

Abstract

Insecure attachment to parents consistently correlates with adolescent depression. However, the order of cause and effect, the impact of confounding, and gender disparities in this relationship remain unresolved. The present study therefore examined the prospective associations between attachment relationships to mothers and fathers and depressive symptoms in a community sample of Spanish children (n=904; 49.4% females) assessed biennially from age 10-16 years, net of all unmeasured time-invariant confounding. Insecure relationships predicted depressive symptoms, and more so among girls, but depressive symptoms also forecasted worsened attachment relationships. At ages 12-14, mother-child attachment proved to be more important for the development of depressive symptoms than father-child attachment. These findings reveal a pattern of reciprocal influence between attachment relationships and depressive symptoms that appears to vary as a function of the parental and child's gender and developmental period. Thus, efforts aimed at strengthening the parent-child attachment relationship - across the transition from middle childhood to adolescence - may prevent or reduce depressive symptoms, especially by targeting mothers and female adolescents.

Keywords: Adolescence, Attachment relationships, Depression, Dynamic panel model, Gender, Reciprocal associations

Introduction

Depressive disorders are prevalent mental health concerns in adolescence (Hankin et al. 2015). However, these disorders may have their roots earlier in life. Importantly, depressive symptoms below the diagnostic threshold may also have a detrimental impact on health and psychosocial functioning in a substantial proportion of adolescents (Ayuso-Mateos et al. 2010), even beyond increasing the risk for later depressive disorders (Lewinsohn et al. 2000). Thus, it is crucial to identify factors responsible for the emergence of depressive symptoms in both childhood and adolescence.

It has been suggested that insecure attachment may operate as one of these risk factors (e.g., Brumariu and Kerns 2010; Madigan et al. 2016). From a developmental perspective, the transition from childhood to adolescence represents a crucial stage for the onset of depressive symptoms (Ferreiro et al. 2012) and also for changes in the quality of attachment relationships (Markiewicz et al. 2006) that, in turn, can affect the development of depressive symptoms (Agerup et al. 2015). Surprisingly though, few studies have investigated the prospective associations between attachment and depressive symptoms in children and adolescents. To date, the majority of prospective studies suggests that insecure attachment *predicts* increased depression during adolescence, thus supporting the view that insecure attachment is an etiological factor in adolescent depression (DeKlyen and Greenberg 2016). These prospective associations notwithstanding, important questions regarding the nature of the attachment—depression link remain unexplored. In particular, from the current literature is not possible to identify the direction of this effects. Indeed, most of the empirical studies measuring the prospective association between attachment and depressive symptoms have hypothesized that the former is a causal factor for the latter, without considering the detrimental effect that depressive symptoms of children may have on attachment to parents (Duchesne and Ratelle 2014). In addition, it is unclear whether this relation may be explained by the effects of potential confounders (e.g., common genes, personality, parent-child relationship, common methods) that could produce a spurious association between the variables but which have not been ruled out in prior research. Moreover, in spite of fathers being important attachment figures in adolescence (Allen and Tan 2016), the particular role of father-child attachment in the development of depressive symptoms has been scarcely explored. This paucity of research also relates to the child's gender. Not only may girls and boys evince different levels of depressive symptoms, but the parent-child attachment relationships may be differentially important to girls' and boys' depressive symptoms (Branje et al. 2010). Recognizing these gaps in the literature, the present study investigates, for the first time, the bidirectional

nature of the attachment–depressive symptoms association from middle childhood to adolescence, by applying an analytical approach that rules out time-invariant confounding factors. In addition, the differential effect of mothers and fathers and the potential child’s gender-specific effects in this relationship will be explored.

Prospective Influence of Insecure Attachment on Depressive Symptoms in Adolescence

Attachment theory (Bowlby 1973) postulates that children develop *internal working models* about themselves and the social world based on the early care environment, and that such mental representations guide their future psychosocial functioning. Children whose attachment needs are not fulfilled, due to inconsistent or unavailable caregiving, are hypothesized to develop less flexible and more self-critical working models (Mikulincer and Shaver 2012). These dysfunctional representational models influence the child’s interpretation of negative events and their response to failure, which may result in feelings of helplessness and incompetence (Morley and Morgan 2011). This, in turn, increases the risk of subsequent depression (Madigan et al. 2016). Notably, depressive symptoms rise dramatically from middle childhood and adolescence (Hankin 2006) and the degree of attachment (in)security can undergo substantial changes (Groh et al. 2014; Jones et al. 2017). Hence, when adolescent depression is investigated, one cannot solely rely on attachment sampled in early childhood, as often is the case (Allen et al. 2007), but rather on the quality of attachment relationships in middle childhood and adolescence (Allen and Tan 2016).

Thus far, numerous cross-sectional studies of adolescents have demonstrated that insecure attachment correlates with depressive symptoms (e.g., Puissant et al. 2011). However, because the possibility that the quality of attachment can prospectively predict the development of depressive symptoms cannot be precluded (DeKlyen and Greenberg 2016), longitudinal studies are needed. In this vein, Sund and Wichstrøm (2002) demonstrated that attachment insecurity at ages 12-14 years was predictive of depressive symptoms one year later, even when initial depressive symptoms were adjusted for. This finding was buffered by Agerup et al. (2015) showing that insecure attachment predicted incidence and continuity of depressive disorders from adolescence to young adulthood whereas secure attachment predicted recovery. Other studies, yet focused on mediational mechanisms related to negative IWMs, such as dysfunctional attitudes and low self-esteem, reported that insecure attachment predicted increases in depressive symptoms through these mediators (Lee and Hankin 2009, Cohen et al. 2013). In short, the review of the literature indicates that insecure attachment prospectively predicts increased depressive symptoms over the course of

adolescence. However, whether such causal implications should be drawn from this prediction has not yet been explored.

Confounders in the Attachment – Depression Relation

Findings from several lines of research cast doubt on the role of insecure attachment as part of the etiology of depression. First, although early attachment does not seem to be inherited (Fearon and Belsky 2016), genetics may play a role in adolescence (Fearon et al. 2014). Also, because adolescent depression is moderately heritable (Rice 2010), one cannot discount the possibility that attachment and depression share genetics in this age period (Belsky 2005). Second, despite the weak association between temperament and attachment in early childhood (Groh et al. 2017), several personality traits have been associated with attachment in adolescence (Blatt and Levy 2003). Moreover, a range of temperamental (Wichstrøm et al. 2018) and personality factors (Dagnino et al. 2017) increase the risk for depression also for non-genetic reasons (Wichstrøm et al. 2018), which may produce a spurious link between insecure attachment and depression. Third, parental behaviors such as sensitivity and mentalization are considered precursors to individual differences in attachment (Bakermans-Kranenburg and van IJzendoorn 2016; Zeegers et al. 2017). Suboptimal parenting behaviors have also been chronicled as predictors of depression (Rudolph 2009); however, it is likely that poor parenting may influence depression directly or through other mechanisms than attachment (e.g., limited promotion of physical activity [Trost and Loprinzi 2011]). Fourth, studies that rely on the same observer for recordings of exposure and outcome, which is typical of adolescent research, could produce inflated associations, also prospectively (Branje et al. 2010).

Importantly, the aforementioned factors are only some of the potential candidates for confounding. To some extent, likely confounders could be measured and entered as covariates, but it is difficult to rule them all out, making etiological interpretations from observational research difficult. One data-analytical approach, the dynamic panel model (DPM)/fixed effects model (Bollen and Brand 2010; Wichstrøm et al. 2017) is able to discount all time-invariant confounders, irrespective of whether they are known or not. In fact, many of the hard-to-measure threats to infer causality from attachment-depression associations stem from such more or less time-invariant factors (e.g., genetics, temperament, parenting styles, response style biases). Notably, the impact of such time-invariant factors may change over the life course (e.g., the increasing impact of gender on depression in adolescence), which may be modelled in DPM. Evidently, even though DPM narrows the gap between mere prediction and causation, time-varying factors (e.g., negative life-events) could still produce a spurious attachment-depression relation.

Nevertheless, even seemingly time-varying factors may evince stability (e.g., life-events [Rudolph 2009], bullying [Scholte et al. 2007]), which is adjusted for in DPM, thus ruling out one obstacle for etiological interpretation.

Reverse Effects: Do Depressive Symptoms Influence the Quality of Attachment Relationships?

Prior longitudinal studies were all based on the assumption that attachment insecurity affects the later development of depressive symptomatology, without considering reverse (i.e., depressive symptoms may deteriorate the quality of attachment relationships) or reciprocal influences. However, depression may color the way relationships are portrayed in questionnaires, interviews or in observations of attachment behavior (Ehrmantrout et al. 2011). Also, because of the aforementioned limited continuity in attachment from infancy to adolescence or early adulthood (Groh et al. 2014; Pinquart et al. 2013), there is ample room for factors influencing and altering the quality of attachment relationships over time. In this regard, recent studies targeting attachment-related constructs (connectedness to parents [Boutelle et al. 2009]; conflict with parents [Briere et al. 2013]) have provided preliminary evidence of reciprocal influence between the parent-child relationship and depressive symptomatology among adolescents. These results can be understood in light of Coyne's interpersonal conceptualization of depression (1999), which postulates that there is a deleterious feedback loop between depressive symptoms and interpersonal relationships; that is, adolescent depressive behavior may elicit more rejecting responses and less positive behavior from parents, which may erode attachment security (Hammen 2006). To date, only one study has provided support for reciprocal relations between attachment and depressive symptoms from mid-adolescence onwards (Branje et al. 2010). Given the possibility that depressive symptoms could diminish the quality of attachment relationships, it is quite possible that this association may remain even when all time-invariant potential confounders have been adjusted. Of note, longitudinal research with several repeated measurements applying analytical approaches that adjusts for time-invariant confounders is needed to disentangle the attachment-depression association; which heretofore has not been conducted.

The Relative Importance of Attachment to Mothers and Fathers

Traditionally, most attachment research explores mother-child relationships or does not distinguish between attachment to mothers and fathers (Lamb and Lewis 2011). Some similarities, although modest, in attachment relationships with mothers and fathers have been documented during infancy (Fox et al. 1991); however, this is not always the case during adolescence when parents may adopt complementary roles (i.e., children find greater safe haven from their mothers in times of distress and greater secure base from fathers from which to explore) (Kerns et

al. 2015). Concerning the attachment-depression link, only a few studies have considered analyzed the quality of attachment with the mother and the father separately across adolescence. Firstly, Branje et al. (2010) reported that the trajectory from relationship quality with mothers to depressive symptoms was evident for boys as well as girls, but the quality of the relationship to fathers predicted depressive symptoms in boys only. Note, however, that this study ran the models separately for mothers and fathers, hence due to some possible overlap between attachment to parents, it is not clear whether attachment to one of the parents is driving the associations or not. Secondly, Duchesne and Ratelle (2014) found that insecure mother-child attachment consistently predicted depressive symptoms across adolescence, whereas insecure father-child attachment only predicted higher risk for depressive symptoms at age 11. Finally, Agerup et al. (2015) reported that insecure attachment to both parents predicted the course of depressive disorders, but only attachment to mother predicted change from non-depressed in adolescence to depressed in emerging adulthood. Taken together, these results underline the prominent role of maternal attachment in the development of depressive symptoms but also the importance of including paternal attachment. In fact, father-child attachment appears to have an impact on the development of depressive symptoms that may differ by child gender and age. Importantly, though, exploring whether attachment to one or the other parent predicts depression does not clarify whether mother-child and father-child attachment relationships are *differentially* important.

Child's Gender-Specific Effects

In general, boys and girls may behave differently towards their parents according to gender-related expectations. For instance, whereas girls are expected to maintain relatedness with parents (perhaps especially mothers), even throughout the autonomy-seeking years of adolescence, boys may expect themselves to decrease their reliance on parents with age (Allen and Tan 2016). For these or related reasons girls may report more secure attachment relationships with mothers and fathers than boys during adolescence (Ruhl et al. 2015). At the same time, stronger interpersonal orientation and emotional closeness to others could render girls more vulnerable to depression (Rudolph 2009). Not only may the importance of attachment to parents for the development of depression differ for girls and boys, but also this differential impact may depend on the gender of the parent. This proposition has received preliminary support from studies finding poorer parent-adolescent relationship quality, especially with the mother, to predict later depressive symptoms in adolescent girls more strongly than in boys (Allen et al. 2007; Lewis et al. 2015). In contrast, it has been underscored that poor relationship quality to fathers

predict more depressive symptoms – but only among boys (Branje et al. 2010). Overall then, child’s gender appears to moderate the effect of attachment on depressive symptoms; however, the evolution of depressive symptoms in boys and girls in relation to each attachment figure remains unexplored.

The Present Study

Adolescent research suggests that attachment insecurity predicts the development of depressive symptoms (Brumariu and Kerns, 2010). However, previous research was not able to report whether or not these associations remain after taking into account potential time-invariant confounders. Also, the majority of studies were based on the assumption of the unidirectional effect of attachment on depressive symptoms without considering the reverse possibility. Moreover, scarce research has examined the differential importance of attachment to the development of depression according to the gender of the attachment figure and the gender of adolescent. Hence, the aim of this study is to investigate the prospective bidirectional association between attachment and depressive symptoms from middle childhood to adolescence, while ruling out time-invariant confounders (e.g., common genes, personality, parent-child relationship, common methods). Besides, the differential effect of attachment to mothers and fathers as separate entities, as well as child’s gender-specific effects will be examined. In line with prior research based on the attachment theory (DeKlyen and Greenberg 2016), it was first hypothesized that insecure attachment relationship with both mothers and fathers would predict later depressive symptoms during middle childhood and adolescence — even when adjusting for initial levels of depressive symptoms and attachment to the other parent. Second, based on Coyne’s interpersonal theory of depression (1999) that supports the deleterious feedback loop between depressive symptoms and interpersonal relationships, it was also expected the reverse association; that is, depressive symptoms would erode the quality of attachment relationships over time. Third, given the existing potential confounders, the present study remained open as to whether the reciprocal associations would hold when all unmeasured time-invariant factors were controlled. Fourth, based on theoretical and empirical works showing that mothers represent the *safe haven* where the child finds reassurance and comfort in times of distress (Kerns et al. 2015), it was hypothesized that mother-child attachment would be a stronger predictor than father-child attachment in the development of depressive symptoms. Finally, due to the fact that girls at this developmental stage has shown to be more sensitive to parent relationships (Allen et al. 2007; Lewis et al. 2015), it was speculated that poor attachment relationships would be more detrimental to girls’ than to boys’ depressive symptoms but also that boys may be especially affected by the attachment relationship with their fathers (Lamb and Lewis 2011).

Methods

Participants

This study is part of a larger project that investigates risk factors for the development of diverse psychological problems in childhood and adolescence (PSI2010-19793). Participants were recruited from 12 different public and private schools that were randomly selected as representative of coastal and inland areas in the province of A Coruña (Galicia, Spain). Enrollment was open to all students in grades 5–6. At baseline (T1) the sample comprised 904 students ($M_{\text{age}} = 10.83$; $SD = 0.75$). These participants were followed-up two (T2), ($n = 879$; $M_{\text{age}} = 12.85$; $SD = 0.77$), four (T3) ($n = 737$; $M_{\text{age}} = 14.98$; $SD = 0.84$), and six years later (T4) ($n = 463$; $M_{\text{age}} = 16.40$; $SD = 0.82$).

At intake, the parents' educational level (measured as the highest educational level attained by either parent) was as follows: 68% primary education, 20% secondary education, and 12% higher education. The ethnic composition of the sample was 98% Caucasian, 1% Arab, and 1% "other", which is consistent with the relatively homogeneous ethnic breakdown of the population of reference (Instituto Galego de Estatística 2017).

Participation rate was 97.2% of adolescents at T2, 81.5% at T3 and 51.2% at T4. Of note, higher attrition at T4 may be due to the fact that, six years later, older participants were difficult to reach for reassessment as most of them had completed compulsory education and therefore, had left school. No significant differences between participants who had available data at all four time points and those who missed one or more time points were found on any baseline clinical variable (depression, attachment) or gender, except that non-participants were half a year older than participants ($t = 8.80$, $p = 0.06$, 95% CI [0.34, 0.54], $M_{\text{age}} \text{ missing} = 11.05$, $M_{\text{age}} \text{ participating} = 10.61$). Moreover, logistic regression analyses showed that at T3 and T4 attrition was higher among children reporting lower quality attachment to the father at T1 (T3: OR = 0.88, 95% CI [0.79, 0.98], T4 = 0.88, 95% CI [0.81, 0.97]). Attrition was also higher at T3 among those reporting more depressive symptoms at T2 (OR = 1.04, 95% CI [1.00, 1.07]).

Procedure

This research received approval from the Bioethics Committee of the University of (blinded for review) and the Regional Government of (blinded for review) (Spain). Permission to carry out the study was obtained from the principals of all schools. Informed consent was obtained from the parents of the students who took part in the study. Informed assent was also obtained from participating children. Participation was rewarded by inclusion in a prize draw for five laptops and four tablet computers at T3 and T4, respectively.

The data were collected in classrooms of 20–25 students. Two trained research assistants were present in the classroom throughout the study session to answer any questions and prevent communication between the students. Students missing the first assessment in the classroom for various reasons (e.g., illness, truancy, and travel) were rescheduled for later evaluation in a few weeks' time.

Measures

Depressive symptoms. The Children's Depression Inventory (CDI; Kovacs 1992) was used to assess depressive symptoms. The CDI is a 27-item self-report measure designed to evaluate depressive symptoms in children and adolescents. Children were asked to respond to one of three statements for each item (e.g., 0 - "I am sad once in a while" to "I am sad all the time"), with higher scores indicating greater levels of depressive symptoms. Total scores range from 0 to 54 with a cutoff score of 19 suggesting significant depression. The Spanish version of the CDI used in this study has demonstrated adequate internal consistency, test-retest reliability, and concurrent and convergent validity (Del Barrio et al. 1999). Total scores range from 0 to 54. In the current sample, α coefficients were .84 at T1, .86 at T2 and T3, and .85 at T4.

Attachment to mother and father. The quality of attachment relationships with the mother and father was assessed using the Inventory of Parent and Peer Attachment (IPPA; Armsden and Greenberg 1987). The IPPA is a self-report measure to assess adolescents' perceptions of the quality of attachment relationship towards mother, father, and peers. For the present study, we used the revised version which comprises 25 items for each parent subscale, rated on a 5-point scale (from 1 = *never* to 5 = *always*). The overall score of attachment is obtained by summing responses of two subscales: degree of Mutual trust (e.g., "My mother/father/friends accept/s me as I am.") and Quality of communication (e.g., "I like to get my mother/father/friend's point of view on things I am concerned about."), and by subtracting the score of the subscale of anger and alienation (e.g., "I feel angry with my mother/father/friends."). Higher scores on Trust and Communication and lower score on Alienation indicate higher quality of attachment relationship. The Spanish-language version of the IPPA (Pardo et al. 2006) used in this study has shown satisfactory internal consistency and concurrent validity. In the current study, α coefficient ranged from .80 to .95 at T1, from .71 to .88 at T2, from .72 to .90 at T3, and from .72 to .91 at T4.

Statistical Analyses

Descriptive analyses were carried out using IBM SPSS Statistics 24. All other analyses were performed in Mplus 8.1 (Muthén and Muthén 1998–2018). As depressive symptoms were expected to be right-skewed, a robust

maximum likelihood estimator was applied, which does not presuppose multivariate normality. Missing data were handled according to full information maximum likelihood (FIML) procedure under the assumption that data were missing at random, as indicated by the attrition analyses.

To investigate whether insecure attachment relationships predicted more depressive symptoms, and *vice versa*, over and above earlier depressive symptoms, a traditional autoregressive cross-lagged model was run. Attachment to both parents and depression at one-time point were regressed on attachment and depression at the previous time point. Residuals in depression and attachment at each time point were allowed to correlate. Next, to rule out all unmeasured time-invariant confounders a Dynamic Panel Model (DPM) was created. In a structural equation approach to DPM, latent factors are added to the autoregressive cross-lagged model, loading on all time-points except for the first measurement point, which is considered exogenous (Allison et al. 2017; Bollen and Brand 2010) and correlate with the latent time-invariant factor(s). In the present analysis, factor loadings were fixed to 1 to achieve convergence. Acknowledging that attachment and depression might have different origins, we included one latent factor for depression and one for attachment to each parent, respectively, and allowed these three factors to correlate. Of note, a fixed effects model has limited statistical power because it only utilizes within subject information, as opposed to a random effects model, which utilizes both within and between information. Hybrid models are possible (Firebaugh et al. 2013), where some, but not all, correlations are set free. Hybrid models have the statistical power of random effects models while preserving the fixed effects advantage. However, a hybrid model implies that the latent time-invariant factors are uncorrelated with some of the initial measures that are set free, which may not be the case. To test whether a hybrid model does not deteriorate fit, it will be compared to a fixed effects model applying the Satorra-Bentler scaled chi-square test (Satorra 2000), which is a functional equivalent to the Hausman test (Hausman 1978).

Results

Descriptive Analyses

Estimated means, standard deviations, and correlations between all study variables are presented in Table 1. As can be seen, attachment to mother and father were negatively correlated with later depression at all-time points, for both boys and girls.

Reciprocal Associations between Attachment and Depressive Symptoms

As shown in the Fig. 1, the autoregressive cross-lagged model revealed moderate to high stability in attachment as well as depression. Regarding the cross-lagged paths, better mother-child attachment at T1 predicted less depressive symptoms at T2 and a similar influence was obtained from T2 to T3. Regarding the opposite effect, depressive symptoms at T2 predicted diminished mother-child attachment quality at T3, and similarly, depressive symptoms at T3 predicted poorer attachment at T4. In contrast, only one (unexpected) cross-lagged path involving fathers emerged: better father-child attachment at T2 predicted more depressive symptoms at T3.

Adjusting for all Time-invariant Confounders

First, a random effects model that presupposes that the initial values (age 10) are uncorrelated with the latent time-invariant factors was tested (Table 2; M2) (Allison 2009). This model fitted the data reasonably well. However, a fixed effects model, which presupposes the initial values can be correlated with the latent time-invariant factors, fitted the data even better (M3). In this model, the time-invariant depression factor was uncorrelated with age-10 attachment to father ($\beta = -.05, p = .79$), and age-10 depression was similarly uncorrelated with the time-invariant attachment-to-father measure ($\beta = -.13, p = .17$), and these two time-invariant factors were unrelated ($\beta = .07, p = .83$). Fixing these parameters to 0 resulted in a hybrid model (M4), which fitted the data no worse than the fixed effects model and was thus preferred for parsimonious and power reasons. Of note, parameters in a hybrid model may stem from both within-person and between-person information and be difficult to interpret (Berry and Willoughby 2017; Hamaker et al. 2015). However, the difference between the standardized cross-lagged parameters between attachment and depression in the hybrid and fixed models never exceeded 0.06 (Fig.2), suggesting that parameters of interest in the final hybrid model mainly result from within-person information.

The results from this hybrid model are depicted in Fig. 3. All autoregressive paths reached statistical significance. Cross-lagged paths indicated that better mother-child attachment predicted less depressive symptoms two years later, from T1 to T2 and from T2 to T3. Moreover, better father-child attachment at T1 also predicted less depressive symptoms at T2. Conversely, more depressive symptoms at T1 predicted poorer father-child attachment at T2. Similarly, depressive symptoms reduced the quality of attachment to mothers from T2 to T3 and from T3 to T4.

Differential Importance from and on Mother-child and Father-child Attachment

Inspection of Fig. 3 indicates that the influence of attachment to mothers were stronger than attachment to fathers *vis-à-vis* later depressive symptoms. Thus, whereas better mother-child attachment quality predicted fewer

depressive symptoms from T1 to T2 and from T2 to T3, only father-child attachment at T1 predicted fewer depressive symptoms at T2. To test whether these differential effects were indeed significant we compared a model where the effects to mothers and fathers were freely estimated to a model where they were fixed to be identical, using Satorra's procedure (Satorra 2000), examining one path at a time. The results of this model comparison can be found in Table 3; although the path coefficients were numerically higher for mothers at all-time points (Fig. 3), the effect was only significantly stronger from T2 attachment to T3 depressive symptoms. With respect to the depressive symptoms → attachment relation, a similar difference was found, also with the effect being stronger for attachment to mothers, this time from T3 depression to T4 attachment.

Child's Gender-Specific Effects

The hybrid DPM model was run separately for girls and boys (Fig. 4). Regarding girls, better mother-child attachment quality at T1 predicted less depressive symptoms at T2 and T3. Moreover, also for girls, more depressive symptoms at T3 predicted poorer mother-child attachment quality at T4. As regards girls' attachment to their father, T1 attachment seemingly protected against depressive symptoms at T2. Conversely, depressive symptoms had a potential negative impact on father-daughter attachment relationship two years later, at T2 as well as at T3. Regarding boys, only one cross-lagged path emerged; depressive symptoms at T3 predicted poorer mother-son attachment quality at T4. Moreover, in order to test whether the above paths were different for the two genders using the model comparison procedure described above. As it turned out, the effect of attachment to mothers and fathers at T2 on depressive symptoms at T3 were stronger for girls than for boys (Table 4). A model constraint approach revealed, however, no differential effects for girls versus boys with respect to attachment to mothers versus fathers (i.e., a three-way interaction) on later depressive symptoms.

Discussion

Previous research has found that insecure attachment predicts depression in childhood and adolescence (e.g., Madigan et al. 2016); however, none of these studies has explored the direction of effects ruling out important potential confounders (e.g., genetics, temperament, parenting, and common methods) that pose threats to inferring etiological impact from these observations. Besides, the scarce research about the differential effect of attachment to mothers and fathers as separate entities, as well as child's gender-specific effects has yielded inconsistent results. Following a community sample of children from ages 10 to 16 with biennial assessments, the current study applied a DPM approach in order to examine whether the prospective associations between attachment and depressive

symptoms remain after accounting for the contribution of potential confounder that do not change over time. This study also explored the possibilities that: (a) depressive symptoms would impede the quality of later attachment, (b) attachment to mothers would prove more important than attachment to fathers, and (c) girls' depressive symptoms would be more affected by poor attachment relationships than boys' symptoms.

In line with the hypotheses, the present results indicated that, while adjusting for all time-invariant confounders as well as previous depressive symptoms, better attachment predicted fewer depressive symptoms, but depressive symptoms also predicted reduced quality of attachment relationships. Moreover, mother-child attachment proved to be a stronger predictor for the development of depressive symptoms than did father-child attachment, and girls' depressive symptoms were potentially more affected by poor attachment relationships than were boys' depressive symptoms. Of note, these predictions were met at some time-points, but not all, lending only partial support to our hypotheses.

Reciprocal Associations between Attachment and Depressive Symptoms

Finding better quality of attachment to predict fewer depressive symptoms parallels previous longitudinal evidence (Agerup et al. 2015; Duchesne and Ratelle 2014; Sund and Wichstrøm 2002). However, it has been questioned how such results should be interpreted, as several more or less stable factors (e.g., genes [Belsky 2005]; temperament [Vaughn and Bost 2016]) might be influencing this relation. In the present study, poor attachment relationships predicted later depressive symptoms even when all the time-invariant factors were taken into account, thus discarding a significant set of obstacles—but certainly not all—to inferring the influence of attachment insecurity on depressive symptoms. Consistent with Bowlby's theory (1973), securely attached adolescents may hold a positive and stable sense of themselves and others rooted in early experiences with their parents that remain even in the face of challenging situations in which they might fail (Mikulincer and Shaver 2012). In consequence, secure adolescents -- holding functional internal working models that act as "interpretative lens" -- are more likely to use more adaptive coping strategies following negative events. For instance, they will tend to focus on more positive aspects of their experience, and interpret challenging moments as an opportunity to learn and improve (Morley and Morgan 2011). In addition, when facing danger or distress, securely attached youths will be able to turn to their parents for support or comfort as they have internalized a representation of their parents as available and reassuring as well as open to communication (Kerns et al. 2015).

On the other hand, the present results showed that depressive symptoms predicted deterioration of attachment to parents, albeit from age 12 to 16. Notably, when entering adolescence, parental monitoring and emotional availability change in accordance with the adolescent's increased need for autonomy (Lamb and Lewis 2011; Zeegers et al. 2017). At the same time, as the adolescent becomes more mature, it is expected a decrease, although gradually, in their need for and dependence on parents (Allen and Tan 2016). Possibly, such changes in the relationship may be reinforced by depressive symptoms across the transition to adolescence. After all, depression may hamper parent-child communication and closeness, and increase conflicts, which, in turn, affect the child's trust in the parent as a source of comfort or support. In fact, such an interpersonal understanding of depression which implies that depressed individuals often do not elicit positive interpersonal responses from others (Coyne 1999) has been supported by a series of research (Boutelle et al. 2009; Branje et al. 2010; Briere et al. 2013). However, the present results are contrary to some of analogous studies among adolescents that did not find a reverse influence of depressive symptoms over time (Stice et al. 2004; Young et al. 2005). This discrepancy might be due mainly to the fact that these studies focused exclusively on parental support and investigated different developmental period, with different follow-ups and analytical approach. In the current study, a potential deleterious reciprocal pattern between low quality attachment and depressive symptoms arose from T2 onwards, which accords with a review reporting stronger associations of attachment with internalizing symptoms at older ages (Brumariu and Kerns 2010). Overall, the present findings support the view that the association between the quality of attachment and the development of depressive symptoms in middle childhood and adolescence is a dynamic and reciprocal process (Boutelle et al. 2009).

Differential Impact from and on Mother-child and Father-child Attachment

Poor mother-child attachment was a stronger predictor of depressive symptoms than poor father-child attachment and this effect was observed between 12 and 14 years of age. This parallels the finding that children rely more on their mothers as "*safe haven*" in times of distress than on their fathers (Kerns et al. 2015; Markiewicz et al. 2006). The mother's more active role in the daily care of the child may render her a more prominent attachment figure, for better or worse. On the one hand, this frontline position allows for quick responses to the child's emotional needs. In consequence, when facing distress, the mother may facilitate the children's emotional regulation by providing care and reassurance (Kerns et al. 2015). On the other hand, when adolescents experience that their mothers are not the reliable source of support or comfort they used to be, they may feel more frustrated than when

their fathers fail in this respect, and this non-availability may foster depressive symptoms (Duchesne and Ratelle 2014).

The results also reveal that depressive symptoms had a stronger detrimental effect on attachment to the mother during the transition to middle adolescence (from 14 to 16 years old). According to previous studies, the search for support and comfort by depressed adolescents could have a harmful effect mainly on the quality of attachment relationships with mothers as they are generally closer than the fathers (Rosenthal and Kobak 2010). Also, fathers are often perceived as less affectively available during this period, using more minimizing or punitive emotion socialization strategies, which may explain the lack of effect (Lamb and Lewis 2011; Markiewicz et al. 2006). To be noted, though, higher quality of attachment does not necessarily imply absence of conflict with parents; but rather that the adolescent may express and maintain divergent views without fear of being rejected or less loved (Allen and Tan 2016).

However, in the current work, the father's lack of contribution in this period vis-à-vis depression should be interpreted with caution given the high correlation between maternal and paternal attachment, and the small-to-moderate correlations between better attachment with the father and depressive symptoms. After all, the role of the father in the entrance of adolescence as a secure base is crucial to foster autonomy and confident exploration of novel situations, for instance, the transition to a different school (Kerns et al. 2015). Although these results emphasize that, concerning depressive symptoms, mothers remain the primary attachment figures during adolescence especially from 12 to 14 years old, more research is needed to replicate these findings.

Child's Gender-Specific Effects

Prior research has chronicled early adolescent girls to be more affected than boys by the attachment quality, not only to the mother (Lamb and Lewis 2011), but also to the father (Liu 2006). The present research showed such a gender-specific effect, particularly of attachment to parents at age 12 on depressive symptoms at age 14, even when adjusting for all time-invariant confounding. This female susceptibility may result from to the possibility that, along with pubertal changes (Skoog et al. 2016), girls are exposed to more interpersonal stressors than boys in early adolescence (Hilt and Nolen-Hoeksema 2009). At this developmental phase, girls tend to report higher concerns with social approval than boys (Rudolph 2009) and show an increased investment in the quality of interpersonal relationships, which may make them more vulnerable to depressive distress when they fail in their attempts (Hilt and Nolen-Hoeksema 2009). In fact, low emotional closeness to the parents as well as family conflict seems to be strong

predictors of depression in females (Lewis et al. 2015). One explanation of these results could be that girls during early adolescence tend to build stronger emotional relationships with their parents than boys, and they may turn to them more frequently in order to regulate their negative emotions, especially to their mothers. However, when these parent-daughter attachment relationships do not provide the adequate support and comfort in times of distress, they may contribute to depression possibly by triggering negative cognitive representations or working models of themselves as unlovable and of others as untrustworthy (Hilt and Nolen-Hoeksema 2009).

In the case of boys, the low impact of attachment could be due to adolescent boys' emotional coping styles, who demonstrate more evasive attachment styles in line with expectations of gender roles (Giudice and Belsky 2010; Polce-Lynch et al. 2001). Conversely, Groh et al. (2012) found that early mother-child insecurity was not more strongly associated with internalizing symptoms for girls than boys. In the same line, Madigan et al. (2013) reported that insecure boys in early childhood were also at significantly heightened risk for developing internalizing symptoms. Thus, it seems that secure attachment relationships are highly correlated with internalizing symptoms in boys but in a different developmental period. In consequence, girls would benefit more from a secure attachment relationship with parents than boys into adolescence, whereas it is possible that boys might benefit more from secure attachment early on at a pre-adolescence stage (Viddal et al. 2015), where actually depression has been reported to be equal or even in some cases more prevalent in boys than in girls (Hilt and Nolen-Hoeksema 2009).

Strengths and Limitations

The present study has a number of important strengths. First, the study included a large community sample followed over multiple waves, with multiple repeated measurements of depressive symptoms and attachment to both parents, which allowed for an examination of the direction of effects. Second, the differential contribution of attachment to the mother and to the father was examined. Third, including boys and girls allowed the examination of gender differences which may contribute to design interventions better tailored to different needs of boys and girls. Finally, the application of DPM is a novel analytical approach that takes into account time-invariant confounding factors, rendering --- for the first time -- estimates of prediction free of contamination from a range of potential confounders such as genes, common methods effects, and stable personality and parenting practices.

Despite the above strengths, the current results should be interpreted in the context of some limitations. First, because the participants were Spanish and predominantly Caucasian, extrapolating our results across countries and cultures should be done with care. This pertains perhaps especially to the differing role that fathers might have

in the upbringing of their children in various cultures (Bornstein et al. 2011). Second, the study relied solely on self-reports from one source. However, as the rater did not change over time, any prospective inflation in predictions due to common methods would, in fact, be adjusted for by the latent time invariant factors applied. Third, depression was studied in terms of symptoms, not disorders, thus the possibility that the effects would have differ if depressive disorders were analyzed cannot be ruled out. Fourth, relatedly, attachment was examined continuously, not categorically. The impact of various insecure organized attachment patterns (i.e., avoidant and ambivalent) and disorganized attachment thus remains to be addressed. Notwithstanding, even if attachment traditionally has been viewed as categorically distributed, some individual's attachments are inevitably less clear-cut than others, including unclear cases, borderline cases, or when the child applies a mixture of attachment strategies. When applying taxometric techniques to a large sample, Fraley and Spieker (2003) found that variation in attachment patterns were continuously rather than categorically distributed. In addition, not only do borderline or mixed cases remain hidden with categorical approaches (Futh et al. 2008), but statistical power is also reduced (Roisman et al. 2007). Consequently, to capture the natural variability in attachment (Roisman et al. 2007), the present study analyzed the quality of attachment relationships and thus increased the statistical power and decreased the risk of a Type II error. Fifth, although time-invariant factors were accounted for, time-*varying* factors such as unexpected life-events (e.g., divorce of parents or death of a family member) or the time-varying protective effect of other relationships (e.g., to peers, siblings) were not included, and such factors could influence both attachment and depressive symptoms and produce spurious relations between the two. The degree to which the relation between attachment and depression varies as a function of the extent of negative and variant life events should be explored further. After all, the relation between attachment and psychopathology has been found to be reinforced in the context of multiple risk factors (Fearon et al. 2016). Sixth, attrition at T4 was relatively high. However, the application of FIML to missingness allowed to utilize all available data.

Implications

The present work contributes to the knowledge on parent-child attachment relationship and development of depressive symptoms in various ways. First, this study underscores not only the prospective impact that insecure attachment to parents exerts on depressive symptoms across middle childhood and adolescence, but also the eroding effect of depressive symptoms on attachment relationships over time, even when all time-invariant confounders are adjusted for. This reciprocal pattern seems to suggest that fostering secure parent-child relationships from infancy

throughout adolescence may not only prevent against depression but also the subsequent detrimental effect of depressive symptoms on attachment relationships (Berlin et al. 2016). Second, during the transition from middle childhood to adolescence, children experience significant changes that require enough cognitive flexibility in order to get late adolescence and young adulthood successfully (DeKlyen and Greenberg 2016). Given the fact that internal working models are open to considerable modifications between early childhood and late adolescence (Groh et al. 2014) and that they become over the course of development more resistant to change (Bowlby 1973), interventions should focus on the cognitive and emotional content of these working models in order to modify them and to prevent the development of depressive symptoms. Third, this work emphasizes the role that the gender of parents and children plays in these bidirectional associations. Given the reported results, it appears that intervention efforts might have a stronger effect on 12 to 14- year-old girls compared to boys, especially with regard to maternal attachment. However, this does not rule out the benefit of these programs in boys early on or the importance of also including the father. Ultimately, such knowledge can be used to design timely and gender-specific prevention strategies involving at-risk young people and their parents.

Conclusion

Prior adolescent research concerning the link between attachment-depressive symptoms have been based on the assumption of the unidirectional effect of attachment on depressive symptoms without considering the reverse possibility. Moreover, the differential importance of attachment to the development of depression according to the gender of the attachment figure and the gender of adolescent have rarely been examined. Finally, even when a prospective relationship between attachment and depression is documented, etiological implications are threatened by a range of third variables that has not been accounted for in existing research. This study contributes to the existent knowledge by prospectively examining the reciprocity in this association, the role of the father and mother separately, and gender influences through the application of a Dynamic Panel Model. The present findings document that insecure attachment to parents predicts prospective depressive symptoms in middle childhood and adolescence, even when all time-invariant confounders are adjusted for. Moreover, depressive symptomatology appears to have an eroding effect on attachment relationships over time. Finally, secure attachment to the mother (rather than to the father) is particularly protective against future depression, and attachment is likely more important to girls' depression than boys'. The present study therefore provided for the first time a stronger and more refined test of attachment theory, advocating insecure attachment as an etiological factor in the development of depression.

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Figures

Fig. 1 Cross-lagged panel model examining the association between depressive symptoms and attachment for full sample. Standardized coefficients are depicted. Results for attachment to mother are named first, results for attachment to father are named second. RMSEA = .065, CFI = .973, TLI = .938, SRMR = .043. T1/T2/T3/T4 = Time 1/Time 2/Time 3/Time 4. * $p < .05$, ** $p < .01$, *** $p < .001$

Fig. 2 Cross-lagged dual path model fixed examining the association between depressive symptoms and attachment for full sample. Standardized coefficients are depicted. Results for attachment to mother are named first, results for attachment to father are named second. RMSEA = .008, CFI = 1.000, TLI = .999, SRMR = .008. T1/T2/T3/T4 = Time 1/Time 2/Time 3/Time 4. * $p < .05$, ** $p < .01$, *** $p < .001$

Fig. 3 Cross-lagged dual path model hybrid examining the association between depressive symptoms and attachment for full sample. Standardized coefficients are depicted. Results for attachment to mother are named first, results for attachment to father are named second. RMSEA = .016, CFI = .999, TLI = .996, SRMR = .015. T1/T2/T3/T4 = Time 1/Time 2/Time 3/Time 4. * p < .05, ** p < .01, *** p < .001

Fig. 4 Dual path model hybrid examining the association between depressive symptoms and attachment to mother and father among boys and girls. Standardized coefficients are depicted. Results for girls are named first, results for boys are named second. RMSEA = .018, CFI = .999, TLI = .996, SRMR = .025. T1/T2/T3/T4 = Time 1/Time 2/Time 3/Time 4. * p < .05, ** p < .01, *** p < .001