E. Marina le prohibió a Susana estar siempre enfadada con los trabajadores.
18F. Víctor le prohibió a Susana estar siempre enfadada con los trabajadores.
18G. Marina le prohibió a Roberto estar siempre enfadada con los trabajadores.
18H. Víctor le prohibió a Roberto estar siempre enfadada con los trabajadores.

19A. Mario le juró a Jaime estar totalmente involucrado en el proyecto.
19B. Mario le juró a Yolanda estar totalmente involucrado en el proyecto.
19C. Margarita le juró a Jaime estar totalmente involucrado en el proyecto.
19D. Margarita le juró a Yolanda estar totalmente involucrado en el proyecto.
19E. Mario le exigió a Jaime estar totalmente involucrado en el proyecto.
19F. Margarita le exigió a Jaime estar totalmente involucrado en el proyecto.
19G. Mario le exigió a Yolanda estar totalmente involucrado en el proyecto.
19H. Margarita le exigió a Yolanda estar totalmente involucrado en el proyecto.

20A. Natalia le aseguró a Eva estar totalmente entregada a la causa.
20B. Natalia le aseguró a Marcos estar totalmente entregada a la causa.
20C. Ignacio le aseguró a Eva estar totalmente entregada a la causa.
20D. Ignacio le aseguró a Marcos estar totalmente entregada a la causa.
20E. Natalia le ordenó a Eva estar totalmente entregada a la causa.
20F. Ignacio le ordenó a Eva estar totalmente entregada a la causa.
20G. Natalia le ordenó a Marcos estar totalmente entregada a la causa.

20H. Ignacio le ordenó a Marcos estar totalmente entregada a la causa.

21A. Alfonso le confesó a Salvador estar un poco huraño tras el disgusto.
21B. Alfonso le confesó a Esther estar un poco huraño tras el disgusto.
21C. Claudia le confesó a Salvador estar un poco huraño tras el disgusto.
21D. Claudia le confesó a Esther estar un poco huraño tras el disgusto.
21E. Alfonso le permitió a Salvador estar un poco huraño tras el disgusto.
21F. Claudia le permitió a Salvador estar un poco huraño tras el disgusto.
21G. Alfonso le permitió a Esther estar un poco huraño tras el disgusto.
21H. Claudia le permitió a Esther estar un poco huraño tras el disgusto.

22A. Noelia le expresó a Ángeles estar más ilusionada con el trabajo.
22B. Noelia le expresó a Jordi estar más ilusionada con el trabajo.
22C. Ricardo le expresó a Ángeles estar más ilusionada con el trabajo.
22D. Ricardo le expresó a Jordi estar más ilusionada con el trabajo.
22E. Noelia le encargó a Ángeles estar más ilusionada con el trabajo.
22F. Ricardo le encargó a Ángeles estar más ilusionada con el trabajo.
22G. Noelia le encargó a Jordi estar más ilusionada con el trabajo.
22H. Ricardo le encargó a Jordi estar más ilusionada con el trabajo.

23A. Emilio le declaró a Guillermo estar más comprometido con la empresa.
23B. Emilio le declaró a Carla estar más comprometido con la empresa.
23C. Verónica le declaró a Guillermo estar más comprometido con la empresa.
23D. Verónica le declaró a Carla estar más comprometido con la empresa.
23E. Emilio le mandó a Guillermo estar más comprometido con la empresa.
23F. Verónica le mandó a Guillermo estar más comprometido con la empresa.
23G. Emilio le mandó a Carla estar más comprometido con la empresa.
23H. Verónica le mandó a Carla estar más comprometido con la empresa.

24A. Sofía le manifestó a Carolina estar algo menos implicada en la causa.
24B. Sofía le manifestó a Gabriel estar algo menos implicada en la causa.
24C. Julián le manifestó a Carolina estar algo menos implicada en la causa.
24D. Julián le manifestó a Gabriel estar algo menos implicada en la causa.
24E. Sofía le consintió a Carolina estar algo menos implicada en la causa.
24F. Julián le consintió a Carolina estar algo menos implicada en la causa.
24G. Sofía le consintió a Gabriel estar algo menos implicada en la causa.
24H. Julián le consintió a Gabriel estar algo menos implicada en la causa.

25A. Nerea le prometió a Lorena ser algo más cuidadosa con los libros.
25B. Nerea le prometió a Hugo ser algo más cuidadosa con los libros.
25C. Julio le prometió a Lorena ser algo más cuidadosa con los libros.
25D. Julio le prometió a Hugo ser algo más cuidadosa con los libros.
25E. Nerea le aconsejó a Lorena ser algo más cuidadosa con los libros.
25F. Julio le aconsejó a Lorena ser algo más cuidadosa con los libros.
25G. Nerea le aconsejó a Hugo ser algo más cuidadosa con los libros.
25H. Julio le aconsejó a Hugo ser algo más cuidadosa con los libros.

26A. Tomás le reconoció a Marc ser muy descuidado con sus amistades.
26B. Tomás le reconoció a Inés ser muy descuidado con sus amistades.
26C. Miriam le reconoció a Marc ser muy descuidado con sus amistades.
26D. Miriam le reconoció a Inés ser muy descuidado con sus amistades.
26E. Tomás le recriminó a Marc ser muy descuidado con sus amistades.
26F. Miriam le recriminó a Marc ser muy descuidado con sus amistades.
26G. Tomás le recriminó a Inés ser muy descuidado con sus amistades.
26H. Miriam le recriminó a Inés ser muy descuidado con sus amistades.

27A. Victoria le reveló a Catalina ser todavía adicta a los antidepresivos.
27B. Victoria le reveló a Gonzalo ser todavía adicta a los antidepresivos.
27C. Agustín le reveló a Catalina ser todavía adicta a los antidepresivos.
27D. Agustín le reveló a Gonzalo ser todavía adicta a los antidepresivos.
27E. Victoria le reprochó a Catalina ser todavía adicta a los antidepresivos.
27F. Agustín le reprochó a Catalina ser todavía adicta a los antidepresivos.
27G. Victoria le reprochó a Gonzalo ser todavía adicta a los antidepresivos.
27H. Agustín le reprochó a Gonzalo ser todavía adicta a los antidepresivos.

28A. Félix le garantizó a Nicolás ser absolutamente meticuloso en sus anotaciones.
28B. Félix le garantizó a Lidia ser absolutamente meticuloso en sus anotaciones.
28C. Consuelo le garantizó a Nicolás ser absolutamente meticuloso en sus anotaciones.
28D. Consuelo le garantizó a Lidia ser absolutamente meticuloso en sus anotaciones.
28E. Félix le recomendó a Nicolás ser absolutamente meticuloso en sus anotaciones.
28F. Consuelo le recomendó a Nicolás ser absolutamente meticuloso en sus anotaciones.
28G. Félix le recomendó a Lidia ser absolutamente meticuloso en sus anotaciones.
28H. Consuelo le recomendó a Lidia ser absolutamente meticuloso en sus anotaciones.

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29A. Daniela le confirmó a Celia ser abiertamente partidaria de la tauromaquia.
29B. Daniela le confirmó a Cristian ser abiertamente partidaria de la tauromaquia.
29C. Ismael le confirmó a Celia ser abiertamente partidaria de la tauromaquia.
29D. Ismael le confirmó a Cristian ser abiertamente partidaria de la tauromaquia.
29E. Daniela le impidió a Celia ser abiertamente partidaria de la tauromaquia.
29F. Ismael le impidió a Celia ser abiertamente partidaria de la tauromaquia.
29G. Daniela le impidió a Cristian ser abiertamente partidaria de la tauromaquia.
29H. Ismael le impidió a Cristian ser abiertamente partidaria de la tauromaquia.

30A. Martín le desmintió a Samuel ser siempre tan irrespetuoso con los visitantes.
30B. Martín le desmintió a Gloria ser siempre tan irrespetuoso con los visitantes.
30C. Luisa le desmintió a Samuel ser siempre tan irrespetuoso con los visitantes.
30D. Luisa le desmintió a Gloria ser siempre tan irrespetuoso con los visitantes.
30E. Martín le prohibió a Samuel ser siempre tan irrespetuoso con los visitantes.
30F. Luisa le prohibió a Samuel ser siempre tan irrespetuoso con los visitantes.
30G. Martín le prohibió a Gloria ser siempre tan irrespetuoso con los visitantes.
30H. Luisa le prohibió a Gloria ser siempre tan irrespetuoso con los visitantes.

31A. Olga le juró a Alejandra ser sumamente delicada con los pacientes.
31B. Olga le juró a Héctor ser sumamente delicada con los pacientes.
31C. Aitor le juró a Alejandra ser sumamente delicada con los pacientes.
31D. Aitor le juró a Héctor ser sumamente delicada con los pacientes.
31E. Olga le exigió a Alejandra ser sumamente delicada con los pacientes.
31F. Aitor le exigió a Alejandra ser sumamente delicada con los pacientes.
31G. Olga le exigió a Héctor ser sumamente delicada con los pacientes.
31H. Aitor le exigió a Héctor ser sumamente delicada con los pacientes.

32A. Alfredo le aseguró a Sebastián ser absolutamente pulcro con las heridas.
32B. Alfredo le aseguró a Esperanza ser absolutamente pulcro con las heridas.
32C. Aurora le aseguró a Sebastián ser absolutamente pulcro con las heridas.
32D. Aurora le aseguró a Esperanza ser absolutamente pulcro con las heridas.
32E. Alfredo le ordenó a Sebastián ser absolutamente pulcro con las heridas.
32F. Aurora le ordenó a Sebastián ser absolutamente pulcro con las heridas.
32G. Alfredo le ordenó a Esperanza ser absolutamente pulcro con las heridas.
32H. Aurora le ordenó a Esperanza ser absolutamente pulcro con las heridas.

33A. Ainhoa le confesó a Clara ser bastante generosa con las notas.
33B. Ainhoa le confesó a Iker ser bastante generosa con las notas.
33C. César le confesó a Clara ser bastante generosa con las notas.
33D. César le confesó a Iker ser bastante generosa con las notas.
33E. Ainhoa le permitió a Clara ser bastante generosa con las notas.
33F. César le permitió a Clara ser bastante generosa con las notas.
33G. Ainhoa le permitió a Iker ser bastante generosa con las notas.
33H. César le permitió a Iker ser bastante generosa con las notas.

34A. Felipe le expresó a Lucas ser totalmente autónomo en la gestión.
34B. Felipe le expresó a Vanesa ser totalmente autónomo en la gestión.
34C. Virginia le expresó a Lucas ser totalmente autónomo en la gestión.
34D. Virginia le expresó a Vanesa ser totalmente autónomo en la gestión.
34E. Felipe le encargó a Lucas ser totalmente autónomo en la gestión.
34F. Virginia le encargó a Lucas ser totalmente autónomo en la gestión.
34G. Felipe le encargó a Vanesa ser totalmente autónomo en la gestión.
34H. Virginia le encargó a Vanesa ser totalmente autónomo en la gestión.

35A. Martina le declaró a Lourdes ser sumamente honrada en el cargo.
35B. Martina le declaró a Gregorio ser sumamente honrada en el cargo.
35C. Rodrigo le declaró a Lourdes ser sumamente honrada en el cargo.
35D. Rodrigo le declaró a Gregorio ser sumamente honrada en el cargo.
35E. Martina le mandó a Lourdes ser sumamente honrada en el cargo.
35F. Rodrigo le mandó a Lourdes ser sumamente honrada en el cargo.
35G. Martina le mandó a Gregorio ser sumamente honrada en el cargo.
35H. Rodrigo le mandó a Gregorio ser sumamente honrada en el cargo.

36A. Esteban le manifestó a Cristóbal ser un poco anárquico con las normas.
36B. Esteban le manifestó a Blanca ser un poco anárquico con las normas.
36C. Begoña le manifestó a Cristóbal ser un poco anárquico con las normas.
36D. Begoña le manifestó a Blanca ser un poco anárquico con las normas.
36E. Esteban le consintió a Cristóbal ser un poco anárquico con las normas.
36F. Begoña le consintió a Cristóbal ser un poco anárquico con las normas.
36G. Esteban le consintió a Blanca ser un poco anárquico con las normas.
36H. Begoña le consintió a Blanca ser un poco anárquico con las normas.

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37A. Arturo le prometió a Borja estar más preocupado por la salud.
37B. Arturo le prometió a Elisa estar más preocupado por la salud.
37C. Estefanía le prometió a Borja estar más preocupado por la salud.
37D. Estefanía le prometió a Elisa estar más preocupado por la salud.
37E. Arturo le aconsejó a Borja estar más preocupado por la salud.
37F. Estefanía le aconsejó a Borja estar más preocupado por la salud.
37G. Arturo le aconsejó a Elisa estar más preocupado por la salud.
37H. Estefanía le aconsejó a Elisa estar más preocupado por la salud.

38A. Araceli le reconoció a Matilde estar muy poco interesada en la política.
38B. Araceli le reconoció a Mateo estar muy poco interesada en la política.
38C. Eugenio le reconoció a Matilde estar muy poco interesada en la política.
38D. Eugenio le reconoció a Mateo estar muy poco interesada en la política.
38E. Araceli le recriminó a Matilde estar muy poco interesada en la política.
38F. Eugenio le recriminó a Matilde estar muy poco interesada en la política.
38G. Araceli le recriminó a Mateo estar muy poco interesada en la política.
38H. Eugenio le recriminó a Mateo estar muy poco interesada en la política.

39A. Isaac le reveló a Germán estar todavía deprimido por la ruptura.
39B. Isaac le reveló a Elvira estar todavía deprimido por la ruptura.
39C. Belén le reveló a Germán estar todavía deprimido por la ruptura.
39D. Belén le reveló a Elvira estar todavía deprimido por la ruptura.
39E. Isaac le reprochó a Germán estar todavía deprimido por la ruptura.
39F. Belén le reprochó a Germán estar todavía deprimido por la ruptura.
39G. Isaac le reprochó a Elvira estar todavía deprimido por la ruptura.
39H. Belén le reprochó a Elvira estar todavía deprimido por la ruptura.

40A. Tamara le garantizó a Paloma estar menos agresiva en el debate.
40B. Tamara le garantizó a Asier estar menos agresiva en el debate.
40C. Valentín le garantizó a Paloma estar menos agresiva en el debate.
40D. Valentín le garantizó a Asier estar menos agresiva en el debate.
40E. Tamara le recomendó a Paloma estar menos agresiva en el debate.
40F. Valentín le recomendó a Paloma estar menos agresiva en el debate.
40G. Tamara le recomendó a Asier estar menos agresiva en el debate.
40H. Valentín le recomendó a Asier estar menos agresiva en el debate.

41A. Abel le confirmó a Adolfo estar todavía dolido por las críticas.
41B. Abel le confirmó a Almudena estar todavía dolido por las críticas.
41C. Rebeca le confirmó a Adolfo estar todavía dolido por las críticas.
41D. Rebeca le confirmó a Almudena estar todavía dolido por las críticas.
41E. Abel le impidió a Adolfo estar todavía dolido por las críticas.
41F. Rebeca le impidió a Adolfo estar todavía dolido por las críticas.
41G. Abel le impidió a Almudena estar todavía dolido por las críticas.
41H. Rebeca le impidió a Almudena estar todavía dolido por las críticas.

42A. Mireia le desmintió a Felisa estar siempre descontenta con los resultados.
42B. Mireia le desmintió a Benito estar siempre descontenta con los resultados.
42C. Íñigo le desmintió a Felisa estar siempre descontenta con los resultados.
42D. Íñigo le desmintió a Benito estar siempre descontenta con los resultados.
42E. Mireia le prohibió a Felisa estar siempre descontenta con los resultados.
42F. Íñigo le prohibió a Felisa estar siempre descontenta con los resultados.
42G. Mireia le prohibió a Benito estar siempre descontenta con los resultados.
42H. Íñigo le prohibió a Benito estar siempre descontenta con los resultados.

43A. Darío le juró a Isidro estar mucho más concienciado con el medioambiente.
43B. Darío le juró a Nieves estar mucho más concienciado con el medioambiente.
43C. Noemí le juró a Isidro estar mucho más concienciado con el medioambiente.
43D. Noemí le juró a Nieves estar mucho más concienciado con el medioambiente.
43E. Darío le exigió a Isidro estar mucho más concienciado con el medioambiente.
43F. Noemí le exigió a Isidro estar mucho más concienciado con el medioambiente.
43G. Darío le exigió a Nieves estar mucho más concienciado con el medioambiente.
43H. Noemí le exigió a Nieves estar mucho más concienciado con el medioambiente.

44A. Adela le aseguró a Tania estar totalmente centrada en los objetivos.
44B. Adela le aseguró a Israel estar totalmente centrada en los objetivos.
44C. Gerardo le aseguró a Tania estar totalmente centrada en los objetivos.
44D. Gerardo le aseguró a Israel estar totalmente centrada en los objetivos.
44E. Adela le ordenó a Tania estar totalmente centrada en los objetivos.
44F. Gerardo le ordenó a Tania estar totalmente centrada en los objetivos.
44G. Adela le ordenó a Israel estar totalmente centrada en los objetivos.
44H. Gerardo le ordenó a Israel estar totalmente centrada en los objetivos.

45A. Omar le confesó a Bruno estar un poco ofendido ante las críticas.

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45B. Omar le confesó a Valeria estar un poco ofendido ante las críticas.
45C. Emma le confesó a Bruno estar un poco ofendido ante las críticas.
45D. Emma le confesó a Valeria estar un poco ofendido ante las críticas.
45E. Omar le permitió a Bruno estar un poco ofendido ante las críticas.
45F. Emma le permitió a Bruno estar un poco ofendido ante las críticas.
45G. Omar le permitió a Valeria estar un poco ofendido ante las críticas.
45H. Emma le permitió a Valeria estar un poco ofendido ante las críticas.

46A. Amalia le expresó a Diana estar más tranquila tras las vacaciones.
46B. Amalia le expresó a Eloy estar más tranquila tras las vacaciones.
46C. Federico le expresó a Diana estar más tranquila tras las vacaciones.
46D. Federico le expresó a Eloy estar más tranquila tras las vacaciones.
46E. Amalia le encargó a Diana estar más tranquila tras las vacaciones.
46F. Federico le encargó a Diana estar más tranquila tras las vacaciones.
46G. Amalia le encargó a Eloy estar más tranquila tras las vacaciones.
46H. Federico le encargó a Eloy estar más tranquila tras las vacaciones.

47A. Fermín le declaró a Benjamín estar absolutamente arrepentido de las mentiras.
47B. Fermín le declaró a Amelia estar absolutamente arrepentido de las mentiras.
47C. Carlota le declaró a Benjamín estar absolutamente arrepentido de las mentiras.
47D. Carlota le declaró a Amelia estar absolutamente arrepentido de las mentiras.
47E. Fermín le mandó a Benjamín estar absolutamente arrepentido de las mentiras.
47F. Carlota le mandó a Benjamín estar absolutamente arrepentido de las mentiras.
47G. Fermín le mandó a Amelia estar absolutamente arrepentido de las mentiras.
47H. Carlota le mandó a Amelia estar absolutamente arrepentido de las mentiras.

48A. Aitana le manifestó a Noa estar ligeramente molesta con la situación.
48B. Aitana le manifestó a Matías estar ligeramente molesta con la situación.
48C. Elías le manifestó a Noa estar ligeramente molesta con la situación.
48D. Elías le manifestó a Matías estar ligeramente molesta con la situación.
48E. Aitana le consintió a Noa estar ligeramente molesta con la situación.
48F. Elías le consintió a Noa estar ligeramente molesta con la situación.
48G. Aitana le consintió a Matías estar ligeramente molesta con la situación.
48H. Elías le consintió a Matías estar ligeramente molesta con la situación.

49A. Amelia le reveló a Carlota estar así de indignada por lo sucedido.
49B. Amelia le reveló a Fermín estar así de indignada por lo sucedido.
49C. Benjamín le reveló a Carlota estar así de indignada por lo sucedido.
49D. Benjamín le reveló a Fermín estar así de indignada por lo sucedido.
49E. Amelia le impidió a Carlota estar así de indignada por lo sucedido.
49F. Benjamín le impidió a Carlota estar así de indignada por lo sucedido.
49G. Amelia le impidió a Fermín estar así de indignada por lo sucedido.
49H. Benjamín le impidió a Fermín estar así de indignada por lo sucedido.

50A. Javier le aseguró a Juan estar un poco cohibido tras el incidente.
50B. Javier le aseguró a Ana estar un poco cohibido tras el incidente.
50C. Cristina le aseguró a Juan estar un poco cohibido tras el incidente.
50D. Cristina le aseguró a Ana estar un poco cohibido tras el incidente.
50E. Javier le consintió a Juan estar un poco cohibido tras el incidente.
50F. Cristina le consintió a Juan estar un poco cohibido tras el incidente.
50G. Javier le consintió a Ana estar un poco cohibido tras el incidente.
50H. Cristina le consintió a Ana estar un poco cohibido tras el incidente.

51A. Antonia le confesó a Marta estar un poco relajada con los estudios.
51B. Antonia le confesó a Daniel estar un poco relajada con los estudios.
51C. Jesús le confesó a Marta estar un poco relajada con los estudios.
51D. Jesús le confesó a Daniel estar un poco relajada con los estudios.
51E. Antonia le permitió a Marta estar un poco relajada con los estudios.
51F. Jesús le permitió a Marta estar un poco relajada con los estudios.
51G. Antonia le permitió a Daniel estar un poco relajada con los estudios.
51H. Jesús le permitió a Daniel estar un poco relajada con los estudios.

52A. David le manifestó a Francisco estar muy ansioso por la visita.
52B. David le manifestó a Isabel estar muy ansioso por la visita.
52C. Laura le manifestó a Francisco estar muy ansioso por la visita.
52D. Laura le manifestó a Isabel estar muy ansioso por la visita.
52E. David le recriminó a Francisco estar muy ansioso por la visita.
52F. Laura le recriminó a Francisco estar muy ansioso por la visita.
52G. David le recriminó a Isabel estar muy ansioso por la visita.
52H. Laura le recriminó a Isabel estar muy ansioso por la visita.

53A. Noa le confirmó a Aitana estar poco entusiasmada con la boda.
53B. Noa le confirmó a Elías estar poco entusiasmada con la boda.

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53C. Matías le confirmó a Aitana estar poco entusiasmada con la boda.
53D. Matías le confirmó a Elías estar poco entusiasmada con la boda.
53E. Noa le reprochó a Aitana estar poco entusiasmada con la boda.
53F. Matías le reprochó a Aitana estar poco entusiasmada con la boda.
53G. Noa le reprochó a Elías estar poco entusiasmada con la boda.
53H. Matías le reprochó a Elías estar poco entusiasmada con la boda.

54A. Diego le expresó a Álvaro estar algo más contento con la plantilla.
54B. Diego le expresó a Nuria estar algo más contento con la plantilla.
54C. Julia le expresó a Álvaro estar algo más contento con la plantilla.
54D. Julia le expresó a Nuria estar algo más contento con la plantilla.
54E. Diego le recomendó a Álvaro estar algo más contento con la plantilla.
54F. Julia le recomendó a Álvaro estar algo más contento con la plantilla.
54G. Diego le recomendó a Nuria estar algo más contento con la plantilla.
54H. Julia le recomendó a Nuria estar algo más contento con la plantilla.

55A. Paula le declaró a Sara estar totalmente segura de la decisión.
55B. Paula le declaró a Miguel estar totalmente segura de la decisión.
55C. Rafael le declaró a Sara estar totalmente segura de la decisión.
55D. Rafael le declaró a Miguel estar totalmente segura de la decisión.
55E. Paula le aconsejó a Sara estar totalmente segura de la decisión.
55F. Rafael le aconsejó a Sara estar totalmente segura de la decisión.
55G. Paula le aconsejó a Miguel estar totalmente segura de la decisión.
55H. Rafael le aconsejó a Miguel estar totalmente segura de la decisión.

56A. Alejandro le desmintió a Carlos estar todavía contrariado por la discusión.
56B. Alejandro le desmintió a Dolores estar todavía contrariado por la discusión.
56C. Lucía le desmintió a Carlos estar todavía contrariado por la discusión.
56D. Lucía le desmintió a Dolores estar todavía contrariado por la discusión.
56E. Alejandro le prohibió a Carlos estar todavía contrariado por la discusión.
56F. Lucía le prohibió a Carlos estar todavía contrariado por la discusión.
56G. Alejandro le prohibió a Dolores estar todavía contrariado por la discusión.
56H. Lucía le prohibió a Dolores estar todavía contrariado por la discusión.

57A. Manuela le prometió a Raquel estar mucho más concentrada en el juego.
57B. Manuela le prometió a Pablo estar mucho más concentrada en el juego.
57C. Fernando le prometió a Raquel estar mucho más concentrada en el juego.
57D. Fernando le prometió a Pablo estar mucho más concentrada en el juego.
57E. Manuela le mandó a Raquel estar mucho más concentrada en el juego.
57F. Fernando le mandó a Raquel estar mucho más concentrada en el juego.
57G. Manuela le mandó a Pablo estar mucho más concentrada en el juego.
57H. Fernando le mandó a Pablo estar mucho más concentrada en el juego.

58A. Luis le garantizó a Sergio estar menos dormido a primera hora.
58B. Luis le garantizó a Mercedes estar menos dormido a primera hora.
58C. Juana le garantizó a Sergio estar menos dormido a primera hora.
58D. Juana le garantizó a Mercedes estar menos dormido a primera hora.
58E. Luis le ordenó a Sergio estar menos dormido a primera hora.
58F. Juana le ordenó a Sergio estar menos dormido a primera hora.
58G. Luis le ordenó a Mercedes estar menos dormido a primera hora.
58H. Juana le ordenó a Mercedes estar menos dormido a primera hora.

59A. Beatriz le juró a Teresa estar mejor preparada la próxima vez.
59B. Beatriz le juró a Jorge estar mejor preparada la próxima vez.
59C. Alberto le juró a Teresa estar mejor preparada la próxima vez.
59D. Alberto le juró a Jorge estar mejor preparada la próxima vez.
59E. Beatriz le exigió a Teresa estar mejor preparada la próxima vez.
59F. Alberto le exigió a Teresa estar mejor preparada la próxima vez.
59G. Beatriz le exigió a Jorge estar mejor preparada la próxima vez.
59H. Alberto le exigió a Jorge estar mejor preparada la próxima vez.

60A. Ángel le reconoció a Pedro estar mucho más motivado tras el ascenso.
60B. Ángel le reconoció a Elena estar mucho más motivado tras el ascenso.
60C. Pilar le reconoció a Pedro estar mucho más motivado tras el ascenso.
60D. Pilar le reconoció a Elena estar mucho más motivado tras el ascenso.
60E. Ángel le encargó a Pedro estar mucho más motivado tras el ascenso.
60F. Pilar le encargó a Pedro estar mucho más motivado tras el ascenso.
60G. Ángel le encargó a Elena estar mucho más motivado tras el ascenso.
60H. Pilar le encargó a Elena estar mucho más motivado tras el ascenso.

61A. Raúl le reveló a Adrián ser abiertamente ateo en cuestiones espirituales.
61B. Raúl le reveló a Silvia ser abiertamente ateo en cuestiones espirituales.
61C. Irene le reveló a Adrián ser abiertamente ateo en cuestiones espirituales.

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61D. Irene le reveló a Silvia ser abiertamente ateo en cuestiones espirituales.
61E. Raúl le impidió a Adrián ser abiertamente ateo en cuestiones espirituales.
61F. Irene le impidió a Adrián ser abiertamente ateo en cuestiones espirituales.
61G. Raúl le impidió a Silvia ser abiertamente ateo en cuestiones espirituales.
61H. Irene le impidió a Silvia ser abiertamente ateo en cuestiones espirituales.

62A. Alba le aseguró a Patricia ser muy solidaria con los refugiados.
62B. Alba le aseguró a Enrique ser muy solidaria con los refugiados.
62C. Iván le aseguró a Patricia ser muy solidaria con los refugiados.
62D. Iván le aseguró a Enrique ser muy solidaria con los refugiados.
62E. Alba le consintió a Patricia ser muy solidaria con los refugiados.
62F. Iván le consintió a Patricia ser muy solidaria con los refugiados.
62G. Alba le consintió a Enrique ser muy solidaria con los refugiados.
62H. Iván le consintió a Enrique ser muy solidaria con los refugiados.

63A. Rubén le confesó a Ramón ser bastante crítico con el sistema.
63B. Rubén le confesó a Rosa ser bastante crítico con el sistema.
63C. Andrea le confesó a Ramón ser bastante crítico con el sistema.
63D. Andrea le confesó a Rosa ser bastante crítico con el sistema.
63E. Rubén le permitió a Ramón ser bastante crítico con el sistema.
63F. Andrea le permitió a Ramón ser bastante crítico con el sistema.
63G. Rubén le permitió a Rosa ser bastante crítico con el sistema.
63H. Andrea le permitió a Rosa ser bastante crítico con el sistema.

64A. Carla le manifestó a Verónica ser abiertamente contraria al cambio legislativo.
64B. Carla le manifestó a Emilio ser abiertamente contraria al cambio legislativo.
64C. Guillermo le manifestó a Verónica ser abiertamente contraria al cambio legislativo.
64D. Guillermo le manifestó a Emilio ser abiertamente contraria al cambio legislativo.
64E. Carla le recriminó a Verónica ser abiertamente contraria al cambio legislativo.
64F. Guillermo le recriminó a Verónica ser abiertamente contraria al cambio legislativo.
64G. Carla le recriminó a Emilio ser abiertamente contraria al cambio legislativo.
64H. Guillermo le recriminó a Emilio ser abiertamente contraria al cambio legislativo.

65A. Joaquín le confirmó a Andrés ser muy quisquilloso con el orden.
65B. Joaquín le confirmó a Ángela ser muy quisquilloso con el orden.
65C. Alicia le confirmó a Andrés ser muy quisquilloso con el orden.
65D. Alicia le confirmó a Ángela ser muy quisquilloso con el orden.
65E. Joaquín le reprochó a Andrés ser muy quisquilloso con el orden.
65F. Alicia le reprochó a Andrés ser muy quisquilloso con el orden.
65G. Joaquín le reprochó a Ángela ser muy quisquilloso con el orden.
65H. Alicia le reprochó a Ángela ser muy quisquilloso con el orden.

66A. Esther le expresó a Claudia ser menos extrovertida con los desconocidos.
66B. Esther le expresó a Alfonso ser menos extrovertida con los desconocidos.
66C. Salvador le expresó a Claudia ser menos extrovertida con los desconocidos.
66D. Salvador le expresó a Alfonso ser menos extrovertida con los desconocidos.
66E. Esther le recomendó a Claudia ser menos extrovertida con los desconocidos.
66F. Salvador le recomendó a Claudia ser menos extrovertida con los desconocidos.
66G. Esther le recomendó a Alfonso ser menos extrovertida con los desconocidos.
66H. Salvador le recomendó a Alfonso ser menos extrovertida con los desconocidos.

67A. Roberto le declaró a Víctor ser más arriesgado en las inversiones.
67B. Roberto le declaró a Marina ser más arriesgado en las inversiones.
67C. Susana le declaró a Víctor ser más arriesgado en las inversiones.
67D. Susana le declaró a Marina ser más arriesgado en las inversiones.
67E. Roberto le aconsejó a Víctor ser más arriesgado en las inversiones.
67F. Susana le aconsejó a Víctor ser más arriesgado en las inversiones.
67G. Roberto le aconsejó a Marina ser más arriesgado en las inversiones.
67H. Susana le aconsejó a Marina ser más arriesgado en las inversiones.

68A. Yolanda le desmintió a Margarita ser siempre tan orgullosa en las discusiones.
68B. Yolanda le desmintió a Mario ser siempre tan orgullosa en las discusiones.
68C. Jaime le desmintió a Margarita ser siempre tan orgullosa en las discusiones.
68D. Jaime le desmintió a Mario ser siempre tan orgullosa en las discusiones.
68E. Yolanda le prohibió a Margarita ser siempre tan orgullosa en las discusiones.
68F. Jaime le prohibió a Margarita ser siempre tan orgullosa en las discusiones.
68G. Yolanda le prohibió a Mario ser siempre tan orgullosa en las discusiones.
68H. Jaime le prohibió a Mario ser siempre tan orgullosa en las discusiones.

69A. Marcos le prometió a Ignacio ser mucho más precavido con el dinero.
69B. Marcos le prometió a Natalia ser mucho más precavido con el dinero.
69C. Eva le prometió a Ignacio ser mucho más precavido con el dinero.
69D. Eva le prometió a Natalia ser mucho más precavido con el dinero.

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69E. Marcos le mandó a Ignacio ser mucho más precavido con el dinero.
69F. Eva le mandó a Ignacio ser mucho más precavido con el dinero.
69G. Marcos le mandó a Natalia ser mucho más precavido con el dinero.
69H. Eva le mandó a Natalia ser mucho más precavido con el dinero.

70A. Sandra le garantizó a Sonia ser sumamente precisa en el acta.
70B. Sandra le garantizó a Santiago ser sumamente precisa en el acta.
70C. Eduardo le garantizó a Sonia ser sumamente precisa en el acta.
70D. Eduardo le garantizó a Santiago ser sumamente precisa en el acta.
70E. Sandra le ordenó a Sonia ser sumamente precisa en el acta.
70F. Eduardo le ordenó a Sonia ser sumamente precisa en el acta.
70G. Sandra le ordenó a Santiago ser sumamente precisa en el acta.
70H. Eduardo le ordenó a Santiago ser sumamente precisa en el acta.

71A. Jordi le juró a Ricardo ser totalmente objetivo en la evaluación.
71B. Jordi le juró a Noelia ser totalmente objetivo en la evaluación.
71C. Ángeles le juró a Ricardo ser totalmente objetivo en la evaluación.
71D. Ángeles le juró a Noelia ser totalmente objetivo en la evaluación.
71E. Jordi le exigió a Ricardo ser totalmente objetivo en la evaluación.
71F. Ángeles le exigió a Ricardo ser totalmente objetivo en la evaluación.
71G. Jordi le exigió a Noelia ser totalmente objetivo en la evaluación.
71H. Ángeles le exigió a Noelia ser totalmente objetivo en la evaluación.

72A. Mónica le reconoció a Rocío ser muy rígida con los empleados.
72B. Mónica le reconoció a Vicente ser muy rígida con los empleados.
72C. Óscar le reconoció a Rocío ser muy rígida con los empleados.
72D. Óscar le reconoció a Vicente ser muy rígida con los empleados.
72E. Mónica le encargó a Rocío ser muy rígida con los empleados.
72F. Óscar le encargó a Rocío ser muy rígida con los empleados.
72G. Mónica le encargó a Vicente ser muy rígida con los empleados.
72H. Óscar le encargó a Vicente ser muy rígida con los empleados.

73A. Carolina le reveló a Sofía estar siempre tensa con el jefe.
73B. Carolina le reveló a Julián estar siempre tensa con el jefe.
73C. Gabriel le reveló a Sofía estar siempre tensa con el jefe.
73D. Gabriel le reveló a Julián estar siempre tensa con el jefe.
73E. Carolina le impidió a Sofía estar siempre tensa con el jefe.
73F. Gabriel le impidió a Sofía estar siempre tensa con el jefe.
73G. Carolina le impidió a Julián estar siempre tensa con el jefe.
73H. Gabriel le impidió a Julián estar siempre tensa con el jefe.

74A. Eloy le aseguró a Federico estar un poco nervioso ante las cámaras.
74B. Eloy le aseguró a Amalia estar un poco nervioso ante las cámaras.
74C. Diana le aseguró a Federico estar un poco nervioso ante las cámaras.
74D. Diana le aseguró a Amalia estar un poco nervioso ante las cámaras.
74E. Eloy le consintió a Federico estar un poco nervioso ante las cámaras.
74F. Diana le consintió a Federico estar un poco nervioso ante las cámaras.
74G. Eloy le consintió a Amalia estar un poco nervioso ante las cámaras.
74H. Diana le consintió a Amalia estar un poco nervioso ante las cámaras.

75A. Inés le confesó a Miriam estar un poco celosa de sus hermanos.
75B. Inés le confesó a Tomás estar un poco celosa de sus hermanos.
75C. Marc le confesó a Miriam estar un poco celosa de sus hermanos.
75D. Marc le confesó a Tomás estar un poco celosa de sus hermanos.
75E. Inés le permitió a Miriam estar un poco celosa de sus hermanos.
75F. Marc le permitió a Miriam estar un poco celosa de sus hermanos.
75G. Inés le permitió a Tomás estar un poco celosa de sus hermanos.
75H. Marc le permitió a Tomás estar un poco celosa de sus hermanos.

76A. Nicolás le manifestó a Félix estar muy cabreado por la derrota.
76B. Nicolás le manifestó a Consuelo estar muy cabreado por la derrota.
76C. Lidia le manifestó a Félix estar muy cabreado por la derrota.
76D. Lidia le manifestó a Consuelo estar muy cabreado por la derrota.
76E. Nicolás le recriminó a Félix estar muy cabreado por la derrota.
76F. Lidia le recriminó a Félix estar muy cabreado por la derrota.
76G. Nicolás le recriminó a Consuelo estar muy cabreado por la derrota.
76H. Lidia le recriminó a Consuelo estar muy cabreado por la derrota.

77A. Celia le confirmó a Daniela estar todavía defraudada por el engaño.
77B. Celia le confirmó a Ismael estar todavía defraudada por el engaño.
77C. Cristian le confirmó a Daniela estar todavía defraudada por el engaño.
77D. Cristian le confirmó a Ismael estar todavía defraudada por el engaño.
77E. Celia le reprochó a Daniela estar todavía defraudada por el engaño.

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77F. Cristian le reprochó a Daniela estar todavía defraudada por el engaño.
77G. Celia le reprochó a Ismael estar todavía defraudada por el engaño.
77H. Cristian le reprochó a Ismael estar todavía defraudada por el engaño.

78A. Gonzalo le expresó a Agustín estar algo más animado con el tratamiento.
78B. Gonzalo le expresó a Victoria estar algo más animado con el tratamiento.
78C. Catalina le expresó a Agustín estar algo más animado con el tratamiento.
78D. Catalina le expresó a Victoria estar algo más animado con el tratamiento.
78E. Gonzalo le recomendó a Agustín estar algo más animado con el tratamiento.
78F. Catalina le recomendó a Agustín estar algo más animado con el tratamiento.
78G. Gonzalo le recomendó a Victoria estar algo más animado con el tratamiento.
78H. Catalina le recomendó a Victoria estar algo más animado con el tratamiento.

79A. Vanesa le declaró a Virginia estar totalmente convencida de la propuesta.
79B. Vanesa le declaró a Felipe estar totalmente convencida de la propuesta.
79C. Lucas le declaró a Virginia estar totalmente convencida de la propuesta.
79D. Lucas le declaró a Felipe estar totalmente convencida de la propuesta.
79E. Vanesa le aconsejó a Virginia estar totalmente convencida de la propuesta.
79F. Lucas le aconsejó a Virginia estar totalmente convencida de la propuesta.
79G. Vanesa le aconsejó a Felipe estar totalmente convencida de la propuesta.
79H. Lucas le aconsejó a Felipe estar totalmente convencida de la propuesta.

80A. Héctor le desmintió a Aitor estar siempre malhumorado con los demás.
80B. Héctor le desmintió a Olga estar siempre malhumorado con los demás.
80C. Alejandra le desmintió a Aitor estar siempre malhumorado con los demás.
80D. Alejandra le desmintió a Olga estar siempre malhumorado con los demás.
80E. Héctor le prohibió a Aitor estar siempre malhumorado con los demás.
80F. Alejandra le prohibió a Aitor estar siempre malhumorado con los demás.
80G. Héctor le prohibió a Olga estar siempre malhumorado con los demás.
80H. Alejandra le prohibió a Olga estar siempre malhumorado con los demás.

81A. Elisa le prometió a Estefanía estar más atenta a los emails.
81B. Elisa le prometió a Arturo estar más atenta a los emails.
81C. Borja le prometió a Estefanía estar más atenta a los emails.
81D. Borja le prometió a Arturo estar más atenta a los emails.
81E. Elisa le mandó a Estefanía estar más atenta a los emails.
81F. Borja le mandó a Estefanía estar más atenta a los emails.
81G. Elisa le mandó a Arturo estar más atenta a los emails.
81H. Borja le mandó a Arturo estar más atenta a los emails.

82A. Iker le garantizó a César estar siempre abierto al diálogo político.
82B. Iker le garantizó a Ainhoa estar siempre abierto al diálogo político.
82C. Clara le garantizó a César estar siempre abierto al diálogo político.
82D. Clara le garantizó a Ainhoa estar siempre abierto al diálogo político.
82E. Iker le ordenó a César estar siempre abierto al diálogo político.
82F. Clara le ordenó a César estar siempre abierto al diálogo político.
82G. Iker le ordenó a Ainhoa estar siempre abierto al diálogo político.
82H. Clara le ordenó a Ainhoa estar siempre abierto al diálogo político.

83A. Lourdes le juró a Martina estar absolutamente dispuesta a cualquier cosa.
83B. Lourdes le juró a Rodrigo estar absolutamente dispuesta a cualquier cosa.
83C. Gregorio le juró a Martina estar absolutamente dispuesta a cualquier cosa.
83D. Gregorio le juró a Rodrigo estar absolutamente dispuesta a cualquier cosa.
83E. Lourdes le exigió a Martina estar absolutamente dispuesta a cualquier cosa.
83F. Gregorio le exigió a Martina estar absolutamente dispuesta a cualquier cosa.
83G. Lourdes le exigió a Rodrigo estar absolutamente dispuesta a cualquier cosa.
83H. Gregorio le exigió a Rodrigo estar absolutamente dispuesta a cualquier cosa.

84A. Asier le reconoció a Valentín estar menos apegado a la familia.
84B. Asier le reconoció a Tamara estar menos apegado a la familia.
84C. Paloma le reconoció a Valentín estar menos apegado a la familia.
84D. Paloma le reconoció a Tamara estar menos apegado a la familia.
84E. Asier le encargó a Valentín estar menos apegado a la familia.
84F. Paloma le encargó a Valentín estar menos apegado a la familia.
84G. Asier le encargó a Tamara estar menos apegado a la familia.
84H. Paloma le encargó a Tamara estar menos apegado a la familia.

85A. Mateo le reveló a Eugenio ser totalmente libertario en cuestiones ideológicas.
85B. Mateo le reveló a Araceli ser totalmente libertario en cuestiones ideológicas.
85C. Matilde le reveló a Eugenio ser totalmente libertario en cuestiones ideológicas.
85D. Matilde le reveló a Araceli ser totalmente libertario en cuestiones ideológicas.
85E. Mateo le impidió a Eugenio ser totalmente libertario en cuestiones ideológicas.
85F. Matilde le impidió a Eugenio ser totalmente libertario en cuestiones ideológicas.

85G. Mateo le impidió a Araceli ser totalmente libertario en cuestiones ideológicas.
85H. Matilde le impidió a Araceli ser totalmente libertario en cuestiones ideológicas.

86A. Gloria le aseguró a Luisa ser sumamente reservada en el trabajo.
86B. Gloria le aseguró a Martín ser sumamente reservada en el trabajo.
86C. Samuel le aseguró a Luisa ser sumamente reservada en el trabajo.
86D. Samuel le aseguró a Martín ser sumamente reservada en el trabajo.
86E. Gloria le consintió a Luisa ser sumamente reservada en el trabajo.
86F. Samuel le consintió a Luisa ser sumamente reservada en el trabajo.
86G. Gloria le consintió a Martín ser sumamente reservada en el trabajo.
86H. Samuel le consintió a Martín ser sumamente reservada en el trabajo.

87A. Sebastián le confesó a Alfredo ser bastante cercano con el alumnado.
87B. Sebastián le confesó a Aurora ser bastante cercano con el alumnado.
87C. Esperanza le confesó a Alfredo ser bastante cercano con el alumnado.
87D. Esperanza le confesó a Aurora ser bastante cercano con el alumnado.
87E. Sebastián le permitió a Alfredo ser bastante cercano con el alumnado.
87F. Esperanza le permitió a Alfredo ser bastante cercano con el alumnado.
87G. Sebastián le permitió a Aurora ser bastante cercano con el alumnado.
87H. Esperanza le permitió a Aurora ser bastante cercano con el alumnado.

88A. Felisa le manifestó a Mireia ser muy escéptica con la homeopatía.
88B. Felisa le manifestó a Íñigo ser muy escéptica con la homeopatía.
88C. Benito le manifestó a Mireia ser muy escéptica con la homeopatía.
88D. Benito le manifestó a Íñigo ser muy escéptica con la homeopatía.
88E. Felisa le recriminó a Mireia ser muy escéptica con la homeopatía.
88F. Benito le recriminó a Mireia ser muy escéptica con la homeopatía.
88G. Felisa le recriminó a Íñigo ser muy escéptica con la homeopatía.
88H. Benito le recriminó a Íñigo ser muy escéptica con la homeopatía.

89A. Germán le confirmó a Isaac ser totalmente reacio al aumento salarial.
89B. Germán le confirmó a Belén ser totalmente reacio al aumento salarial.
89C. Elvira le confirmó a Isaac ser totalmente reacio al aumento salarial.
89D. Elvira le confirmó a Belén ser totalmente reacio al aumento salarial.
89E. Germán le reprochó a Isaac ser totalmente reacio al aumento salarial.
89F. Elvira le reprochó a Isaac ser totalmente reacio al aumento salarial.
89G. Germán le reprochó a Belén ser totalmente reacio al aumento salarial.
89H. Elvira le reprochó a Belén ser totalmente reacio al aumento salarial.

90A. Blanca le expresó a Begoña ser más positiva ante los problemas.
90B. Blanca le expresó a Esteban ser más positiva ante los problemas.
90C. Cristóbal le expresó a Begoña ser más positiva ante los problemas.
90D. Cristóbal le expresó a Esteban ser más positiva ante los problemas.
90E. Blanca le recomendó a Begoña ser más positiva ante los problemas.
90F. Cristóbal le recomendó a Begoña ser más positiva ante los problemas.
90G. Blanca le recomendó a Esteban ser más positiva ante los problemas.
90H. Cristóbal le recomendó a Esteban ser más positiva ante los problemas.

91A. Adolfo le declaró a Abel ser muy cauto con los rumores.
91B. Adolfo le declaró a Rebeca ser muy cauto con los rumores.
91C. Almudena le declaró a Abel ser muy cauto con los rumores.
91D. Almudena le declaró a Rebeca ser muy cauto con los rumores.
91E. Adolfo le aconsejó a Abel ser muy cauto con los rumores.
91F. Almudena le aconsejó a Abel ser muy cauto con los rumores.
91G. Adolfo le aconsejó a Rebeca ser muy cauto con los rumores.
91H. Almudena le aconsejó a Rebeca ser muy cauto con los rumores.

92A. Nieves le desmintió a Noemí ser siempre tan maleducada con los invitados.
92B. Nieves le desmintió a Darío ser siempre tan maleducada con los invitados.
92C. Isidro le desmintió a Noemí ser siempre tan maleducada con los invitados.
92D. Isidro le desmintió a Darío ser siempre tan maleducada con los invitados.
92E. Nieves le prohibió a Noemí ser siempre tan maleducada con los invitados.
92F. Isidro le prohibió a Noemí ser siempre tan maleducada con los invitados.
92G. Nieves le prohibió a Darío ser siempre tan maleducada con los invitados.
92H. Isidro le prohibió a Darío ser siempre tan maleducada con los invitados.

93A. Israel le prometió a Gerardo ser mucho más discreto con los secretos.
93B. Israel le prometió a Adela ser mucho más discreto con los secretos.
93C. Tania le prometió a Gerardo ser mucho más discreto con los secretos.
93D. Tania le prometió a Adela ser mucho más discreto con los secretos.
93E. Israel le mandó a Gerardo ser mucho más discreto con los secretos.
93F. Tania le mandó a Gerardo ser mucho más discreto con los secretos.
93G. Israel le mandó a Adela ser mucho más discreto con los secretos.

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93H. Tania le mandó a Adela ser mucho más discreto con los secretos.

94A. Valeria le garantizó a Emma ser muy sensata con el alcohol.
94B. Valeria le garantizó a Omar ser muy sensata con el alcohol.
94C. Bruno le garantizó a Emma ser muy sensata con el alcohol.
94D. Bruno le garantizó a Omar ser muy sensata con el alcohol.
94E. Valeria le ordenó a Emma ser muy sensata con el alcohol.
94F. Bruno le ordenó a Emma ser muy sensata con el alcohol.
94G. Valeria le ordenó a Omar ser muy sensata con el alcohol.
94H. Bruno le ordenó a Omar ser muy sensata con el alcohol.

95A. Hugo le juró a Julio ser sumamente equitativo en el reparto.
95B. Hugo le juró a Nerea ser sumamente equitativo en el reparto.
95C. Lorena le juró a Julio ser sumamente equitativo en el reparto.
95D. Lorena le juró a Nerea ser sumamente equitativo en el reparto.
95E. Hugo le exigió a Julio ser sumamente equitativo en el reparto.
95F. Lorena le exigió a Julio ser sumamente equitativo en el reparto.
95G. Hugo le exigió a Nerea ser sumamente equitativo en el reparto.
95H. Lorena le exigió a Nerea ser sumamente equitativo en el reparto.

96A. Carmen le reconoció a María ser mucho más cautelosa tras el accidente.
96B. Carmen le reconoció a José ser mucho más cautelosa tras el accidente.
96C. Manuel le reconoció a María ser mucho más cautelosa tras el accidente.
96D. Manuel le reconoció a José ser mucho más cautelosa tras el accidente.
96E. Carmen le encargó a María ser mucho más cautelosa tras el accidente.
96F. Manuel le encargó a María ser mucho más cautelosa tras el accidente.
96G. Carmen le encargó a José ser mucho más cautelosa tras el accidente.
96H. Manuel le encargó a José ser mucho más cautelosa tras el accidente.

C.4 Experiment 6 (eye-tracking)

English translation of Table 17.

Subject control	
Grammatical	María$_i^{fem}$ promised Manuel$_j^{masc}$ PRO$_i$ to be **tidier^{fem}** with the notes.
Ungrammatical	Manuel$_i^{masc}$ promised María$_j^{fem}$ PRO$_i$ to be **tidier^{fem}** with the notes.
Object control	
Grammatical	Manuel$_i^{masc}$ ordered María$_j^{fem}$ PRO$_j$ to be **tidier^{fem}** with the notes.
Ungrammatical	María$_i^{fem}$ ordered Manuel$_j^{masc}$ PRO$_j$ to be **tidier^{fem}** with the notes.

1A. María le prometió a Jose ser más ordenada con los apuntes.
1B. Jose le prometió a María ser más ordenada con los apuntes.
1C. Jose le aconsejó a María ser más ordenada con los apuntes.
1D. María le aconsejó a Jose ser más ordenada con los apuntes.

2A. Manuel le reconoció a Carmen ser demasiado escrupuloso con la comida.
2B. Carmen le reconoció a Manuel ser demasiado escrupuloso con la comida.
2C. Carmen le recriminó a Manuel ser demasiado escrupuloso con la comida.
2D. Manuel le recriminó a Carmen ser demasiado escrupuloso con la comida.

3A. Isabel le reveló a Francisco ser muy temerosa durante las tormentas.
3B. Francisco le reveló a Isabel ser muy temerosa durante las tormentas.
3C. Francisco le reprochó a Isabel ser muy temerosa durante las tormentas.
3D. Isabel le reprochó a Francisco ser muy temerosa durante las tormentas.

4A. David le garantizó a Laura ser más afectuoso con los clientes.
4B. Laura le garantizó a David ser más afectuoso con los clientes.
4C. Laura le recomendó a David ser más afectuoso con los clientes.
4D. David le recomendó a Laura ser más afectuoso con los clientes.

5A. Ana le confirmó a Juan ser siempre tan competitiva en el trabajo.
5B. Juan le confirmó a Ana ser siempre tan competitiva en el trabajo.
5C. Juan le impidió a Ana ser siempre tan competitiva en el trabajo.
5D. Ana le impidió a Juan ser siempre tan competitiva en el trabajo.

6A. Javier le desmintió a Cristina ser demasiado codicioso con los beneficios.
6B. Cristina le desmintió a Javier ser demasiado codicioso con los beneficios.
6C. Cristina le prohibió a Javier ser demasiado codicioso con los beneficios.
6D. Javier le prohibió a Cristina ser demasiado codicioso con los beneficios.

7A. Marta le juró a Daniel ser absolutamente honesta en la declaración.
7B. Daniel le juró a Marta ser absolutamente honesta en la declaración.
7C. Daniel le exigió a Marta ser absolutamente honesta en la declaración.
7D. Marta le exigió a Daniel ser absolutamente honesta en la declaración.

8A. Jesús le aseguró a Antonia ser totalmente sincero sobre lo ocurrido.
8B. Antonia le aseguró a Jesús ser totalmente sincero sobre lo ocurrido.
8C. Antonia le ordenó a Jesús ser totalmente sincero sobre lo ocurrido.
8D. Jesús le ordenó a Antonia ser totalmente sincero sobre lo ocurrido.

9A. Dolores le confesó a Carlos ser un poco despreocupada con el papeleo.
9B. Carlos le confesó a Dolores ser un poco despreocupada con el papeleo.
9C. Carlos le permitió a Dolores ser un poco despreocupada con el papeleo.
9D. Dolores le permitió a Carlos ser un poco despreocupada con el papeleo.

10A. Alejandro le expresó a Lucía ser muy comprensivo con las circunstancias.
10B. Lucía le expresó a Alejandro ser muy comprensivo con las circunstancias.
10C. Lucía le encargó a Alejandro ser muy comprensivo con las circunstancias.
10D. Alejandro le encargó a Lucía ser muy comprensivo con las circunstancias.

11A. Sara le declaró a Miguel ser más productiva a última hora.
11B. Miguel le declaró a Sara ser más productiva a última hora.
11C. Miguel le mandó a Sara ser más productiva a última hora.
11D. Sara le mandó a Miguel ser más productiva a última hora.

12A. Rafael le manifestó a Paula ser algo desconfiado con los compañeros.
12B. Paula le manifestó a Rafael ser algo desconfiado con los compañeros.
12C. Paula le consintió a Rafael ser algo desconfiado con los compañeros.
12D. Rafael le consintió a Paula ser algo desconfiado con los compañeros.

13A. Pedro le prometió a Elena estar mucho más espabilado antes de conducir.
13B. Elena le prometió a Pedro estar mucho más espabilado antes de conducir.
13C. Elena le aconsejó a Pedro estar mucho más espabilado antes de conducir.
13D. Pedro le aconsejó a Elena estar mucho más espabilado antes de conducir.

14A. Pilar le reconoció a Ángel estar muy confundida por los cambios.
14B. Ángel le reconoció a Pilar estar muy confundida por los cambios.
14C. Ángel le recriminó a Pilar estar muy confundida por los cambios.
14D. Pilar le recriminó a Ángel estar muy confundida por los cambios.

15A. Pablo le reveló a Raquel estar muy inquieto por el juicio.
15B. Raquel le reveló a Pablo estar muy inquieto por el juicio.
15C. Raquel le reprochó a Pablo estar muy inquieto por el juicio.
15D. Pablo le reprochó a Raquel estar muy inquieto por el juicio.

16A. Manuela le garantizó a Fernando estar menos seria durante la negociación.
16B. Fernando le garantizó a Manuela estar menos seria durante la negociación.
16C. Fernando le recomendó a Manuela estar menos seria durante la negociación.
16D. Manuela le recomendó a Fernando estar menos seria durante la negociación.

17A. Sergio le confirmó a Mercedes estar totalmente volcado en la investigación.
17B. Mercedes le confirmó a Sergio estar totalmente volcado en la investigación.
17C. Mercedes le impidió a Sergio estar totalmente volcado en la investigación.
17D. Sergio le impidió a Mercedes estar totalmente volcado en la investigación.

18A. Juana le desmintió a Luís estar siempre enfadada con los trabajadores.
18B. Luís le desmintió a Juana estar siempre enfadada con los trabajadores.
18C. Luís le prohibió a Juana estar siempre enfadada con los trabajadores.
18D. Juana le prohibió a Luís estar siempre enfadada con los trabajadores.

19A. Jorge le juró a Teresa estar totalmente involucrado en el proyecto.
19B. Teresa le juró a Jorge estar totalmente involucrado en el proyecto.
19C. Teresa le exigió a Jorge estar totalmente involucrado en el proyecto.
19D. Jorge le exigió a Teresa estar totalmente involucrado en el proyecto.

20A. Beatriz le aseguró a Alberto estar totalmente entregada a la causa.
20B. Alberto le aseguró a Beatriz estar totalmente entregada a la causa.
20C. Alberto le ordenó a Beatriz estar totalmente entregada a la causa.

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20D. Beatriz le ordenó a Alberto estar totalmente entregada a la causa.

21A. Álvaro le confesó a Nuria estar un poco huraño tras el disgusto.
21B. Nuria le confesó a Álvaro estar un poco huraño tras el disgusto.
21C. Nuria le permitió a Álvaro estar un poco huraño tras el disgusto.
21D. Álvaro le permitió a Nuria estar un poco huraño tras el disgusto.

22A. Julia le expresó a Diego estar más ilusionada con el trabajo.
22B. Diego le expresó a Julia estar más ilusionada con el trabajo.
22C. Diego le encargó a Julia estar más ilusionada con el trabajo.
22D. Julia le encargó a Diego estar más ilusionada con el trabajo.

23A. Adrián le declaró a Silvia estar más comprometido con la empresa.
23B. Silvia le declaró a Adrián estar más comprometido con la empresa.
23C. Silvia le mandó a Adrián estar más comprometido con la empresa.
23D. Adrián le mandó a Silvia estar más comprometido con la empresa.

24A. Irene le manifestó a Raúl estar algo menos implicada en la causa.
24B. Raúl le manifestó a Irene estar algo menos implicada en la causa.
24C. Raúl le consintió a Irene estar algo menos implicada en la causa.
24D. Irene le consintió a Raúl estar algo menos implicada en la causa.

25A. Patricia le prometió a Enrique ser algo más cuidadosa con los libros.
25B. Enrique le prometió a Patricia ser algo más cuidadosa con los libros.
25C. Enrique le aconsejó a Patricia ser algo más cuidadosa con los libros.
25D. Patricia le aconsejó a Enrique ser algo más cuidadosa con los libros.

26A. Iván le reconoció a Alba ser muy descuidado con sus amistades.
26B. Alba le reconoció a Iván ser muy descuidado con sus amistades.
26C. Alba le recriminó a Iván ser muy descuidado con sus amistades.
26D. Iván le recriminó a Alba ser muy descuidado con sus amistades.

27A. Rosa le reveló a Ramón ser todavía adicta a los antidepresivos.
27B. Ramón le reveló a Rosa ser todavía adicta a los antidepresivos.
27C. Ramón le reprochó a Rosa ser todavía adicta a los antidepresivos.
27D. Rosa le reprochó a Ramón ser todavía adicta a los antidepresivos.

28A. Rubén le garantizó a Andrea ser absolutamente meticuloso en sus anotaciones.
28B. Andrea le garantizó a Rubén ser absolutamente meticuloso en sus anotaciones.
28C. Andrea le recomendó a Rubén ser absolutamente meticuloso en sus anotaciones.
28D. Rubén le recomendó a Andrea ser absolutamente meticuloso en sus anotaciones.

29A. Rocío le confirmó a Vicente ser abiertamente partidaria de la tauromaquia.
29B. Vicente le confirmó a Rocío ser abiertamente partidaria de la tauromaquia.
29C. Vicente le impidió a Rocío ser abiertamente partidaria de la tauromaquia.
29D. Rocío le impidió a Vicente ser abiertamente partidaria de la tauromaquia.

30A. Óscar le desmintió a Mónica ser siempre tan irrespetuoso con los visitantes.
30B. Mónica le desmintió a Óscar ser siempre tan irrespetuoso con los visitantes.
30C. Mónica le prohibió a Óscar ser siempre tan irrespetuoso con los visitantes.
30D. Óscar le prohibió a Mónica ser siempre tan irrespetuoso con los visitantes.

31A. Ángela le juró a Andrés ser sumamente delicada con los pacientes.
31B. Andrés le juró a Ángela ser sumamente delicada con los pacientes.
31C. Andrés le exigió a Ángela ser sumamente delicada con los pacientes.
31D. Ángela le exigió a Andrés ser sumamente delicada con los pacientes.

32A. Joaquín le aseguró a Alicia ser absolutamente pulcro con las heridas.
32B. Alicia le aseguró a Joaquín ser absolutamente pulcro con las heridas.
32C. Alicia le ordenó a Joaquín ser absolutamente pulcro con las heridas.
32D. Joaquín le ordenó a Alicia ser absolutamente pulcro con las heridas.

33A. Sonia le confesó a Santiago ser bastante generosa con las notas.
33B. Santiago le confesó a Sonia ser bastante generosa con las notas.
33C. Santiago le permitió a Sonia ser bastante generosa con las notas.
33D. Sonia le permitió a Santiago ser bastante generosa con las notas.

34A. Eduardo le expresó a Sandra ser totalmente autónomo en la gestión.
34B. Sandra le expresó a Eduardo ser totalmente autónomo en la gestión.
34C. Sandra le encargó a Eduardo ser totalmente autónomo en la gestión.
34D. Eduardo le encargó a Sandra ser totalmente autónomo en la gestión.

35A. Marina le declaró a Víctor ser sumamente honrada en el cargo.

35B. Víctor le declaró a Marina ser sumamente honrada en el cargo.
35C. Víctor le mandó a Marina ser sumamente honrada en el cargo.
35D. Marina le mandó a Víctor ser sumamente honrada en el cargo.

36A. Roberto le manifestó a Susana ser un poco anárquico con las normas.
36B. Susana le manifestó a Roberto ser un poco anárquico con las normas.
36C. Susana le consintió a Roberto ser un poco anárquico con las normas.
36D. Roberto le consintió a Susana ser un poco anárquico con las normas.

37A. Mario le prometió a Margarita estar más preocupado por la salud.
37B. Margarita le prometió a Mario estar más preocupado por la salud.
37C. Margarita le aconsejó a Mario estar más preocupado por la salud.
37D. Mario le aconsejó a Margarita estar más preocupado por la salud.

38A. Yolanda le reconoció a Jaime estar muy poco interesada en la política.
38B. Jaime le reconoció a Yolanda estar muy poco interesada en la política.
38C. Jaime le recriminó a Yolanda estar muy poco interesada en la política.
38D. Yolanda le recriminó a Jaime estar muy poco interesada en la política.

39A. Ignacio le reveló a Natalia estar todavía deprimido por la ruptura.
39B. Natalia le reveló a Ignacio estar todavía deprimido por la ruptura.
39C. Natalia le reprochó a Ignacio estar todavía deprimido por la ruptura.
39D. Ignacio le reprochó a Natalia estar todavía deprimido por la ruptura.

40A. Eva le garantizó a Marcos estar menos agresiva en el debate.
40B. Marcos le garantizó a Eva estar menos agresiva en el debate.
40C. Marcos le recomendó a Eva estar menos agresiva en el debate.
40D. Eva le recomendó a Marcos estar menos agresiva en el debate.

41A. Alfonso le confirmó a Claudia estar todavía dolido por las críticas.
41B. Claudia le confirmó a Alfonso estar todavía dolido por las críticas.
41C. Claudia le impidió a Alfonso estar todavía dolido por las críticas.
41D. Alfonso le impidió a Claudia estar todavía dolido por las críticas.

42A. Esther le desmintió a Salvador estar siempre descontenta con los resultados.
42B. Salvador le desmintió a Esther estar siempre descontenta con los resultados.
42C. Salvador le prohibió a Esther estar siempre descontenta con los resultados.
42D. Esther le prohibió a Salvador estar siempre descontenta con los resultados.

43A. Ricardo le juró a Noelia estar mucho más concienciado con el medioambiente.
43B. Noelia le juró a Ricardo estar mucho más concienciado con el medioambiente.
43C. Noelia le exigió a Ricardo estar mucho más concienciado con el medioambiente.
43D. Ricardo le exigió a Noelia estar mucho más concienciado con el medioambiente.

44A. Ángeles le aseguró a Jordi estar totalmente centrada en los objetivos.
44B. Jordi le aseguró a Ángeles estar totalmente centrada en los objetivos.
44C. Jordi le ordenó a Ángeles estar totalmente centrada en los objetivos.
44D. Ángeles le ordenó a Jordi estar totalmente centrada en los objetivos.

45A. Emilio le confesó a Verónica estar un poco ofendido ante las críticas.
45B. Verónica le confesó a Emilio estar un poco ofendido ante las críticas.
45C. Verónica le permitió a Emilio estar un poco ofendido ante las críticas.
45D. Emilio le permitió a Verónica estar un poco ofendido ante las críticas.

46A. Carla le expresó a Guillermo estar más tranquila tras las vacaciones.
46B. Guillermo le expresó a Carla estar más tranquila tras las vacaciones.
46C. Guillermo le encargó a Carla estar más tranquila tras las vacaciones.
46D. Carla le encargó a Guillermo estar más tranquila tras las vacaciones.

47A. Julián le declaró a Sofía estar absolutamente arrepentido de las mentiras.
47B. Sofía le declaró a Julián estar absolutamente arrepentido de las mentiras.
47C. Sofía le mandó a Julián estar absolutamente arrepentido de las mentiras.
47D. Julián le mandó a Sofía estar absolutamente arrepentido de las mentiras.

48A. Carolina le manifestó a Gabriel estar ligeramente molesta con la situación.
48B. Gabriel le manifestó a Carolina estar ligeramente molesta con la situación.
48C. Gabriel le consintió a Carolina estar ligeramente molesta con la situación.
48D. Carolina le consintió a Gabriel estar ligeramente molesta con la situación.

49A. Nerea le reveló a Julio estar así de indignada por lo sucedido.
49B. Julio le reveló a Nerea estar así de indignada por lo sucedido.
49C. Julio le impidió a Nerea estar así de indignada por lo sucedido.
49D. Nerea le impidió a Julio estar así de indignada por lo sucedido.

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50A. Hugo le aseguró a Lorena estar un poco cohibido tras el incidente.
50B. Lorena le aseguró a Hugo estar un poco cohibido tras el incidente.
50C. Lorena le consintió a Hugo estar un poco cohibido tras el incidente.
50D. Hugo le consintió a Lorena estar un poco cohibido tras el incidente.

51A. Miriam le confesó a Tomás estar un poco relajada con los estudios.
51B. Tomás le confesó a Miriam estar un poco relajada con los estudios.
51C. Tomás le permitió a Miriam estar un poco relajada con los estudios.
51D. Miriam le permitió a Tomás estar un poco relajada con los estudios.

52A. Marc le manifestó a Inés estar muy ansioso por la visita.
52B. Inés le manifestó a Marc estar muy ansioso por la visita.
52C. Inés le recriminó a Marc estar muy ansioso por la visita.
52D. Marc le recriminó a Inés estar muy ansioso por la visita.

53A. Victoria le confirmó a Agustín estar poco entusiasmada con la boda.
53B. Agustín le confirmó a Victoria estar poco entusiasmada con la boda.
53C. Agustín le reprochó a Victoria estar poco entusiasmada con la boda.
53D. Victoria le reprochó a Agustín estar poco entusiasmada con la boda.

54A. Gonzalo le expresó a Catalina estar algo más contento con la plantilla.
54B. Catalina le expresó a Gonzalo estar algo más contento con la plantilla.
54C. Catalina le recomendó a Gonzalo estar algo más contento con la plantilla.
54D. Gonzalo le recomendó a Catalina estar algo más contento con la plantilla.

55A. Consuelo le declaró a Félix estar totalmente segura de la decisión.
55B. Félix le declaró a Consuelo estar totalmente segura de la decisión.
55C. Félix le aconsejó a Consuelo estar totalmente segura de la decisión.
55D. Consuelo le aconsejó a Félix estar totalmente segura de la decisión.

56A. Nicolás le desmintió a Lidia estar todavía contrariado por la discusión.
56B. Lidia le desmintió a Nicolás estar todavía contrariado por la discusión.
56C. Lidia le prohibió a Nicolás estar todavía contrariado por la discusión.
56D. Nicolás le prohibió a Lidia estar todavía contrariado por la discusión.

57A. Daniela le prometió a Ismael estar mucho más concentrada en el juego.
57B. Ismael le prometió a Daniela estar mucho más concentrada en el juego.
57C. Ismael le mandó a Daniela estar mucho más concentrada en el juego.
57D. Daniela le mandó a Ismael estar mucho más concentrada en el juego.

58A. Cristian le garantizó a Celia estar menos dormido a primera hora.
58B. Celia le garantizó a Cristian estar menos dormido a primera hora.
58C. Celia le ordenó a Cristian estar menos dormido a primera hora.
58D. Cristian le ordenó a Celia estar menos dormido a primera hora.

59A. Luisa le juró a Martín estar mejor preparada la próxima vez.
59B. Martín le juró a Luisa estar mejor preparada la próxima vez.
59C. Martín le exigió a Luisa estar mejor preparada la próxima vez.
59D. Luisa le exigió a Martín estar mejor preparada la próxima vez.

60A. Samuel le reconoció a Gloria estar mucho más motivado tras el ascenso.
60B. Gloria le reconoció a Samuel estar mucho más motivado tras el ascenso.
60C. Gloria le encargó a Samuel estar mucho más motivado tras el ascenso.
60D. Samuel le encargó a Gloria estar mucho más motivado tras el ascenso.

61A. Aitor le reveló a Olga ser abiertamente ateo en cuestiones espirituales.
61B. Olga le reveló a Aitor ser abiertamente ateo en cuestiones espirituales.
61C. Olga le impidió a Aitor ser abiertamente ateo en cuestiones espirituales.
61D. Aitor le impidió a Olga ser abiertamente ateo en cuestiones espirituales.

62A. Alejandra le aseguró a Héctor ser muy solidaria con los refugiados.
62B. Héctor le aseguró a Alejandra ser muy solidaria con los refugiados.
62C. Héctor le consintió a Alejandra ser muy solidaria con los refugiados.
62D. Alejandra le consintió a Héctor ser muy solidaria con los refugiados.

63A. Alfredo le confesó a Aurora ser bastante crítico con el sistema.
63B. Aurora le confesó a Alfredo ser bastante crítico con el sistema.
63C. Aurora le permitió a Alfredo ser bastante crítico con el sistema.
63D. Alfredo le permitió a Aurora ser bastante crítico con el sistema.

64A. Esperanza le manifestó a Sebastián ser abiertamente contraria al cambio legislativo.
64B. Sebastián le manifestó a Esperanza ser abiertamente contraria al cambio legislativo.

64C. Sebastián le recriminó a Esperanza ser abiertamente contraria al cambio legislativo.
64D. Esperanza le recriminó a Sebastián ser abiertamente contraria al cambio legislativo.

65A. César le confirmó a Ainhoa ser muy quisquilloso con el orden.
65B. Ainhoa le confirmó a César ser muy quisquilloso con el orden.
65C. Ainhoa le reprochó a César ser muy quisquilloso con el orden.
65D. César le reprochó a Ainhoa ser muy quisquilloso con el orden.

66A. Clara le expresó a Iker ser menos extrovertida con los desconocidos.
66B. Iker le expresó a Clara ser menos extrovertida con los desconocidos.
66C. Iker le recomendó a Clara ser menos extrovertida con los desconocidos.
66D. Clara le recomendó a Iker ser menos extrovertida con los desconocidos.

67A. Felipe le declaró a Virginia ser más arriesgado en las inversiones.
67B. Virginia le declaró a Felipe ser más arriesgado en las inversiones.
67C. Virginia le aconsejó a Felipe ser más arriesgado en las inversiones.
67D. Felipe le aconsejó a Virginia ser más arriesgado en las inversiones.

68A. Vanesa le desmintió a Lucas ser siempre tan orgullosa en las discusiones.
68B. Lucas le desmintió a Vanesa ser siempre tan orgullosa en las discusiones.
68C. Lucas le prohibió a Vanesa ser siempre tan orgullosa en las discusiones.
68D. Vanesa le prohibió a Lucas ser siempre tan orgullosa en las discusiones.

69A. Rodrigo le prometió a Martina ser mucho más precavido con el dinero.
69B. Martina le prometió a Rodrigo ser mucho más precavido con el dinero.
69C. Martina le mandó a Rodrigo ser mucho más precavido con el dinero.
69D. Rodrigo le mandó a Martina ser mucho más precavido con el dinero.

70A. Lourdes le garantizó a Gregorio ser sumamente precisa en el acta.
70B. Gregorio le garantizó a Lourdes ser sumamente precisa en el acta.
70C. Gregorio le ordenó a Lourdes ser sumamente precisa en el acta.
70D. Lourdes le ordenó a Gregorio ser sumamente precisa en el acta.

71A. Esteban le juró a Begoña ser totalmente objetivo en la evaluación.
71B. Begoña le juró a Esteban ser totalmente objetivo en la evaluación.
71C. Begoña le exigió a Esteban ser totalmente objetivo en la evaluación.
71D. Esteban le exigió a Begoña ser totalmente objetivo en la evaluación.

72A. Blanca le reconoció a Cristóbal ser muy rígida con los empleados.
72B. Cristóbal le reconoció a Blanca ser muy rígida con los empleados.
72C. Cristóbal le encargó a Blanca ser muy rígida con los empleados.
72D. Blanca le encargó a Cristóbal ser muy rígida con los empleados.

73A. Estefanía le reveló a Arturo estar siempre tensa con el jefe.
73B. Arturo le reveló a Estefanía estar siempre tensa con el jefe.
73C. Arturo le impidió a Estefanía estar siempre tensa con el jefe.
73D. Estefanía le impidió a Arturo estar siempre tensa con el jefe.

74A. Borja le aseguró a Elisa estar un poco nervioso ante las cámaras.
74B. Elisa le aseguró a Borja estar un poco nervioso ante las cámaras.
74C. Elisa le consintió a Borja estar un poco nervioso ante las cámaras.
74D. Borja le consintió a Elisa estar un poco nervioso ante las cámaras.

75A. Araceli le confesó a Eugenio estar un poco celosa de sus hermanos.
75B. Eugenio le confesó a Araceli estar un poco celosa de sus hermanos.
75C. Eugenio le permitió a Araceli estar un poco celosa de sus hermanos.
75D. Araceli le permitió a Eugenio estar un poco celosa de sus hermanos.

76A. Mateo le manifestó a Matilde estar muy cabreado por la derrota.
76B. Matilde le manifestó a Mateo estar muy cabreado por la derrota.
76C. Matilde le recriminó a Mateo estar muy cabreado por la derrota.
76D. Mateo le recriminó a Matilde estar muy cabreado por la derrota.

77A. Belén le confirmó a Isaac estar todavía defraudada por el engaño.
77B. Isaac le confirmó a Belén estar todavía defraudada por el engaño.
77C. Isaac le reprochó a Belén estar todavía defraudada por el engaño.
77D. Belén le reprochó a Isaac estar todavía defraudada por el engaño.

78A. Germán le expresó a Elvira estar algo más animado con el tratamiento.
78B. Elvira le expresó a Germán estar algo más animado con el tratamiento.
78C. Elvira le recomendó a Germán estar algo más animado con el tratamiento.
78D. Germán le recomendó a Elvira estar algo más animado con el tratamiento.

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79A. Tamara le declaró a Valentín estar totalmente convencida de la propuesta.
79B. Valentín le declaró a Tamara estar totalmente convencida de la propuesta.
79C. Valentín le aconsejó a Tamara estar totalmente convencida de la propuesta.
79D. Tamara le aconsejó a Valentín estar totalmente convencida de la propuesta.

80A. Asier le desmintió a Paloma estar siempre malhumorado con los demás.
80B. Paloma le desmintió a Asier estar siempre malhumorado con los demás.
80C. Paloma le prohibió a Asier estar siempre malhumorado con los demás.
80D. Asier le prohibió a Paloma estar siempre malhumorado con los demás.

81A. Rebeca le prometió a Abel estar más atenta a los emails.
81B. Abel le prometió a Rebeca estar más atenta a los emails.
81C. Abel le mandó a Rebeca estar más atenta a los emails.
81D. Rebeca le mandó a Abel estar más atenta a los emails.

82A. Adolfo le garantizó a Almudena estar siempre abierto al diálogo político.
82B. Almudena le garantizó a Adolfo estar siempre abierto al diálogo político.
82C. Almudena le ordenó a Adolfo estar siempre abierto al diálogo político.
82D. Adolfo le ordenó a Almudena estar siempre abierto al diálogo político.

83A. Mireia le juró a Íñigo estar absolutamente dispuesta a cualquier cosa.
83B. Íñigo le juró a Mireia estar absolutamente dispuesta a cualquier cosa.
83C. Íñigo le exigió a Mireia estar absolutamente dispuesta a cualquier cosa.
83D. Mireia le exigió a Íñigo estar absolutamente dispuesta a cualquier cosa.

84A. Benito le reconoció a Felisa estar menos apegado a la familia.
84B. Felisa le reconoció a Benito estar menos apegado a la familia.
84C. Felisa le encargó a Benito estar menos apegado a la familia.
84D. Benito le encargó a Felisa estar menos apegado a la familia.

85A. Darío le reveló a Noemí ser totalmente libertario en cuestiones ideológicas.
85B. Noemí le reveló a Darío ser totalmente libertario en cuestiones ideológicas.
85C. Noemí le impidió a Darío ser totalmente libertario en cuestiones ideológicas.
85D. Darío le impidió a Noemí ser totalmente libertario en cuestiones ideológicas.

86A. Nieves le aseguró a Isidro ser sumamente reservada en el trabajo.
86B. Isidro le aseguró a Nieves ser sumamente reservada en el trabajo.
86C. Isidro le consintió a Nieves ser sumamente reservada en el trabajo.
86D. Nieves le consintió a Isidro ser sumamente reservada en el trabajo.

87A. Gerardo le confesó a Adela ser bastante cercano con el alumnado.
87B. Adela le confesó a Gerardo ser bastante cercano con el alumnado.
87C. Adela le permitió a Gerardo ser bastante cercano con el alumnado.
87D. Gerardo le permitió a Adela ser bastante cercano con el alumnado.

88A. Tania le manifestó a Israel ser muy escéptica con la homeopatía.
88B. Israel le manifestó a Tania ser muy escéptica con la homeopatía.
88C. Israel le recriminó a Tania ser muy escéptica con la homeopatía.
88D. Tania le recriminó a Israel ser muy escéptica con la homeopatía.

89A. Omar le confirmó a Emma ser totalmente reacio al aumento salarial.
89B. Emma le confirmó a Omar ser totalmente reacio al aumento salarial.
89C. Emma le reprochó a Omar ser totalmente reacio al aumento salarial.
89D. Omar le reprochó a Emma ser totalmente reacio al aumento salarial.

90A. Valeria le expresó a Bruno ser más positiva ante los problemas.
90B. Bruno le expresó a Valeria ser más positiva ante los problemas.
90C. Bruno le recomendó a Valeria ser más positiva ante los problemas.
90D. Valeria le recomendó a Bruno ser más positiva ante los problemas.

91A. Federico le declaró a Amalia ser muy cauto con los rumores.
91B. Amalia le declaró a Federico ser muy cauto con los rumores.
91C. Amalia le aconsejó a Federico ser muy cauto con los rumores.
91D. Federico le aconsejó a Amalia ser muy cauto con los rumores.

92A. Amelia le desmintió a Eloy ser siempre tan maleducada con los invitados.
92B. Eloy le desmintió a Amelia ser siempre tan maleducada con los invitados.
92C. Eloy le prohibió a Amelia ser siempre tan maleducada con los invitados.
92D. Amelia le prohibió a Eloy ser siempre tan maleducada con los invitados.

93A. Fermín le prometió a Carlota ser mucho más discreto con los secretos.
93B. Carlota le prometió a Fermín ser mucho más discreto con los secretos.
93C. Carlota le mandó a Fermín ser mucho más discreto con los secretos.

93D. Fermín le mandó a Carlota ser mucho más discreto con los secretos.

94A. Diana le garantizó a Benjamín ser muy sensata con el alcohol.
94B. Benjamín le garantizó a Diana ser muy sensata con el alcohol.
94C. Benjamín le ordenó a Diana ser muy sensata con el alcohol.
94D. Diana le ordenó a Benjamín ser muy sensata con el alcohol.

95A. Elías le juró a Aitana ser sumamente equitativo en el reparto.
95B. Aitana le juró a Elías ser sumamente equitativo en el reparto.
95C. Aitana le exigió a Elías ser sumamente equitativo en el reparto.
95D. Elías le exigió a Aitana ser sumamente equitativo en el reparto.

96A. Noa le reconoció a Matías ser mucho más cautelosa tras el accidente.
96B. Matías le reconoció a Noa ser mucho más cautelosa tras el accidente.
96C. Matías le encargó a Noa ser mucho más cautelosa tras el accidente.
96D. Noa le encargó a Matías ser mucho más cautelosa tras el accidente.

APPENDIX D: Statistical models from Chapter 5

D.1 Experiment 3 (eye-tracking)

Model structure and power transformation applied in each measure and region of interest. The fixed effects reported in the model structure are abbreviated as follows: C (control), G (grammaticality), and D (distractor).

Meassure/region	Model structure	Power
First pass		
NP2	C*G*D + (1|participant) + (1|item)	-0.1897
Infinitive	C*G*D + (1|participant) + (1|item)	-0.2258
Adverb	C*G*D + (1|participant) + (1|item)	-0.2073
Adjective	C*G*D + (C+G+D|participant) + (1|item)	-0.3771
PP1	C*G*D + (1|participant) + (1|item)	0.3947
First-pass regressions out		
NP2	C*G*D + (C+G+D|participant) + (1|item)	N/A
Infinitive	C*G*D + (C+G+D|participant) + (1|item)	N/A
Adverb	C*G*D + (C+G+D|participant) + (1|item)	N/A
Adjective	C*G*D + (C+G+D|participant) + (1|item)	N/A
PP1	C*G*D + (C+G+D|participant) + (1|item)	N/A
Go-past		
NP2	C*G*D + (1|participant) + (1|item)	-0.5116
Infinitive	C*G*D + (C+G+D |participant) + (1|item)	-0.54
Adverb	C*G*D + (C+G+D |participant) + (1|item)	-0.3571
Adjective	C*G*D + (D|participant) + (1|item)	-0.6224
PP1	C*G*D + (1|participant) + (1|item)	-0.2525
Total time		
NP2	C*G*D + (1|participant) + (1|item)	-0.3988
Infinitive	C*G*D + (C+G+D|participant) + (1|item)	-0.4346
Adverb	C*G*D + (C+G+D|participant) + (1|item)	-0.2883
Adjective	C*G*D + (1|participant) + (1|item)	-0.4696
PP1	C*G*D + (C+G+D|participant) + (1|item)	0.0688
Regressions in		
NP1	C*G*D + (C+G+D|participant) + (1|item)	N/A
Control verb	C*G*D + (C+G+D|participant) + (1|item)	N/A
NP2	C*G*D + (C+G+D|participant) + (1|item)	N/A
Adjective	C*G*D + (C+G+D|participant) + (1|item)	N/A

D.2 Experiment 5 (self-paced reading)

Model structure and power transformation applied in each region of interest. The fixed effects reported in the model structure are abbreviated as follows: C (control), G (grammaticality), D (distractor) and P (presentation).

Region	Model structure	Power
NP2 (region 5)	P+C*G*D + (C+G+D|participant) + (1|item)	-0.6899
Infinitive (region 6)	C*G*D + (C+G+D|participant) + (1|item)	-0.6223
Adverb (region 7)	P+C*G*D + (C+G+D|participant) + (1|item)	-0.6602
Adjective (region 8)	P+C*G*D + (C+G+D |participant) + (1|item)	-0.6011
Preposition (region 9)	P+C*G*D + (C+G+D|participant) + (1|item)	-0.6132

D.3 Experiment 6 (eye-tracking)

Model structure and power transformation applied in each measure and region of interest. The fixed effects reported in the model structure are abbreviated as follows: C (control) and G (grammaticality).

Meassure/region	Model structure	Power
First pass		
NP2	C*G + (1|participant) + (1|item)	-0.3169
Infinitive	C*G + (1|participant) + (1|item)	-0.0734
Adverb	C*G + (C+G|participant) + (1|item)	-0.2796
Adjective	C*G + (1|participant) + (1|item)	-0.1237
PP	C*G + (1|participant) + (1|item)	0.7254
First-pass regressions out		
NP2	C*G + (C+G|participant) + (C+G|item)	N/A
Infinitive	C*G + (C+G|participant) + (C+G|item)	N/A
Adverb	C*G + (C+G|participant) + (C+G|item)	N/A
Adjective	C*G + (C+G|participant) + (C+G|item)	N/A
PP	C*G + (C+G|participant) + (C+G|item)	N/A
Go-past		
NP2	C*G + (C+G|participant) + (1|item)	-0.7207
Infinitive	C*G + (C+G|participant) + (1|item)	-0.6073
Adverb	C*G + (C+G|participant) + (1|item)	-0.4886
Adjective	C*G + (1|participant) + (1|item)	-0.583
PP	C*G + (1|participant) + (1|item)	-0.0906
Total time		
NP2	C*G + (C+G|participant) + (1|item)	-0.4353
Infinitive	C*G + (1|participant) + (1|item)	0.4842
Adverb	C*G + (C+G|participant) + (1|item)	-0.3238
Adjective	C*G + (1|participant) + (1|item)	-0.2179
PP	C*G + (C+G|participant) + (1|item)	0.4247
Regressions in		
NP1	C*G + (C+G|participant) + (C+G|item)	N/A
Control verb	C*G + (C+G|participant) + (C+G|item)	N/A
NP2	C*G + (C+G|participant) + (C+G|item)	N/A
Adjective	C*G + (C+G|participant) + (C+G|item)	N/A

RESUMO EN GALEGO

Unha das cuestións centrais no estudo da comprensión de oracións ten que ver con definir cal é o papel da información gramatical durante o procesamento incremental da linguaxe. Para poder realizar con éxito a difícil tarefa de comprender unha mensaxe lingüística, o sistema de compresión da linguaxe (o 'parser' ou procesador) debe ser capaz, entre outras cousas, de resolver a ampla variedade de relacións que se establecen entre as distintas partes dunha oración. Estas relacións coñécense como dependencias lingüísticas. As dependencias lingüísticas están suxeitas a unha diversa gama de restricións gramaticais (e.g. sintácticas, morfolóxicas, léxicas, etc.). Como se aplican en tempo real estas restricións é unha das preguntas fundamentais da investigación en psicolingüística. Nesta busca púxose frecuentemente o foco no estudo da sensibilidade que os falantes exhiben ante diferentes contrastes gramaticais durante a comprensión de oracións. Esta sensibilidade gramatical aparenta ser altamente detallada, como se mostra a través da alta precisión coa que os falantes detectan de maneira rutineira as anomalías gramaticais, tanto en experimentos 'online' –é dicir en tempo real– como en xuízos 'offline' –é dicir, sen restricións temporais– (Phillips et al. 2011; Lewis & Phillips 2015). A riqueza gramatical coa que opera o sistema de comprensión da linguaxe ou 'parser' fai que sexa aínda máis interesante o feito de atoparmos casos nos que os resultados de procesamento non converxen coas restricións impostas pola gramática. A existencia destas discrepancias ten sido identificada nunha ampla variedade de estruturas, e estes procesos son xeralmente explicados recorrendo a (nalgúns casos) diferentes principios lingüísticos e psicolóxicos. O estudo destes desaxustes ou discrepancias entre os resultados do 'parser' e as restricións gramaticais deu lugar a un frutífero programa de investigación.

Este traballo pretende contribuír á ampla e estimulante liña de investigación que se centra en entender como o 'parser' aborda as dependencias lingüísticas a través do estudo dun fenómeno coñecido como ilusións gramaticais (ou ilusións lingüísticas). As ilusións gramaticais son un exemplo dos desaxustes que en ocasións teñen lugar entre a gramática e o

procesamento, e ocorren cando certas dependencias lingüísticas que son claramente incorrectas son procesadas (polo menos temporalmente) como se fosen correctas (Phillips et al. 2011). En palabras de Muller & Phillips, unha ilusión gramatical ocorre cando "native speakers experience a fleeting perception of acceptability or unacceptability that mismatches their more considered judgements"(2020: 656). Máis concretamente, este traballo céntrase no estudo da presenza de ilusións gramaticais en dous tipos de dependencias lingüísticas: o procesamento dos termos de polaridade negativa (TPNs) en inglés, e o procesamento das dependencias anafóricas en estruturas de control verbal en español. Estes dous fenómenos ilústranse, respectivamente, nos exemplos (1) e (2):

(1) *The bills [that no senators voted for] have ever become law.

(2) *Juan$_i$ prometió a Ana$_j$ [Ø$_i$ ser más cuidadosa con los documentos].

En (1), o TPN *ever* é agramatical porque infrinxe a restrición que dita que a súa aparición debe ter lugar nunha oración negativa. En (2), o adxectivo feminino *cuidadosa* infrinxe a restrición que dita que os adxectivos deben concordar co nome ao que modifican –neste caso, *Juan*, o suxeito implícito da cláusula subordinada marcado co símbolo Ø no exemplo. Diversos traballos recentes teñen demostrado que a presenza de elementos estruturalmente irrelevantes que, porén, exhiben características parcialmente compatibles –por exemplo o cuantificador negativo *no* na cláusula de relativo en (1) ou o nome feminino *Ana* na cláusula principal en (2)– facilitan a integración de elementos agramaticais como *ever* en (1) ou *cuidadosa* en (2). Deste modo, xérase un patrón de ilusión gramatical en tanto que estas oracións son percibidas como correctas a pesar de seren agramaticais. O traballo realizado nesta tese pretende enriquecer o coñecemento destas dúas construcións e, principalmente, estudar cando e por que diferentes configuracións xeran patróns de ilusión gramatical.

Debido á diferente natureza dos dous tipos de dependencias estudadas en canto ás restricións gramaticais que deben ser postas en funcionamento, e mais ás dúas linguas nas que se realizan os experimentos, esta tese está organizada en dúas partes. A primeira parte (Capítulos 2 e 3) presenta os resultados de seis experimentos e un estudo de corpus dirixidos a estudar a aparición de ilusións gramaticais durante o procesamento dos TPNs. A segunda parte (Capítulos 4 e 5) presenta os resultados de seis experimentos dirixidos a estudar o procesamento das dependencias anafóricas en estruturas de control verbal, e a aparición de ilusións

gramaticais durante o seu procesamento. A continuación, faremos un breve resumo das principais contribucións dos seis capítulos que compoñen a presente tese doutoral.

O Capítulo 1 (*Introdución*) presenta unha visión global do marco conceptual no que se insire este traballo, así como un panorama xeral dos fenómenos identificados como ilusións gramaticais e outros exemplos de discrepancias entre a gramática e o 'parser'. Entre outros, alén dos fenómenos que son obxecto de estudo nesta tese, cómpre destacar como exemplos de ilusións gramaticais as dependencias lingüísticas de concordancia entre suxeito e verbo, a resolución de pronomes reflexivos, as ilusións comparativas ou a elipse. Como veñen demostrando investigacións anteriores, o estudo e perfilado dos erros que xorden no procesamento de estruturas que xeran ilusións ten o grande potencial de proporcionar observacións moi valiosas sobre o funcionamento interno do sistema da linguaxe e os mecanismos postos en marcha durante a implementación en tempo real das restricións gramaticais. A heteroxeneidade do existente inventorio de discrepancias entre os resultados do procesamento e as restricións da gramática motivou un interesante debate sobre o papel que xoga a información gramatical durante a comprensión de oracións en tempo real. Este debate encárnase na división coñecida como "un sistema/dous sistemas" (Lewis & Phillips 2015; Parker 2019).

En termos xerais, os defensores da existencia de dous sistemas (e.g. Bever 1970; Ferreira et al. 2002; Ferreira & Patson 2007; Frank et al. 2012; Townsend & Bever 2001), é dicir, dunha arquitectura dual para a comprensión da linguaxe, argumentan que a comprensión e produción da linguaxe se apoia nun conxunto de procedementos heurísticos usados para a comunicación rápida e eficiente que recorren a representacións definidas como "quick and dirty" (rápidas e informais) ou "good-enough" (suficientemente boas). Este tipo de representacións non requiren que os falantes constrúan ou consulten información gramatical detallada, e, en certo modo, son incompletas. Nesta arquitectura, a información gramatical é considerada un corpus de coñecemento estático só utilizado como reserva que se pode consultar máis tarde para verificar a aceptabilidade gramatical da mensaxe, pero que non é preciso para a comprensión da mesma. Nesta arquitectura dual, as discrepancias entre o 'parser' e a gramática son consideradas como un resultado natural dos diferentes produtos destes dous sistemas cognitivos. Polo contrario, os defensores da existencia dun único sistema (Embick & Poeppel 2015; Lewis & Phillips 2015; Mancini 2018; Parker 2019; Phillips 2013; Phillips & Lewis 2013), é dicir, dunha arquitectura unitaria, argumentan que, no canto de ser un módulo consultivo, a gramática é un sistema

dinámico cuxas operacións serven para construír representacións lingüísticas en tempo real. Baixo esta óptica, a gramática, entendida como o conxunto do léxico e as regras morfosintácticas, é implementada facendo uso de recursos cognitivos con fins xenéricos como a memoria de traballo, o control cognitivo ou o coñecemento do mundo (Phillips 1996). Daquela, no canto de interpretar as ilusións gramaticais como un erro arbitrario do sistema, os defensores dunha arquitectura unitaria poñen o foco en comprender e predicir de maneira sistemática que computacións lingüísticas causan a aparición destes erros, para así entender o perfil común das discrepancias entre 'parser' e gramática. Tomando o procesamento dos TPN e das construcións anafóricas de control como punto de partida, este traballo explora novas e interesantes configuracións de ilusións gramaticais enriquecendo o panorama das mesmas e contribuíndo a unha mellor comprensión dos procesos que xeran estas discrepancias durante a resolución de dependencias lingüísticas.

A Parte I desta tese céntrase no primeiro fenómeno de interese, o procesamento dos TPN, e componse do Capítulo 2 (*Ilusións de termos de polaridade negativa: antecedentes*) e o Capítulo 3 (*Ilusións de termos de polaridade negativa: proba experimental*). O Capítulo 2 presenta unha revisión teórica da complexa gramática dos TPN e, seguidamente, unha aproximación crítica aos estudos experimentais existentes sobre o fenómeno das ilusións gramaticais no procesamento dos TPN. A maioría das palabras que atopamos nos inventorios léxicos das linguas do mundo poden ocorrer tanto en contextos positivos como negativos. Porén, as linguas tamén exhiben algúns elementos léxicos cuxa distribución está restrinxida pola polaridade da cláusula na que aparecen. Un exemplo destes son os TPN, que constitúen una clase pechada pero moi variada de palabras que se caracterizan polo feito de requiriren a presenza doutro elemento (un *licenciador*). En xeral, este licenciador debe ser un elemento negativo, aínda que non necesariamente. Por motivos de espazo non afondaremos máis na complexidade da gramática dos TPN e as diferentes propostas teóricas ao respecto (ver Giannakidou 2011 para unha visión xeral das mesmas). O adverbio *ever* ou o determinante *any* son exemplos prototípicos de TPN en inglés. Unha aproximación en galego podería ser o adverbio *nunca* en posición posverbal –con certas reservas que non cabe mencionar neste resumo. As propiedades distribucionais deste tipo de elementos pódense observar no contraste gramatical dos exemplos (3a/b) en inglés e (4a/b) en galego, nos que a ausencia da negación verbal (*isn't* ou *non*) converte as oracións en agramaticais.

(3) a. John **isn't** here **yet**.
b. *John is here **yet**.

(4) a. O neno **non** come **nunca** froita.
b. *O neno come **nunca** froita.

O fenómeno das ilusións de TPN ocorre en oracións como a (5) en tanto que os falantes son propensos a identificar, inicialmente, que o TPN *ever* é gramatical, xerando unha ilusión de aceptabilidade errónea. Como xa dixemos, os TPN deben aparecer precedidos por unha negación, mais esta negación debe ocupar unha posición estrutural dende a que poida dominar sintacticamente o TPN. É dicir, mesmo se a oración en (5) contén unha negación, esta aparece nunha cláusula subordinada dende a que non pode dominar sintacticamente o TPN. É por isto que (5) é agramatical.

(5) *The authors [that no critics recommended] have **ever** received acknowledgement.

A cuestión de interese en oracións como (5) é que é precisamente a presenza dunha negación estruturalmente inaccesible o que causa a percepción ilusoria de gramaticalidade. Porén, os procesos polos cales o 'parser' subverte as regras gramaticais accedendo a este elemento negativo irrelevante aínda non se coñecen con exactitude. O estudo destes procesos cognitivos non só ten o potencial de informar como e por que aparecen as ilusións gramaticais, senón que tamén pode proporcionar unha mellor comprensión do procesamento das dependencias lingüísticas en xeral e da gramática dos TPN en particular. Na actualidade, existen catro hipóteses psicolingüísticas principais que pretenden explicar as ilusións de TPN: a *hipótese baseada na memoria*, a *hipótese do rescate pragmático*, a *hipótese das codificacións cambiantes*, e a *hipótese da confusión ever-never*. As diferentes predicións destas hipóteses serán testadas de forma empírica no Capítulo 3, polo que as explicamos a continuación en conxunto cos experimentos que conformar o terceiro capítulo desta tese.

O Capítulo 3 contén seis experimentos e un estudo de corpus que se dividen, conceptualmente, en dous grupos. Os primeiros tres experimentos –un estudo de aceptabilidade temporizada (Experimento 1), un estudo de lectura auto-administrada (Experimento 2) e un xuízo de gramaticalidade (Experimento 3)– están fundamentalmente dirixidos a testar a *hipótese da confusión ever-never*. O que esta hipótese propón é que as ilusións de TPN ocorren debido a

unha confusión perceptiva entre *ever* e *never* motivada pola súa similitude ortográfica, e sendo este último unha opción perfectamente gramatical, como se mostra en (6). Un erro deste tipo na detección do sinal lingüístico podería ser conceptualizado baixo as arquitecturas cognitivas do procesamento da linguaxe coñecidas como 'noisy-channel models' (modelos de canle ruidosa ou inexacta) (Levy 2008a; 2008b; Levy et al. 2009; Gibson et al. 2013).

(6) The authors [that no critics recommended] have **never** received acknowledgement.

Precisamente, os Experimentos 1-3 do Capítulo 3 poñen a proba o procesamento de oracións como a (6), comparándoas con outras oracións de referencia (negación simple e negación dobre). Os resultados son claros e consistentes ao longo das tres medidas experimentais utilizadas: as oracións que conteñen *never* no canto de *ever* incorren nun grande custo de procesamento e son percibidas como pouco aceptables. En si mesmo, este resultado é sorprendente, posto que son oracións perfectamente gramaticais. Porén, estes resultados proporcionan probas moi convincentes en contra da proposta da *hipótese da confusión ever-never*. Os seguintes tres experimentos – un xuízo de gramaticalidade (Experimento 4) e dous estudos de aceptabilidade temporizada (Experimentos 5 e 6)– deste capítulo, e mais o estudo de corpus, están dirixidos a testar as predicións das tres hipóteses restantes: a *hipótese baseada na memoria*, a *hipótese do rescate pragmático*, a *hipótese das codificacións cambiantes*.

Sen entrar en moito detalle debido a cuestións de espazo, estas tres hipóteses propoñen diferentes mecanismos como orixe das ilusións de TPN, mais coinciden no feito de que a cuestión chave é a presenza dun elemento negativo dentro da cláusula de relativo que, ben a través de procesos de memoria, pragmáticos, ou de codificación da mensaxe, é accedido de maneira errónea producindo a ilusión de gramaticalidade. O importante destas tres hipóteses é que coinciden nunha predición: calquera oración similar á (5) que conteña un elemento negativo deberá xerar unha ilusión similar. Os Experimentos 4-6 testan precisamente isto a través do estudo do procesamento de oracións como (7), que conteñen unha negación verbal (*not*) no canto dunha negación de cuantificación (*no*).

(7) The authors [that the critics have not recommended] have **ever** received acknowledgement.

De novo, os resultados son claros e consistentes ao longo das medidas experimentais utilizadas: oracións como a (6) non producen ilusións de gramaticalidade, contradicindo as predicións

destas tres hipóteses. En consecuencia, neste traballo propoñemos dúas alternativas que poderían dar resposta á pregunta fundamental neste punto: cal é o motivo polo que a negación cuantificadora produce ilusións e a negación verbal non? Referímonos a estas alternativas como a *hipótese das alternativas escalares* e a *hipótese do erro de cálculo de alcance*. Moi brevemente, a primera hipótese baséase na idea de que elementos cuantificadores como *no* evocan alternativas escalares do tipo *nunca<algunha vez<a miúdo<sempre*, etc, mentres que a negación verbal evoca alternativas binarias do tipo *si*/*non*. Posto que a través de análises lingüísticas (e.g. Chierchia 2006; Fauconnier 1975) sabemos que os TPN son sensibles a este tipo de inferencias escalares, é posible que a presenza dunha negación cuantificadora proporcione un contexto máis propicio para aceptar o TPN que, no entanto, é agramatical. Por outra banda, a hipótese do erro de cálculo de alcance baséase na idea de que os cuantificadores poden, nalgún casos, tomar varias interpretacións de alcance diferentes, dominando sintacticamente diferentes elementos da cláusula. Por tanto, quizais o feito de que *no* xere ilusións pero *not* non sexa debido a un erro de cálculo no alcance do cuantificador *no* que se atopa dentro de cláusula de relativo e que, de forma errónea, toma alcance sintáctico fóra da mesma, dominando ao TPN. Desafortunadamente, a proba dispoñible na actualidade non nos permite arbitrar entre estas dúas alternativas prometedoras. Na discusión xeral do Capítulo 3 propoñemos diferentes tarefas que axudarían a clarificar esta incógnita.

A Parte II desta tese céntrase no segundo fenómeno de interese, o procesamento das dependencias anafóricas en estruturas de control verbal en español, e componse do Capítulo 4 (*Dependencias de control: antecedentes*) e o Capítulo 5 (*Dependencias de control: proba experimental*). O Capítulo 4 presenta unha revisión teórica da gramática do fenómeno coñecido como *control* e a rama da lingüística que se ocupa do mesmo, coñecida como Teoría de Control. Seguidamente, o Capítulo 4 proporciona unha aproximación crítica aos estudos experimentais realizados sobre o procesamento de oracións de control e os dous estudos existentes sobre a aparición de ilusións gramaticais no procesamento destas estruturas. O fenómeno de control atópase en estruturas que conteñen suxeitos implícitos, nomeados xeralmente como categorías baleiras ou *PRO* dentro da Gramática Xenerativa. As oracións en (8a/b) mostran un exemplo.

(8) a. Ana$_i$ prometió a Juan$_j$ [Ø$_i$ ser más cuidadosa$_i$ con los documentos].

b. Ana$_i$ ordenó a Juan$_j$ [Ø$_j$ ser más cuidadoso$_j$ con los documentos].

O que resulta máis interesante deste tipo de oracións é que un dos complementos do verbo principal (*prometer* ou *ordenar*) se materializa a través dunha cláusula subordinada de infinitivo (*ser más cuidadosa/o con los documentos*) que contén un suxeito implícito –é dicir, sen realización fonética– marcado co símbolo Ø no exemplo. Cando os falantes se atopan co verbo infinitivo *ser*, que marca o inicio da cláusula subordinada, deben interpretar cal é o suxeito implícito deste verbo. Noutras palabras, quen é coidadosa/o cos documentos? Neste contexto, o termo control reflicte a idea de que este suxeito implícito está controlado ou determinado por outro referente, neste caso, ben *Ana* ou *Juan*. Que sexa un ou outro depende das propiedades léxicas de control do verbo principal: *prometer* é un verbo de control de suxeito e, en consecuencia, determina que o antecedente do suxeito implícito é *Ana*. Pola contra, *ordenar* é un verbo de control de obxecto e, en consecuencia, determina que o antecedente do suxeito implícito é *Juan*. Estamos entón ante un exemplo de dependencia anafórica, posto que o 'parser' debe recuperar un antecedente para poder construír unha interpretación correcta da mensaxe (quen fai que). Ademais, a resolución desta primeira dependencia anafórica é tamén indispensable para computar a dependencia de concordancia que ocorre no adxectivo *cuidadosa/o*, posto que este debe concordar en xénero co antecedente correcto (*Ana* ou *Juan*).

Comprender, clasificar e predicir os diferentes tipos de relacións de control ten sido un obxectivo central das teorías sintácticas dende que o fenómeno de control foi introducido por primeira vez na literatura (Rosenbaum 1967; Postal 1970). Neste senso, ten particular interese o control de tipo léxico que presentamos aquí, ao ser este ditado polas propiedades do verbo principal. Existen diferentes teorías lingüísticas que proporcionan achegas dende o punto de vista sintáctico (Hornstein 1999; Hornstein 2001; Hornstein & Polinsky 2010; Boeckx & Hornstein 2003; Boeckx & Hornstein 2004; Hornstein 2003) ou semántico (e.g. Culicover & Jackendoff 2006; Jackendoff & Culicover 2003; Sag & Pollard 1991) deste fenómeno. No entanto, hai un amplo consenso en considerar o control verbal como o produto directo das propiedades léxicas (e os roles temáticos) dos verbos das cláusulas principais que rexen ou dominan as cláusulas subordinadas de infinitivo.

As estruturas de control proporcionan unha fiestra aberta á gramática e ao procesamento das dependencias referenciais, e o seu estudo revela complexas conexións sintácticas, léxicas e psicolóxicas. No tocante ao seu procesamento, o interese dos psicolingüistas por este tipo de estruturas comezou hai polo menos catro décadas, e na actualidade existen dous bloques principais de teorías ou modelos. A pregunta fundamental en termos da psicoloxía da linguaxe

é como o 'parser' accede á información léxica de control e como a utiliza en tempo real para resolver as dependencias entre o suxeito implícito da cláusula de relativo e o seu antecedente. Por unha banda, unha serie de traballos veñen argumentando que a información de control non é accesible nos primeiros momentos do procesamento, senón que, debido á súa natureza léxica, é consultada en estadios tardíos (e.g. Clifton & Frazier 1986; McElree & Bever 1989; Nicol & Osterhaut 1988). Por outra banda, estudos máis recentes presentan probas que suxiren que a información de control é accesible e utilizada dende o primeiro momento no que o 'parser' atopa o suxeito implícito (e.g. Betancort et al. 2006; Boland et al. 1990; Kwon & Sturt 2016; Demestre et al. 1999). É dicir, cando procesa o verbo infinitivo que inicia a cláusula subordinada. Os experimentos presentados no Capítulo 5 pretenden achegar probas empíricas que permitan arbitrar entre estas dúas teorías. Asemade, debido a que varios traballos teñen identificado a aparición de ilusións gramaticais en estruturas de control diferentes ás investigadas aquí (Parker et al. 2015; Sturt & Kwon 2015), a presente tese pretende tamén investigar se as estruturas de control léxico verbal en español son susceptibles de sufrir ilusións gramaticais.

A axenda de investigación que se presenta no Capítulo 5 toma como principal punto de partida un experimento de movementos oculares realizado por Betancort et al. (2006). Neste traballo, os autores comparan os tempos e patróns de lectura de oracións gramaticais e agramaticais de control de suxeito e obxecto como as mostradas en (9). Os seus resultados indican que a información de control é utilizada tan pronto como se procesa o verbo infinitivo e o que tamén é crítico, que os falantes son capaces de distinguir o erro gramatical introducido no adxectivo tanto en contextos de control de suxeito (9b) como de control de obxecto (9d). Porén, os autores tamén identifican que no momento de construción da dependencia anafórica entre o suxeito implícito e o seu antecedente, as oracións de control de obxecto presentan tempos de lectura máis rápidos. Betancort et al. propoñen que isto pode ser debido a un efecto de recencia, posto que en oracións de control de obxecto o antecedente é o nome máis próximo. Tras unha detallada análise dos estímulos utilizados por estes autores, atopamos algunhas diferenzas na construción dos mesmos que poderían estar detrás da facilidade observada en oracións de control de obxecto. É por isto que parte da investigación que compón o Capítulo 5 pode ser considerada unha réplica parcial deste traballo, coa adición do estudo das ilusións gramaticais, non consideradas en Betancort et al. (2006).

(9) a. Ana$_i$ prometió a Juan$_j$ [Ø$_i$ ser más cuidadosa$_i$ con los documentos].
b. *Juan$_i$ prometió a Ana$_j$ [Ø$_i$ ser más cuidadosa$_j$ con los documentos].
c. Juan$_i$ ordenó a Ana$_j$ [Ø$_j$ ser más cuidadosa$_j$ con los documentos].
d. *Ana$_i$ ordenó a Juan$_j$ [Ø$_j$ ser más cuidadosa$_j$ con los documentos].

O Experimento 1 do Capítulo 5 é unha tarefa de completamento realizada para verificar se as interpretacións de control dos verbos que se utilizarán nas seguintes tarefas son robustas. Os resultados demostran que si, pois ambos grupos de verbos exhiben claras interpretacións de control (preferentemente suxeito ou preferentemente obxecto) en máis do 95% dos casos. O Experimento 2 é un xuízo de aceptabilidade que pon a proba os estímulos que serán utilizados despois, demostrando tamén que os falantes nativos de español son capaces de detectar sen problemas os erros gramaticais en ambos tipos de control. O Experimento 3 é unha tarefa de movementos oculares, máis complexa que as anteriores, na que se miden os movementos dos ollos mentres os participantes len as oracións. Os resultados desta tarefa pódense dividir en dous grupos: en primeiro lugar, atopamos probas de ilusións gramaticais, que se observan no feito de que oracións agramaticais como (9b/d) son procesadas con maior facilidade que oracións nas que non existe ningún nome que, malia ser estruturalmente irrelevante, concorde en xénero co adxectivo, como en (10). O segundo resultado máis interesante é que non se replica o efecto de proximidade ou recencia atopado en Betancort et al. (2006), posto que os verbos infinitivos son procesados do mesmo modo en oracións de control de suxeito e de obxecto.

(9) a. *Pedro$_i$ prometió a Juan$_j$ [Ø$_i$ ser más cuidadosa$_i$ con los documentos].
b. *Juan$_i$ ordenó a Pedro$_j$ [Ø$_j$ ser más cuidadosa$_j$ con los documentos].

Debido á falta de probas a favor do efecto de proximidade, decidimos elaborar un novo set de materiais que serán testados a través dun xuízo de gramaticalidade (Experimento 4), unha tarefa de lectura auto-administrada (Experimento 5) e un estudo de movementos oculares (Experimento 6). De novo, o efecto de proximidade non se replica, polo que concluímos que o efecto descrito en Betancort et al. (2006) é moi posiblemente produto dun desatino na construción dos seus materiais. Alén disto, atopamos de novo efectos de ilusión gramatical, así como probas claras de que os participantes detectan con facilidade os erros de concordancia. A cronoloxía dos efectos atopados nos diferentes experimentos apunta a que a información léxica

de control é utilizada dende os primeiros momentos do procesamento, mais a integración do adxectivo na cláusula subordinada activa a xeración de novas dependencias que están suxeitas á interferencia de elementos distractores que promoven a aparición de ilusións gramaticais.

En conclusión, como se remarca no Capítulo 6 (*Observacións finais*), esta tese de doutoramento contribúe a entender mellor o fenómeno das ilusións gramaticais de forma global, así como aquelas que xorden durante o procesamento dos TPN e das estruturas anafóricas de control verbal de forma específica. Asemade, as probas acumuladas neste traballo reducen de maneira substancial o panorama de hipóteses ao redor destes fenómenos, demostrando que ningunha das teorías existentes sobre as ilusións de TPN pode acomodar os resultados obtidos no Capítulo 3, e engadindo probas a favor dos modelos que propoñen que o 'parser' fai uso da información de control verbal tan pronto como é precisa (Capítulo 5). Por último, agardamos que este traballo sirva tamén para promover a idea de que o fenómeno das ilusións gramaticais é unha ferramenta moi útil para investigar os mecanismos que fornecen con éxito a comprensión rutineira da linguaxe e que poden ser tamén de grande utilidade noutros eidos da ciencia cognitiva da linguaxe, como o estudo da mente bilingüe, a aprendizaxe de segundas linguas ou as diferenzas individuais.

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