

## DEONTIC REASONING AND WASON'S SELECTION TASK: STATE OF THE ART

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### INTRODUCTION

Deontic selection task is a metainference problem in which subjects reason from a conditional rule involving deontic terms (must, should). These statements express obligations, permissions or prohibitions. The aim of this paper is to analyze the state of the art on deontic reasoning and the Wason selection task. **Method:** A bibliographic search was conducted in the databases **PsycINFO** and **Scopus**, from **2010 to the first half of 2025**.

### DEONTIC WASON'S SELECTION TASK

A standard deontic abstract version of the task is:

There are four cards lying on a table. Each has a capital letter on one side and a single digit on the other side. The visible sides of the cards are: A, D, 3, 7.



The following statement applies to these four cards and may be true or false:

**“If there is an A on one side of the card, then there must be a 3 on the other side of the card”.**

Which cards, and only which cards, would need to be turned over in order to check whether the rule is true or false?.

Research have shown that subjects' reasoning is frequently better with this deontic version than with the original indicative task (rule: **“If there is an A on one side of the card, then there is a 3 on the other side of the card”**). In the original problem (Wason, 1966), less than 10% of the participants selected the formal **correct answer: A, 7**. Cards **A and 3** were frequently selected **incorrectly (verification/matching biases)**. Why? How do people reason with the deontic task? Different theories were proposed (see Ragni, Kola & Johnson-Laird, 2018, for a review).

### Deontic Selection Task: Theoretical Explanations.

AUTHORS	THEORY	KEY IDEA
Cheng & Holyoak (1985)	Pragmatic Reasoning Schemas	Activation of schemas for situations involving obligations and permissions.
Cosmides (1985); Cosmides & Tooby (1989)	Social Contract Theory	Modular human mind. Deontic selection task relates to social contract and cheater detection.
Manktelow & Over (1990; 1991; 1995)	Decision Theory	Reasoning and Decision Making (probability & utility judgments).
Cummins (1996; 1999)	Dominance Theory	Deontic concepts innately built-in to the mind, enabling fast learning of the rules and regulations.
Sperber, Cara & Girotto (1995); Sperber & Girotto (2002)	Relevance Theory	Maximize the most relevant information with the least effort in social and moral contexts.

Fiddick, Cosmides & Tooby (2000); Fiddick & Elrich (2010)	Hazard Management Theory	Modular mind. Domain specific cognitive module for making inferences to possible hazards.
Bucciarelli & Johnson-Laird (2005; 2024); Johnson-Laird & Byrne (2002); Johnson-Laird & Ragni (2019; 2025)	Mental Models Theory of Naive Deontics	Models can represent deontic or epistemic situations that modulate the interpretation and reasoning.  Counterexamples are more salient for specific framing, violation instructions, etc.  Modulation based on relevant knowledge, emotions, etc.
Evans & Over (1996); Evans (2010); Evans & Stanovich (2013); Evans & Elqayam (2020); Over & Evans (2024)	Dual-Process Theory  (Dual mind rationality)	Two cognitive systems underlying reasoning:  S1: automatic, unconscious;  S2: conscious, related to abstract and hypothetical thinking.  Deontic task related to Rationality 1. Indicative problem with Rationality 2.

In addition to the specific mechanisms that each theory have defended, some key strategies are also proposed to improve the hypothesis testing process and reasoning, such as **“think in opposites”** (Branchini, Bianchi & Burro, 2025) or look for **“knowledge of the contrary”** (Johnson-Laird & Ragni, 2025).

A review of the experimental research that has analyzed **which factors modulate reasoning with the deontic selection task** is presented next (2010-2025).

Works that have studied deontic reasoning from an evolutionary perspective are not included here (in this sense it can be seen, for example, Ferrera & Sánchez Herrera, 2014).

**Empirical research on Deontic Selection Task (2010-2025),  
in chronological order.**

AUTHOR	RULE-EXAMPLE	KEY RESULT
López Astorga (2014)	“If you are under 18, then you drink coke” vs “It is required that if you are under 18, then you drink coke”	A deontic operator in the rule allows subject to consider all the possible models.
Thompson, Plowright, Atance & Caza (2015)	"If it is the first day of the month, then there must be pancakes for lunch"; “If the child takes a cookie then the child must have earned a gold star sticker”	Interaction type of problem (“cheater or non-cheater”) and parental connection with the child (existent or non-existent).  Altruism detection module.
Fiddick, Brase, Cosmides & Tooby (2017)	“If you go out at night, then you must first milk the cow”; “If a man eats cassava root, then he must have a tattoo on his face”	Structural priming.  Inference based on specific evolved reasoning abilities.

<b>Sivan, Curry &amp; Van Lissa (2018)</b>	“If a player has a dirty jersey, then that player must wash it”; If someone plays for the Rangers, then they must wear a green jersey”	Participants are better at detecting violations of adaptive social moral rules than neutral control ones. One common mechanism rather than multiple.
<b>Lampinen, Dasgupta, Chan, Sheahan, Creswell, Kumaran, McClelland &amp; Hill (2024)</b>	“If the clients are going skydiving, then they must have a parachute”; “If the cards have plural word, then they must have a positive emotion”	Advantages for the realistic tasks compared to arbitrary ones. Spending longer on logical problems can improve answers. Better reasoning about consistent situations with subjects’ world.
<b>Yang, Liang &amp; Wang (2025)</b>	“If a village head decides to implement a spending cut on social welfare, then he/she must first hold a village public meeting”; “If a village head decides ... then he/she is fiscally conservative”.	Participants have universal cheater-detection mechanisms to infer contractual expectations. These are independent to cultural background or political system.
<b>Martín &amp; Valiña (2025)</b>	“If a card has cat written on one side then it must have rose written on the other side”; “If a card has bricklayer written on one side then it must have hard hat written on the other side”	The best performance was registered in thematic permission problems. The worst was observed in thematic-neutral rules. People who reasoned in a scenario: better performance if the task was included in a deontic framework.

### SOME OPEN QUESTIONS

**(1) Is there evidence of “deontic advantage”? If it exists, is it innate or learned?; (2) What are the reasoning strategies involved in deontic tasks?; (3) “Not thinking” helps reasoning with the deontic versions? That is: how intuitive and/or analytic processes operate?; (4) How individual differences related to cognitive ability or rational thinking dispositions modulate reasoning with the deontic selection task?; (5) How people acquire the deontic rules that serve them in the everyday world? (6) Is reasoning with this problem based on the activation of concrete beliefs, emotions, innate modules, pragmatic schemas, mental models from relevant knowledge, abstract structures or something else?**

### CONCLUSIONS

**\* Deontic and indicative versions are qualitatively different. Both could require distinct cognitive strategies. Deontic tasks seem more natural than indicative ones.**

**\* The most complete theoretical explanations on this topic are: Mental Models and Dual Process Theories.**

**\* Reasoning with deontic tasks seems modulated by contextual and pragmatic keys. The effect of rule content, scenario, instructions, framing, etc. should not be attributed to the presence of an explicit modal verb in the rule.**

**\* Empirical results with the deontic Wason’s selection task have shown the dynamic, flexible and pragmatic nature of human reasoning.**

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