



Social anxiety mediates the effect of attachment to parents on friendships and loneliness during the college transition

Rodrigo J. Carcedo¹ · Pilar Vázquez-Iglesias¹ · Stephanie Parade^{2,3} · Alicia Herreros-Fraile¹ · Diego Hervalejo¹

Accepted: 7 October 2022 / Published online: 11 November 2022
© The Author(s) 2022

Abstract

The main goal of this study was to investigate direct and indirect effects of attachment to parents on the formation of friendships, satisfaction with friends, and loneliness over the transition to college. Social anxiety and gender were tested as a possible mediator and moderator respectively. A total of 210 college freshmen at a large university in Spain participated in at a baseline assessment and a six-month follow-up assessment. Results demonstrated indirect effects of attachment to parents on ease forming friendships, satisfaction with friends, and loneliness through social anxiety, and a direct effect of attachment to loneliness. Gender did not play a moderating role. Taken together, these results suggest that programs to support the development of healthy social relationships across the college transition may be particularly beneficial for youth with challenges in familial relationships, and that screening for social anxiety may identify those students who would particularly benefit from support.

Keywords Attachment · Social anxiety · Loneliness · Friendship · Gender · College

Positive interpersonal relationships are associated with adjustment across numerous domains of social-emotional health including psychological well-being, self-worth, and self-esteem across the lifespan (Hartup & Stevens, 1997). On the contrary, a lack of positive social interactions is

related to higher levels of anxiety (Baumeister & Leary, 1995), loneliness (Peplau & Perlman, 1982), depression (Leary, 1990), and anger (Williams et al., 1998). Among college students, relationships with peers contribute to adjustment during the college transition, academic success, and personal well-being (Abby et al., 1985; Brook & Willoughby, 2015; Zea et al., 1995). Given that relationships during adolescence and young adulthood contribute to current and future well-being (Brooks & DuBois, 1995; Fass & Tubman, 2002; García-Mendoza et al., 2018), understanding factors that shape social adjustment among college students is important.

Bowlby argued that attachment bonds between children and their caregivers shape future relationships, and that when children develop secure attachment bonds, they experience higher quality relationships in adulthood (Bowlby, 1969, 1980). To date, many studies support this view (Gorrese & Ruggieri, 2012; McGinn et al., 2005; Roisman et al., 2005; Tiwari & Garg, 2015), however the mechanisms by which attachment shapes close relationships remains unclear. There is evidence of associations between parental attachment insecurity and social anxiety (Manning et al., 2017; Notzon et al., 2016), as well as between social anxiety and negative social outcomes (Larkins, 2014; Parade et al., 2010) found that social anxiety mediated the association between

✉ Rodrigo J. Carcedo
rcarcedo@usal.es

Pilar Vázquez-Iglesias
ralip.vi@gmail.com

Stephanie Parade
Stephanie_Parade@Brown.edu

Alicia Herreros-Fraile
aliciaherfra@gmail.com

Diego Hervalejo
diegoherva@usal.es

¹ Faculty of Psychology, Department of Developmental and Educational Psychology, University of Salamanca, Avda. de la Merced 109-131, 37005 Salamanca, Spain

² Department of Psychiatry and Human Behavior, The Warren Alpert Medical School of Brown University, 222 Richmond Street, 02903 Providence, RI, United States of America

³ Bradley/Hasbro Children's Research Center, E. P. Bradley Hospital, 1 Hoppin Street, 02903 East Providence, RI, United States of America

parental attachment prior to college and two aspects of close interpersonal relationships: satisfaction with and ease of forming close relationships. Given the view that the attachment system is particularly relevant during times of stress (Ainsworth et al., 1978), it is not surprising that attachment contributed to social anxiety and subsequent experiences in close relationships in this potentially stressful transition (Kenny, 1987; Lu, 1994). Indeed, students who are securely attached to their parents are reported to have a higher positive adjustment to college life (Holt et al., 2018; Mattanah et al., 2011; Swenson et al., 2008). However, Parade et al.'s study only included female participants which clearly limited their conclusions. Also, other important interpersonal outcomes, such as loneliness, have also been found to be associated with attachment (Fransson et al., 2016; Wiseman et al., 2006) and social anxiety (Lasgaard et al., 2011) but were not included in this prior work. Our study focused on further examining social anxiety as a mediator of attachment to parents and the quality of close relationships in a sample of Spanish first year college students. Additionally, we tested the moderating effect of gender in this model, as well as loneliness as an additional outcome to build upon Parade et al.'s (2010) previous work.

Attachment and Close Relationships

According to Bowlby, the security of the child-caregiver attachment bond shapes subsequent relationships of the child. Children that have their needs for safety met consequently develop a secure attachment to their parents characterized by more positive representations of the self and others, including greater feelings of competence, and trust. On the contrary, children who lack a secure attachment to their parents present less positive representation of the self and others, including feelings of incompetence and distrust (Bowlby, 1969; Bretherton & Munholland, 1999; Pallini et al., 2014), in their meta-analysis, found support for the assumption that early child-parent attachment bonds are related to the child's subsequent relationships with peers. Adolescents securely attached to their parents demonstrate more pro-social behavior, are more emotionally and socially competent, experience higher relationship quality and less conflict, and are more accepted by their peers (Benson et al., 2006; Laible, 2007; Lieberman et al., 1999; Moore et al., 1998; Weimer et al., 2004). Similar results have been found in studies of college students with a secure attachment style (Welch & Houser, 2010). Finally, some evidence has indicated that first year college students that are securely attached to their parents are less prone to experience loneliness (Wiseman et al., 2006). Secure individuals tend to form closer relationships with others and get more involved in

social groups than insecure attached individuals. Similar results have been found in samples with children (Richaude Minzi, 2006).

Social anxiety as a Mediator

Social anxiety is characterized by marked fear and anxiety about one or more social situations in which the individual is exposed to possible scrutiny by others (American Psychiatric Association, 2022) and it is prevalent among college students (Strahan, 2003; Strahan & Conger, 1998; Zhao & Dai, 2016). From both theoretical and empirical perspectives, attachment to parents contributes to the development of social anxiety. Children with less secure attachments are thought to develop more difficulties regulating emotion, which may result in the development of psychopathology, including social anxiety (Bowlby, 1969, 1973, 1980). Indeed, associations between parental attachment insecurity and social anxiety have been previously demonstrated (Manning et al., 2017; Notzon et al., 2016). Insecure child-parent attachment is related to higher levels of social anxiety in adolescents (Erozkan, 2009; Mothander & Wang, 2014; Papini et al., 1991), as well as general anxiety disorders in adolescents, young adults, and college students (Love, 2008; Schimmenti & Bifulco, 2015).

Social anxiety is a risk factor for a wide range of negative consequences in different aspects of social interaction (Cuming & Rapee, 2010; La Greca & Lopez, 1998; Larkins, 2014). Socially anxious adolescents are reported as having fewer friendships, higher levels of loneliness and experiencing more victimization (Erath et al., 2010). Additionally, social anxiety has also been related to a lack of social ties which in turn is associated with lower academic achievement in college students (Brook & Willoughby, 2015; Lasgaard et al., 2011); Adjustment to college for first year students may be compromised among youth with greater social anxiety.

Finally, Parade et al. (2010) found that social anxiety mediates the relationship between parental attachment prior to college and ease forming close relationships and satisfaction with them at the end of the first semester with a sample of female US students. However, more evidence is needed to support this effect, also in a different cultural context. Here, we plan to test this mediation effect with a Spanish sample of both gender Spanish students, including loneliness as an outcome and studying possible differential effects due to gender.

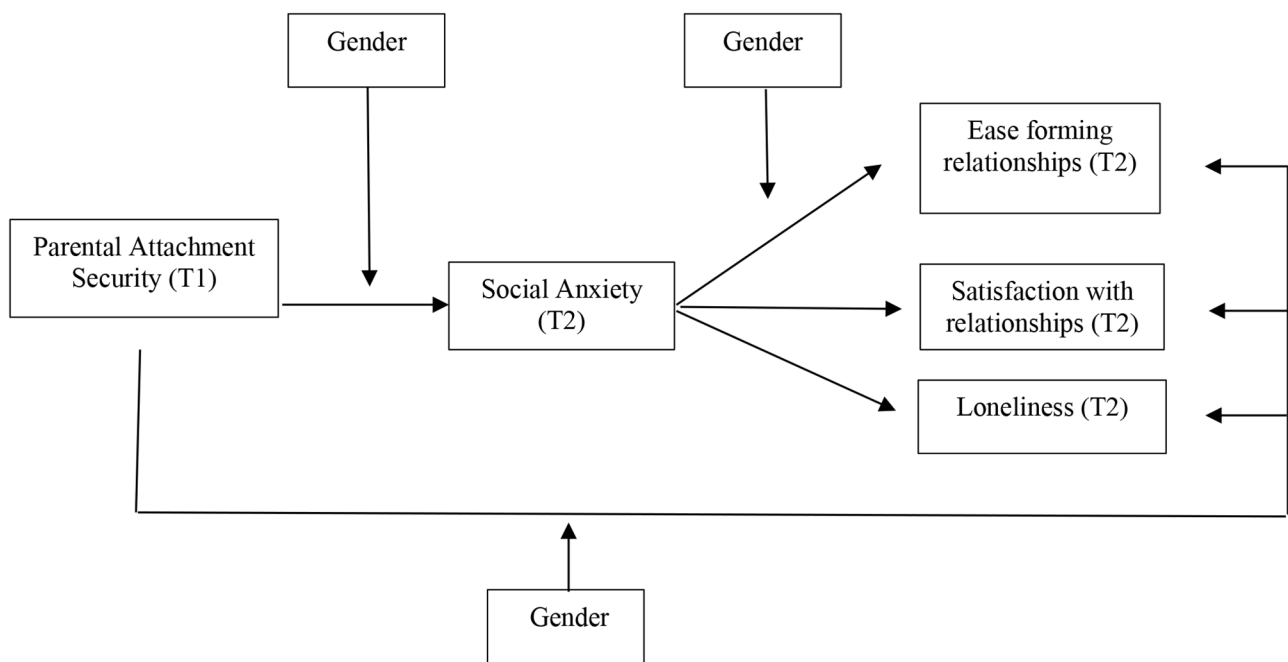


Fig. 1 Conceptual model of parental attachment security, social anxiety, and social outcomes

The moderating effect of gender

Parade et al.'s (2010) study that demonstrated a mediating effect of social anxiety in the association of attachment to parents and close relationships was conducted in a sample of female first-year college students. Race was a significant moderator these associations, however, due to the sample composition, this study was not able to test the moderating effect of gender. The authors called for replication of their findings in samples that include male students because there may be important gender differences in the mechanisms that underlying associations of attachment security and experiences within close relationships.

There is accumulating evidence that gender differences exist in attachment, social anxiety, and domains of experiences within close relationships. Compared to men, women are more attached to their peers, report higher peer trust and are more communicative (Gorrese & Ruggiere, 2012), show higher social skills and self-efficacy, have more mutual friendships (Erath et al., 2010), are more socially anxious (La Greca & Lopez, 1998; Selfhout et al., 2009), and self-report greater positive friendship quality (Weimer et al., 2004).

Beyond mean differences between males and females, the contribution of gender as a possible moderator of the proposed mediational model remains a relevant question for research. To our knowledge, there has been no prior research focused on gender as a moderator of the effect of attachment to parents and social anxiety in the college transition.

However, stronger associations between social anxiety and social functioning and friendship quality have been observed among women than men in some prior research (Biggs et al., 2012, La Greca & Lopez 1998; Vernberg et al., 1992), although these effects are not consistently observed in other studies (Brook & Willoughby, 2015; Tillfors et al., 2012). Thus, the influence of gender as a moderator in the relationship between social anxiety and friendship outcomes still remains unclear.

Hypotheses

The present study examines associations of attachment to parents, social anxiety, and friendships and loneliness during the college transition. As illustrated in Fig. 1, we hypothesized that:

1. College students who reported more secure parental attachment at the start of the first semester of college would greater ease forming relationships, more satisfaction with friends, and less loneliness at the end of the first semester.
2. Social anxiety would mediate associations of attachment to parents and friendship and loneliness in the college transition such that students who were more securely attached to their parents would report less social anxiety and more positive experiences in their

friendships (more ease forming relationships, more satisfaction with friends, and less loneliness).

- Gender would moderate the association between attachment, social anxiety, and the outcomes (ease forming friendships, satisfaction with friends, and loneliness); women would present greater associations between these variables.

Method

Participants

Four hundred and thirty-eight college freshmen at a large university in the Midwest of Spain initially enrolled in this study at the start of their first college semester. Of these, 233 also completed measures six months later, just after the end of the first semester. The main reason for attrition was that the students did not attend to the second class ($n=205$), including some students who withdrew from the university ($n=5$). All the students in the class were invited to participate, although those questionnaires stemming from participants with ages above 21 years old were removed from the final sample ($n=10$). Likewise, 7 univariate outliers and 1 multivariate outlier were excluded from the final sample for analysis. Therefore, study results are based on a sample of 210 participants with a mean age of 18.6 years ($SD=1.33$) and included 70 male and 140 female students.

The same proportion of male and female students participated in wave 1 and 2 ($\chi^2(1)=0.11$, $p=.75$). Furthermore, equal proportions of 17- ($\chi^2(1)=1.02$, $p=.31$), 18- ($\chi^2(1)=0.01$, $p=.96$), 19- ($\chi^2(1)=0.01$, $p=.96$), 20- ($\chi^2(1)=0.01$, $p=.92$), and 21-year-old ($\chi^2(1)=0.43$, $p=.51$) students participated in both waves. It is also significant to mention that 34.30% of the participants lived with their parents. Because the correlations among the current study variables did not significantly differ between those who lived with their parents and those who did not, both groups were analyzed together.

The sample size was determined on similar studies concerning identical variables, population, and SEM software (e.g., Parade et al., 2010), and researchers' recommendations on SEM about having at least 150–200 participants (Kline, 2005; Muthén & Muthén, 2002), 5 or 10 observations per estimated parameter (Bentler & Chou, 1987), and 100 participants per group in multigroup analyses (Kline, 2005). In this last case, the final sample of male students was lower than expected due to attrition.

Procedure

During the presentation day, an experimenter who attended college classes invited freshmen to participate in this study. Interested students signed the informed consent form and complete a questionnaire that included demographic information and a measure of parental attachment security. Students were also informed that they will be contacted six months later to complete a second questionnaire. This second session included measures to assess social anxiety, ease at forming college friendships, satisfaction with college friendships, and loneliness.

This study was carried out in accordance with the recommendations of the Bioethics Committee of the University of Salamanca. All subjects gave written informed consent in accordance with the Declaration of Helsinki. The protocol was approved by the above-mentioned committee. Data collection was always carried out by the first author of this manuscript who reminded participants of the aim of the study and explained the questionnaires. Participants were informed that they could refuse to participate or withdraw from the study at any time.

Measures

Parental Attachment Security. Twelve items from the Inventory of Parent and Peer Attachment, parent subscale (IPPA; Armsden & Greenberg, 1987) were used to measure the quality of the participants' attachment to their parents (e.g., "I can trust my parents"; Cronbach's $\alpha=0.78$). Participants first identified the father or mother figure they considered to play the most important role in their upbringing and care. They also reported their agreement with each of the twelve items on a 5-point Likert scale from 1 (*almost always or always true*) to 5 (*rarely or never true*) regarding this person. The mean of the 12-items was calculated to compute a range of possible scores from 1 to 5, with higher scores indicating more secure attachment.

Social Anxiety. The Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998) was utilized to evaluate participants' social anxiety. A total of 20-items were answered (e.g., "I am tense mixing in a group"; Cronbach's $\alpha=0.88$). Responses were given on a 5-point Likert scale, ranging from 0 (*not at all characteristic or true of me*) to 4 (*extremely characteristic or true of me*). The mean of the 20-items was calculated to compute a range of possible scores from 1 to 5, with higher scores indicating more social anxiety.

Ease Forming Friendships. The initiation subscale of the Interpersonal Competence Questionnaire (ICQ; Buhrmester et al., 1988) was used to assess participants' ease forming

friendships. A total of 8-items were answered (e.g., “I am tense mixing in a group”; Cronbach’s $\alpha=0.88$). Responses were given on a 5-point Likert scale, ranging from 0 (*I’m poor at this; I’d feel so uncomfortable and unable to handle this situation*) to 4 (*I’m extremely good at this; I’d feel very comfortable and could handle this situation very well*). The mean of the 8-items was calculated to compute a range of possible scores range from 1 to 5, with higher scores indicating more ease forming relationships.

Satisfaction with friends. The Relationship Assessment Scale (RAS; Hendrick, 1988) is a 7-item measure originally designed to evaluate romantic relationship satisfaction. This scale is unidimensional and can be modified to evaluate satisfaction in nonromantic relationships. In this case, this scale was used to evaluate the satisfaction with friends (e.g., “In general, how satisfied are you with your relationship?”; Cronbach’s $\alpha=0.83$). Responses are made on a 5-point Likert scale ranging from 1 (different labels are used; e.g., *bad, never*) to 5 (e.g., *excellent, very often*). The mean of the 7-items was calculated to compute a range of possible scores range from 1 to 5, with higher scores indicating more satisfaction.

Loneliness. To measure this construct, the 6-Item De Jong-Gierveld Loneliness Scale (De Jong Gierveld & Van Tilburg, 2006) was utilized (e.g., “I have a feeling of emptiness”; “I can trust many people when I’m in trouble”; Cronbach’s $\alpha=0.70$). Item number five was not included due to low reliability. Responses were given on a 12-point Likert scale ranging from 0 (not agree at all) to 11 (totally agree). The mean of the 6-items was calculated to compute a range of possible scores from 0 to 11, with higher scores indicating more loneliness.

Statistical analyses

To test study hypotheses, we conducted path analysis using AMOS 25 following procedures outlined by Byrne (2001). First, descriptive statistics and simple correlations among the variables were conducted using SPSS 25. Second, participant age and parental educational attainment were considered as covariates. Correlations showed that neither participant age nor parental educational attainment were associated with any of the variables of interest. Therefore, participant age and parental educational attainment were not treated as covariates in the substantive analyses.

Next, we used AMOS 25 to test a baseline path model. The baseline model tested both direct and indirect effects of attachment security on the interpersonal outcomes (ease forming relationships, satisfaction with friendships, and loneliness). Pathways were specified between attachment security and the interpersonal outcomes, as well as between

Table 1 Correlations and Descriptive Statistics

Variables	1	2	3	4	5
1. Parental Attachment Security	--				
2. Social Anxiety	−0.218*	--			
3. Ease Forming Friendships	0.014	−0.598*	--		
4. Satisfaction with Friends	0.075	−0.338*	0.276*	--	
5. Loneliness	−0.241*	0.432*	−0.289*	−0.532*	--
M	4.02	2.04	3.13	4.26	2.73
SD	0.52	0.52	0.75	0.52	1.85
Range	2.50–5.00	1.05–3.55	1.13–5.00	2.71–5.00	0.00–8.00

Note: $N=210$ for correlations. * $p < .01$. (two-tailed)

attachment security and social anxiety, and social anxiety and the interpersonal outcomes. 95% confidence intervals for the significance of the indirect pathways were calculated in AMOS using bootstrapping procedures based upon 2000 samples.

To test the moderation hypothesis and to understand if results were consistent across male and female students, we conducted multi-group analyses in AMOS 25. To conduct multi-group analyses there must first be a well-fitting baseline path model (Byrne, 2001). Structural pathways within the path model were constrained be equal across male and female students, and the fit of the constrained model was compared to the fit of an unconstrained model where the pathways varied across male and female students. If there was a significant change in chi-square between the constrained and unconstrained models, we examined individual pathways for gender differences.

Results

Descriptive statistics and simple correlations are shown in Table 1. Parental attachment security was negatively associated with social anxiety and loneliness, but not with ease forming relationships or satisfaction with friendships. Social anxiety was negatively associated with ease forming relationships, satisfaction with friendships and positively with loneliness. Ease forming relationships, satisfaction with friendships, and loneliness were all associated with one another in the expected direction of effects.

Based upon the pattern of simple correlations we developed the baseline path model. The baseline path model specified pathways between attachment security and social anxiety, and between social anxiety all three interpersonal outcomes (ease forming relationships, satisfaction with friendships, and loneliness). The baseline path model also specified a direct pathway from attachment security to

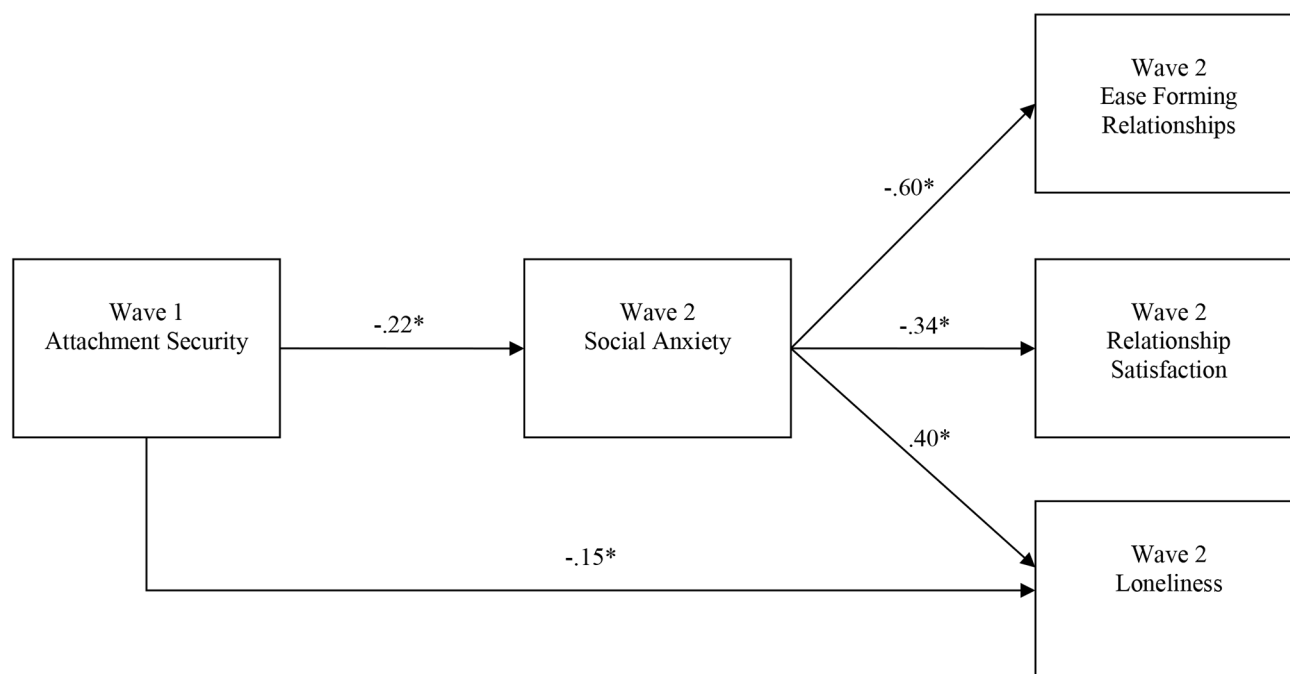


Fig. 2 Structural Equation Model Predicting Interpersonal Outcomes. Note: Standardized Solution ($N=210$); $\chi^2(4)=6.94$, *ns*; CFI=0.99; NFI=0.97; RMSEA=0.06; SRMR=0.04.

* $p < .01$. Residuals terms are not shown to facilitate the understanding of the diagram

loneliness; however, given that correlations between attachment security and ease forming relationships and satisfaction with friendships were not significant, we did not include those pathways in the model in an effort to produce a well-fitting baseline path model for the multi-group analysis (Byrne, 2001).

Results of the final path model are displayed in Fig. 2. The path model demonstrated an excellent fit to the data as illustrated by the non-significant chi-square statistic, the tolerable RMSEA statistic, and CFI and NFI statistics which approach 1. Due to the characteristics of the sample, we also use the SRMR recommended by Hu and Bentler (1999) for samples below 250 participants. Results of the path model demonstrated that attachment security was negatively associated with loneliness as a direct main effect. In examination of the hypothesized indirect effects, attachment security was negatively associated with social anxiety, and social anxiety was negatively associated with ease forming relationships and satisfaction with friendships, and positively associated with loneliness. Examination of indirect effects using bootstrapping procedures demonstrated that attachment security significantly influenced loneliness ($B = -0.09$, $SE = 0.03$, 95% CI $[-0.15, -0.03]$), ease forming friendships ($B = 0.13$, $SE = 0.04$, 95% CI $[0.05, 0.21]$) and satisfaction with friends ($B = 0.07$, $SE = 0.03$, 95% CI $[0.02, 0.13]$) through social anxiety.

Multi-group analyses demonstrated that student gender was not a moderator of the path model. That is, there was not a statistically significant change in chi-square when the path coefficients were set to be equal versus when they were free to vary. ($\chi^2(4) = 2.84$, *ns*). We also analyzed the difference between groups constraining one path at a time. That is, we also explored the possible differences between the groups in each particular relationship between the variables. No differences between groups of gender were found, the proposed model and paths are applied in the same way to men and women.

Discussion

The primary aim of the present study was to examine social anxiety as a mediator of the impact of attachment to parents on subsequent friendships among college students and feelings of loneliness. The second aim was to investigate gender as a possible moderator of these effects. This study addresses two important gaps in previous literature incorporating the study of these processes on loneliness and examining the role of gender as a moderator. In addition, this is the first study of these characteristics in Spain.

Consistent with previous research (Parade et al., 2010), results from our study clearly point out that social anxiety is a significant mechanism that mediates in the relationship

between attachment to parents and current friendship relationships and loneliness. Significant indirect effects of attachment to parents on ease forming friendships, satisfaction with friendships and loneliness through social anxiety were found in the expected direction. Higher parental security attachment predicted lower levels of social anxiety, whereas the latter predicted a better state regarding the relational outcomes. Gender did not moderate these effects.

Our results that social anxiety mediated effects of attachment to parents are in accordance with Bowlby's (1969, 1973, 1980) notions on how insecure attachment increases vulnerability to psychopathology across the lifespan. This process may have several explanations. First, Bowlby argued that attachment insecurity contributes to a negative view of self, which may contribute to anxiety and less competence in social interactions. Second, caregivers play an instrumental role in shaping how children learn how to regulate their emotions. Youth securely attached to their parents may experience less trouble managing their anxiety in stressful situations as a result of strategies they learned from their parents. The literature has widely supported the relationship between attachment and social anxiety (Mothander & Wang, 2014; Papini et al., 1991). Furthermore, Brumariu and Kerns (2008) suggests that the relationship between attachment security to parents and social anxiety might be more complicated than we initially thought. They conducted a 2-year longitudinal study with children ages 9 to 11 to measure the influence of attachment to parents and social anxiety. According to their findings, there exist different types of attachment insecurity to parents that respectively relate to diverse aspects of social anxiety. While it is stated that there might be a strong relation between attachment security to parents early in life and social anxiety later on, further investigation is needed in order to obtain a better knowledge of the mechanisms of such relation.

Apart from the association of attachment to parents and social anxiety that we observed, attachment to parents was negatively associated with loneliness. Participants who reported that they were more securely attached to their parents also experienced lower levels of loneliness. According to these findings, secure relationships with caregivers may protect from feelings of loneliness during the college transition. One explanation for this is that youth who have developed a secure attachment to their caregivers might also have secure attachment bonds with other people. Thus, they have learnt to enjoy these social interactions and likely it became a reinforced behavior while they continued making similar boundaries with other people as they grew up. For this reason, it is likely that they are often surrounded by people, in accordance with Wiseman et al.'s (2006) findings and hence they report lower levels of loneliness. Although there are other few studies that have examined the relation

between attachment security and loneliness, some evidence exists in agreement with these results (Fransson et al., 2016; Richaud-de Minzi, 2006).

Surprisingly, significant direct associations between attachment security and ease forming relationships and between satisfaction with friends were not found in this study, as has been observed in previous research (Benson et al., 2006; Laible, 2007; Parade et al., 2010; Weimer et al., 2004; Welch & Houser, 2010). There are several different explanations for this inconsistency with prior research. First, attachment to parents has been found to facilitate friendships but friendships may also compensate when youth have less secure parental attachment bonds (Perlman et al., 2015). In Way and Greene's (2006) longitudinal study across 4 years of high school, a positive association between quality of family ties and quality of friendship was found for some students, but also the greatest improvements in friendship quality were among those reporting low quality of family ties, indicating a compensatory pattern of influence for friendships. Second, different and somewhat opposite individual attachment styles (secure and preoccupied) have been associated with a large number of friends (Murakami, 2014). Third, in Parade et al.'s (2010) study attachment security predicted satisfaction with friends among racial minority students, but not white students, and the authors noted that students who were racial minorities may have experienced more stress and greater activation of the attachment system as a result of experiences of racism and discrimination. In the current sample of college students, we did not expect that group differences in activation of the attachment system. Future research should examine the potential compensatory role of friendships, the size of friendship networks, and the role of stress during the collection transition, as moderators of the effect of attachment to parents on social outcomes during college.

At the same time, attachment to parents was significantly associated with loneliness but not ease forming friendships and satisfaction with friendships. A possible explanation of this result is that the experience of loneliness may be a broader construct than ease forming relationships or satisfaction with friends. While the first takes into consideration an overall feeling that does not refer to any person in particular, the other two specifically allude to new relationships or friends. Moreover, there were significant correlations between ease forming relationships and satisfaction with friends, but loneliness was not significantly correlate with either of these constructs, supporting the idea that loneliness may entail unique aspects of relationships. It is possible that when students were asked how lonely they felt, those that were more secured attached to their parents also knew that, regardless their social situation at college, they have people to rely on at home. Likewise, attachment to parents might be

a construct that is more strongly related to intimate aspects of relationships at the emotional level that are also more strongly associated with loneliness than is ease forming relationships or satisfaction with friends. Taken together, this suggests that parental attachment security is directly related to the experience of loneliness and only indirectly to ease forming friendships and satisfaction with friendships through social anxiety.

Consistent with previous findings in the literature (Erozkun, 2009; Manning et al., 2017; Mothander & Wang, 2014; Notzon et al., 2016; Papini et al., 1991), lower levels of social anxiety significantly predicted ease forming relationships, more satisfaction with friends, and less loneliness in this study. Students who experienced social anxiety may have avoided social interactions and may also have been less socially competent when they did interact with their peers. It is also plausible that students who were social anxious had less self-confidence which negatively influenced their interpersonal relationships (Parade et al., 2010). Furthermore, Cuming and Rapee (2010) argued that socially anxious adults tend to disclose less about themselves in close relationships and have fewer social skills, behaviors which may contribute to satisfaction and loneliness. Similar results have been found in adolescence, showing a significant association between higher levels of social anxiety and higher levels of loneliness in young adolescents (Erath et al., 2010), and social phobia and higher levels of peer-related and romantic loneliness in older adolescents (Larsgaard et al., 2011). All these results bring stronger evidence to support the association between social anxiety and loneliness in young adults.

Finally, gender did not moderate the effect of attachment to parents on ease forming friendships, friendship satisfaction, or loneliness. These results are consistent with previous studies that did not find evidence of a moderating effect of gender in the association of attachment to parents and social competence (Mattanah et al., 2011), and between social anxiety and social ties (Brook & Willoughby, 2015). By contrast, these findings contradict previous research that found greater associations between social anxiety and social functioning and friendship quality in women than men (Biggs et al., 2012; La Greca & Lopez, 1998; Vernberg et al., 1992). In sum, it appears that a strong attachment to parents may give both female and male students a higher level of security that is advantageous for social interactions and close relationships during transition to college.

Despite the scientific contribution of this short-term longitudinal study, gaps remain in our understanding of social interactions during the college transition. First, it is unclear if the positive effects of parental attachment security on relational outcomes through social anxiety are maintained during the following years of college as our research only

focused on the first six months. Second, all our measures were student self-report questionnaires, and future research should utilize observational assessments. Third, we had unequal numbers of female and male students in our sample, with a lower number of male participants, and future research should examine these associations in more balanced and longer samples. Fourth, this research tested only gender and social anxiety as moderating and mediating factors, respectively. Future studies should consider other potential moderators (e.g., IQ) and mediators (e.g., self-esteem -Karababa, 2022-, emotion regulation -Read et al., 2018-, mood and coping -Abraham & Kerns, 2013-, empathy and cognitive flexibility -Tei et al., 2020-, social perception -Kanai et al., 2012-, etc.) which have already demonstrated their significance in studies with other populations.

In spite of these limitations, the current study presents several important practical and theoretical implications. First, this research supports the theoretical proposition that early attachment bonds shape subsequent relationships. (Pallini et al., 2014; Welch & Houser, 2010; Wiseman et al., 2006), and that social anxiety is a mechanism of this effect (Parade et al., 2010). Second, these results provide information about which students may be at risk for challenges in the college transition, knowledge that may be helpful for identifying students who may benefit most from additional support. Third, this research suggests the need of prevention programs during high school and prior to the college transition that address these aspects. These interventions would benefit from explanatory models that explain how attachment and social anxiety impact social relationships. Cognitive-behavioral models of social anxiety emphasize dysfunctional thought processes about oneself and one's social world (Rapee & Heimberg, 1997), whereas attachment theory proposes that early experiences develop cognitive schemas of the self and others, named working models (Bowlby, 1969). These internal working models function as the basis for developing subsequent interpersonal relationships and are believed to influence how individuals deal with emotions in all areas of life, especially in the context of social relationships (Bretherton & Munholland, 1999). Interventions in this area should focus on the perception of the self and others. It should be a central aim to identify where these perceptions and their related emotions stem from and influence social behavior. Additionally, social and emotional learning programs for students that address competencies such as self-management or self-regulation (emotions, cognitions, and behaviors) and relationship skills, as the CASEL model states (Weissberg et al., 2015), may also support students in developing healthy relationships. Finally, following Bronfenbrenner's ecological model (1979), working with the adolescents' and youths' microsystems would improve the effectiveness of interventions.

Positive parenting programs that promote secure attachment bonds between parents and their children may also be beneficial (Lindquist & Watkins, 2014).

Thus, attachment theory, cognitive-behavioral models of social anxiety, the CASEL model, and Bronfenbrenner's model are clearly intertwined and may be a good guide for interventions to improve social adaptation to college. Taken together, this research underscores the role of parental attachment and social anxiety in shaping the social experiences of students in the college transition.

Authors' contribution RJC contributed to the study's conception and design, collected the data, participated in the statistical analysis, reviewed the final results, participated in the draft and review of the manuscript; PV-I participated in the draft and review of the manuscript; SP contributed to the study's conception and design, reviewed the manuscript, and performed preliminary statistical analysis; AH-F participated in the draft, update, and review of the manuscript; DH participated in the statistical analysis and drafted the first version of the results.

Funding Open Access funding provided thanks to the CRUE-CSIC agreement with Springer Nature.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

- Abby, A., Abramis, D. J., & Caplan, R. D. (1985). Effects of different sources of social support and social conflict on emotional wellbeing. *Basic and Applied Social Psychology*, 6(2), 111–129. https://doi.org/10.1207/s15324834basp0602_2
- Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. (1978). *Patterns of attachment: A psychological study of the strange situation*. Hillsdale, NJ: Erlbaum.
- Abraham, M. M., & Kerns, K. A. (2013). Positive and Negative Emotions and Coping as Mediators of Mother-Child Attachment and Peer Relationships. *Merrill-Palmer Quarterly*, 59(4), 399–425. <https://doi.org/10.13110/merrpalmquar1982.59.4.0399>
- American Psychiatric Association (2022). *Diagnostic and statistical manual of mental disorders* (5th ed., text rev.). <https://doi.org/10.1176/appi.books.9780890425787>
- Armsden, G. C., & Greenberg, M. T. (1987). The inventory of parent and peer attachment: Individual differences and their relationship to psychological well-being in adolescence. *Journal of Youth and Adolescence*, 16(5), 427–453. <https://doi.org/10.1007/BF02202939>
- Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, 117(3), 497–529. <https://doi.org/10.1037/0033-2909.117.3.497>
- Benson, M. J., McWey, L. M., & Ross, J. J. (2006). Parental attachment and peer relations in adolescence: A meta-analysis. *Research in Human Development*, 3(1), 33–43. https://doi.org/10.1207/s15427617rhd0301_4
- Biggs, B. K., Vernberg, E. M., & Wu, Y. P. (2012). Social Anxiety and Adolescents' Friendships: The Role of Social Withdrawal. *Journal of Early Adolescence*, 32(6), 802–823. <https://doi.org/10.1177/0272431611426145>
- Bentler, P. M., & Chou, C. (1987). Practical issues in structural modeling. *Sociological Methods and Research*, 16(1), 78–117. <https://doi.org/10.1177/0049124187016001004>
- Bowlby, J. (1969). *Attachment and Loss: Vol. 1. Attachment*. New York: Basic Books.
- Bowlby, J. (1973). *Attachment and Loss: Vol. 2. Separation and Anxiety*. New York: Basic Books.
- Bowlby, J. (1980). *Attachment and Loss: Vol. 3. Loss and Sadness*. New York: Basic Books.
- Bretherton, I., & Munholland, K. A. (1999). Internal working models in attachment relationships: A construct revisited. In J. Cassidy, & P. R. Shaver (Eds.), *Handbook of attachment: Theory, research and clinical applications* (pp. 89–111). New York: Guilford Press.
- Bronfenbrenner, U. (1979). *The ecology of human development*. Cambridge: Harvard University Press.
- Brook, C. A., & Willoughby, T. (2015). The social ties that bind: social anxiety and academic achievement across the university years. *Journal of Youth Adolescence*, 44(5), 1139–1152. <https://doi.org/10.1007/s10964-015-0262-8>
- Brooks, J. H., & DuBois, D. L. (1995). Individual and environmental predictors of adjustment during the first year of college. *Journal of College Student Development*, 36(4), 347–360.
- Brumariu, L. E., & Kerns, K. A. (2008). Mother-child attachment and social anxiety symptoms in middle childhood. *Journal of Applied Developmental Psychology*, 29(5), 393–402. <https://doi.org/10.1016/j.appdev.2008.06.002>
- Buhrmester, D., Furman, W., Wittenberg, M. T., & Reis, H. T. (1988). Five domains of interpersonal competence in peer relations. *Journal of Personality and Social Psychology*, 55(6), 991–1008. <https://doi.org/10.1037/0022-3514.55.6.991>
- Byrne, B. M. (2001). *Multivariate applications book series. Structural equation modeling with AMOS: Basic concepts, applications, and programming*. Lawrence Erlbaum Associates Publishers.
- Cuming, S., & Rapee, R. M. (2010). Social anxiety and self-protective communication style in close relationships. *Behaviour Research and Therapy*, 48(2), 87–96. <https://doi.org/10.1016/j.brat.2009.09.010>
- Erath, S., Flanagan, K. S., Bierman, K. L., & Tu, K. M. (2010). Friendships moderate psychosocial maladjustment in socially anxious early adolescents. *Journal of Applied Developmental Psychology*, 31(1), 15–26. <https://doi.org/10.1016/j.appdev.2009.05.005>
- Erozkan, A. (2009). The relationship between attachment styles and social anxiety: An investigation with Turkish university students. *Social Behavior and Personality: An International Journal*, 37(6), 835–844. <https://doi.org/10.2224/sbp.2009.37.6.835>
- Fass, M. E., & Tubman, J. G. (2002). The influence of parental and peer attachment on college students' academic achievement. *Psychology in the Schools*, 39(5), 561–574. <https://doi.org/10.1002/pits.10050>
- Fransson, M., Granqvist, P., Marciszko, C., Hagekull, B., & Bohlin, G. (2016). Is middle childhood attachment related to social functioning in young adulthood? *Scandinavian Journal of Psychology*, 57(2), 108–116. <https://doi.org/10.1111/sjop.12276>

- García-Mendoza, M. D. C., Sánchez-Queija, M. I., & Parra-Jiménez, Á. (2018). The role of parents in emerging adults' psychological well-being: A person-oriented approach. *Family Process, 58*(4), 954–971. <https://doi.org/10.1111/famp.12388>
- Gierveld, J., & van Tilburg, T. (2006). A 6-Item Scale for Overall, Emotional, and Social Loneliness Confirmatory Tests on Survey Data. *Research on Aging, 28*(5), 582–598. <https://doi.org/10.1177/0164027506289723>
- Correse, A., & Ruggieri, R. (2012). Peer attachment: A meta-analytic review of gender and age differences and associations with parent attachment. *Journal of Youth and Adolescence, 41*, 650–672. <https://doi.org/10.1007/s10964-012-9759-6>
- Hartup, W. W., & Stevens, N. (1997). Friendships and adaptation in the life course. *Psychological Bulletin, 121*(3), 355–370. <https://doi.org/10.1037/0033-2909.121.3.355>
- Hendrick, S. S. (1988). A generic measure of relationship satisfaction. *Journal of Marriage and The Family, 50*(1), 93–98. <https://doi.org/10.2307/352430>
- Holt, L. J., Mattanah, J. F., & Long, M. W. (2018). Change in parental and peer relationship quality during emerging adulthood: Implications for academic, social, and emotional functioning. *Journal of Social and Personal Relationships, 35*(5), 743–769. <https://doi.org/10.1177/0265407517697856>
- Kanai, R., Bahrami, B., Duchaine, B., Janik, A., Banissy, M. J., & Rees, G. (2012). Brain Structure Links Loneliness to Social Perception. *Current Biology, 22*(20), 1975–1979. <https://doi.org/10.1016/j.cub.2012.08.045>
- Karababa, A. (2022). Understanding the association between parental attachment and loneliness among adolescents: The mediating role of self-esteem. *Current Psychology, 41*, 6655–6665. <https://doi.org/10.1007/s12144-021-01417-z>. Advance online publication.
- Kenny, M. E. (1987). The extent and function of parental attachment among first-year college students. *Journal of Youth and Adolescence, 16*(1), 17–29. <https://doi.org/10.1007/BF02141544>
- Kline, R. B. (2005). *Principles and practice of structural equation modeling* (2nd Edition). Guilford Press.
- La Greca, A. M., & Lopez, N. (1998). Social anxiety among adolescents: Linkages with peer relations and friendships. *Journal of Abnormal Child Psychology, 26*(2), 83–94. <https://doi.org/10.1023/A:1022684520514>
- Laible, D. (2007). Attachment with parents and peers in late adolescence: Links with emotional competence and social behavior. *Personality and Individual Differences, 43*(5), 1185–1197. <https://doi.org/10.1016/j.paid.2007.03.010>
- Larkins, C. W. (2014). Friendship in Children with Anxiety Disorders: A Longitudinal Examination (Doctoral dissertation, UCLA).
- Lasgaard, M., Goossens, L., Bramsen, R. H., Trillingsgaard, T., & Elklit, A. (2011). Different sources of loneliness are associated with different forms of psychopathology in adolescence. *Journal of Research in Personality, 45*(2), 233–237. <https://doi.org/10.1016/j.jrp.2010.12.005>
- Leary, M. R. (1990). Responses to social exclusion: Social anxiety, jealousy, loneliness, depression, and low self-esteem. *Journal of Social and Clinical Psychology, 9*(2), 221–229. <https://doi.org/10.1521/jscp.1990.9.2.221>
- Lieberman, M., Doyle, A., & Markiewicz, D. (1999). Developmental patterns in security of attachment to mother and father in late childhood and early adolescence: Associations with peer relations. *Child Development, 70*(1), 202–213. <https://doi.org/10.1111/1467-8624.00015>
- Lindquist, T. G., & Watkins, K. L. (2014). Modern approaches to modern challenges: A review of widely used parenting programs. *Journal of Individual Psychology, 70*(2), 148–165. <https://doi.org/10.1353/jip.2014.0013>
- Love, K. M. (2008). Parental Attachments and Psychological Distress Among African American College Students. *Journal of College Student Development, 49*(1), 31–40. <https://doi.org/10.1353/csd.2008.0000>
- Lu, L. (1994). University transition: Major and minor stressors, personality characteristics and mental health. *Psychological Medicine, 24*(1), 81–87. <https://doi.org/10.1017/S0033291700026854>
- Manning, R. P., Dickson, J. M., Palmier-Claus, J., Cunliffe, A., & Taylor, P. J. (2017). A systematic review of adult attachment and social anxiety. *Journal of Affective Disorders, 211*, 44–59. <https://doi.org/10.1016/j.jad.2016.12.020>
- Mattanah, J. F., Lopez, F. G., & Govern, J. M. (2011). The contributions of parental attachment bonds to college student development and adjustment: A meta-analytic review. *Journal of Counseling Psychology, 58*(4), 565–596. <https://doi.org/10.1037/a0024635>
- Mattick, R. P., & Clarke, J. C. (1998). Development and validation of measures of social phobia scrutiny fear and social interaction anxiety. *Behavior Research and Therapy, 36*(4), 455–470. [https://doi.org/10.1016/S0005-7967\(97\)10031-6](https://doi.org/10.1016/S0005-7967(97)10031-6)
- McGinn, L. K., Cukor, D., & Sanderson, W. C. (2005). The relationship between parenting style, cognitive style, and anxiety and depression: Does increased early adversity influence symptom severity through the mediating role of cognitive style? *Cognitive Therapy and Research, 29*(2), 219–242. [https://doi.org/10.1016/S0005-7967\(97\)10031-6](https://doi.org/10.1016/S0005-7967(97)10031-6)
- Mothander, P. R., & Wang, M. (2014). Parental rearing, attachment, and social anxiety in Chinese adolescents. *Youth & Society, 46*(2), 155–175. <https://doi.org/10.1177/0044118X11427573>
- Murakami, T. (2014). Relation between attachment styles and friendship motivation in university students. *The Japanese Journal of Personality, 22*(3), 289–292. <https://doi.org/10.2132/personality.22.289>
- Muthén, L. K., & Muthén, B. O. (2002). How to use a Monte Carlo study to decide on sample size and determine power. *Structural Equation Modeling, 9*(4), 599–620. https://doi.org/10.1207/S15328007SEM0904_8
- Notzon, S., Domschke, K., Holitschke, K., Ziegler, C., Arolt, V., Pauli, P., Reif, A., Deckert, J., & Zwanzerger, P. (2016). Attachment style and oxytocin receptor gene variation interact in influencing social anxiety. *The World Journal of Biological Psychiatry, 17*(1), 76–83. <https://doi.org/10.3109/15622975.2015.1091502>
- Pallini, S., Baiocco, R., Schneider, B. H., Madigan, S., & Atkinson, L. (2014). Early Child-Parent Attachment and Peer Relations: A Meta-Analysis of Recent Research. *Journal of Family Psychology, 28*(1), 118–123. <https://doi.org/10.1037/a0035736>
- Papini, D. R., Roggman, L. A., & Anderson, J. (1991). Early-adolescent perceptions of attachment to mother and father: A test of emotional-distancing and buffering hypotheses. *The Journal of Early Adolescence, 11*(2), 258–275. <https://doi.org/10.1177/0272431691112006>
- Parade, S., Leerkes, E., & Blankson, A. (2010). Attachment to Parents, Social Anxiety, and Close Relationships of Female Students over the Transition to College. *Journal of Youth and Adolescence, 39*(2), 127–137. <https://doi.org/10.1007/s10964-009-9396-x>
- Peplau, L. A., & Perlman, D. (Eds.). (1982). *Loneliness: A sourcebook of current theory, research, and therapy*. New York: Wiley-Interscience.
- Perlman, D., Stevens, N. L., & Carcedo, R. J. (2015). Friendship. In M. Mikulincer, P. R. Shaver, J. A. Simpson, & J. F. Dovidio (Eds.), *APA handbook of personality and social psychology, Volume 3: Interpersonal relations* (pp. 463–493). Washington, DC, US: American Psychological Association. <https://doi.org/10.1037/14344-017>
- Rapee, R. M., & Heimberg, R. G. (1997). A cognitive-behavioral model of anxiety in social phobia. *Behaviour Research & Therapy, 35*(8), 741. [https://doi.org/10.1016/S0005-7967\(97\)00022-3](https://doi.org/10.1016/S0005-7967(97)00022-3)
- Read, D. L., Clark, G. I., Rock, A. J., & Coventry, W. L. (2018). Adult attachment and social anxiety: The mediating role of

- emotion regulation strategies. *Plos One*, 13(12), 1–21. <https://doi.org/10.1371/journal.pone.0207514>
- Richaud-de Minzi, M. C. (2006). Loneliness and depression in middle and late childhood: the relationship to attachment and parental styles. *The Journal of Genetic Psychology*, 167(2), 189–210. <https://doi.org/10.3200/GNTP.167.2.189-210>
- Roisman, G. I., Collins, W. A., Sroufe, L. A., & Egeland, B. (2005). Predictors of young adults' representations of and behavior in their current romantic relationship: prospective tests of the prototype hypothesis. *Attachment & Human Development*, 7(2), 105–121. <https://doi.org/10.1080/14616730500134928>
- Schimmenti, A., & Bifulco, A. (2015). Linking lack of care in childhood to anxiety disorders in emerging adulthood: The role of attachment styles. *Child and Adolescent Mental Health*, 20(1), 41–48. <https://doi.org/10.1111/camh.12051>
- Selfhout, M. H. W., Branje, S. J. T., Delsing, M., ter Bogt, T. F. M., & Meeus, W. H. J. (2009). Different types of Internet use, depression, and social anxiety: The role of perceived friendship quality. *Journal of Adolescence*, 32(4), 819–833. <https://doi.org/10.1016/j.adolescence.2008.10.011>
- Strahan, E. (2003). The effects of social anxiety and social skills on academic performance. *Personality and Individual Differences*, 34(2), 347–366. [https://doi.org/10.1016/S0191-8869\(02\)00049-1](https://doi.org/10.1016/S0191-8869(02)00049-1)
- Strahan, E., & Conger, A. J. (1998). Social anxiety and its effects on performance and perception. *Journal of Anxiety Disorders*, 12(4), 293–305. [https://doi.org/10.1016/S0887-6185\(98\)00016-4](https://doi.org/10.1016/S0887-6185(98)00016-4)
- Swenson, L., Nordstrom, A., & Hiester, M. (2008). The Role of Peer Relationships in Adjustment to College. *Journal of College Student Development*, 49(6), 551–567. <https://doi.org/10.1353/csd.0.0038>
- Tei, S., Kauppi, J. P., Jankowski, K. F., Fujino, J., Monti, R. P., Tohka, J., Abe, N., Murai, T., Takahashi, H., & Hari, R. (2020). Brain and behavioral alterations in subjects with social anxiety dominated by empathic embarrassment. *Proceedings of the National Academy of Sciences of the United States of America*, 117(8), 4385–4391. <https://doi.org/10.1073/pnas.1918081117>
- Tillfors, M., Persson, S., Willen, M., & Burk, W. J. (2012). Prospective links between social anxiety and adolescent peer relations. *Journal of Adolescence*, 35(5), 1255–1263. <https://doi.org/10.1016/j.adolescence.2012.04.008>
- Tiwari, S., & Garg, P. (2015). The relation between early attachment experience and adult interpersonal relationships. *Indian Journal of Health and Wellbeing*, 6(3), 325–327.
- Vernberg, E. M., Abwender, D. A., Ewell, K. K., & Beery, S. H. (1992). Social anxiety and peer relationships in early adolescence: A prospective analysis. *Journal of Clinical Child Psychology*, 21(2), 189–196. https://doi.org/10.1207/s15374424jccp2102_11
- Way, N., & Greene, M. L. (2006). Trajectories of perceived friendship quality during adolescence: The patterns and contextual predictors. *Journal of Research on Adolescence*, 16(2), 293–320. <https://doi.org/10.1111/j.1532-7795.2006.00133.x>
- Weimer, B. L., Kerns, K. A., & Oldenburg, C. M. (2004). Adolescents' interactions with a best friend: Associations with attachment style. *Journal of Experimental Child Psychology*, 88(1), 102–120. <https://doi.org/10.1016/j.jecp.2004.01.003>
- Weissberg, R., Durlak, J., Domitrovich, R., & y Gullotta, T. (2015). Social and emotional learning: past, present, and future. In E. J. Durlak, C. Domitrovich, R. Weissberg, & T. Gullotta (Eds.), *Handbook of Social and Emotional Learning* (pp. 3–19). New York: The Guilford Press.
- Welch, R. D., & Houser, M. E. (2010). Extending the four-category model of adult attachment: An interpersonal model of friendship attachment. *Journal of Social and Personal Relationships*, 27(3), 351–366. <https://doi.org/10.1177/0265407509349632>
- Williams, K. D., Shore, W. J., & Grahe, J. E. (1998). The silent treatment: Perceptions of its behaviors and associated feelings. *Group Processes & Intergroup Relations*, 1(2), 117–141. <https://doi.org/10.1177/1368430298012002>
- Wiseman, H., Maysel, O., & Sharabany, R. (2006). Why are they lonely? Perceived quality of early relationships with parents, attachment, personality predispositions and loneliness in first-year university students. *Personality and Individual Differences*, 40(2), 237–248. <https://doi.org/10.1016/j.paid.2005.05.015>
- Zhao, C., & Dai, B. (2016). Relationship of fear of negative evaluation and social anxiety in college students. *China Journal of Health Psychology*, 24(11), 1746–1749.
- Zea, M. C., Jarama, S. L., & Bianchi, F. T. (1995). Social support and psychosocial competence: Explaining the adaptation to college of ethnically diverse students. *American Journal of Community Psychology*, 23(4), 509–531. <https://doi.org/10.1007/BF02506966>

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.