Mediational mechanisms involved in the relation between attachment insecurity and depression: A meta-analysis

Laura Cortés-García [a*], Bahi Takkouche[b, c], Ruben Rodriguez-Cano[d], Carmen Senra [a]

[a] Department of Clinical Psychology and Psychobiology, University of Santiago de Compostela, Spain

[b] Department of Preventive Medicine, University of Santiago de Compostela, Spain

[c] Centro de Investigación Biomédica en Red de Epidemiología y Salud Pública (CIBER-ESP), Madrid, Spain

[d] Department of Behavioral Science, The University of Texas MD Anderson Cancer Center, Houston, TX, USA

Corresponding author: Laura Cortés-García (laura.cortes@usc.es), Department of Clinical Psychology and Psychobiology, Faculty of Psychology, University of Santiago de Compostela. Campus Vida, Calle Xosé María Suárez Núñez, s/n, 15782, Santiago de Compostela, A Coruña, Spain. Phone: +34 881813304.

Declarations of interest: None

1. Introduction

Depression is a commonly occurring, seriously impairing, and often recurrent mental disorder that represents a significant and unquestionable global health concern (Kessler, 2012). Currently, it is the leading cause of disability worldwide affecting quality of life, mortality and morbidity (Kessler and Bromet, 2013; Miret et al., 2013), and producing extremely high socioeconomic costs (Greenberg et al., 2015; Kessler, 2012). It is noteworthy that depressive symptoms below the diagnostic threshold may also have a detrimental impact on health and psychosocial functioning (Ayuso-Mateos et al., 2010), even beyond increasing the risk for later depressive disorders (Lewinsohn et al., 2000). Given the personal and societal burden incurred by depression, it is crucial to identify factors responsible for their emergence, maintenance or exarcebation. Such knowledge will help prevention and treatment efforts.

Numerous theorists have suggested that early experiences can—and do— play an *enduring* role in placing an individual at risk for depression (Fraley et al., 2013; Moran et al., 2008). Attachment theory (Bowlby, 1969/1982) offers important insights to enlarge and depeen our understanding of how these early experiences of care and attention shape child's mental representations of self, others and relations across life span (Cassidy, 2016). Such mental representations or working models, based on infant's expectations for the accessibility and responsiveness of their caregiver, work as guidelines of thoughts, feelings, and behaviors in future relationships (Cassidy, 2016). In this regard, children come to develop an insecure attachment when caregivers are inconsistent or unavailable in responding to their needs. This results in maladaptive mental representations that will function as a pessimistic template through which one interprets the world and the future (Roepke and Seligman, 2016).

Several studies have examined links between insecure attachment and depressive symptoms in children (DeKlyen and Greenberg, 2016), adolescents (Allen and Tan, 2016) and adults (Stovall-McClough and Dozier, 2016). However, many scholars have questioned the direct path between these two constructs from infancy to adulthood (Fraley et al., 2013), and instead, they argue that early attachment experiences do influence later depression through different intermediate mechanisms (Hankin et al., 2005; Malik et al., 2015; Morley and Moran, 2011). In this regard, mediation analysis is a suitable statistical method to evaluate the extent to which a third intermediate or mediating variable (*M*, mediator) explains the effect of an exposure (*X;* e.g., attachment insecurity) on an outcome (*Y*; e.g., depressive symptoms) (Fig. 1) (Hayes and Rockwood, 2017). A simple mediation model examines the *direct effect* (path c') of *X* on *Y* without passing through *M*, and the *indirect effect* (path a*b) of *X* on *Y* through *M*. The *total effect* (path c) can be calculated as the sum of the direct and indirect effects from the resulting mediational model (Hayes, 2018, p.79). In an effort to understand the legacy of early insecure attachment experiences in the development of depression, researchers have identified a set of cognitive, emotional and interpersonal mechanisms that are related and complementary as explanatory processes through which such association persists over time (Monti and Rudolph, 2014; Moran et al., 2008).

Maladaptive cognitive processes have been the focus of numerous well-established theories of vulnerability to depression for their consistent implication in the onset, maintenance and remission of depression (Abela and Hankin, 2009). This perspective considers that each child develops such cognitive vulnerability in maladaptive early experiences with caregivers (Beck, 1987), which is a premise entirely consistent with attachment theory. According to Morley and Moran (2011), *negative*

self representations rooted in dysfunctional early attachment relationships influence the perception, interpretation and response to future stressful events. Insecurely attached individuals may hold "negative interpretative lens" that give rise to maladaptive person-specific cognitive biases (e.g., tendency to selectively focus on disappointing aspects of a situation; Beck, 1987). Hence, when individuals with a history of insecure attachment undergo adverse life experiences, self-critical attitudes and negative attributions arise, eventually undermining their self-concept and increasing the vulnerability to depression (Lee and Hankin, 2009; Moran et al., 2008).

Other models of depression suggest that insecure attachment promotes later depression through *dysfunctional emotion regulation strategies* that develop within the parent-child dyad (DeKlyen and Greenberg, 2016; Malik et al., 2015) – not surprisingly as dysfunctional emotion regulation plays a major role in the development and course of depressive symptoms (Compas et al., 2009; Mennin et al., 2007). One of the functions of attachment relationships is to assist in regulating children's emotions, especially emotions that are potentially disturbing or overwhelming (Thompson, 2016). In secure attachment relationships, primary attachment figures act as *safe haven* in times of distress, that is, they are sensitive to the child's need for proximity and comfort and provide the necessary assistance to regulate negative emotions, alleviate distress and protect them from physical and emotional threats. However, individuals with insecure attachment following distress and the failure of relieving responses from attachment figures, employ secondary strategies of emotional regulation to restore emotional balance (Mikulincer and Shaver, 2012). For instance, they either hyperactivate their attachment system to maintain proximity with their caregivers and thus avoid potential abandonment (anxious attachment), or deactivate their attachment system and minimize their need to relate for fear of the aversive results that proximity with the attachment

figure could generate (avoidant attachment). A type of hyperactivating cognitive strategy centered on negative emotions that has acquired great relevance in the study of vulnerability to depression is *rumination* (Malik et al., 2015). Rumination represents an ineffective coping response whereby people try to better understand their depressive mood by repeatedly think about its causes, meanings and consequences (Nolen-Hoeksema et al., 2008). However, rumination is not a unitary construct. In fact, factor analysis of the Ruminative Response Scale (RRS; Treynor et al., 2003), a self-report questionnaire commonly used to evaluate rumination, reveals two factors associated with depression: *brooding* which involves the tendency to dig into the negative consequences of one's depression and *reflection* which involves attempts to understand the reasons for one's depressed mood (Miranda and Nolen-Hoeksema, 2007). Both rumination subtypes are similar at the process level (repetitive thought chains) but, while brooding focuses on the discomfort felt (e.g., 'I think, what am I doing to deserve this?') and on the obstacles that prevent from overcoming problems (e.g., 'I think, why can't I handle problems better?'), the reflection subtype addresses a more general self-reflection (e.g., 'I go to a place just to think about my feelings') and suggests possible options to face the problem (e.g., 'Write what you are thinking and analyze it') (Nolen-Hoeksema et al., 2008). Whereas brooding subtype has been consistently related to more depression concurrently and longitudinally (e.g., Aldao et al., 2010; Burwell and Shirk, 2007), reflection has been associated with less depression over time, so it seems that its more maladaptive facet in the short-term decreases as solutions to problems are found (Nolen-Hoeksema et al., 2008). Nevertheless, this does not mean that reflection has an adaptive role, since individuals with depression tend to engage in this form of rumination more than controls (Joormann et al., 2006; Treynor et al., 2003). Thus,

researchers consider that rumination may be a compelling mediational mechanism in the association between insecure attachment and depressive symptomatology.

Lastly, the repeated interactions and experiences with attachment figures provide an interpersonal context through which children organize individuals' expectations of others and acquire a general understanding of relationships (Bowlby, 1988; Shaver and Mikulincer, 2014). As a result of early insecure attachment relationships characterized by parent's rejection or insensitivity towards child's needs, individuals may either try to counteract the fear of abandonment and rejection by engaging in close, intense, and demanding relationships to ensure closeness (anxious attachment), or distrust others and systematically reject closeness by maintaining distance in interactions (avoidant attachment) (Mikulincer and Shaver, 2012; Paech et al., 2016). These particular ways of being in relation to others can eventually result in experiencing real or perceived low interpersonal competence (Paech et al., 2016; Wei et al., 2005) or low social support (Keleher et al., 2010; Zhu et al., 2016). Moreover, any disappointment or failure in interpersonal experiences can be interpreted in terms of personal unworthiness and incompetence, which may, in turn, contribute to the development of depressive symptoms (Margolese et al., 2005; Sund and Wichstrøm, 2002).

2. The present meta-analysis

Broad research supports the link between attachment and depressive symptoms across life span. However, in most cases the influence of insecure attachment on depression may be indirectly conditioned by the concurrence of different intermediate variables, mainly related to cognitive vulnerabilities, dysfunctional emotional regulation strategies and interpersonal difficulties. Despite the growing number of studies testing mediation models, no research has yet identified and evaluated the effect size of such mediating mechanisms. Consequently, evidence on putative mediators that may explain

how insecure attachment predisposes to the development of depressive symptoms is needed. In order to fill this gap, we conducted a comprehensive meta-analysis of prospective and cross-sectional studies examining potential mediators between insecure attachment and depressive symptoms, both at the clinical and sub-clinical levels, including participants of any age. Our results will provide new insight to clarify how insecure attachment may increase vulnerability to depressive symptoms. Moreover, a better understanding of the specific mechanisms involved in the development of such a debilitating condition will enable the optimization of clinical interventions and prevention programs.

3. Method

The protocol for the current review was registered with the PROSPERO international prospective register of systematic reviews (ref: CRD42017079626). This review followed the PRISMA reporting guidelines (Moher et al., 2009).

3.1. Search strategy

First, a comprehensive systematic search was performed in the following databases: MEDLINE, Pubmed, PsycINFO and EMBASE from the earliest records until November 2017. These searches were later updated to May 2019. We used the following search strategy in PsycInfo and the same combination of keywords for the different databases: [ab(attachment) AND ab (depress* OR "depression" OR depressive disorder* OR depressive symptom*) AND ab (mediat* OR indirect OR "structural equation modeling" OR "structural equation modelling" OR "SEM" OR "path" OR (Baron AND Kenny) OR "MacKinnon" OR "product of coefficient" OR "difference in coefficient" OR "sobel" OR "causal pathway" OR "intermediate" OR "indirect effect" OR "mechanism")]. Additionally, Proceedings Web of Science (Conference Proceedings Citation Index- Science (CPCI-S), Social Science & Humanities (CPCI-

SSH)) and ProQuest Dissertations & Theses Global were also searched to identify relevant studies. Reference lists of included studies and systematic reviews were scanned for any additional relevant studies.

3.2. Inclusion/exclusion criteria

The following inclusion criteria were adhered to in all studies: (1) only empirical studies reporting on the effect of mediating mechanisms linking attachment style (attachment towards a close person) and depressive symptoms; (2) studies that had formally conducted a mediation analysis (e.g. Baron and Kenny's causal steps of mediation, structural equation modelling) or significance tests of mediation (e.g. Sobel test, bootstrapping); (3) studies carried out with participants at any age from clinical (by criteria DSM-IV, DSM-IV-TR, or DSM-5) and subclinical samples (individuals exceeding the clinical cut-off of depression measures or reporting depressive symptoms that place them at risk); and (4) only articles written in English, Spanish, German or French.

Patients with other significant physical diseases or mental disorders were excluded. We did not consider papers exploring attachment as a mediator since the focus of our study is to understand attachment as an independent variable. We also excluded other reviews and meta-analyses.

As regards elegibility criteria for the meta-analysis, it was required at least two different studies exploring the mediation effect of the same or similar variable to create a subgroup per mediator. As such, studies reporting mediational effects of variables that could not be categorized into the different mediators' subgroups due to their conceptual heterogeneity were excluded from the meta-analysis.

3.3. Study selection

Preliminary screening of the studies obtained by the systematic search in relation to the inclusion and exclusion criteria was performed by the main author (LCG). Three co-authors (LCG, RRC, CS) reviewed all titles and abstracts, excluded studies that did not address mediation analysis, and independently examined each full article to determine final inclusion or exclusion. Reasons for exclusion of full texts were recorded and documented in a PRISMA flow diagram (Fig. 2). Discordances on inclusion or exclusion of articles were analyzed, and disagreements were resolved via discussion. A data extraction template including all eligible studies with key items based on a year of publication, country, recruited population, sample size, methods to assess attachment, mediating variables and depressive symptomatology and main results was designed.

3.4. Data extraction

Data were extracted by two reviewers independently (LCG, CS) using a form that was specifically developed for the current review. These data were further verified independently by a third reviewer (RRC). Extraction data included author, year and country of publication, research aims, setting and design, sample characteristics (i.e. sample size, age range and sex of participants and type of sample), measures used for the independent, mediating and dependent variables, specific mediator(s) under investigation, method of mediation analysis and standardized regression coefficients for the different paths (direct, indirect and total effects). In case of any disagreements between the reviewers regarding the extracted data, they were resolved by consensus, by reviewing again the study or by contacting directly the original author. If necessary, an email request was also sent to the corresponding authors in order to obtain any unpublished data necessary to perform the meta-analysis.

3.5. Data synthesis analysis

Meta-analysis was conducted for a subset of included studies using the software Comprehensive Meta-Analysis (CMA; Borenstein et al., 2013). We first calculated the pooled overall effect size of the mediators including all studies together, using the inverse of their variance as a weight, and second, we compared if the effect sizes differed according to the sample type, attachment type, age, sex and quality. Moreover, we categorized the data by mediators (including at least two studies per mediator) before pooling. Aditionally, within each mediator subgroup, we stratified the studies by participants' age (children/adolescents and adults). It should be noted that, to carry out the pooled analysis at this level, it was required at least two different estimates per variable. In the case of having only one estimate by age, we included the single study results for informative purposes. For each analysis, we used standardized regression coefficients (β) and sample sizes to calculate a pooled effect size for the indirect (a*b) and total effects (path c) (Hayes, 2018; Hayes and Rockwood, 2017). When only studies reported the unstandardized regression coefficient (B), we either calculated the β by using unstandardized variables and then multiply them by the ratio between the standard deviation of the respective independent variable and the standard deviation of the dependent variable (β = B*[Sx/Sy]) (Bring, 1994) or used the Pearson correlation coefficient (r) (Peterson and Brown, 2005)]. To inform about the effect size of the mediation effect, we calculated the ratio of the pooled indirect effect and the pooled total effect (Preacher and Kelley, 2011) [P_M = (a*b/c)]. Heterogeneity was assessed using the I^2 statistic and we assigned thresholds of 25%, 50%, and 75% to signify low, moderate, and high heterogeneity, respectively (Higgins et al., 2003). Meta-analyses were performed using a random-effects model.

Publication bias was assessed using Egger's test (Egger et al., 1997). Sensitivity analyses recalculating the pooled estimates under extreme conditions were also performed.

3.6. Quality rating

Eligible papers were evaluated for methodological quality with the critical appraisal tool originally developed by Lee et al. (2015), but further adapted by Cortés-García et al. (2019) for the purpose of the present study (Supplementary Table 1). Each study was independently rated by 2 reviewers providing a score of 1 (yes) or 0 (no) to the 9 items. Studies were categorized into weak (scoring 0-3), moderate (scoring 4-6), and strong (scoring 7-9) on the basis of these criteria. The quality of studies was assessed with regard to the following elements: aims clearly described, study's design appropriate to aims, representativeness of the sample, psychometric characteristics reported, statistically acceptable methods of data analysis, control of temporal precedence of the variables, main findings clearly described and control of confounding factors. Disagreements between reviewers were resolved by consensus. Furthermore, we carried out a pooled analysis comparing low quality studies (scores < = 5) with moderate-high quality studies (scores > 5).

4. Results

4.1. Study characteristics

A flow diagram of the screening process from identification through to inclusion is presented in Figure 1. Initially, a total of 1237 records were selected as eligible to be screened further, of which 213 remained after abstract screening. Among them, 105 did not meet the inclusion criteria and were excluded. Finally, 108 studies met our inclusion criteria and were included for review (88 studies from peer-review journals, 1 conference proceeding and 19 doctoral dissertations), and out of them, 80 were eligible

for the meta-analysis (66 studies from peer-review journals and 14 doctoral dissertations). The remaining 28 studies reported mediational effects of very diverse variables that could not be categorized into mediators' subgroups; consequently, they were excluded from the meta-analysis, as it was required at least two different studies per variable to create a subgroup (for extracted and coded data see Supplementary Table 2). Up to three email requests were sent to the authors of 18 studies in order to obtain the necessary data to perform the meta-analysis. Study characteristics are summarised in Table 1. A total of 93 cross-sectional studies and 15 longitudinal studies provided data on mediational mechanisms. Included studies were conducted in 19 different countries, most commonly in the US and in the UK. All but four studies included participants recruited from the community. Sample sizes ranged from 53 to 5065 participants and the mean age of participants across studies ranged from 3.7 to 72.08 years (mostly, adolescent university students and young adults). The majority of studies included both sexes, except 18 studies that involved exclusively females and two other studies that included only males.

Attachment was assessed using a broad variety of self-report measures, but the most commonly used were: the Experiences in Close Relationships (ECR; Brennan et al., 1998) (including original version, revised versions, short version or version adapted to children), the Inventory of Parent and Peer Attachment (IPPA; Armsden and Greenberg, 1987); the Adult Attachment Scale (AAS; Collins and Read, 1990); the Relationships Questionnaire (RQ; Bartholomew and Horowitz, 1991); and the Relationship Scales Questionnaire (RSQ; Griffin and Bartholomew, 1994).

The main mediators explored in the reviewed literature were divided into three categories related to the cognitive (i.e., dysfunctional attitudes, low self-esteem, maladaptive perfectionism, self-criticism, self-compassion and low sense of coherence),

emotional (i.e., emotional dysregulation, alexithimia and coping strategies) and interpersonal domain (i.e., self-disclosure, over-dependence, perceived social support, relational satisfaction, social comparison, social self-efficacy, interpersonal stressors). The definition of the mediators that did not reach significant indirect effects can be found in Other Supplementary Material. Moreover, Supplementary Table 3 provides detailed extracted and coded data included in the meta-analysis.

The methodological quality of the 108 retrieved studies ranked from 2 (weak) to 9 (strong) (see Table 2 for individual study quality ratings). The pooled estimate for the indirect effect of mediating variables was 40%, for low quality studies, and 35% for moderate-high quality studies. In consequence, no significant differences in our results were found regarding quality.

4.2. Meta-analysis

The pooled correlation coefficients for path *a*, path *b*, total effect (path *c*) and indirect effect (path *a***b*), with their CIs, the I^2 statistic and effect sizes of each mediation model (*mediation ratio*) are presented in Table 3.

4.2.1. Primary analyses

Overall, 38% of the total effect of insecure attachment on depressive symptoms was explained by the indirect effect of the main mediating variables. Heterogeneity was substantial overall and similarly high after stratification by sample, type of attachment, age, sex or quality. No individual study seemed to represent an influential point that increased heterogeneity dramatically. We, therefore, focused on the random effects analyses as recommended by experts (Higgins et al., 2009; National Research Council, 1992).

Comparing sample types, in clinical samples the percentage of the total effect explained by the indirect effect was larger (81%) than in non-clinical samples (31%).

Regarding attachment style, the percentage of the total effect explained by the indirect effect was 30% with anxious attachment and 36% with avoidant attachment. The effect size of the mediating variables was not significant among children/adolescents, but was significant among adults and the percentage of the total effect explained by the indirect effect was 35%. Additionally, the effect size of the mediating variables was not significant when differing by sex.

4.2.2. Subgroup analysis by mediators

4.2.2.1. Cognitive domain

Six different mediators were classified in the cognitive domain; however, only dysfunctional attitudes, self-criticism and low self-compassion achieved significant indirect effects.

Dysfunctional attitudes

A total of five empirical studies (Hankin et al., 2005; Reinecke and Rogers, 2001; Roberts et al., 1996; Safford et al., 2004; Williams and Risking, 2004) and two doctoral dissertations (Martin, 2001; Smagur, 2018) examined the mediational effect of dysfunctional attitudes among adults. Based on this evidence, the pooled estimate of its indirect effect was significant. The percentage of the total effect explained by the indirect effect was 40%; heterogeneity was moderate for the indirect effect (I^2 = 53%) and high for the total effect (I^2 = 97%). However, the pooled estimate of its indirect effect based on the results of three empirical studies (Kamkar et al., 2012; Lee and Hankin, 2009; Margolese et al., 2005) and one doctoral dissertation (Chaowiang, 2008), was not significant in samples of adolescents. Heterogeneity was moderate for the indirect effect (I^2 = 60%) and high for the total effect (I^2 = 94%).

Self-criticism

The pooled estimate of the indirect effect of self-criticism was significant based on the results of three empirical studies (Cantazaro and Wei, 2010; Dagnino et al., 2017; Permuy et al., 2010) and one doctoral dissertation (Rosen Marsh, 2013) with adults. The percentage of the total effect explained by the indirect effect was 57%; there was no heterogeneity. No study evaluated this model in children/adolescents.

Low self-compassion

Two empirical studies (Joeng et al., 2017; Valikhani et al., 2018) and one doctoral dissertation (Rosen Marsch, 2013) with adults showed that *low self-compassion* was a significant mediator. The percentage of the total effect explained by the indirect effect was 41%; there was no heterogeneity. Conversely, among adolescents, the pooled estimate of the indirect effect was not significant (Graham, 2018).

Other non-significant mediators

Despite the numerous studies exploring *low self-esteem* as a mediator in adults (Boo, 2010; Hankin et al., 2005; Kang et al., 2014; Kenny and Sirin, 2006; Lee and Koo, 2015; Love and Murdock, 2012; Roberts et al., 1996; Wei and Ku, 2007) as well as in children (Lecompte et al., 2014) and adolescents (Bosacki et al., 2007; Graham, 2018; Kamkar et al., 2012; Kenney, 2006; Kenny et al., 1993; Lee and Hankin, 2009; Suzuki and Tomoda, 2015), the pooled estimate for its indirect effect was not significant. In addition, four studies investigated *maladaptive perfectionism* (Gnilka et al., 2013; Reis and Grenyer, 2002; Wei et al., 2004; Wei et al., 2006), and two studies *low sense of coherence* (Han and Lee, 2011; Ying et al., 2007) as mediators, but their estimated indirect effects were not significant.

4.2.2.2. Emotional domain

Out of the three different subgroups of mediators analyzed in the emotional domain, only cognitive hyperactivating strategies, including repetitive thinking and brooding rumination, were identified as significant mediators.

Coping strategies (*Cognitive hyperactivating strategies*)

Nine empirical studies (Beyderman and Young, 2016; Burnette et al., 2009; Gülüm and Dağ, 2014; Lopez et al., 2001; Mohammadkhani et al., 2017; Vahedi et al., 2016; Valikhani et al., 2018; Wei et al., 2003, 2006) and two doctoral dissertations (Land, 2012; Rosen Marsh, 2013) utilizing adult samples measured *cognitive hyperactivating strategies* and its indirect effect was significant. The percentage of the total effect that was explained by the indirect effect was 33%; heterogeneity was low for the indirect effect (I^2 = 36%) and high for the total effect (I^2 = 90%). In contrast, gathering the results of six empirical studies (Chen et al., 2019; Kullik and Petermann, 2013; Li et al., 2015; Margolese et al., 2005; Ruijten et al., 2011; Van de Walle et al., 2016) and one doctoral dissertation (Lindsay, 2007) among adolescents, the pooled estimate of indirect effect was not significant. Heterogeneity was low-moderate for the indirect effect (I^2 = 26%) and high for the total effect (I^2 = 97%).

Repetitive thinking

Build on the evidence yielded by four empirical studies (Beyderman and Young, 2016; Burnette et al., 2009; Gulum and Dag, 2014; Mohammadkhani et al., 2017) and two doctoral dissertations (Land, 2012; Rosen Marsh, 2013) with adults, the indirect effect of repetitive thinking was significant. The percentage of the total effect that was explained by the indirect effect was 45%; heterogeneity was high-moderate for the total effect (I^2 = 72%) and none for the indirect effect. However, the pooled estimate of the indirect effect among children/adolescents was not significant (Lindsay, 2007;

Margolese et al., 2005; Ruijten et al., 2011; Van de Walle et al., 2016). Heterogeneity was high for the total effect (I^2 = 88%) and absent for the indirect effect.

Brooding rumination

The brooding subtype of rumination emerged as a significant mediator between attachment insecurity and depression based on the evidence of two empirical studies (Beyderman and Young, 2016; Mohammadkhani et al., 2017) and two doctoral dissertations (Land, 2012; Rosen Marsh, 2013) with adults. The percentage of the total effect that was explained by the indirect effect was 53%; there was no heterogeneity. Brooding rumination was in turn found not significant among adolescents (Lindsay, 2007).

Other non-significant mediators

The evidence concerning the indirect effect of *behavioral hyperactivating strategies* in adult samples (Cooley et al., 2010; Wei et al., 2003) and in adolescents (Gaylord-Harden et al., 2009; Kullik and Petermann, 2013; Merlo, 2005) was not significant. Likewise, three empirical studies evaluating *coping deactivation strategies* as mediators between attachment insecurity and depressive symptoms in adults (López et al., 2001; Wei et al., 2003) and in adolescents (Gaylord-Harden et al., 2009), did not obtain a significant indirect effect. *Rumination* (as a unitary construct) was evaluated as a mediator in two studies with adolescents (Margolese et al., 2005; Ruijten et al., 2011), and the *reflection* subtype of rumination in adults (Burnette et al., 2009) and adolescents (Lindsay, 2007), but none of these mediators reached significance.

Lastly, other studies assessed the mediational effect of *emotional dysregulation* in adults (Clout and Brown, 2016; Marganska et al., 2013; Owens et al., 2018; Pickard et al., 2016) and adolescents (Brenning et al., 2012; Chen et al., 2019); *self-control* in adults (Valikhani et al., 2018) and adolescents (Li et al., 2015); and *alexithymia* in

adults (Monti and Rudolph, 2014; Owens et al., 2018; Şenkal and Işıklı, 2015), but the pooled estimates of their indirect effects were not significant.

4.2.2.3. Interpersonal domain

None of the eight mediators classified in the interpersonal domain showed significant indirect effects. Concretely, amongst studies utilizing adult samples to test the mediational effect of *self-disclosure* (Cruddas et al., 2012; Wei et al., 2005), *relational satisfaction* (Altin and Terzi, 2010; Clout and Brown, 2016; Kuan Mak et al., 2010; Paech et al., 2016; Shaver et al., 2005; Wijngaards-de Meij et al., 2007), *relational conflict* (Eberhart and Hammen, 2010; You et al., 2015), and *social self-efficacy* (Leal, 2018; Paech et al., 2016; Wei and Ku, 2007; Wei et al., 2005), the pooled estimates for the indirect effects were not significant. In addition, *perceived social support* was not significant neither in studies with adults (Keleher et al., 2010; Kuan Mak et al., 2010; You et al., 2015; Zhu et al., 2016) nor among adolescents (Liu, 2006; Silverman, 2003; Webster, 2000). Similarly, the pooled estimates for the indirect effects of *interpersonal stressors* in adults (Hankin et al., 2005) or in adolescents (Cohen et al., 2013), and *over-dependence* in adults (Altin and Terzi, 2010; Besser and Priel, 2008; Cantazaro and Wei, 2010; Dagnino et al., 2017; Koroly, 2017; Permuy et al., 2010; Wei et al., 2005) or in adolescents (Irons and Gilbert, 2005; Puissant et al., 2011), did not reach significance. Ultimately, *social comparison* tested as a mediator only with adolescents (Irons and Gilbert, 2005; Puissant et al., 2011), was not significant.

4.3. Publication bias

For the total effect (path *c*), the Egger's test yielded a *P* value of 0.00001. Further, the Trim and Fill analysis using random effects model suggested that 15 studies might be missing. Before the imputation of these potential studies, the pooled *r* was 0.16 (95%CI: 0.01-0.21). After the imputation of the 15 suggested studies, the pooled *r*

was 0.11 (95%CI: 0.06-0.16). For the indirect effect (path *a*b*), there was sign of publication bias since the Egger's test yielded a *P* value of 0.0002. The Trim and Fill procedure suggested that 20 studies were missing. Before the imputation of these studies, the pooled *r* was 0.06 (95%CI: 0.04-0.08). After the imputation of the 20 studies, the pooled *r* was 0.03 (95%CI: 0.01-0.05). Although our analyses suggested that there might be publication bias and the Trim and Fill analysis suggested to include a high number of studies, the estimates after imputation are still robust and significant.

To further evaluate the possibility that our results could be due to publication bias, we recalculated our pooled estimates under the following extreme assumptions: (1) published studies are only half of the studies identifying mediating variables between insecure attachment and depressive symptoms, (2) all unpublished studies found an *r* of 0, and (3) the unpublished studies have a sample size that is the same as the sample average of the published studies. Under these extreme assumptions, the pooled *r* for path *c* was still significant [0.08 (95%CI: 0.05-0.10)]. Similarly, the pooled *r* for path *a*b* showed significance [0.02 (95%CI: 0.01-0.03)]. As such, these analyses indicate that it is unlikely that the observed effects could have been undermined by publication bias.

5. Discussion

The present study provides the first meta-analytic estimates of the indirect effect of a wide variety of mediators that could explain the association between attachment insecurity and depression in individuals of the general population and patients with depression including all developmental stages (from infancy to adulthood). We analyzed a total of 80 studies (66 articles and 14 doctoral dissertations) which included data from 41,500 participants. As outcome, 22 different mediators belonging to cognitive, emotional and interpersonal domains were assessed. Our results support an

enduring effects model that involves different cognitive-emotional mechanisms as pathways that contribute in the association between insecure attachment and the development of depressive symptoms across time, which is in agreement with previous reviews (Malik et al., 2015; Morley and Moran, 2011). Contrary to our expectation, the meta-analytic evidence of indirect effects of certain variables pertaining to the interpersonal domain was not significant.

According to primary analyses, the influence of the different cognitive-emotional-interpersonal mediators prevails regardless of type of sample (clinical or non-clinical), sex (male or female) or insecure attachment style (anxious or avoidant). Differences were only found between studies with adults and with children/adolescents; concretely, the indirect effects of insecure attachment through these mediators were not significant in the latter group. Such findings might be explained, at least in part, by the following reasons. First, the relative limited number of studies with children or adolescents could contribute to this divergence, as the majority of studies used non-clinical adult samples. Moreover, it might be possible that the underlying mechanisms through which insecure attachment exerts its influence on childhood and adult depression might differ (Harrington et al., 1996). Nevertheless, this hypothesis needs to be confirmed by further longitudinal research with young populations to ascertain whether such a difference is indeed related to the developmental phase. Second, it is plausible that in childhood and adolescence, as the caregiving environment is relatively stable, the direct impact of early attachment experiences in predicting the development of depressive symptoms is more evident than at a later developmental stage (Groh et al., 2014; Groh et al., 2012). During adulthood, however, as individuals develop and new attachment relationships are established, it would appear that such direct path diminishes over time (Lamb et al., 1984; Lewis, 1998). In this regard, and according

with prior research (Fraley et al., 2013), our findings support that the effects of early attachment experiences on depressive symptoms might be sustained over time through relative consolidated mediators.

5.1. Cognitive domain

In line with the theoretical assertions of Bowlby (1969/1982) and Beck (1979), early insecure experiences have a strong influence on the development of different negative cognitive processes that make individuals more vulnerable to depression later in life (Morley and Moran, 2011). As expected, our results showed that insecure attachment in part increases the risk for depression by cognitive processes, particularly, via dysfunctional attitudes, self-criticism and low self-compassion.

In this meta-analysis, our results showed that *dysfunctional attitudes* could explain the association between insecure attachment and depression. In line with attachment theory, dysfunctional attitudes can be considered as cognitive products that result from negative mental representations or working models (Hazan and Shaver, 1994; Morley and Moran, 2011) and as predictors of depression in adults (Abramson et al., 2002; Scher et al., 2005). Thus, adults who experienced early insecure parent-child attachment relationships hold these relatively enduring, underlying attitudes and assumptions of themselves and the world which, in turn, predispose them to increases in depression (Cummings and Cicchetti, 1990; Gotlib and Hammen, 1992).

In addition, constant and severe self-scrutinity of oneself (i.e., *self-criticism*) (Kannan and Levitt, 2013) proved to be the mediator with the highest effect size. When self-criticism is related to depression in terms of diathesis-stress, it is postulated that individuals characterized by feelings of inferiority, guilt, and a sense of non-compliance with their own expectations and standards are vulnerable to developing introjective or self-critical depression (Blatt et al., 1982). From an attachment perspective, when

individuals experience inconsistent early caregiving, they are more likely to develop a model of the self as failure and incompetent (Bowlby, 1969/1982). Such negative feelings elicit self-criticism which initially may serve to help correct their misbehaviour and keep a good standing with others (Blatt and Homann, 1992; Zuroff and Fitzpatrick, 1995). Yet, self-critical individuals holding negative working models may systematically interprete failures as evidence of their unworthiness which will increase the appearance of depressive symptoms (Blatt, 2004).

Lastly, our results indicated that low levels of *self-compassion* had one of the highest indirect effect sizes linking insecure attachment to depression. Self-compassion is a healthy and kind attitude towards oneself in times of struggle (Neff, 2003), and appears to operate as an effective self-regulatory strategy for dealing with negative emotions (Vettese et al., 2011). In fact, self-compassion, which can be understood as the inverse of self-criticism (Neff, 2003), has been consistently associated with less depression (Krieger et al., 2013), and may help insecurely attached individuals to experience less emotional distress (Mackintosh et al., 2018). Notably, the ability to self-soothe after stressful or threatening events, which is closely related to self-compassion, develops when the child is comforted by his caregivers in early relationships (Mikulincer and Shaver, 2016). Self-compassion helps to buffer people against the negative cognitive implications of their mistakes (Körner et al., 2015; Terry and Leary, 2011). In this vein, previous studies have shown that high levels of self-compassion mediate between attachment and intrapersonal well being (Raque-Bogdan et al., 2011). Consequently, lacking self-compassion would contribute to increased self-criticism and negative self-feelings among insecurely attached people after personal failures or inadequacies, and eventually, result in more depression.

5.2. Emotional domain

Insecurely attached people struggle facing negative emotions as result of real or perceived lack of effective coping strategies (which can be very much entwined with maladaptive cognitive factors) and, in turn, are more likely to become depressed. Such maladaptive strategies to regulate emotions either hyperactivate or deactivate the attachment system (Mikulincer and Shaver, 2016). In this regard, our results support hyperactivating emotion regulation strategies as significant mediators in the link insecure attachment–depression. Particularly, individuals with anxious attachment are hypothesized to use hyperactivating strategies which include the use of worry and rumination and a tendency to overreact to their negative feelings, thus gaining support and attention from others (Cassidy, 2016; Mikulincer and Shaver, 2016). Although perhaps these strategies may be initially seen as adaptive for these individuals—particularly, within parent-child relationships in which they were shaped—, they often fail to regulate emotions and can amplify distress (Aldao et al., 2010; Malik et al., 2015). As such, individuals with an ineffective coping system as a consequence of having insecure attachment are more vulnerable to developing depression.

The present meta-analysis evidenced the significant mediational effect of *cognitive hyperactivating coping strategies*, which is in line with the research of Malik et al. (2015), who asserts that emotion dysregulation broadly explains the association between attachment insecurity and depression; however, our results detail it by identifying specific emotional mediational mechanisms that govern such association. Within this domain, *repetitive thinking*, which consists of a perseverative, constant, and relatively uncontrolled cognitive activity centered on negative features of the self and relationships (Watkins, 2008), and more specifically, *brooding rumination*, have been identified as potential mediators explaining the link attachment–depression in both clinical (Beyderman and Young, 2016) and subclinical samples (Margolese et al., 2005;

Ruijten et al., 2011). By contrast, the *reflection* subtype was not identified as a significant mediator, suggesting that it may be a less maladaptive facet of rumination. Prior findings have shown that *brooding* clearly represents the most maladaptive component of rumination and predicts the development of depressive symptoms (Burwell and Shirk, 2007; Olson and Kwon, 2008; Senra et al., 2018); however, the role of *reflection* in depressive symptoms has not been determined yet (Burwell and Shirk, 2007). Overall, evidence suggests that reflective rumination is also associated with depression, but not at the same magnitude as brooding (Olatunji et al., 2013). The present study supports the idea that insecurely attached people are likely to get trapped in a spiral of repetitive and negative thoughts (i.e., brooding), focusing their attention on fear of abandonment or failure which in turn fosters the development and maintenance of depressive symptoms.

5.3. Interpersonal domain

Despite the hypothetical mediating role that interpersonal processes could have, according to the assumptions of attachment theory (Hankin et al., 2005; Williams and Risking, 2004), the present study did not find significant estimates of their indirect effects.

The lack of significance of the variables pertaining to this domain might be partly explained by the reduced number of studies exploring such variables compared with the broad research testing cognitive-emotional mediators. Also, it is plausible that these variables may function as *moderators*, that is, they could indeed contribute to the development of depressive symptoms but interacting with negative attachment cognitions and emotional dysregulation that arise from insecure attachment relationships (Hammen et al., 1995; Hankin et al., 2005). For instance, negative cognitions and dysfunctional attitudes have been broadly associated with interpersonal

problems such as perceptions of poorer social skills and less satisfaction in social relationships (Compas et al., 2009; Rudolph, 2009), and self-reports of negative social interactions (Hammen, 2009; Lakey et al., 1994). Also, self-critical individuals emphasize achievement at the expense of interpersonal relationships, which may lead to interpersonal stress and lack of social support (Priel and Shahar, 2000) and, by the same token, less self-compasionate people have less motivation to resolve interpersonal mistakes, and in turn, experience more relationship problems (Baker and McNulty, 2011). Similarly, brooding rumination as a maladaptive emotion strategy has been associated with deficits in interpersonal functioning, such as excessive dependency on others (Gorski and Young, 2002) and impaired social problem-solving (Watkins and Moulds, 2005).

Consequently, it is possible that individuals who are vulnerable to depression because of the negative cognitive-emotion processes rooted in insecure attachment relationships are likely to perceive themselves as less socially competent and to experience more interpersonal stressors and hence, are at increased risk to develop depressive symptoms (Hammen, 2009; Hankin et al., 2005). Longitudinal research is, however, needed to further elucidate these developmental pathways to depression as mediational or moderational in nature.

6. Strenghts and Limitations

The present meta-analytic review has gathered evidence of the existing literature concerning mediating variables in the link attachment–depression, including peer-review journals, conference proceedings and doctoral dissertations, which may reduce publication bias. Moreover, to our knowledge, this is the first meta-analysis assessing the indirect effect of a wide range of cognitive, emotional and interpersonal processes that underlie the associations between insecure attachment to different attachment

figures and depression in both clinical and sub-clinical samples at any age. This knowledge represents a novelty in attachment research and allows the design of better assessments and interventions.

Despite these assets, the current study should be interpreted in the context of some limitations. First, the majority of the findings proved in this meta-analysis were provided by studies with non-clinical population and Caucasian adults, thus reducing the possibility for extrapolating the results across countries and cultures. Second, our findings were based on data from mostly cross-sectional studies (with exception of 13 empirical studies and 2 doctoral dissertations) which did not make it possible to draw definitive conclusions regarding the direction of the effects between insecure attachment–depression. Third, the heterogeneity of effects between studies was high. Nevertheless, as it is claimed by many authorities in the field, we consider that heterogeneity should be understood as a characteristic rather than a nuisance of a particular meta-analysis (Berlin, 1995). Heterogeneity describes the meta-analysis at hand and its exploration may shed light on other interesting features. In our work, we explored it further by stratifying the analysis into smaller and, theoretically, more homogenous groups (e.g., sample type, attachment style, mediators) and decided to interpret our results taking random-effects estimates as it might be the most appropriate way to deal with this issue (Higgins, 2008; Higgins et al., 2009). Fourth, the mediation ratio (Ditlevsen et al., 2005) used as a summary of the effect size for each mediator, although it is the most widely used measure, is not exempt from various limitations (Hayes, 2018; Preacher and Kelley, 2011). However, we followed recommendations of its application as the data included in the present meta-analysis reported larger total effects than indirect effects of the same sign, and were based on large samples. Fifth, due to the heterogeneity of attachment measures and that in most of the studies –

particularly among adults– authors did not specify the attachment figure (i.e., they rather examined attachment to a close person that could be a parent, romantic partner, a friend or a sibling), was not possible to stratify our data by attachment figure and run the pertinent analyses. Finally, the psychometric measures used in most of the studies were predominantly self-report measures. Therefore, some results may be subject not only to retrospective bias, but also to bias related to the the lack of insight or denial due to the emotional pain coming from acknowledging poor bonding with attachment figures (Davis and Schwartz, 1987).

7. Implications for research

Further longitudinal studies should explore mediating mechanisms implementing designs with a temporal sequence ascertaining the precedence of the variables, for instance, by applying powerful statistical techniques such as Structural Equation Modeling with bootstrapping (Hayes and Rockwood, 2017). Because of the possible association between the cognitive-emotional-interpersonal factors, it would be interesting to explore the interplay among them through sequential multiple mediation models. Additionally, more prospective studies should test mediational models with clinically depressed patients and with adolescents' samples, due to the paucity of studies with these populations, and explore the differenctial effect of different attachment figures (i.e., mother, father, peers or romantic partner) vis à vis depression. Also, future research should apply other observational measures of attachment as the majority of studies were based on self-report measures. In this regard, as recommended by attachment researchers, the Adult Attachment Interview (AAI) is acknowledged as the gold standard measure for adult samples (Main et al., 1985), and the Child Attachment Interview (CAI; Shmueli-Goetz et al., 2008) has shown the best psychometric properties for children and adolescent populations (Jewell et al., 2019). Lastly, the control for

confounding variables to rule out possible spurious effects merits particular attention. Importantly, the application of Dynamic Panel Model (DPM) is highly rcommended as it is a novel analytical approach that takes into account time-invariant confounding factors (Bollen and Brand, 2010; Wichstrøm et al., 2017), rendering estimates of prediction free of contamination from a range of potential confounders such as genes, common methods effects, and stable personality and parenting practices.

8. Clinical Implications

The negative influence of insecure attachment on depressive psychopathology into adulthood has been widely demonstrated (Dagan et al., 2018; Stovall-McClough and Dozier, 2016), but the present results expand it by indicating the specific cognitive-emotional variables that may operate as intermediate mechanisms. Since the findings of this work indicate that in adult samples, insecurely attached patients suffering from depression might tend to use hyperactivating cognitive coping strategies, such as rumination, in response to negative thoughts or dysfunctional beliefs, clinicians might benefit from the integration of Metacognitive Therapy (MCT) techniques into their interventions (Wells, 2008). Indeed, the metacognitive model considers that there is an association between early insecure attachment experiences and the development of dysfunctional metacognitive beliefs and control (Wells, 2013). Instead of focusing exclusively on changing cognitive schemas, MCT aims to modify the inflexible and perseverative cognitive processes that underlie dysfunctional thinking patterns and interfere with mood regulation. For instance, practicing *attention training* (promoting more awareness of control of thinking and experiencing how thinking and action are separate processes from negative thoughts and feelings), *detached mindfulness* (standing back from a negative thought, without responding to it) and *rumination postponement* (setting aside a rumination time per day) have been proved to be effective

even in depressed patients resistant to treatment (Wells et al., 2012). In sum, this evidence may guide clinicians working from an attachment perspective to address those cognitive-emotional processes that maintain and aggravate depressive symptoms or pose a risk for their possible development. Eventually, altering the mediational chain by which insecure attachment leads to depression may guarantee better therapeutic outcomes (Malik et al., 2015; Morley and Moran, 2011).

9. Conclusions

The results obtained in the present meta-analysis extend previous findings by showing that specific cognitive-emotion processes could be essential psychological mechanisms for explaining the pathways through which insecure attachment may increase the vulnerability to depression. However, further studies are needed to corroborate our results, particularly among children and adolescents and clinical samples. Specifically, future longitudinal studies should clarify the interplay of these mediators along with other interpersonal factors between insecure attachment and depression.

Acknowledgments: Dr. Takkouche's work is funded by a Grant from the Regional Ministry of Education, Universities and Vocational Training, Santiago de Compostela, Spain, ED431C 2018/20. Dr. Rodriguez-Cano's work is supported by The Cancer Prevention and Research Institute of Texas (CPRIT) (ID RP170259), and by the MD Anderson's Cancer Center Support Grant (CA016672) funded by the National Cancer Institute.

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Table 1

Main characteristics of the included studies

Author/s (year) Country	N	Sample characteristics (M_{age} *SD*, % female)	Design	Attachment measure	Mediation test	Mediator measure	Outcome measure	Mediator/s	Quality rating
Aderka et al. (2009) Israel	102	M_{age}=29.5, *SD*=9.0 70.6%	CS	ECR	Baron & Kenny steps (1986)	SoCS SBS LSAS-SR	BDI	- Social Anxiety	**5**
Altin & Terzi (2010) Turkey	146	M_{age}=20.34, *SD*=1.68 22.2%	CS	RSQ	Baron & Kenny steps (1986)	MRQ	BDI	- Relational satisfaction *Dependence* - Relational monitoring	**4**
Besser & Priel (2008) Israel	113	M_{age}=72.08, *SD*=3.55 46%	CS	RQ	Baron & Kenny steps (1986)	DEQ	CES-D	*Dependence* - Neediness	**5**
Beyderman & Young (2016) UK	100	M_{age}=46.60, *SD*=10.43 60%	CS	ECR	PROCESS Bootstrapping	RRS	DID	*Cognitive hyperactivating strategies* *Repetitive thinking* - Brooding rumination	**5**
Bishop et al. (2018) US	251	M_{age}=19.45 Range 18-25. 40.4%	CS	ERC-R	Path analyses SEM	IRRBS	PHQ	- Role balance	**6**
Boo (2010) US Thesis	218	M_{age}=21.5, *SD*=3.4 78.4%	CS	AAQ ECR-R	SEM	RSE	BDI-II CES-D	- Self-Esteem	**5**
Bosacki et al. (2007) Canada	7290	M_{age}=15, *SD*=1.4 52%	CS	IPPA	Baron & Kenny steps (1986) Sobel Test	RSE	CES-D	- Self-esteem	**6**
Bozanoglu et al. (2017) Turkey	374	M_{age}=16.08 59%	CS	IPPA	SEM Bootstrapping	BAFL	BSI	- Gap between experience and language	**5**
Brenning et al. (2012) Belgium	Study 1: 339 Study 2: 746	M_{age}=12.6, *SD*=0.67 63% M_{age}=12, *SD*=1.23 59%	CS	ECR-R	SEM	ERI	CDI	- Emotion dysregulation	**5**

Author/s (year) Country	N	Sample characteristics (M_{age} *SD*, % female)	Design	Attachment measure	Mediation test	Mediator measure	Outcome measure	Mediator/s	Quality rating
Burnette et al. (2009) US	221	M_{age}=19.30, *SD*=15.85 64%	CS	ECR-R	SEM	TFS b IRI RRQ	CES-D	*Cognitive hyperactivating strategies* *Repetitive thinking* - Reflection rumination - Empathy (lack) - Forgivingness	**3**
Cantazaro & Wei (2010) US	424	M_{age}=19.45, *SD*=1.88 62%	CS	ECR	SEM Bootstrapping	DEQ PSI-II	SRDS CES-D DASS	- Dependence - Self-Criticism	**5**
Chaowiang (2008) US Thesis	950	M_{age}=17, *SD*=0.9 56%	CS	IPPA	Multiple regressions analysis	ACSQ	CES-D	*Dysfunctional attitudes* -Negative cognitive Styles	**5**
Chen et al., 2018 China	1955	M_{age}=14.85, *SD*=2.86 50%	CS	IPPA	PROCESS Bootstrapping	ERQ	CES-D	*Cognitive hyperactivating strategies* - Cognitive reappraisal *Emotional dysregulation* - Expressive suppression	**7**
Chi Kuan & Bond (2010) Hong Kong & US	359	Hong Kong=150 M_{age}=20.44, *SD*=1.90 54% US=209 M_{age}=19.03, *SD*=1.23 52.1%	CS	ECR	SEM	RSS SSQ	CES-D	- Perceived Social Support from romantic partner - Relationship Satisfaction with romantic partner	**5**
Clout & Brown (2016) Australia	105	M_{age}=31.6, *SD*=4.35 100%	LO	ECR ECR-R	Baron & Kenny steps (1986) Bootstrapping	DAS	DASS EPDS	- Emotional dysregulation *Relational satisfaction* - Dyadic satisfaction	**6**
Cohen et al. (2013) China	1150	M_{age}=16.26 [14,19] 52%	LO	AAQ	Multilevel mediation Bootstrapping	ALEQ	CES-D	- Interpersonal stressors	**7** **4**

Author/s (year) Country	N	Sample characteristics (M_{age} *SD*, % female)	Design	Attachment measure	Mediation test	Mediator measure	Outcome measure	Mediator/s	Quality rating
Cooley et al. (2010) US	93	M_{age}=20.66, *SD*=5.55 100%	CS	RQ	Baron & Kenny steps (1986)	ICQ	BDI-II	*Behavioral hyperactivating strategies*: - Conflict management	
Cooper-Newark (2015) UK Thesis	225	M_{age}=17 44.4%	CS	ECR-R-GSF	PROCESS macro Bootstrap	IIP-SC	BDI-II	Affiliative interpersonal problems (Low/High): - Vindictive - Cold - Socially Avoidant - Nonassertive - Exploitable - Overly Nurturant - Intrusive - Domineering	**5**
Cruddas et al. (2012) UK	92	M_{age}=24.26, *SD*=7.84 87%	CS	AAS	Baron & Kenny steps (1986) Sobel test	ITQ-FD	DASS	- Fear of self-disclosure	**3**
Dagnino et al. (2017) Chile	70	M_{age}=41.47, *SD*=12.91 83%	CS	ECR	MACRO (Preacher & Hayes) Bootstrap	DEQ SSQ-short form	BDI	- Self-criticism - Dependence	**5**
Eberhart & Hammen (2010) US	104	M_{age}=18.82, *SD*=1.24 100%	LO	ECR-R	Baron & Kenny causal steps (1986) Sobel test	Daily Diary Romantic Life Stress Interview	BDI-II	*Relational conflict* - Romantic Conflict Stress	**6**
Farinelli & Guerrero (2011) US	194	M_{age}=67.57, *SD*=10.34 68%	CS	Attachment questionnaire (Guerrero, Farinelli & McEwan, 2009)	Baron & Kenny causal steps (1986) Sobel test	Kunce and Shaver's caregiving scale	CES-D	- Over- involved caregiving	**4**
Felton & Jowett (2015) UK	241	M_{age}=20.74, *SD*=2.23 64%	CS	CAAS	Bootstrapping MEDIATE macro	PNTS	BSI	- Need of thwarting sport	**5**
Gaylord-Harden et al. (2009) US	393	M_{age}=12.03, *SD*=.85 55%	LO	IPPA	Baron & Kenny steps (1986) SEM	CCSC	CDI	*Behavioural hyperactivating strategies* - Active - Support-seeking	**6**

Author/s (year) Country	N	Sample characteristics (M_{age} *SD*, % female)	Design	Attachment measure	Mediation test	Mediator measure	Outcome measure	Mediator/s	Quality rating
								- Distraction - Avoidant	
Gnilka et al. (2013) US	180	M_{age}=21.2 74.4%	CS	ECR-R	Baron & Kenny steps (1986) Bootstrapping	APS-R	KDS	- Maladaptive perfectionism	**5**
Graham (2018) UK Thesis	53	M_{age}=15.52, *SD*=1.15 75% female	CS	AAQ	PROCESS Boostraping	SCS RSE	RCADS	- Self-compassion - Self-esteem	**5**
Gülüm & Dag (2014) Turkey	Study 1. 992	M_{age}=20.70, *SD*=2.22 66.6%	CS	ECR-R	SEM Baron & Kenny steps (1986) Sobel test	LCS RTQ	BDI	- Locus of Control	**3**
	Study 2. 875	M_{age}=21.1, *SD*=1.90 66.4%						- Repetitive thinking	
Halpern et al. (2012) Canada	189 ambulance workers	M_{age}=37.4, *SD*=9.2 38%	CS	RSQ	Stepwise regression analysis (Baron & Kenny, 1986).	Five components of the acute stress reaction	CES-D	- Slower recovery from social withdrawal - Physical arousal following the critical incident	**2**
Han & Lee (2011) US	134	M_{age}=21.44, *SD*=1.50 57.3%	CS	IPPA	Stepwise regression analysis (Baron & Kenny, 1986) Sobel test	SOC	CES-D	- Low sense of coherence	**4**
Hankin et al. (2005) ÚS	**Study 2** 202	M_{age}=19.5, *SD*=2.08 75%	LO	AAS	SEM	DAttS RSE	IDD	- Dysfunctional attitudes - Low self-esteem	**6**
	Study 3 233	M_{age}=18.6, *SD*=0.84 70%				NLEQ		- Interpersonal stressors	
Hopkins et al. (2018) US	796	M_{age}=4.44 50.9%	LO	AQS	Path analysis SEM Bootstrapping	CBQ	DISC-YC	Effortful control	**9**
Irons & Gilbert (2005) UK	140	M_{age}=14.63 45%	CS	AQ-C	Stepwise regression analysis (Baron & Kenny, 1986)	ASCS-R ASBS	CDI	*Social comparison* - Social rank - Dependence	**4**
Joeng et al. (2017) South Corea	473	M_{age}=25.24, *SD*=3.78 39%	CS	ECR-R	SEM	SCS FSSS	CES-D	Self-compassion	**5**
Kamkar et al.	140	M_{age}=12.65, *SD*=.70	CS	ARSQ	Hierarchical	SDQ-II-GSE	CDI	*Dysfunctional*	**5**

Author/s (year) Country	N	Sample characteristics (M_{age} *SD*, % female)	Design	Attachment measure	Mediation test	Mediator measure	Outcome measure	Mediator/s	Quality rating
(2012) Canada		62.14%		CASQ-R	multiple regressions (Baron & Kenny, 1986) Sobel test			*attitudes* - Attributions for negative events - Self-esteem	
Kang et al. (2014) UK	254	Postpartum group: M_{age}=32.30, *SD*=3.53 Non-postpartum group: M_{age}=35.75, *SD*=3.43 100%	CS	RQ	Hierarchical multiple regressions (Baron & Kenny, 1986) Sobel test	RSE	BDI	- Low self-esteem	**5**
Keleher et al. (2010) US	163	M_{age}=30, *SD*=11.21 100%	CS	ECR-S	SEM Bootstrapping	LIHS MSPSS	DASS	*Perceived social support* - Perceived general support of others - Positive Feelings about being a Lesbian	**5**
Kenney (2006) US Thesis	5065	M_{age}=- *SD*=- Early-late adolescents 51.82%	CS	Parent-child attachment survey	Multiple regressions	RSE	CES-D	- Self-esteem	**5**
Kenny et al. (1993) US	207	Mage=13.17, SD=.43 44.4%	CS	PAQ	SEM	SPPA	CDI	- Low self-esteem	**5**
Kenny & Sirin (2006) US	81	M_{age}=25.98, *SD*=1.42 39.5%	CS	PAQ	Hierarchical multiple regressions (Baron & Kenny, 1986) Sobel test	ASPP	CES-D	- Low self-esteem	**5**
Kidd & Sheffield (2005) UK	191	M_{age}=27, *SD*=4 73.8%	CS	AAS-R	ANCOVA	STAI-II PSSQ	GHQ-28	- Anger - Social support	**3**
Koroly (2017) US Thesis	222	With partner: M_{age}=31.52, *SD*=11.10 77.2% Single: M_{age}=29.24, *SD*=11.05 75.6%	CS	ECR-S	Bootstrap	IOS Scale	CES-D	- Low sense of coherence *Dependence* - Desire for closeness to best friend - Desire for closeness	**6**

Author/s (year) Country	N	Sample characteristics (M_{age} *SD*, % female)	Design	Attachment measure	Mediation test	Mediator measure	Outcome measure	Mediator/s	Quality rating
								to romantic partner	
Kullik & Petermann (2013) Germany	248	M_{age}=14.41, *SD*=1.39 51.2%	CS	IPPA	Hierarchical multiple regressions (Baron & Kenny, 1986) Bootstrapping	REQ	CES-D	*Cognitive hyperactivating coping strategies* - Internal emotion regulation *Behavioural hyperactivating coping strategies* - External emotion regulation	**6**
Land (2012) US Thesis	120	M_{age}=22, *SD*=2.87	CS	ECR-S	Baron & Kenny steps	RRS	CES-D	*Cognitive hyperactivating strategies* *Repetitive thinking* -Brooding rumination	**4**
Leal (2018) US/Mexico Thesis	235 360	Mexican-american sample: M_{age}= 22.77 (SD = 3.77) 63.80% Mexican sample: M_{age} = 19.83, *SD*= 2.02 45.60%	CS	ECR-S	PROCESS Bootstrap	Shere's Social self-efficacy Scale	CESD-R	- Social self-efficacy	**5**
Lecompte et al. (2014) Canada	68	T1: M_{age}=3.7, *SD*=4.4 T2: M_{age}=11.7, *SD*=4.3 48.5%	LO	Separation-reunion procedure	Hierarchical multiple regressions (Baron & Kenny, 1986) Bootstrapping	SPPC	DIC- DS	- Low self-esteem	**6**
Lee & Hankin (2009) US	350	M_{age}=14.5, *SD*=1.4 57%	LO	ECR	SEM	CDAS SPPC	CDI	- Dysfunctional attitudes - Self-esteem	**8**
Lee & Koo (2015) Korea	176	M_{age}=32.84, *SD*=3.45 100%	CS	K-RQ	Process Bootstrapping	MES K-RSE	K-BDI	- Low self-esteem	**5**
Li et al. (2015) Italy China	2632	China=1305 M_{age}=14.07, *SD*=1.37 49.6% Italy=1327 M_{age}=13.84, *SD*=1.46	CS	IPPA-R	SEM Bootstrapping	ASC	CDI	- Self-control	**6**

Author/s (year) Country	N	Sample characteristics (M_{age} *SD*, % female)	Design	Attachment measure	Mediation test	Mediator measure	Outcome measure	Mediator/s	Quality rating
		53.05%							
Linares et al. (2016) Spain	505	M_{age}=26.72, *SD*=11.16 76.3%	CS	RQ	PROCESS Bootstrapping	FFMQ	CES-D	- Metacognition	**6**
Lindsay (2007) US Thesis	117	Mage=12.6, SD=1.03 60%	CS	PAQ	Path analyses	RRS	CES-D	*Cognitive hyperactivating strategies* *Repetitive thinking* -Brooding rumination -Reflection rumination	**5**
Liu (2006) Taiwan	1144	M_{age}=14, [13-14] 45.63%	CS	CPS	SEM	CESBQ PSS-Fr	CDI	*Perceived social support* - Peer support - Social expectation	**5**
Lopez et al. (2001) US	55	M_{age}=21.75, *SD*=4.74 69.09%	CS	ECR-S	Hierarchical multiple regressions (Baron & Kenny, 1986)	PF-SOC	DACL	- Deactivating coping strategies - Cognitive hyperactivating coping strategies	**5**
Love & Murdock (2012) US	167	M_{age}=20.5, *SD*=2.39 56%	CS	PAQ	SEM	SEQ-G TI-GT	COPAS-D	- Low self-esteem -Trustworthiness	**5**
Marchand-Reilly (2009) US	110	M_{age}=19.85 75.45%	CS	AAS	Baron & Kenny steps	CRBQ	CES-D	- Attacking conflict behaviours	**4**
Marganska et al. (2013) US	284	M_{age}=20.5, *SD*=4.8 80.9%	CS	RSQ	SEM Hierarchical multiple regressions (Baron & Kenny, 1986) Sobel test	DERS	BDI-II	- Emotion dysregulation	**5**
Margolese et al. (2005) Canada	134	M_{age}=16.95, *SD*=.74 65.7%	CS	RQ	Hierarchical regression analysis	Vignette task: coping items about rumination and maladaptive attributions	BDI	*Dysfunctional attitudes* - Maladaptive attributions *Cognitive*	**5**

Author/s (year) Country	N	Sample characteristics (M_{age} *SD*, % female)	Design	Attachment measure	Mediation test	Mediator measure	Outcome measure	Mediator/s	Quality rating
								hyperactivating coping strategies *Repetitive thinking* - Rumination	
Marks et al. (2016) Australia	343	M_{age}=33.93, *SD*=12.29 78.13%	CS	ECR	SEM Bootstrap	AES	GHQ-28	- Emotional intelligence	**5**
Martin (2001) US Thesis	112	M_{age}=43.3, *SD*=14.1 56%	CS	RQ	Hierarchical Regression Analysis	CTI	SRDS	*Dysfunctional attitudes* -Cognitive Triad	**6**
Martin (2008) US Thesis	174	M_{age}=32, *SD*=9.9 0%	CS	ASQ	Regression Analysis	ICG-R	BDI-II	Complicated Grief	**5**
McDermott et al. (2015) US	2644	M_{age}=22.5, *SD*=5.26 46%	CS	ECR-S	SEM Bootstrapping	ATHS	CCAPS-62	- Hope	**6**
Mendes (2019) Portugal	91 adults	M_{age}=24, *SD*=5.26 100%	CS	AQ-C	SEM	SSPS	DASS	- Social safeness	**3**
Merlo (2005) US Thesis	150	M_{age}=15.75, *SD*=1.13 53%	CS	AAQ	Baron & Kenny steps Bootstrap	CSI	CES-D	*Behavioral hyperactivating strategies* -Coping strategies	**5**
Milne and Greenway (2007) *Australia*	82	M_{age}=15.25, *SD*=0.68 63%	CS	IPPA-Parent	Regression analyses Sobel test	DEQ-A SII IPPA-Peers	SRDS	- Peer attachment - Anaclictic depression - Separation-individuation - Introjective depression	**3**
Mohammadkhani et al. (2018) Iran	175	M_{age}= 21, *SD* = 2.75 57.7%	CS	AAQ	PROCESS Bootstrapping	RRS	BDI-II	*Cognitive hyperactivating coping strategies* *Repetitive thinking* - Brooding rumination	**3**
Monti & Rudolph (2014) US	417	M_{age}=37.83, *SD*=6.51 100%	LO	RSQ	SEM Bootstrapping	EAQ	MASQ	- Alexithymia	**7**
Ng & Hou (2017) China	284	M_{age}=21.75, *SD*=2.43 82.4%	CS	ECRRS (Chinese version)	SEM	10 items Non-validated	BDI-II	- Contentment-Intensity - Contentment-	**5**

Author/s (year) Country	N	Sample characteristics (M_{age} *SD*, % female)	Design	Attachment measure	Mediation test	Mediator measure	Outcome measure	Mediator/s	Quality rating
Nichols (2005) UK Thesis	147	M_{age}=23.78, *SD*=7.37 81.8%	LO	ECR-S PBI	Baron & Kenny steps	The Defeat Scale, Social Comparison scale	The Symptom Check List - 90 Depression Subscale	Duration Involuntary Defeat Strategy	**5**
Owens et al. (2018) US	336	M_{age}=19.26, *SD* = 3.70 64%	CS	ECR-S	PROCESS Bootstrapping	DERS	DASS	- Emotional dysregulation *Alexithymia* - Lack of awareness	**6**
Paech et al. (2015) Germany	343	M_{age}=34.0 38.2%	CS	ECRQ	SEM Bootstrapping	Ryff's scales of Psychological Well-being-short version	CES-D	*Social self-efficacy* - Environmental mastery *Relational satisfaction* - Positive relations with others	**5**
Permuy et al. (2010) Spain	164	M_{age}=21.26, *SD*=2.30 86.8%	CS	RQ	Hierarchical multiple regressions (Baron & Kenny, 1986) Sobel test	PSI-II	BDI	- Dependence *Self-criticism* - Sociotropy - Autonomy	**4**
Pickard et al. (2016) Australia	151	M_{age}=21.28, *SD*=5.89 73.5%	CS	RQ	PROCESS Bootstrapping	FFMQ DERS	DASS-42	- Mindfulness - Emotional dysregulation	**5**
Puissant et al. (2011) Belgium	225	M_{age}=15.67, *SD*=1.83 72%	CS	IPPA AQ-C	Multiple regression model	ASCS-R ASBS	CES-D	- Dependence *Social comparison* - Social rank	**4**
Reinecke & Rogers (2001) US	54	M_{age}=38, *SD*=13.6 57.4%	CS	AAS-R	Hierarchical multiple regressions (Baron & Kenny, 1986)	DAttS	BDI	Dysfunctional attitudes	**5**

Author/s (year) Country	N	Sample characteristics (M_{age} *SD*, % female)	Design	Attachment measure	Mediation test	Mediator measure	Outcome measure	Mediator/s	Quality rating
Reis & Grenyer (2002) Australia	245	M_{age}=21.38, *SD*=5.88 75.9%	CS	RSQ RQ	Hierarchical multiple regressions (Baron & Kenny, 1986)	MPS	BDI DEQ	*Maladaptive perfectionism* - Socially prescribed perfectionism - Self-Oriented perfectionism	**5**
Riggs et al. (2009) US	317	M_{age}=21.01, *SD*=3.65 66%	CS	RSQ	SEM	STAI-T	CES-D	- Chronic Anxiety	**6**
Roberts et al. (1996) US	255	M_{age}=20.3, *SD*=5.1 62.8%	LO	AAS	Multiple regression	RSE DAttS RSE	IDD	- Dysfunctional attitudes - Self-esteem	**4**
Roelofs et al. (2011) Netherlands	222	M_{age}=14.7, *SD*=1.6 62.1%	CS	IPPA	Regression analysis Bootstrapping	YSQ	BDI-II	- Early maladaptive schemas	**5** **6**
Rosen Marsh (2013) UK Thesis	356	M_{age}=34.4, *SD*=10.9 77.3%	CS	ECR-S	Multiple mediation bootstrapping analyses PROCESS	SCS-SF FSCRS RRS	CESD-SF	- Self-criticism - Self-compassion - Brooding rumination - Hated self-criticism	
Rosenthal et al. (2014) UK	104	20–30 years old 68.3%	CS	ECRRS-partner subscale	Hierarchical multiple regressions (Baron & Kenny, 1986) Bootstrapping	Group identification	BDI	- Group identification	**6**
Ruitjen et al. (2011) Netherlands	455	M_{age}=14.3, *SD*=1.3 55.8%	CS	IPPA	Bootstrapping	RRS	BDI-II	*Cognitive hyperactivating coping strategies* *Repetitive thinking* - Rumination	**6**
Safford et al. (2004) US	167	M_{age}=18.64, *SD*=2.32 65.3%	CS	PBI IPPA AORI RAAS	Hierarchical regression analysis	CSQ	MASQ BDI	*Dysfunctional attitudes* - Cognitive style	**5**
Şenkal & Işikli (2015) Turkey	417	*M*=19.9, *SD*=2.1 76.3%	CS	ECR-R	Hierarchical Regression Analysis	TAS-20	BDI	- Alexithymia	**5**

Author/s (year) Country	N	Sample characteristics (M_{age} *SD*, % female)	Design	Attachment measure	Mediation test	Mediator measure	Outcome measure	Mediator/s	Quality rating
Shaver et al. (2005) US	122	M_{age}=20 *Range* = 17-28 50%	CS	ECR	Sobel test Hierarchical Regression Analyses	ERSS PRQC	CES-D	*Relational satisfaction* - Perceived relationship quality	**4**
Shochet et al. (2008) Australia	153	M_{age}=15.2, *SD*=1.48 50.3%	CS	PAQ	Hierarchical multiple regressions (Baron & Kenny, 1986) Sobel test	PSSM	CDI	- School connectedness	**5**
Silverman (2003) Canada Thesis	451	M_{age}=16.02, *SD*=1.39 61%	LO	RSQ RQ	SEM	PSS SSFI	BDI-II CES-D	- Perceived social support	**7**
Smagur (2018) US Thesis	301	M_{age}=19.52, *SD* = 1.24 100%	CS	ECR	SEM	SST	CES-D	*Dysfunctional attitudes* -Negative interpretation bias	**7**
Smojver-Azic et al. (2015) CroatiSuzuki	219	M_{age}=19.02, *SD*=1.14 65.29%	CS	ECR~~I~~	Hierarchical Regression Analysis	BPNS Scale - general version (croatian version) SACQ-emotional adjustment subscale	BDI-II	- Emotional adjustment - Psychological needs	**5**
Sudol (2005) US Thesis	206	M_{age}=25.4, *SD*=8.3	CS	ECR	SEM	BSRI	BDI-II CES-D	- Agency - Nurturance	**5**
Sutin & Gillath (2009) US	Study 1 454 Study 2 534	Study 1 M_{age}=19.69, *SD*=1.66 64% Study 2 M_{age}=19.3, *SD*=2.1 62%	CS	ECR	Bootstrapping Sobel test	Sef-defining memory questions	MASQ	- Memory coherence - Emotional intensity - Negative affective content of memory	**5**
Suzuki & Tomoda (2015) Japan	342	M_{age}=13.5, *SD*=2.4 56.4%	CS	IWMQ	SEM	RSE	BDSRS-C	- Low self-esteem	**7**
Vahedi et al. (2016) Iran	285	*Mage*=23.60, *SD*=1.43 Range=22-26 64%	CS	AAS	SEM	CERQ	DASS	*Cognitive hyperactivating coping strategies* - Positive	**5**

Author/s (year) Country	N	Sample characteristics (M_{age} *SD*, % female)	Design	Attachment measure	Mediation test	Mediator measure	Outcome measure	Mediator/s	Quality rating
								cognitive emotion regulation - Negative cognitive emotion regulation	
Valikhani et al. (2018) Iran	400	M_{age}=24.75, *SD*=3.74 49.75%	CS	AAS-R	PROCESS Bootstrapping	ISK; MAAS; SCoS; SCS-SF	DASS	*Cognitive hyperactivating coping strategies* - Self-knowledge - Self-control - Self-compassion - Mindfulness	**5**
Van de Walle et al. (2016) Belgium	Study 1 390 children Study 2 157 children	Study 1 M_{age}=11.25, *SD*=0.65 53% Study 2 M_{age}=10.91, *SD*=0.87 52%	CS	ECR-RC	PROCESS Bootstrapping	CRSQ-ext-Brooding subscale PTMQ	CDI CBCL Withdrawn -Depressed scale EATQ-R	*Cognitive hyperactivating coping strategies* - Repetitive thinking about negative affect - Repetitive thinking about negative affect - Repetitive thinking about mother	**7**
Wang (2007) US Thesis	480	M_{age}=16.81, *SD*=0.91 50%	CS	RSQ-C	SEM	DFPS	CHI-A SAED-R ADS	- Piety	**6**
Webster (2000) US Thesis	163	M_{age}=14.41, *SD*=0.57 52.15%	CS	PAQ	Regression analysis	SSSC	CDI	- Perceived Social Support	**3**
Wei et al. (2003) US	515	M_{age}=18.93, *SD*=2.26 68%	CS	AAS	SEM Sobel test	PF-SOC	BDI	- Deactivating coping strategies - Behavioral hyperactivating coping strategies - Cognitive hyperactivating coping strategies	**5**
Wei et al. (2004)	310	M_{age}=19.27, *SD*=1.88 73%	CS	ECR-S	SEM Bootstrap Sobel test	APS-R FMPS	BHS BDI	- Maladaptive perfectionism	**5**
Wei et al. (2005b)	425	M_{age}=19.38, *SD*=1.59 61%	CS	ECR-S	SEM Bootstrap	BFNE FSRQ	CES-D SRDS	*Dependence* - Need for	**5**

Author/s (year) Country	N	Sample characteristics (M_{age} *SD*, % female)	Design	Attachment measure	Mediation test	Mediator measure	Outcome measure	Mediator/s	Quality rating
						RMLAM		reassurance from others - Self-reinforcement	
Wei et al. (2005c)	308	M_{age}=18.31, *SD*=0.47 59%	LO	ECR-S	SEM Bootstrap	DDI UCLA-3	CES-D	- Social self-efficacy - Self-disclosure - Loneliness	**5**
Wei et al. (2005a)	299	M_{age}=19.73, *SD*=2.92 68%	CS	ECR-S	SEM Bootstrap	BPNS PFQ UCLA-3	CES-D SRDS DASS	- Basic psychological needs satisfaction	**4**
Wei et al. (2006)	372	M_{age}=20.01, *SD*=1.07 59%	LO	ECR-S	SEM Bootstrap	APS-R FMPS	CES-D	*Cognitive hyperactivating coping strategies* - Ineffective coping - Maladaptive perfectionism	**7**
Wei et al. (2007)	390	M_{age}=19.38, *SD*=1.54 63%	CS	ECR	SEM Bootstrap	SDPS RSE SSE-Social Self-Efficacy subscale	CES-D	- Social-self efficacy - Low self-esteem - Self-defeating patterns	**5**
Wijngaards-de Meij et al. (2007) Neetherland	438	M_{age}=42.2, *SD*=9.1 50%	LO	AAS	Multilevel regression analysis	RISS	ICG SCL-90 (depression subscale)	*Relational satifaction* -Marital satisfaction	**6**
Williams et al (2004) US	291	M_{age}=22.5, *SD*=7.20 71.5%	CS	ECR	Multiple regression (Baron & Kenny, 1986) Sobel test	LMSQ AttSQ	BDI-II BAI	*Dysfunctional attitudes* - Cognitive vulnerabilities	**3**
Ying et al. (2007) US	353	M_{age}=20.23, *SD*=1.77 50.7%	CS	IPPA	Multiple regression (Baron & Kenny, 1986) Sobel test	SOC	CES-D	- Low sense of coherence	**6**
You et al. (2015) US China	Chinese sample 153 American	M_{age}=20.44, *SD*=1.90 54% M_{age}=19.03, *SD*=1.23	CS	ECR	SEM Bootstrap	SSQ CM	CES-D-10	- Perceived social support - Relational conflict	**6**

Author/s (year) Country	N	Sample characteristics (M_{age} *SD*, % female)	Design	Attachment measure	Mediation test	Mediator measure	Outcome measure	Mediator/s	Quality rating
	sample 214	53%							
Zakalik & Wei (2006) US	234	M_{age}=37, *SD*=13.52 0%	CS	ECR-S	SEM Bootstrap	GALOSI–F PPS ASSIS- PD	CES-D DASS	- Perceived discrimination	**6**
Zhu et al. (2016) US/ China	Chinese sample 363	M_{age}=19.83, *SD*=1.35 63.1%	CS	ECR-S	PROCESS Bootstrap	MSPSS	DASS	- Perceived social support	**6**
	American sample 363	M_{age}=19.83, *SD*=1.35 63.1%							

Note: Authors written in bold = Studies included in the meta-analysis; CS = Cross-sectional; LO = Longitudinal; SEM = Structural Equation Modeling; **Attachment measures:** AAQ = Adolescent Attachment Questionnaire; AAS = Adult Attachment Scale; AAS-R = Adult Attachment Scale; AORI = Attachment and Object Relations Inventory; AQ-S = Attachment Questionnaire-Sort; AQ-C = Attachment Questionnaire for Children; ARSQ = Adolescent Relationship Scale Questionnaire; CAAS = Coach–Athlete Attachment Scale; CASQ-R = Children's Attributional Style Questionnaire-Revised; CPS = Child's Perception of Security; ECR = Experiences in Close Relationships Questionnaire; ECRQ = Experiences in Close Relationships Questionnaire; ECR-R = Experiences in Close Relationships-Revised Questionnaire; ECR-RC = Experiences in Close Relationships Scale-Revised; ECRRS = Experiences in Close Relationships Relationship Structures; ECR-R-GSF = Experiences in Close Relationships-Revised- General Short Form; ECR-S = Experiences in Close Relationship Scale-Short Form; IPPA = Inventory of Parent and Peer Attachment; IPPA-R = Inventory of Parent and Peer Attachment-Revised; IWMQ = Internal Working Models Questionnaire; K-RQ = Korean Version of the Relationship Questionnaire; PAQ = Parental Attachment Questionnaire; PBI = Parental Bonding Instrument; RQ = The Relationships Questionnaire; RSQ = The Relationship Scales Questionnaire; RSQ-C = Relationships structures questionnaire-Chinese. **Mediators measures:** ACSQ = Adolescent Cognitive Style Questionnaire; AES = Assessing emotions scale; ALEQ = Adolescent Life Events Questionnaire; APS-R = Almost Perfection Scale–Revised; ATHS = Adult Trait Hope Scale; AttSQ = Attributional Style Questionnaire; ASC = Adolescent Self-Consciousness Questionnaire; ASCS-R = Adolescent Social Comparison Scale-Revised; ASBS = Adolescent Submissive Behavior Scale; ASPP = Adult Self-Perception Profile; ASSIS-PD = Acculturative Stress Scale for International Student- Perceived Discrimination; BAFL = Beliefs about the Functions of Language Scale; BAI = Beck Anxiety Inventory; BFNE = Brief Fear of Negative Evaluation; BPNS = Basic Psychological Needs Satisfaction Scale; BSRI = Bern Sex Role Inventory; CBQ = Children's Behavior Questionnaire; CCSC = Children's Coping Strategies Checklist; CDAS = Children's Dysfunctional Attitudes Scale; CERQ = Cognitive Emotion Regulation Questionnaire; CESBQ = Children's Expectation of Social Behavior Questionnaire; CM = Conflict Measure; CRBQ = Conflict-Resolution Behavior Questionnaire; RSQ-ext = Children's Response Styles Questionnaire-Extended; CSI = Coping Strategy Indicator ; CSQ = Cognitive Style Questionnaire; CTI = Cognitive Triad Inventory; DDI = Distress Disclosure Index; DAttS = Dysfunctional Attitudes Scale; DAS = Dyadic Adjustment Scale; DEQ = Depressive Experiences Questionnaire; DEQ-A = Depressive Experiences Questionnaire for Adolescents; DERS = Difficulties in Emotion Regulation Scale; DFPS = Dual Filial Piety Scale; EAQ = Emotional Awareness questionnaire; ERI = Emotion Regulation Inventory; ERQ = Emotion Regulation Questionnaire; ERSS = Excessive Reassurance Seeking Scale; FFMQ = Five Factors Questionnaire Mindfulness; FMPS = Multidimensional Perfectionism Scale; FSCRS = Forms of Self-Criticising/Attacking & Self-Reassuring Scale; FSRQ = Frequency of Self-Reinforcement Questionnaire; FSSS = Fear of Compassion for Self-Scale; GALOSI-F = Gay and Lesbian Oppressive Situations Inventory—Frequency; ICG-R = Inventory of Complicated Grief-Revised; ICQ = Interpersonal Competence Questionnaire; IIP-SC = Inventory of Interpersonal Problems-Short Circumplex Form; IOS Scale = The Inclusion of Other in the Self; IPPA = Inventory of Parent and Peer Attachment; IRRBS = Individual and Relations Role Balance Scale; IRI = Interpersonal Reactivity Index; ISK = Integrative Self-Knowledge Scale; ITQ-FD = Interpersonal Trust Questionnaire- Fear Disclosure; K-RSE = Korean-Rosenberg Self-Esteem Scale; LCS = Locus of Control Scale; LIHS = Lesbian Internalized Homophobia Scale; LSAS-R = Liebowitz Social Anxiety Scale-Self-Report; MAAS = Mindful Attention Awareness Scale; MES = Maternal Efficacy Scale; MPS = The Multidimensional Perfectionism Scale; MRQ = Multidimensional Relationship Questionnaire; MSPSS = Multidimensional Scale of Perceived Social Support; NLEQ = Negative Life Events Questionnaire; PFQ = Personal Feelings Questionnaire; PF-SOC = Problem-Focused Style of Coping; PNTS = Psychological Need Thwarting Scale (PNTS); PPS = Perceived Prejudice Scale; PSI-II = Personal Style Inventory-II; PSS = Perceived Social Support Scale; PSS-Fr = Perceived Social Support –Friends; PSSM = Psychological Sense Of School Membership; PSSQ = Perceived Social Support Questionnaire; PTMQ = Perseverative Thinking about Mother Questionnaire; REQ = Regulation of Emotion Questionnaire; RISS = Relational Interaction Satisfaction Scale; RMLAM = Revised Martin-Larsen Approval Motivation scale; RRQ = Rumiation-Reflecction Questionnaire; RRS = Ruminative Responses Scale; RSE = Rosenberg Self-Esteem Scale; RSS = Relationship Satisfaction Scale; RTQ = Repetitive Thinking Questionnaire ; SACQ = Student Adaptation to College Questionnaire; SBS = Submissive Behavior Scale; SCoS = Self-Control Scale; SDPS = Self-Defeating Personality Scale; SoCS = Social Comparison Scale; SCS = Self-Compassion Scale; SCS-SF = Self-Compassion Scale Short Form; SDQ-II-GSE = Self-Description Questionnaire II, General Self-Esteem; SEQ = Self-Steem Questionnaire; SOC = Sense of Coherence; SPPA = Self-Perception Profile for Adolescents; SPPC = Self-Perception Profile for Children; SSI = Separation-Individuation Inventory; SSPS = Social Safeness and Pleasure Scale; SSQ = Social Support Questionnaire; SSFI = Social Support Functions Inventory; SSSC = Social Support Scale for Children; SST = Scrambled Sentences Test; STAI-II = State Trait Anger Inventory-2 version; TAS-20 = Toronto Alexithymia Scale; TFS = Trait Forgivingness Scale; TI-GT = Trust Inventory Generalized Trust Subscale; UCLA-3 = UCLA Loneliness Scale–Version 3; YSQ = Young Schema Questionnaire. **Outcome measure:** ADS = Adolescent Depression Scale; BDI = Beck depression inventory; BDI-II = Beck Depression Inventory-II; BDSRS-C = Birleson Depression Self-Rating Scale for Children; BHS = Beck Hopelessness Scale; BSI = Symptom Inventory; CBCL = Child Behavior Checklist;

CCAPS-62 = Counseling Center Assessment of Psychological Symptoms-62; CES-D = Center for Epidemiological Studies Depression Scale; CESD-R = Center for Epidemiological Studies Depression Scale Revised; CES-D-10 = Center for Epidemiological Studies Depression Scale-10 items; CESD-SF = Center for Epidemiological Studies Depression Short Form; CDI = Children's Depression Inventory; CHI-A = Chinese Happiness Inventory-Adolescent; COPAS = Comprehensive Personality and Affect Scales; DACL = Depression Adjective Checklist, Forms F and G; DASS = Depression Anxiety Stress Scale-short version; DASS-42 = Depression Anxiety Stress Scale; DEQ = Depressive Experiences Questionnaire; DIC-DS = Dominic Interactive Questionnaire- Depression subscale; DID = Diagnostic Inventory of Depression; DISC-YC = Diagnostic Interview Schedule for Children-Parent Scale—Young Child; EATQ-R = The Early Adolescent Temperament Questionnaire-Revised; EPDS = Edinburgh Postnatal Depression Scale; GHQ-28 = General Health Questionnaire-28; ICG = Inventory of Complicated Grief; IDD = Inventory to Diagnose Depression; K-BDI = Korean-Beck Depression Inventory; KDS = Kandel Depressive Symptoms; MASQ= Mood And Anxiety Symptoms Questionnaire; PHQ = Patient Health Questionnaire; RCADS = Revised Child Anxiety and Depression Scale-Short Version; SCL-90 Depression = Symptom Checklist-90; SAED-R = Scale of Assessing Emotional Disturbance-Revised; SRDS = Self-Rating Depression Scale; SRDS = Zung Self-Rating Depression Scale.

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Table 2

Quality assessment of the included studies

	Aim clear	Design appropriate to aim	Sample representative	Psychometric characteristics	Acceptable methods of data analysis	Changes in M preceded changes in Y	Changes in X preceded changes in M	Clear findings	Control confounding factors	Final Rating
Aderka et al. (2009)	1	1	0	1	1	0	0	1	0	**5**
Altin & Terzi (2010)	1	1	0	1	0	0	0	1	0	**4**
Besser & Priel (2008)	1	1	1	0	0	0	0	1	1	**5**
Beyderman & Young (2016)	1	1	0	1	1	0	0	1	0	**5**
Bishop et al. (2018)	1	1	0	1	1	0	0	1	1	**6**
Boo (2010) Thesis	1	1	0	1	1	0	0	1	0	**5**
Bosacki et al. (2007)	1	1	1	1	0	0	0	1	1	**6**
Bozanoglu et al. (2017)	1	1	0	1	1	0	0	1	0	**5**
Brenning et al. (2012)	1	1	0	1	1	0	0	1	0	**5**
Burnette et al. (2009)	1	1	0	0	1	0	0	0	0	**3**
Cantazaro & Wei (2010)	1	1	0	1	1	0	0	1	0	**5**
Chaowiang (2008) Thesis	1	1	0	1	0	0	0	1	1	**5**
Chen et al. (2018)	1	1	1	1	1	0	0	1	1	**7**
Clout & Brown (2016)	1	1	1	1	0	0	0	1	1	**6**
Chikuan & Bond (2010)	1	1	0	0	1	0	0	1	1	**5**
Cohen et al. (2013)	1	1	1	1	1	0	0	1	1	**7**
Cooley et al. (2010)	1	1	0	1	0	0	0	1	0	**4**
Cooper-Newark (2015) Thesis	1	1	0	1	1	0	0	1	0	**5**
Cruddas et al. (2012)	0	1	0	1	0	0	0	1	0	**3**
Dagnino et al. (2017)	1	1	0	1	1	0	0	1	0	**5**
Eberhart & Hammen (2010)	1	1	0	1	1	0	0	1	1	**6**
Farinelli & Guerrero (2011)	1	1	0	1	0	0	0	1	0	**4**
Felton & Jowett (2015)	1	1	0	1	1	0	0	1	0	**5**
Gaylord-Harden et al. (2009)	1	1	0	1	1	0	0	1	1	**6**
Gnilka et al. (2013)	1	1	0	1	1	0	0	1	0	**5**
Graham (2018) UK Thesis	1	1	0	1	1	0	0	1	0	**5**
Gülüm & Dag (2013)	1	1	0	1	0	0	0	0	0	**3**
Halpern et al. (2012)	0	1	0	1	0	0	0	0	0	**2**
Han & Lee (2011)	0	1	0	1	0	0	0	1	1	**4**
Hankin et al. (2005)	1	1	0	1	1	0	0	1	1	**6**
Hopkins et al. (2019)	1	1	1	1	1	1	1	1	1	**9**
Irons & Gilbert (2005)	1	1	0	1	0	0	0	1	0	**4**
Joeng et al. (2017)	1	1	0	1	1	0	0	1	0	**5**
Kamkar et al. (2012)	1	1	0	1	0	0	0	1	1	**5**
Kang et al. (2014)	1	1	0	1	0	0	0	1	1	**5**
Keleher et al. (2010)	1	1	0	1	1	0	0	1	0	**5**
Kenney (2006) Thesis	1	1	1	1	0	0	0	0	1	**5**
Kenny et al. (1993)	1	1	0	1	1	0	0	1	0	**5**
Kenny & Sirin (2006)	1	1	0	1	0	0	0	1	1	**5**
Kidd & Sheffield (2005)	1	1	0	0	0	0	0	1	0	**3**
Korolly (2017) Thesis	1	1	0	1	1	0	0	1	1	**6**
Kullik & Petermann (2013)	1	1	0	1	1	0	0	1	1	**6**
Land (2012) Thesis	1	1	0	1	0	0	0	1	0	**4**
Leal (2018) Thesis	1	1	0	1	1	0	0	1	0	**5**
Lecompte et al. (2014)	1	1	0	1	1	0	0	1	1	**6**
Lee & Hankin (2009)	1	1	1	1	1	1	0	1	1	**8**

	Aim clear	Design appropriate to aim	Sample representative	Psychometric characteristics	Acceptable methods of data analysis	Changes in M preceded changes in Y	Changes in X preceded changes in M	Clear findings	Control confounding factors	Final Rating
Lee & Koo (2015)	1	1	0	1	1	0	0	1	0	**5**
Li et al. (2015)	1	1	0	1	1	0	0	1	1	**6**
Linares et al. (2016)	1	1	0	1	1	0	0	1	1	**6**
Lindsay (2007) Thesis	1	1	0	1	1	0	0	1	0	**5**
Liu (2006)	0	1	1	1	1	0	0	1	0	**5**
Lopez et al. (2001)	1	1	0	1	0	0	0	1	1	**5**
Love & Murdock (2012)	1	1	0	1	1	0	0	1	0	**5**
Marchand-Reilly (2009)	1	1	0	1	0	0	0	1	0	**4**
Marganska et al. (2013)	1	1	0	1	1	0	0	1	0	**5**
Margolese et al. (2005)	1	1	0	1	0	0	0	1	1	**5**
Marks et al. (2016)	1	1	0	1	1	0	0	1	0	**5**
Martin (2001) Thesis	1	1	1	1	0	0	0	1	1	**6**
Martin (2008) Thesis	1	1	1	1	0	0	0	1	0	**5**
McDermott et al. (2015)	1	1	1	1	1	0	0	1	0	**6**
Mendes (2019)	0	1	0	0	1	0	0	1	0	**3**
Merlo (2005) Thesis	1	1	0	1	1	0	0	1	0	**5**
Milne & Greenway (2007)	1	1	0	0	1	0	0	0	0	**3**
Mohammadkhani et al. (2018)	1	1	0	0	1	0	0	0	0	**3**
Monti & Rudolph (2014)	1	1	0	1	1	1	1	1	0	**7**
Ng & Hou (2017)	1	1	0	1	1	0	0	1	0	**5**
Nichols (2005) Thesis	1	1	1	1	0	0	0	1	0	**5**
Owens et al. (2018)	1	1	1	1	1	0	0	1	0	**6**
Paech et al. (2015)	0	1	1	1	1	0	0	1	0	**5**
Permuy et al. (2010)	1	1	0	1	0	0	0	1	0	**4**
Pickard et al. (2016)	1	1	0	1	1	0	0	1	0	**5**
Puissant et al. (2011)	1	1	0	0	0	0	0	1	1	**4**
Reinecke & Rogers (2001)	1	1	1	1	0	0	0	1	0	**5**
Reis & Grenyer (2002)	1	1	0	1	0	0	0	1	1	**5**
Riggs et al. (2009)	1	1	0	1	1	0	0	1	1	**6**
Roberts et al. (1996)	1	1	0	1	0	0	0	1	0	**4**
Roelofs et al. (2011)	1	1	1	0	1	0	0	1	0	**5**
Rosen Marsh (2013) Thesis	1	1	1	1	1	0	0	1	0	**6**
Rosenthal et al. (2014)	1	1	1	1	1	0	0	1	0	**6**
Ruitjen et al. (2011)	1	1	1	1	1	0	0	1	0	**6**
Safford et al. (2004)	1	1	1	1	0	0	0	0	1	**5**
Şenkal & Işikli (2015)	1	1	1	1	0	0	0	1	0	**5**
Shaver et al. (2005)	1	1	1	0	0	0	0	1	0	**4**
Shochet et al. (2008)	1	1	1	1	0	0	0	1	0	**5**
Silverman (2003) Thesis	1	1	1	1	1	0	0	1	1	**7**
Smagur (2018) Thesis	1	1	1	1	1	0	0	1	1	**7**
Smojver-Azic et al. (2015)	1	1	1	1	0	0	0	1	0	**5**
Sudol (2005) Thesis	1	1	0	1	1	0	0	1	0	**5**
Sutin & Gillath (2009)	1	1	0	1	1	0	0	1	0	**5**
Suzuki & Tomoda (2015)	1	1	1	1	1	0	0	1	1	**7**
Vahedi et al. (2016)	1	1	0	1	1	0	0	1	0	**5**
Valikhani et al. (2018)	1	1	0	1	1	0	0	1	0	**5**
Van de Walle et al. (2016)	1	1	1	1	1	0	0	1	1	**7**
Wang (2007) Thesis	1	1	1	1	1	0	0	1	0	**6**
Webster (2000) Thesis	1	0	0	1	0	0	0	1	0	**3**
Wei et al. (2003)	1	1	0	1	1	0	0	1	0	**5**
Wei et al. (2004)	1	1	0	1	1	0	0	1	0	**5**

	Aim clear	Design appropriate to aim	Sample representative	Psychometric characteristics	Acceptable methods of data analysis	Changes in M preceded changes in Y	Changes in X preceded changes in M	Clear findings	Control confounding factors	Final Rating
Wei et al. (2005b	1	1	0	1	1	0	0	1	0	**5**
Wei et al. (2005c)	1	1	0	1	1	0	0	1	0	**5**
Wei et al. (2005a)	1	1	0	1	1	1	1	1	0	**4**
Wei et al. (2006)	1	1	0	1	1	1	1	1	0	**7**
Wei et al. (2007)	1	1	0	1	1	0	0	1	0	**5**
Wijngaardsde et al. (2007)	1	1	1	1	0	0	0	1	1	**6**
Williams et al (2004)	1	1	0	0	0	0	0	1	0	**3**
Ying et al. (2007)	1	1	1	1	0	0	0	1	1	**6**
You et al. (2015)	1	1	1	1	1	0	0	1	0	**6**
Zakalik & Wei (2006)	1	1	1	1	1	0	0	1	0	**6**
Zhu et al. (2016)	1	1	0	1	1	0	0	1	1	**6**

Table 3

Random effects pooled correlation coefficients of path a, path b, indirect effect and total effect; heterogeneity and mediation ratio

	Nº of models	Path a (95% CI)	I^2	Path b (95% CI)	I^2	Path a*b (95%CI)	I^2	Path c (95%CI)	I^2	|a*b/c|
Total	141	0.07 (0.02-0.12)	0.97	0.05 (-0.01-0.11)	0.97	0.06 (0.04-0.08)	0.81	0.16 (0.11-0.21)	0.97	0.38
Clinical sample	7	0.46 0.27 0.62	0.70	0.13 -0.15 0.39	0.91	0.13 (0.01-0.24)	0.09	0.16 (-0.07-0.37)	0.88	0.81
Non clinical sample	134	0.05 0.01 0.10	0.97	0.05 -0.02 0.11	0.98	0.05 (0.03-0.07)	0.81	0.16 (0.11-0.21)	0.97	0.31
Anxious	74	0.09 (0.01-0.16)	0.97	0.08 (-0.01-0.18)	0.98	0.11 (0.09-0.13)	0.57	0.37 (0.34-0.40)	0.76	0.30
Avoidant	64	-0.02 (-0.10-0.07)	0.97	0.03 (-0.07-0.13)	0.98	0.09 (0.07-0.12)	0.50	0.25 (0.22-0.28)	0.82	0.36
Children/adolescents	48	0.03 (-0.05-0.11)	0.97	-0.01(-0.09-0.08)	0.98	0.01 (-0.03-0.04)	0.80	-0.03 (-0.10-0.04)	0.97	0.33
Adults	93	0.09 (0.03-0.15)	0.97	0.08 (-0.01-0.17)	0.98	0.09 (0.06-0.11)	0.73	0.26 (0.21-0.30)	0.92	0.35
High quality	53	0.07 (-0.01-0.14)	0.97	0.06 (-0.04-0.16)	0.98	0.06 (0.03-0.09)	0.72	0.17 (0.10-0.25)	0.98	0.35
Low quality	88	0.07 (0.01-0.13)	0.97	0.04 (-0.03-0.12)	0.98	0.06 (0.03-0.08)	0.84	0.15 (0.09-0.21)	0.96	0.40
Males	7	0.11 (-0.13-0.34)	0.97	0.25 (-0.40-0.74)	0.99	-0.01(-0.16-0.14)	0.92	-0.01(-0.32-0.31)	0.98	1.00
Females	18	0.06 (-0.09-0.21)	0.97	0.05 (-0.36-0.45)	0.99	0.01 (-0.08-0.11)	0.91	0.07 (-0.13-0.27)	0.98	0.14
Dysfunctional attitudes	11	0.21 (0.05-0.35)	0.98	0.33 (0.19-0.46)	0.98	0.07 (-0.01-0.14)	0.67	0.17 (-0.01-0.33)	0.97	0.41
Children/adolescents	4	0.01 (-0.23-0.22)	0.98	0.30 (0.11-0.47)	0.80	0.01 (-0.10-0.11)	0.60	0.04 (-0.21-0.28)	0.94	0.25
Adults	7	0.33 (0.12-0.51)	0.94	0.34 (0.16-0.50)	0.31	0.10 (0.01-0.20)	0.53	0.25(0.08-0.39)	0.97	0.40
Low self-esteem	16	0.06 (-0.07-0.19)	0.98	-0.55 (-0.63--0.46)	0.70	-0.03 (-0.09-0.03)	0.95	0.01 (-0.14-0.15)	0.98	3.00
Children/adolescents	8	0.05 (-0.12-0.21)	0.98	-0.52 (-0.62--0.40)	0.97	-0.05 (-0.13-0.03)	0.94	0.03 (-0.15-0.21)	0.98	1.67
Adults	8	0.07 (-0.13-0.27)	0.99	-0.58 (-0.69- -0.46)	0.80	-0.02 (-0.11-0.07)	0.96	-0.01 (-0.16-0.15)	0.97	2.00
Maladaptive perfectionism	4	0.27 (0.02-0.49)	0.80	0.37 (0.14-0.56)	0.90	0.11 (-0.01-0.23)	0.55	0.34 (0.07-0.57)	0.66	0.32
Children/adolescents	0	--	--	--	--	--	--	--	--	
Adults	4	0.27 (0.02-0.49)	0.80	0.37 (0.14-0.56)	0.90	0.11 (-0.01-0.23)	0.55	0.34 (0.07-0.57)	0.66	0.32

	Nº of models	Path a (95% CI)	I^2	Path b (95% CI)	I^2	Path a*b (95%CI)	I^2	Path c (95%CI)	I^2	|a*b/c|
Self-criticism	4	0.38 (0.14-0.58)	0.98	0.46 (0.25-0.64)	0.43	0.17 (0.04-0.28)	0	0.30 (0.02-0.54)	0	0.57
Children/adolescents	0	--	--	--	--	--	--	--	--	
Adults	4	0.38 (0.14-0.58)	0.98	0.46 (0.25-0.64)	0.43	0.17 (0.04-0.28)	0	0.30 (0.02-0.54)	0	0.57
Self-compassion	4	-0.26 (-0.49 --0.01)	0.90	-0.47 (-0.64--0.25)	0.71	0.13 (0.01-0.24)	0	0.23 (-0.06-0.48)	0.93	0.57
Children/adolescents	1	0.15 (-0.35-0.58)	--	-0.51 (-0.77--0.09)	--	-0.08 (-0.39-0.24)	--	-0.39 (-0.75-0.14)	--	0.21
Adults	3	-0.36 (-0.61- -0.06)	0.87	-0.45 (-0.65--0.20)	0.85	0.16 (0.02-0.29)	0	0.39 (0.16-0.57)		0.41
Low sense of coherence	2	0.21 (-0.16-0.53)	0	-0.47 (-0.70--0.16)	0.99	-0.10 (-0.28-0.09)	0	-0.26 (-0.59-0.15)	0.45	0.38
Children/adolescents	0	--	--	--	--	--	--	--	--	
Adults	2	0.21 (-0.16-0.53)	0	-0.47 (-0.70--0.16)	0.99	-0.10 (-0.28-0.09)	0	-0.26 (-0.59-0.15)	0.45	0.38
Emotional dysregulation	6	0.05 (-0.16-0.26)	0.97	0.36 (-0.17-0.52)	0.99	0.09 (-0.01-0.18)	0.80	0.13 (-0.10-0.35)	0.99	0.69
Children/adolescents	2	0.12 (-0.18-0.41)	0.99	0.18 (-0.09-0.43)	0	0.07 (-0.06-0.20)	0.94	-0.02 -0.35 0.31	0.99	3.50
Adults	4	0.01 (-0.27-0.29)	0.92	0.45 (0.22-0.62)	0.97	0.10 (-0.03-0.22)	0.14	0.21 -0.01 0.40	0.76	0.48
Alexithymia	3	0.16 (-0.13-0.43)	0.96	0.07 (-0.20--0.34)	0	0.07 (-0.06-0.19)	0	0.21 (-0.12-0.49)	0.89	0.33
Children/adolescents	0	--	--	--	--	--	--	--	--	
Adults	3	0.16 (-0.13-0.43)	0.96	0.07 (-0.20--0.34)	0	0.07 (-0.06-0.19)	0	0.21 (-0.12-0.49)	0.89	0.33
COPING: Behavioral hyperactivating strategies	5	0.02 (-0.21-0.25)	0.93	-0.02 (-0.23-0.20)	0.71	0.02 (-0.09-0.13)	0	-0.01 (-0.26-0.25)	0.98	2.00
Children/adolescents	3	-0.13 (-0.37-0.13)	0.95	-0.07 (-0.30-0.16)	0.89	0.02 (-0.11-0.15)	0.23	0.01 (-0.28-0.29)	0.98	2.00
Adults	2	0.24 (-0.16-0.58)	0	0.06 (-0.29-0.40)	0.95	0.02 (-0.16-0.20)	0	-0.01 (-0.31-0.29)	0.97	2.00
COPING: Cognitive hyperactivating strategies	20	0.14 (0.03-0.25)	0.95	0.24 (0.13-0.34)	0.99	0.06 (0.01-0.11)	0.72	0.18 (0.06-0.30)	0.98	0.33
Children/adolescents	9	0.10 (-0.05-0.24)	0.85	0.15 (0.02-0.27)	0.98	-0.01 (-0.08-0.06)	0.26	-0.10 (-0.26-0.06)	0.97	0.10
Adults	11	0.18 (0.01-0.34)	0.97	0.31 (0.17-0.44)	0.94	0.13 (0.05-0.20)	0.36	0.40 (0.29-0.51)	0.90	0.33

	Nº of models	Path a (95% CI)	I^2	Path b (95% CI)	I^2	Path a*b (95%CI)	I^2	Path c (95%CI)	I^2	|a*b/c|
Repetitive thinking	11	0.25 (0.09-0.39)	0.88	0.43 (0.30-0.54)	0	0.11 (0.04-0.18)	0.28	0.23 (0.06-0.39)	0.91	0.48
Children/adolescents	5	0.06 (-0.14-0.26)	0.56	0.38 (0.22-0.53)	0.81	0.04 (-0.06-0.14)	0	0.04 (-0.18-0.26)	0.88	1.00
Adults	6	0.39 (0.18-0.57)	0.77	0.47 (0.29-0.61)	0.51	0.17 (0.07-0.28)	0	0.38 (0.22-0.52)	0.72	0.45
Rumination	2	0.06 (-0.30-0.40)	0.57	0.36 (0.02-0.62)	0.43	0.03 (-0.14-0.20)	0	-0.01 (-0.39-0.38)	0.02	3.00
Children/adolescents	2	0.06 (-0.25-0.36)	0.57	0.36 (0.02-0.62)	0.43	0.03 (-0.14-0.20)	0	-0.01 (-0.39-0.38)	0.02	3.00
Adults	0	--	--	--	--	--	--	--	--	
Brooding rumination	5	0.33 (0.11-0.53)	0.89	0.42 (0.22-0.59)	0.71	0.16 (0.05-0.27)	0.21	0.27 (0.02-0.49)	0.89	0.59
Children/adolescents	1	-0.11 (-0.52-0.34)	--	0.11 (-0.30-0.49)	--	-0.02 (-0.27-0.23)	--	-0.20 (-0.62-0.30)	--	0.10
Adults	4	0.43-0.17-0.63)	0.30	0.48 (0.27-0.66)	0.68	0.20 (0.07-0.32)		0.38 (0.17-0.55)	0	0.53
Reflection rumination	2	0.16 (-0.21-0.49)	0.95	0.38 (0.05-0.64)	0.99	0.09 (-0.09-0.26)	0.71	0.19 (-0.21-0.54)	0.98	0.47
Children/adolescents	1	-0.12 (-0.53-0.33)	--	0.32 (-0.09-0.64)	--	-0.03 (-0.27-0.22)	--	-0.20 (-0.62-0.30)	--	0.15
Adults	1	0.40 (-0.14-0.76)	--	0.44 (-0.03-0.75)	--	0.18 (-0.07-0.41)	--	0.52 (0.15-0.76)	--	0.35
Self-control	4	0.05 (-0.20--0.30)	0.98	-0.06 (-0.29-0.18)	0	-0.01 (-0.11-0.10)	0	0.05 (-0.23-0.32)	0.98	0.20
Children/adolescents	3	0.22 (-0.03-0.44)	0	-0.05 (-0.26-0.17)	0	-0.01 (-0.12-0.09)	0	-0.10 (-0.37-0.18)	0.45	0.10
Adults	1	-0.44 (-0.78- -0.09)	--	-0.10 (-0.53-0.38)	--	0.04 (-0.20-0.27)	--	0.48 (0.10-0.74)	--	0.08
COPING: Deactivating strategies	3	0.09 (-0.21-0.38)	0.92	0.04 (-0.24-0.32)	0.71	0.08 (-0.06-0.22)	0.61	0.08 (-0.25-0.40)	0.98	1.00
Children/adolescents	1	0.14 (-0.29-0.52)	--	-0.01 (-0.38-0.36)	--	0.01 (-0.20-0.20)	--	-0.30 (-0.67-0.18)	--	0.03
Adults	2	0.07 (-0.29-0.41)	0.97	0.07 (-0.29-0.41)	0.98	0.14 (-0.06-0.32)	0	0.29 (-0.02-0.55)	0	0.48
Self-disclosure	2	-0.48 (-0.71 - -0.14)	0.94	0.14 (-0.21-0.46)	0.71	-0.10 (-0.27-0.08)	0.93	-0.04 (-0.42-0.36)	0.93	2.50
Children/adolescents	0	--	--	--	--	--	--	--	--	
Adults	2	-0.48 (-0.71 - -0.14)	0.94	0.14 (-0.21-0.46)	0.71	-0.10 (-0.27-0.08)	0.93	-0.04 (-0.42-0.36)	0.93	2.50
Over-dependence	9	0.04 (-0.13-0.21)	0.96	0.10 (-0.07--0.26)	0	0.04 (-0.05-0.12)	0.80	0.15 (-0.05-0.33)	0.96	0.27

	Nº of models	Path a (95% CI)	I^2	Path b (95% CI)	I^2	Path a*b (95%CI)	I^2	Path c (95%CI)	I^2	|a*b/c|
Children/adolescents	2	-0.10 (-0.40-0.22)	0.93	0.24 (0.04-0.49)	0.92	-0.06 (-0.22-0.10)	0.31	-0.22 (-0.52-0.14)	0.97	0.27
Adults	7	0.08 (-0.14-0.29)	0.97	0.06 (-0.14-0.24)	0.98	0.07 (-0.03-0.17)	0.80	0.25 (0.09-0.40)	0.90	0.28
Perceived social support	11	-0.23 (-0.38 - -0.08)	0.93	-0.19 (-0.32--0.04)	0.99	0.06 (-0.01-0.13)	0.75	0.22 (0.05-0.38)	0.91	0.27
Children/adolescents	3	-0.19 (-0.42-0.07)	0.98	-0.32 (-0.51--0.10)	0.97	0.10 (-0.02-0.22)	0.94	0.08 (-0.21-0.35)	0.98	1.25
Adults	8	-0.25 (-0.43- -0.06)	0.80	-0.13 (-0.30-0.04)	0.85	0.04 (-0.05-0.13)	0	0.27 (0.12-0.40)	0.47	0.15
Relational satisfaction	7	-0.23 (-0.41 - -0.03)	0.92	-0.25 (-0.42--0.07)	0	0.06 (-0.04-0.15)	0	0.24 (0.02-0.43)	0.89	0.25
Children/adolescents	0	--	--	--	--	--	--	--	--	
Adults	7	-0.23 (-0.41 - -0.03)	0.92	-0.25 (-0.42--0.07)	0	0.06 (-0.04-0.15)	0	0.24 (0.02-0.43)	0.89	0.25
Relational conflict	3	0.22 (-0.08-0.48)	0	0.22 (-0.06-0.47)	0.71	0.05 (-0.10-0.19)	0	0.30 (-0.03-0.57)	0	0.17
Children/adolescents	0	--	--	--	--	--	--	--	--	
Adults	3	0.22 (-0.08-0.48)	0	0.22 (-0.06-0.47)	0.71	0.05 (-0.10-0.19)	0	0.30 (-0.03-0.57)	0	0.17
Social comparison	2	-0.11 (-0.45-0.25)	0.49	-0.33 (-0.60-0.01)	0.99	0.03 (-0.14-0.21)	0	0.10 (-0.30-0.47)	0	0.30
Children/adolescents	2	-0.11 (-0.45-0.25)	0.49	-0.33 (-0.60-0.01)	0.99	0.03 (-0.14-0.21)	0	0.10 (-0.30-0.47)	0	0.30
Adults	0	--	--	--	--	--	--	--	--	
Social self-efficacy	3	-0.22 (-0.48-0.07)	0.74	-0.26 (-0.50-0.01)	0	0.07 (-0.06-0.20)	0.33	0.26 (-0.06-0.53)	0	0.27
Children/adolescents	0	--	--	--	--	--	--	--	--	
Adults	3	-0.22 (-0.48-0.07)	0.74	-0.26 (-0.50-0.01)	0	0.07 (-0.06-0.20)	0.33	0.26 (-0.06-0.53)	0	0.27
Interpersonal stressors	2	0.21 (-0.15-0.52)	0.02	0.20 (-0.14--0.50)	0	0.04 (-0.12-0.19)	0	0.24 (-0.16-0.57)	0.43	0.17
Children/adolescents	1	0.24 (-0.19-0.59)	--	0.09 (-0.28-0.44)	--	0.02 (-0.16-0.20)	--	0.28 (-0.20-0.65)	--	0.07
Adults	1	0.17 (-0.38- 0.63)	--	0.31 (-0.18-0.68)	--	0.06 (-0.19-0.30)	--	0.19 (-0.23-0.55)	--	0.32

Note. Path *a*: association between independent variable and mediator; **Path *b*:** association between mediator and dependent variable; **Path *a*b*:** the indirect effect of the independent variable on the dependent variable controlling the mediator; **Path *c*:** total effect of the independent variable on the dependent variable; **I^2**: heterogeneity; **|a*b/c|:** mediation ratio. effect size in mediation analysis.

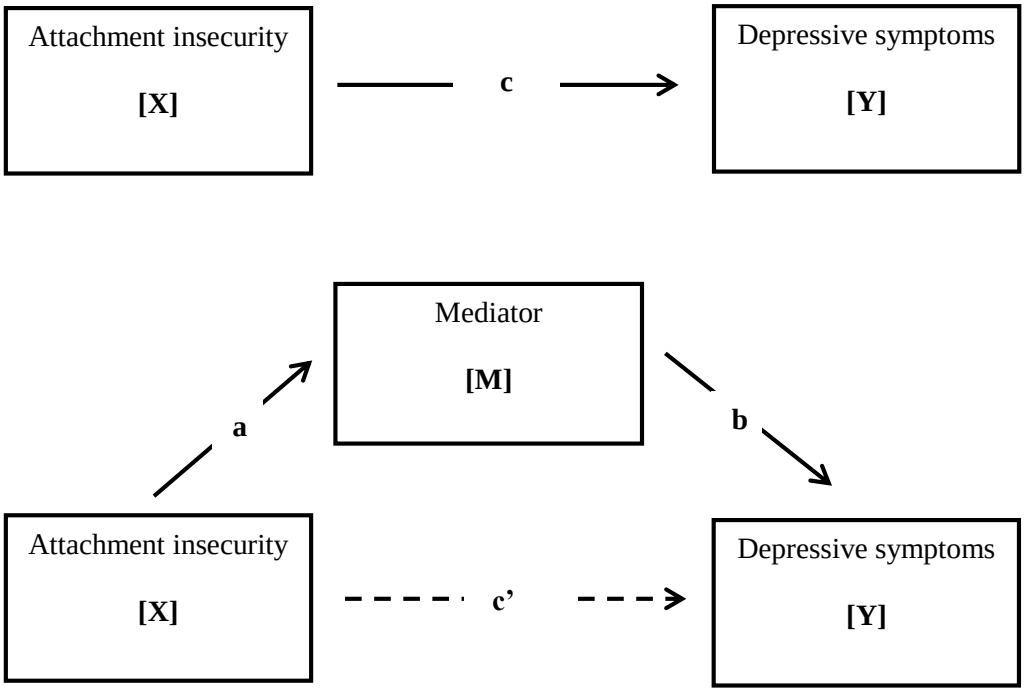

Figure 1. Conceptual diagram of the mediation model included in the meta-analysis

Note: X = Exposure; M = Mediator(s); Y = Outcome; path c = Total effect of X on Y which can be calculated as the sum of the direct and indirect effects; path a = Effect of X on M; path b = Effect of M on Y; path c' = Direct effect of X on Y controlling for M; path a*b = Indirect effect of X on Y through M which is quantified by the product of paths a and b.

Flowchart for search strategy

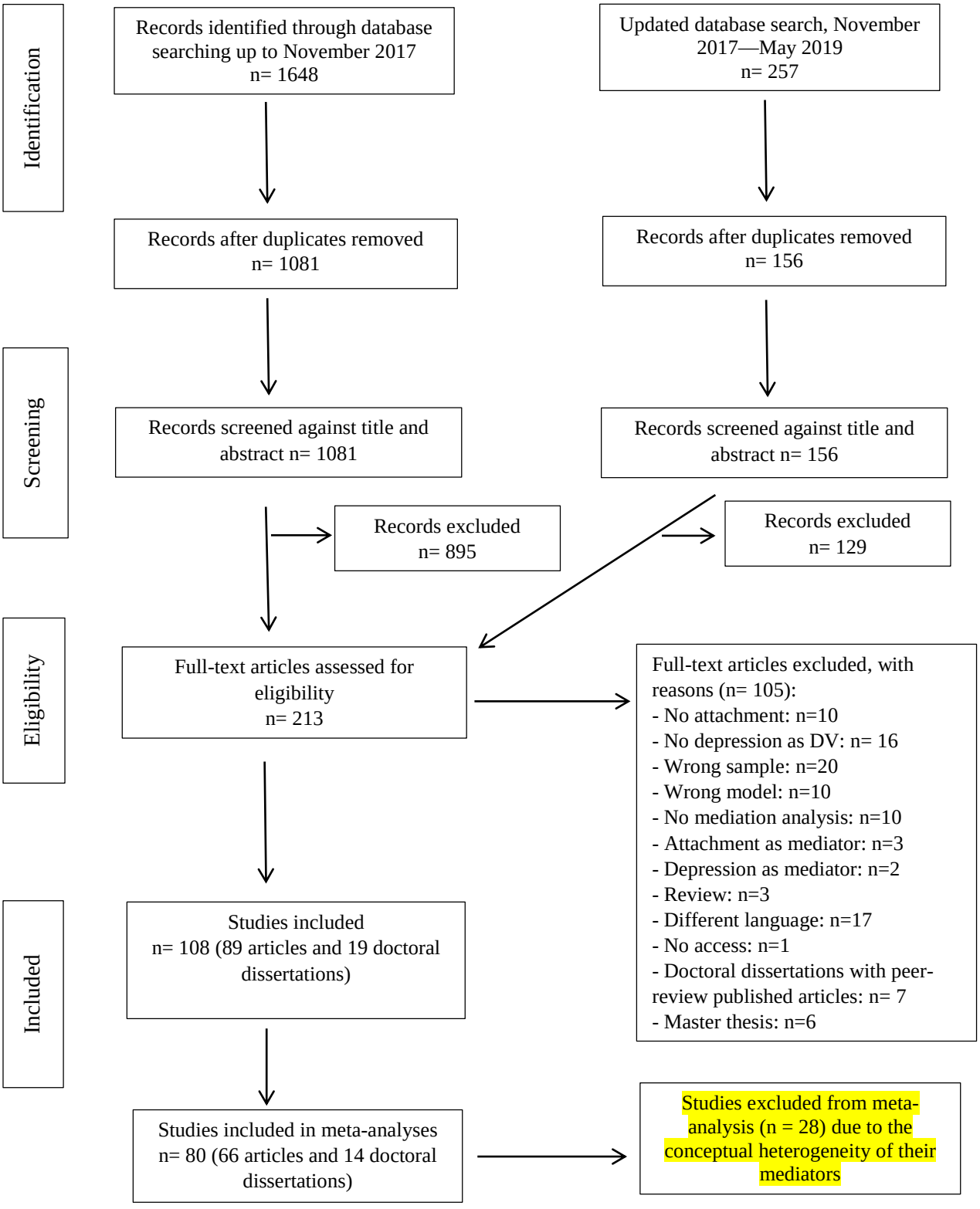

Figure 2. Flowchart for search strategy

Conflict of interest

The authors have no conflicts of interest to declare.

Author Statement

Contributors: LCG, BT, RRC and CS collaboratively contributed to the study concept and designed the meta-analysis. LCG, CS and RRC conducted the literature searches and screening of the literature. LCG provided summaries of previous research studies. LCG, RRC and CS extracted and coded the data. Statistical analyses were performed by BT. LCG wrote the first draft of the manuscript under the supervision of CS. All authors contributed to and approved the final version of the manuscript for submission.

Role of the Funding Source: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Acknowledgments: Dr. Takkouche's work is funded by a Grant from the Regional Ministry of Education, Universities and Vocational Training, Santiago de Compostela, Spain, ED431C 2018/20. Dr. Rodriguez-Cano's work is supported by The Cancer Prevention and Research Institute of Texas (CPRIT) (ID RP170259), and by the MD Anderson's Cancer Center Support Grant (CA016672) funded by the National Cancer Institute.

Definitions of non-significant mediators included in the meta-analysis

Checklist for measuring study quality

Detailed extracted and coded data of studies with additional mediators

Detailed extracted and coded data for meta-analysis