Parental Depression and Adolescents' Internalizing Symptoms: The Role of Attachment to Physically Ill and Healthy Parents

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Abstract

Parental Depression is a well-established risk factor for the development of internalizing symptoms (i.e. problematic behaviors directed towards the self, including depression/anxiety, somatic complaints and withdrawn behavior) during adolescence. Using a cross-sectional design, we examined a possible moderated mediation of quality of attachment to both parents in this link in a Dutch sample of 133 adolescents (70 male, 63 female, mean age = 14.59), who had one physically ill parent (mean age = 46.78) and one healthy parent (mean age = 47.40). By means of a Conditional Process Analysis (Hayes, 2013) we found a significant mediation effect of adolescents' perceived quality of attachment to the physically ill parent in the link between depression of that parent and adolescents' internalizing symptoms, $F(2, 130) = 14.73$, $p < .001$, $R^2 = .18$. Using a moderated mediation model, we found quality of attachment to the physically ill parent to mediate this link only when perceived quality of attachment to the healthy parent was low but not when it was high, $F(1, 131) = 13.71$, $p < 001$, $R^2 = .30$. In terms of clinical implications, findings suggest that in families with parental physical illness a high quality of attachment to the healthy parent has the potential to alleviate negative effects on adolescents' internalzing symptoms, that result from a decline in quality of attachment to the physically ill parent with depression. We recommend a family-centered approach towards interventions improving the quality of attachment between adolescent and healthy parent.

Keywords: parental depression, quality of attachment, internalizing symptoms, adolescence

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Worldwide 10-20% of children and adolescents suffer from mental disorders (World Health Organization [WHO], 2016). Particularly depression is a global health problem, being one of the main causes of disability worldwide and estimated to become the leading cause of psychiatrically related death and disease burden across the globe by 2030 (WHO, 2008). Given that exhibiting problem behavior during childhood and adolescence is associated with an elevated risk for future psychopathology, such as depression (Reef, Diamantopoulou, van Meurs, Verhulst, & van der Ende, 2009), and early interventions can prevent the development of mental disorders, it is important to identify risk and protective factors for these adolescents. Of particular concern is the identification of those risk and protective factors in families with parental physical illness, as adolescents living with a parent suffering from a physical illness are at a high risk of developing behavioral and emotional problems (Visser, Huizinga, van der Graaf, Hoekstra, & Hoekstra-Weebers, 2004, Sieh, Visser-Meily, Oort, & Meijer, 2012a). Especially internalizing symptoms, which can be conceptualized as problematic behaviors directed toward the self, and include symptoms of depression/anxiety, somatic complaints and withdrawn behavior appear to be prevalent in adolescents with parental physical illness (Sieh et al., 2012a). As internalizing symptoms are among the most frequent signs of psychopathology affecting adolescents (Costello et al., 1996), it is important to understand the dynamic processes that give rise to these conditions. So what exposes adolescents to the risk of developing internalizing symptoms in families with parental physical illness? According to Bronfenbrenner's ecological systems model (1997), child adjustment can be explained by three systems: 1) actions of individual family members (microsystem), 2) interactions between family members (mesosystem), and 3) the external environment (exosystem). This model is in line with family systems theory (Bowen, 1966), which proposes that family

members are interrelated and mutually influence each other's functioning. Specifically, the family is seen as a united system in which a change in functioning of one family member is directly associated with a change in functioning of another member. Family systems theory considers internalizing symptoms to be "embedded in the family's network of relationships" (Becvar & Becvar, 2003, p. 211), implying that they occur in the context of dynamic relationships with other family members. Rolland's family-systems-illness model (1999) further supports the relevance of the family system in families with parental physical illness by outlining the importance of considering family relationships in explaining a child's stress level, particularly in response to parental illness. These models suggest to take family functioning, which we operationalize as the dynamic interplay between parental health status and quality of attachment to both parents, into account while trying to explain adolescents' adjustment outcomes.

One risk factor for adolescents' internalizing symptoms in light of family functioning, which is accounted for by the family-systems-illness model (Rolland, 1999) is depression in the parent suffering from a physical illness, referred to as *parental depression* in this paper. Research has shown that adolescents growing up with a parent who is either physically or mentally ill are at an increased risk for developing internalizing symptoms (Middleton, Scott, & Renk, 2009; Reising et al., 2013; Sieh et al., 2012a). Whereas most of the evidence supporting the link between parental physical illness and children's internalizing symptoms was demonstrated recently (e.g. Ireland & Pakenham, 2010; Middleton et al., 2009, Sieh et al., 2012a), the association between parental mental disorders and poor adolescent outcomes in form of increased psychopathology rates has long been known (e.g. Rutter, 1966). In a recent study, the chance of developing depression or anxiety disorders was found to be three times higher in adolescents whose parents were depressed than in adolescents whose parents were not depressed (Halligan, Murray, Martins, & Cooper, 2007). A recent meta-analytic

review of 193 studies including 80,851 mother-child dyads conducted in the United States on the link between maternal depression and child psychopathology confirmed a significant relationship between maternal depression and children's internalizing symptoms (Goodman et al., 2011). Living with a parent who suffers from depression beyond a physical illness heightens the risk for developing internalizing symptoms (Sieh, Visser-Meily, & Meijer, 2012b).

Another aspect of family functioning, which will be investigated in the present study as a potential risk factor for adolescents' internalizing symptoms, is the quality of attachment between adolescents and their parents (Armsden & Greenberg, 1987). Attachment is a concept that was originally defined as the affective bond between infant and primary caregiver (Bowlby, 1983) but has nowadays been expanded to contain significant relationships throughout the life span, including attachment to parents during childhood and adolescence (Liable, Carlo, & Raffaelli, 2000). Over the last decades, there has been an increased interest within the field of developmental psychopathology to understand the clinical implications of attachment. Whereas Bowlby (1983) already provided a theoretical basis for hypothesizing that a low quality of attachment is linked to internalizing symptoms in adolescents, research supported this idea by showing that children whose quality of attachment to their parents was low were more likely to develop behavioral and emotional problems (see Greenberg, 1999 for a review). A recent review of 33 studies investigating the link between quality of attachment between adolescents and their parents and internalizing symptoms found that a low quality of attachment was linked to behavioral problems in form of internalizing symptoms, especially to depression and anxiety (Brumariu & Kerns, 2010).

In the present study, we aim at applying both, attachment theory and family systems theory, by taking parental depression and adolescents' perceived quality of attachment to their parents - as potential risk factors for the emergence of internalizing symptoms into account.

Since the association between parental depression and adolescents' internalizing symptoms is already established (e.g. Sieh et al., 2012a), this study seeks to explore the role of quality of attachment to the parent with physical illness (i.e. ill parent) and the quality of attachment to the parent without physical illness (i.e. healthy parent) in this link. Firstly, we seek to examine the role of perceived quality of attachment to the ill parent in the link between parental depression and adolescents' internalizing symptoms. Generally, previous research suggests that parental depression is not only directly associated with adolescents' internalizing symptoms (Sieh et al., 2012a) but also goes hand in hand with a decreased ability of these parents to maintain a high quality of attachment to their adolescents (Cunningham, Harris, Vostanis, Oyebode, & Bisset, 2004; Hoffenaar, 2012). Whereas physical proximity constitutes the essence of a high quality of attachment during infancy and childhood (Bowlby, 1983), this emphasis shifts during adolescence towards a growing need for emotional support from the parent (Armsden & Greenberg, 1987). Emotional support is an integral component of quality of attachment, which we define and operationalize as communication with the parent, confidence in the parent, and prevention of alienation from the parent (Armsden & Greenberg, 1987). The shift in focus during adolescence towards increasing importance of emotional support instead of physical proximity implies that a high quality of attachment can be maintained, regardless of physical availability. That is, even if the physical illness limits the parent's ability to be physically available (e.g. through physical restraints, hospitalization) if the parent is mentally healthy the ability to emotionally support the adolescents by means of communication, confidence, and prevention of alienation might be retained.

Parental depression, on the other hand, is likely to conflict with the fulfillment of adolescents' need for a high quality of attachment, due to the nature of depressive symptoms (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). For example, feelings of hopelessness, which are common in depression (American Psychological Association, 2013), might impair

a parent's ability to convey confidence and thereby might lower adolescents' perceived quality of attachment to that parent. This idea of a decreased quality of attachment in adolescents of parents with depression finds support in the literature, as several authors observed a decreased quality of attachment in adolescents of parents with a wide range of psychological disorders, including depression (e.g. Adshead, Falkov, & Gopfert, 2004; Graham & King, 2004; Hipwell, Goossens, Melhuish, & Kumar, 2000). In one study adolescents' perceived quality of attachment to a parent with depression indeed mediated the link between parental depression and internalizing symptoms (Hoffenaar, 2012). These findings point to the importance of considering quality of attachment to the ill parent in the link between parental depression and adolescents' internalizing symptoms.

In addition to considering quality of attachment to the ill parent in the relationship between parental depression and adolescents' internalizing symptoms, this study further investigates adolescents' perceived quality of attachment to the healthy parent. More specifically, we examine whether a high quality of attachment to the healthy parent serves as a buffer for the potential inability of the ill parent to uphold a high quality of attachment and thereby meet their the adolescents' need for communication, confidence, and prevention of alienation. Longitudinal research on the link between parent-child attachment and future behavior problems has shown that for children who displayed a low quality of attachment to one parent during infancy, as indicated by an insecure attachment style (see Bowlby, 1966 for an elaboration on attachment styles), having a higher quality of attachment to the other parent could effectively offset the risk for developing behavioral problems in middle childhood (Kochanska & Kim, 2013). This effect was similar across parental gender; a high quality of attachment with either parent could effectively offset developmental problems, whereas a low quality of attachment to both parents was associated with the highest risk. Given these findings and the theoretical basis of attachment and family systems theory (Bowen, 1966;

Bowlby, 1966), a high quality of attachment to the healthy parent might protect adolescents from developing internalizing symptoms in families where the other parent's ability to strive after a high quality of attachment might be restrained as a result of illness.

By means of a cross-sectional design, this study seeks to investigate a possible moderated mediation of attachment to both parents in the relationship between parental depression and adolescents' internalizing symptoms. A mediator is defined as the mechanism through which a predictor variable transmits its effect on an outcome variable (Hayes, 2013). A variable can be said to function as a mediator to the extent that it accounts for the relationship between the two other variables. Whereas a mediator *explains* the relationship between two other variables, a moderator, also known as interaction, can be defined as a variable that *influences* the strength of a relationship between two other variables (Hayes, 2013). That is, a moderator helps to establish the boundary conditions, i.e. the circumstances under which a link between two other variables exists, by interacting with the predictor variable. A moderated mediation is a combination of these two concepts and means in the present study that the path from the independent variable (X) to the mediator (MED) is constant, but the effect of the mediator on the outcome variable (Y) depends on the level of a moderator (MOD) (Morgan-Lopez & MacKinnon, 2006; see Figure 1).

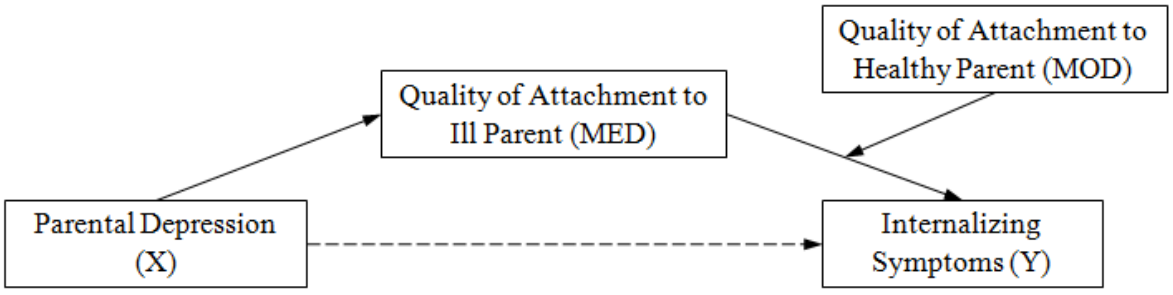

Figure 1. Conceptual model of moderated mediation. Parental Depression represents the independent variable (X), Internalizing Symptoms represents the outcome variable (Y), Quality of Attachment to Ill Parent represents the mediator (MED) between X and Y, and Quality of Attachment to Healthy Parent represents the moderator (MOD) between MED and Y.

We aim at answering two research questions concerning moderated mediation in the present study: Firstly, we will investigate whether the relationship between parental depression and adolescents' internalizing symptoms is mediated by the perceived quality of attachment to the ill parent. To address this research question, we hypothesize that parental depression is associated with a lower perceived quality of attachment to the ill parent than no parental depression (H1). We further hypothesize that a lower perceived quality of attachment to the ill parent is associated with more internalizing symptoms than a higher perceived quality of attachment to the ill parent (H2). Thirdly, we hypothesize that the direct link between parental depression and adolescent's internalizing symptoms will decrease when the mediator, i.e. quality of attachment to the ill parent, is added to the model (H3).

Furthermore, we aim at answering whether the indirect effect of parental depression on adolescents' internalizing symptoms through perceived quality of attachment to the ill parent is moderated by the perceived quality of attachment to the healthy parent. Specifically, we hypothesize that the link between perceived quality of attachment to the ill parent and adolescents' internalizing symptoms will be weaker when the perceived quality of attachment to the healthy parent is high than when the perceived quality of attachment to the healthy parent is low (H4). To address the overall moderated mediation in the link between parental depression and adolescents' internalizing symptoms, we further hypothesize that the quality of attachment to the ill parent will mediate the link between parental depression and adolescents' internalizing symptoms only when the perceived quality of attachment to the healthy parent is low, but not when it is high (H5).

Method

Participants

Participants were originally recruited for a cross-sectional study about the impact of parental physical illness and living in a single parent family on children by Sieh et al. (2008-

2010), who aimed at developing a screening device for children with parental physical illness. In the current study, data of intact families with parental physical illness, i.e. families in which both parents were living together with their children, and one parent suffered from a physical illness were included. Inclusion criteria for these families contained that one parent had to be diagnosed with a current chronic physical illness, which we defined as a disease or traumatic injury involving at least one organ system, impairing physical health and lasting for at least six months (Livneh & Antonak, 2005). The other parent had to be healthy at the time of measurement, and we defined healthy as the absence of physical illness and depressive symptoms. Since we were only interested in comparing depression in parents with physical illness with no depression in parents with physical illness, we excluded families in which the presumed healthy parent showed any depressive symptoms, suffered from a physical illness, or both. Data had to be available for all family members, including both parents and their adolescents. The final sample consisted of 82 families, including 133 adolescents (70 boys, 63 girls) and their parents. The adolescents' age ranged from 10 to 20 years (M = 14.59 , SD = 2.39), and the parents' age ranged from 32 to 64 years (M = 46.78, SD = 5.64). In 51 families, the mother was the ill parent, and in the remaining 31 families, the father was the ill parent. The majority of families had an average socioeconomic status (as measured by their monthly family income, with taxed deducted) and were living in the Netherlands at the time of measurement. All subjects were fluent in Dutch.

Measurements

Parent characteristics. Depression in the parent with physical illness (i.e. parental depression) was measured with the Beck's Depression Inventory (BDI), a self-report measure of 21 items, including *cognitive* (e.g. concentration difficulties), *emotional* (e.g. sadness), *behavioral* (e.g. indecisiveness), and *somatic* (e.g. tiredness/fatigue) signs of depression (Beck et al., 1961), with higher scores reflecting more depressive symptoms. Depression

scores were dichotomously divided into two categories: Scores ranging from 0 to 10 indicated no depression, whereas scores of 11 or higher indicated depression. BDI scores meeting the criteria for depression were further subdivided into mild (scores ranging from 11 to 17), moderate (scores ranging from 18 to 23), and severe (scores ranging from 24 to 42) depression. As evidence has shown that all family members of a parent with depression are at risk for developing depressive symptoms as well (Han & Haley, 1999; Visser-Meily & Meijer, 2006), both parents filled out the BDI to rule out depressive symptoms in the healthy parent. Cronbach's alpha indicated good reliability for the BDI ($\alpha = .85$).

Adolescent characteristics. Adolescent characteristics of interest included 1) perceived quality of attachment to the ill parent, 2) perceived quality of attachment to the healthy parent and 3) internalizing symptoms. The adolescents' perceived quality of attachment was measured with three 4-item subscales from the Inventory of Parent and Peer Attachment (IPPA; Armsden & Greenberg, 1987) for the ill and healthy parent, respectively. The subscales consisted of 1) *communication* with the parent (e.g. "I talk with my father about my problems"), 2) *confidence* in the parent (e.g. "My father respects my feelings"), and 3) *alienation* from the parent (e.g. "I wish I had a different father"), and were administered separately for father and mother attachment. Scores were rated on a 4-point scale ranging from 1 (*almost never*) to 4 (*almost always*), with higher scores indicating higher quality of communication, more confidence, and more alienation. After recoding alienation, an average item score for all subscales taken together was obtained as an index of perceived quality of attachment to the respective parent. Cronbach's alpha showed good internal consistency for both, perceived attachment quality to the father ($\alpha = .84$) and perceived attachment quality to the mother ($\alpha = .88$). Adolescents' internalizing symptoms were assessed by means of three subscales of the Youth Self-Report (YSR; Achenbach, 1991) making up internalizing symptoms, namely 1) *anxiety/depression* (e.g. "I feel worthless"), 2) *withdrawn behavior* (e.g.

"I prefer to be alone instead of being with others"), and 3) *somatic complaints* (e.g. "I feel dizzy"). Adolescents rated their behavior on a 3-point scale, ranging from *not true* (0) over *somewhat/sometimes true* (1) up to *very/often true* (2), with higher scores indicating more internalizing symptoms. The sum of items was then calculated to obtain the total score for internalizing symptoms. The total scores were divided into three categories: Scores up to 59 indicated no significant internalizing symptoms (normal range), 60 to 64 indicated subclinical internalizing symptoms, and 64 or higher indicated clinical internalizing problems. Cronbach's alpha demonstrated excellent reliability for the internalizing symptoms scale (α = .91).

Procedure

Participants were recruited between September 2008 and April 2010 across the Netherlands (e.g. in community and rehabilitation centers, at general health practitioners, health organizations, schools, hospitals, and public places) by means of postings and letters, and via information on the websites of leading national patient organizations. Families were asked to contact the researchers by phone or e-mail to demonstrate interest in participation. After the participants were screened for eligibility via phone, they received an information package including an informed consent form. After both parents and adolescents had given their written informed consent, families were visited by trained research assistants in their home environment, where the questionnaires were administered. Both, adolescents and their parents filled in a test battery containing the variables of interest. Additionally, a short questionnaire covering demographic variables, such as age and gender, was administered. All measures were obtained by means of self-report in form of paper-pen questionnaires. Throughout the procedure the research assistants followed a standardized protocol conceptualized by the project manager. Participation was voluntary and adolescents received a cinema ticket, gift voucher, or mobile phone cover as a reward after completing the

questionnaires. The study was approved by the ethics committee of the research institute of the Department of Child Development and Education of the University of Amsterdam in December 2008.

Data Analysis

Preliminary analysis. Only 0.6% of the data from adolescents and 2.9 % of the data from parents were missing throughout the data set. As data were missing completely at random (Little, 1988), we used expectation maximization to substitute missing values (Graham, 2009). Descriptive statistics of the variables of interest were obtained for families with and without parental depression, separately. To rule out the possibility that adolescents' age systemically differed between families with and without parental depression and thereby bias our results, an independent samples *t*-test of the mean differences in adolescents' age was conducted. We further conducted a chi-square test between gender and parental depression to check for a significant gender difference in adolescents between families with and without parental depression. We used the continuity correction to account for the fact that the Pearson chi-square test is considered to be too liberal for 2x2 contingency tables (Yates, 1934), meaning that we counteracted the likelihood of conducting Type I errors. Also, a one-way ANOVA was conducted to examine whether there were statistically significant mean differences in adolescents' internalizing symptom scores across families with mild, moderate, and severe parental depression. Moreover, we conducted two multiple linear regressions (MLR) to examine how strongly the separate subscales of quality of attachment were related to adolescents' internalizing symptoms. That is, we conducted one MLR for quality of attachment to the ill parent and one MLR for quality of attachment to the healthy parent.

Main analysis. An independent samples *t*-test checked for differences in mean internalizing symptom scores between families with and without parental depression to determine a possible direct relationship between parental depression and adolescents'

internalizing symptoms. In the following, we conducted a Conditional Process Analysis, which is used when the goal of a study is to understand the "conditional nature of the mechanisms by which a variable transmits its effect on another" (Hayes, 2013). Specifically, we investigated the moderated mediation of adolescents' perceived quality of attachment to the both parents in the relationship between parental depression and internalizing symptoms (see Figure 2). Even though our data were only correlational due to the cross-sectional nature of our study design, we assumed causality and conducted moderated mediation analyses, which is a valid approach if choice of research design and data collection rule out empirical substantiation of causality (Hayes, 2013).

As a computational tool PROCESS, saved as macro on SPSS, was used to integrate path-analysis based moderation and mediation into a conditional process model (Hayes, 2013). The macro automatically produced unstandardized regression coefficients, with scales equivalent to the respective scales of measurement of the particular variables in the model. The effects were automatically quantified by PROCESS and bootstrapping was applied to generalize the results and to rule out the possibility that the effects observed were due to chance. Specifically, PROCESS bootstrapped the conditional indirect effect using 10,000 resamples and outputted a two-tailed 95% confidence interval (CI; $\alpha = 0.05$) for each conditional indirect effect. The application of bootstrapped CIs had the advantage of avoiding power problems resulting from non-normal sampling distribution of indirect effects (MacKinnon, Lockwood, & Williams, 2004).

To answer our first research question whether an indirect effect of parental depression (X) on internalizing symptoms (Y) through perceived quality of attachment to the ill parent (MED) exists and thereby test H1, H2, and H3, a simple mediation model (Model 4; Hayes, 2013) was explored. Traditional mediation models were often based on the multistep approach (Baron & Kenny, 1986), which required the direct effect of X on Y (i.e., Step 1) to

be significant in order to support mediation. Recently, methodologists identified critical shortcomings associated with this approach and presented an updated version of Baron's and Kenny's approach, concluding that Step 1 is no longer necessary in establishing mediation (Kenny, Kashy, & Bolger, 1998). Therefore, we investigated the indirect effect of X on Y, regardless of whether the independent samples *t*-test found a direct link between X and Y or not. In order to investigate the link between X and MED (and thereby testing H1), we analyzed unstandardized regression coefficients and significance tests of the bootstrapped PROCESS analysis. We further investigated the link between MED and Y (and thereby tested H2), using the same analysis. In case the independent samples *t*-test found a direct link between X and Y, we further check whether this link became non-significant after MED was added to the model (and thereby test H3).

To answer our second research question, whether the indirect effect of parental depression on internalizing symptoms through perceived quality of attachment to the ill parent differs as a function of perceived quality of attachment to the healthy parent (MOD), and thereby test H4 and H5, the moderator was added to the secondary path in the previously tested mediation model (Model 14, Hayes, 2013; see *Figure 2*).

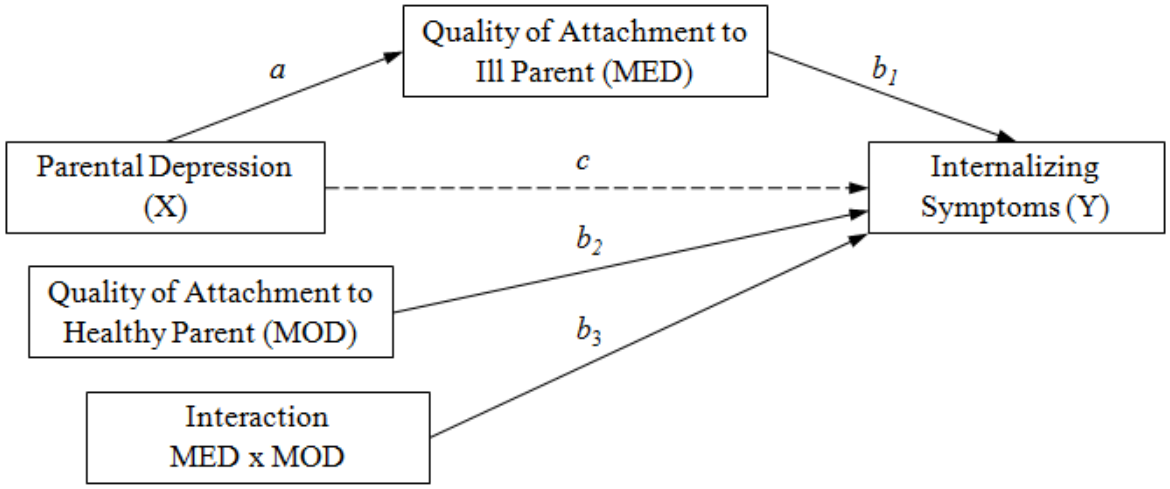

Figure 2. Statistical model representing moderated mediation (on the basis of Hayes, 2013). *c* = direct path from X to Y, *a* = path from X to MED, b_1 = path from MED to Y, b_2 = path from MOD to Y, b_3 = Interaction effect between MED and MOD on Y.

To test H4, we investigated the moderation of the path from MED to Y via MOD by examining the interaction effect between MED and MOD on Y. To test H5, we investigated the overall conditional indirect effect of X on Y through MED at various values of MOD. Specifically, the 10th, 25th, 50th, 75th, and 90th percentiles of MOD represented "very low", "low", "moderate", "high", and "very high" levels of perceived quality of attachment to the healthy parent, respectively (Hayes, 2013). These percentiles yielded the effect of various levels of MED on Y among various levels of MOD. The indirect effect of X on Y was calculated as the product of estimates of two effects: one unconditional effect - the effect of X on MED assumed to be constant across all levels of MOD, and one conditional effect - the effect of MED on Y assumed to be conditional on MOD. When one component of the indirect effect is conditional, the indirect effect itself can be considered conditional.

Results

Preliminary results

Descriptive statistics of families with and without parental depression are presented in Table 1. Even though the percentage of girls was numerically higher in families with parental depression compared to families without parental depression, this difference was not statistically significant, $\chi^2(1, N = 133) = 0.92$, $p = .35$. Similarly, although adolescents of families with parental depression were 1.59 years older, on average, compared to adolescents of families without parental depression, this difference was not significant, $t(131) = -1.13$, $p = .26$. That is, adolescents of families with and without parental depression did not systemically differ in age and gender. Also, we found no significant differences in mean internalizing symptom scores among adolescents of families with mild ($M = 9.65$, $SD = 8.11$), moderate ($M = 11.00$, $SD = 8.21$), and severe ($M = 14.43$, $SD = 11.46$) parental depression, $F(2,63) = 1.54$, $p = .22$, implying that we can exclude severity of parental depression from our conditional process analysis. Regarding the subscales of attachment, we found alienation from the parent

to have the strongest unique contribution to adolescents' internalizing symptoms for both parents, as indicated by semipartial correlations (sr_{ill} = -.38, $sr_{healthy}$ = -.37), compared to communication (sr_{ill} = .15, $sr_{healthy}$ = .001) and confidence (sr_{ill} = .15, $sr_{healthy}$ = .06).

Table 1

Descriptive Statistics for Members of Families With and Without Parental Depression.

	Parental Depression	No Parental Depression
Adolescents (*n*)	66	67
Gender (females)	57.58 %	47.76 %
Mean Age (*SD*)	14.83 (2.31)	14.34 (2.45)
Mean Quality of Attachment to Ill Parent (*SD*)	3.17 (.57)	3.36 (.44)
Mean Quality of Attachment to Healthy Parent (*SD*)	3.13 (.55)	3.40 (.38)
Internalizing Symptoms		
Mean score (*SD*)	11.12 (9.12)	7.96 (7.39)
Clinical range (%)	16.7%	7.5%
Subclinical range (%)	9.1%	9.0%
Ill Parents (*n*)	66	67
Gender (females)	48.0%	52.0%
Mean Age (*SD*)	46.78 (5.54)	47.91 (4.86)
Mean BDI score (*SD*)	18.91 (6.74)	6.45 (2.22)
Mild Depression (%)	53.0%	-
Moderate Depression (%)	22.7%	-
Severe Depression (%)	24.2%	-
Healthy Parents (n)	66	67
Gender (females)	47.7%	52.3%
Mean Age (*SD*)	45.70 (5.44)	48.62 (4.75)

Note. All scores presented are raw scores.

Main Results

Even though Levene's Test confirmed homogeneity of variances, F = 3.14, p = .08, and the data set did not include any influential outliers (Cook's D < 1), the Shapiro-Wilk test revealed a violation of the assumption of normality. However, the sample size (N = 133) was sufficiently large to rely on the central limit theorem, stating that for large sample sizes (N >

30), the distribution of the sample mean is approximately normal, regardless of the shape of the population distribution (Field, 2009). Independence of observations was questionable due to the possibility of family cluster effect influencing our findings, which by definition means that family members possess a very similar genetic makeup and share the same environment, resulting in characteristics that are statistically dependent on each other (Snijders & Bosker, 1999; see Sieh et al., 2012a for elaboration on the family-cluster effect). The Intraclass Correlation Coefficient (ICC) was calculated as an index of the percentage of total variance in internalizing symptom scores attributable to the family cluster effect. The ICC was $\rho = .50$, implying that 50% of the total variance in internalizing symptom scores could be attributed to similarities within families, meaning that half of this variance was explained by family characteristics and the other half by individual characteristics. We proceeded with the analysis, keeping in mind that results might be overestimated as a result of family cluster effects violating the assumptions of independence. Before adding moderator or mediator to the model, the total mean score of internalizing symptoms was significantly higher in adolescents with parental depression compared to adolescents without parental depression, $t(131) = -2.20$, $p = .03$.

Simple mediation model. We tested H1, H2, and H3 with a simple mediation model (Model 4; Hayes, 2013). The model summary revealed that our mediation model was significant, $F(2, 130) = 14.73$, $p < .001$, and that parental depression and perceived quality of attachment to the ill parent together explained 18.48% of the variance in adolescents' internalizing symptoms. As depicted in Figure 2 and Table 3, parental depression was indeed linked to a lower perceived quality of attachment to the ill parent than no parental depression, $a = -.19$, $t(130) = -2.18$, $p = .03$, thereby confirming H1. Moreover, analyses found perceived quality of attachment to the ill parent to be negatively associated with adolescents' internalizing symptoms, $b_1 = -6.36$, $t(130) = -4.88$, $p < .001$, confirming H2. Also, after

controlling for the indirect effect the direct link between parental depression and adolescents' internalizing symptoms turned out to be non-significant, $c = 1.94$, $t(130) = 1.43$, $p = .15$, which leads us to confirm H3.

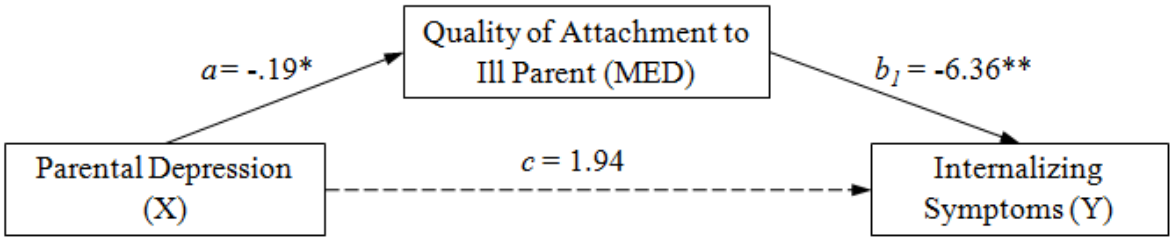

Figure 3. Statistical model representing simple mediation (on the basis of Hayes, 2013). *c* = direct path from X to Y, *a* = path from X to MED, b_1 = path from MED to Y.*$p < .05$.; **$p < .001$.

As Hayes (2013) recommends against the usage of standardized effect sizes when the independent variable is dichotomous, we measured a partially standardized effect size of the indirect effect, $ab_{ps} = .15$, which means that adolescents differed by 0.15 standard deviations in their internalizing symptom scores, as the result of the mediated influence of parental depression through quality of attachment to the ill parent. As the overall mediation effect was significant, 95% CI [0.20, 3.17], and all of our hypotheses relating to the simple mediation model were confirmed, there is evidence that the direct link between parental depression and internalizing symptoms was indeed mediated by perceived attachment quality to the ill parent.

Table 2
Simple Mediation Model.

					95% CI	
	B	SE	*t*	*p*	*LB*	*UB*
c (X on Y)	1.94	1.35	1.34	.15	-0.74	4.61
a (X on M)	-.19	.09	-2.18	.03	-0.37	-0.02
b_1 *(M on Y)*	-6.36	1.30	-4.88	.00	-8.94	-3.78

Note. *B* = unstandardized regression coefficient; CI = confidence interval; *LB* = lower bound, *UB* = upper bound.

Moderated mediation model. In order to test H4 and H5, we added the moderator to the secondary path in the previously tested mediation model (Model 14; Hayes, 2013). The model summary revealed that our moderated mediation model was significant, $F(1, 131) = 13.71$, $p < .001$, with 30% of the variance in adolescents' internalizing symptoms being explained by parental depression and perceived quality of attachment to both the ill and the healthy parent. As depicted in Table 3 and Figure 4, parental depression was again associated with a lower perceived quality of attachment to the ill parent than no depression, $a = -.19$, $t(130) = -2.18$, $p = .03$. Also, the lower the perceived quality of attachment to the ill parent was the more internalizing symptoms the adolescent displayed, $b_1 = -23.57$, $t(130) = -4.88$, $p < .001$. The direct link between parental depression on internalizing symptoms remained non-significant, $c = 1.51$, $t(128) = 1.17$, $p = .25$, and decreased even further compared to the previously tested mediation model.

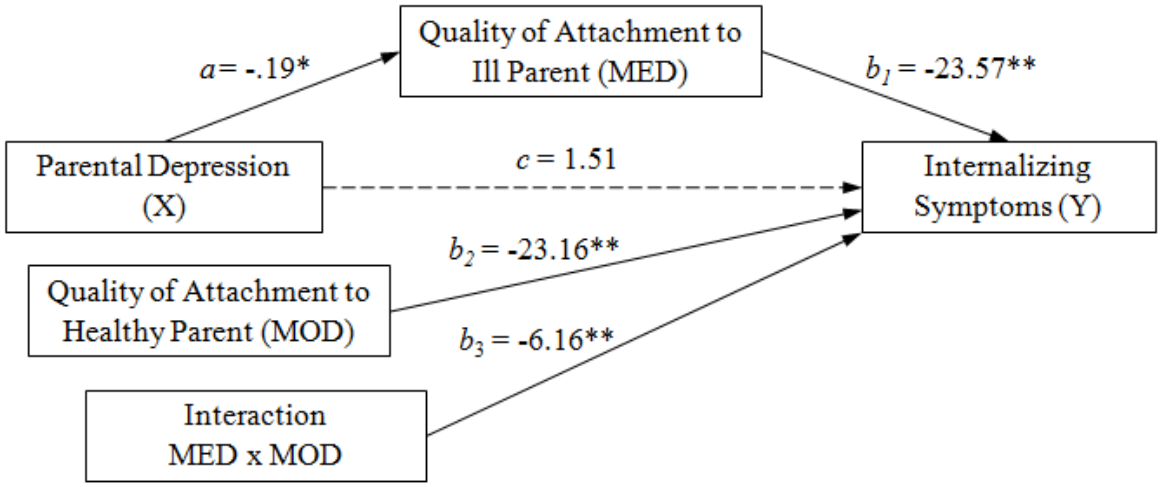

Figure 4. Statistical model representing moderated mediation (on the basis of Hayes, 2013). c = direct path from X to Y, a = path from X to MED, b_1 = path from MED to Y, b_2 = path from MOD to Y, b_3 = Interaction effect between MED and MOD on Y. *$p < .05$, **$p < .001$.

We were unable to calculate effect sizes for the moderated mediation model, as measures for models that simultaneously analyze moderation and mediation are not yet sufficiently researched (Fairchild & MacKinnon, 2009).

Table 3
Moderated Mediation Model.

					95% CI	
	B	SE	*t*	*p*	*LB*	*UB*
c (X on Y)	1.51	1.29	1.17	.25	-1.05	4.07
a (X on M)	-.19	.09	-2.18	.03	-0.37	-0.02
b_1 *(M on Y)*	-23.57	5.53	-4.26	.00	-34.50	-12.63
b_2 *(V on Y)*	-23.16	5.42	-4.27	.00	-33.90	-12.43
b_3 *(VM on Y)*	6.16	1.71	3.62	.00	2.79	9.54

Note. *B* = unstandardized regression coefficient, CI = confidence interval; *LB* = lower bound, *UB* = upper bound.

To test H4 we examined the interaction effect of perceived quality of attachment to the ill parent and perceived quality of attachment to the healthy parent on internalizing symptoms. As the effect of perceived quality of attachment to the ill parent on adolescents' internalizing symptoms was indeed contingent on perceived quality of attachment to the healthy parent, as evidenced by the statistically significant interaction effect between quality of attachment to the ill parent and quality of attachment to the healthy parent in the model, $b_3 = 6.16$, $t(128) = 3.62$, $p < .001$, we can confirm H4. For investigation of H5, the percentiles of the conditional indirect effects and corresponding CIs at the 95% level were examined (see Table 4). As depicted in Table 4 and consistent with H5, only when the perceived quality of attachment to the healthy parent was very low or low (as automatically categorized by the default option in PROCESS), perceived quality of attachment to the ill parent mediated the link between parental depression and adolescents' internalizing symptoms, 95% CIs [0.14, 3.43] and [0.09, 2.86], respectively. This means that if the perceived quality of attachment to the healthy parent was moderate, high, or very high, perceived quality of attachment to the ill parent no longer mediated the link between parental depression and adolescents' internalizing symptoms, 95% CIs [-0.13, 2.11], [-0.45, 1.82], and [-1.07, 1.36], respectively, suggesting that we can confirm H5.

Table 4
Conditional Indirect Effect(s) of X on Y at values of the moderator

Mediator	Moderator	*beta*	*SE*	95% CI	
				LB	*UB*
Indirect Effect	2.67 (very low)	1.38*	.83	0.14	3.43
Indirect Effect	2.92 (low)	1.08*	.69	0.09	2.86
Indirect Effect	3.33 (moderate)	.58	.53	-0.13	2.11
Indirect Effect	3.58 (high)	.29	.52	-0.45	1.82
Indirect Effect	3.83 (very high)	-.01	.58	-1.07	1.36

Note. *beta* = unstandardized regression coefficient; CI = confidence interval; *LB* = lower bound, *UB* = upper bound; *$p < .05$.

As we confirmed all of our hypotheses, there is evidence that the mediation of the link between parental depression and internalizing symptoms by perceived quality of attachment to the ill parent is indeed moderated by perceived quality of attachment to the healthy parent.

Discussion

The aim of our study was to examine the role of attachment to one parent with physical illness and one healthy parent as potential risk or protective factors in the link between depression in the parent with physical illness and adolescents' internalizing symptoms. As expected (e.g. Armsden & Greenberg, 1987; Brumariu & Kerns, 2010; Hoffenaar, 2012), quality of attachment to the ill parent mediated the link between parental depression and adolescents' internalizing symptoms. In particular, if the parent with physical illness was depressed, adolescents perceived the quality of attachment to that parent to be lower than when the parent was not depressed. Furthermore, a lower quality of attachment to the parent with physical illness was associated with more internalizing symptoms than a higher quality of attachment to the that parent. As we found the indirect effect of parental depression on internalizing symptoms through quality of attachment to the ill parent to be significant, our findings yield evidence that instead of directly affecting adolescents' internalizing symptoms (as suggested by Leschied, Chiodo, Whitehead, & Hurley, 2005),

parental depression exerts its influence through a change in quality of attachment between adolescent and ill parent. Even though there is a study prosposing that quality of attachment to a parent with physical illness is not associated with child adjustment (Ireland & Pakenham, 2010), most of the recent research is in line with our finding. For example, Brenning et al. (2011) conducted a study including 238 adolescents and their depressed mothers and found attachment to be the mechanism through which internalizing symptoms were transmitted from one generation to the next. Furthermore, they identified responsiveness, which refers to the parents' capacity to interact with their children in an emotionally supportive, warm and affectionate fashion (Davidow & Gusec, 2006) to explain a significant proportion of the variance in adolescents' internalizing symptoms. As the definition of responsiveness implies frequent communication, conveyance of confidence and prevention of alienation, it resembles our definition of quality of attachment. A possible explanation for why we and other researchers observed a decrease in quality of attachment in adolescents of parents with depression is that these parents' ability to emotionally support their children (as emphasized by Armsden & Greenberg, 1987) might be restrained, because they are overwhelmed by their own needs. It might be that parents with depression tend to pursue self-oriented goals at the expense of child-oriented goals, which is an idea supported by Dix and Meunier (2009). To be precise, the elevated distress in parents with depression may elicit a strong urge to reduce this distress, which in turn limits the resources they have left for proper involvement with their children. Furthermore, whereas parenting requires a lot of energy (both physically and emotionally), depression is known to include incompatible features such as lack of energy, loss of interest, and feelings of hopelessness (Beck et al., 1961). This might be a reason for why adolescents perceived the quality of attachment to the parent with physical illness to be lower when the parent was depressed than when the parent was not depressed.

Secondly and as expected (Kochanska & Kim, 2013), quality of attachment to the ill

parent mediated the link between parental depression and adolescents' internalizing symptoms only when the perceived quality of attachment to the healthy parent was low, but not when it was high. That is, if adolescents rated the quality of attachment to the healthy parent to be high, a low attachment quality to the ill parent was no longer associated with an increase in internalizing symptoms. These findings from a moderated mediation model imply that in families with parental depression, a high quality of attachment to the healthy parent has the potential to alleviate the negative effects on adolescents' internalizing symptoms, that are likely to result from parental depression and the accompanying decline in attachment quality to the ill parent. Recent evidence supporting this finding comes from Bold, Kochanska, Yoon and Nordling (2014), who replicated Kochanska and Kim's (2013) findings that a high quality of attachment to one parent effectively offset risks resulting from a lower quality of attachment with the other parent. More specifically, a high quality of attachment to either parent was a powerful protective factor for future mental health issues. Similarly, a confident and emotionally supportive parenting style of fathers in families with maternal depression was found to be essential in preventing children's development of psychopathology (Goodman & Gotlib, 1999), backing our findings further.

Beyond quality of attachment, there might be other dynamic processes within the family system that might help to explain adolescents' adjustment outcomes in response to parental depression. Given that physical illness is associated with a decrease in parental functioning and thereby leads to changes in family roles (Ireland & Pakenham, 2010), it is not surprising that adolescents often have to adopt caregiving responsibilities, which can be diverse and often include domestic care (e.g. cooking or cleaning), emotional care (e.g. comforting the ill parent), or child care (e.g. caring for siblings). A study including 145 young caregivers and 100 non-caregivers and their parents on the psychosocial impact of caregiving responsibilities on adolescents' well-being revealed that young caregivers presented with more

somatic complaints, lower life satisfaction, higher levels of worry, more social isolation and stronger feelings of loneliness, compared to non-caregivers (Pakenham, Bursnall, Chiu, Cannon & Okochi, 2006). In contrast to this range of internalizing symptoms, an earlier study found that young caregivers also reported positive outcomes, such as increased tolerance, helpfulness, and independence (Johnston, Martin, Martin, & Gumaer, 1992). Particularly when adolescents indicated a high quality of attachment with a parent, research has shown that young caregivers experienced less caregiving discomfort and more caregiving confidence (Ireland & Pakenham, 2010). Maintaining a high quality of attachment to the healthy parent, however, might not be easy, as also the healthy parent is likely to experience caregiver strain in response to spousal illness (Visser-Meily et al., 2005). Caregiver strain is a concept that includes being emotionally and physically less available (Sieh et al., 2012a) and thereby is likely to affect adolescent outcomes. A study on the impact of parental stroke on adolescents, for example, found a high caregiver strain in the healthy parent to be a risk factor for the development of internalizing symptoms (Visser-Meily et al., 2005). A low caregiver strain in the healthy parent, on the other hand, was related to higher caregiver strain in the child and also more internalizing symptoms, outlining the complexity of relationships between risk factors that is needed to explain adolescents' internalizing symptoms.

Naturally, there are some methodological limitations to our study. First and foremost, sampling bias might have influenced our findings, due to the way the cases (i.e. parents with depression) were identified, as they all shared the common characteristic of suffering from a chronic physical illness. Researchers already identified several characteristics of physical illness, such as illness duration (Sieh et al., 2012a), predictability of the illness (Pakenham et al., 2006), functional impairment (Korneluk & Lee, 1998) and illness prognosis (Pederson & Revenson, 2005) to be associated with an elevated risk for adolecsents' adjustment difficulties. As adding physical illness characteristics to our model was beyond the scope of

this study, we cannot rule out the possibility that characteristics associated with physical illness other than depression contributed to a change in quality of attachment and internalizing symptoms. Similarly, we excluded families in which the healthy parent showed depressive symptoms from the dataset. As a consequence, only families remained in which the healthy parent was resistant to the risks of developing depressive symptoms in response to spousal illness (Han & Haley, 1999; Visser-Meily & Meijer, 2006). This indicates sampling bias, favoring families in which the healthy parent was resistant to risks associated with spousal illness. Secondly, to avoid overcomplexity of statistical analyses, we did not specifically distinguish between maternal vs. paternal depression and mother-child vs. father-child attachment in our main analysis, even though evidence exists highlighting mothers' and fathers' distinct impact on adolescents' internalizing symptoms (Grossmann et al., 2002). For example, a meta-analysis of 134 studies found children's internalizing symptoms to be more closely related to psychopathology in mothers than in fathers (Connell & Goodman, 2002). Also, there is evidence supporting the idea of gender-matching between parents and children being influential. More specifically, negative family-factors - such as parental illness or a low quality of attachment - in fathers had a higher impact on symptoms in boys, whereas those factors in mothers were more closely related to symptoms in girls (Roelofs, J., Meesters, C., TerHuurne, M., Bamelis, L., & Muris, P., 2006). Thirdly, we were unable to integrate multilevel analyses in our Conditional Process Analysis to control for the family cluster effect, even though the ICC indicated that half of the total variance in internalizing symptoms could be attributed to within-family characteristics. Finally, given the constraints of a cross-sectional design, we could only assume causal relations based on theory and previous research, implying that the extent to which causal inferences should be drawn on the basis of our findings is limited.

The limitations just discussed provide various opportunities for future replications and

extensions. First of all, to account for the possibility that characteristics associated with physical illness confounded our results, prospective research could rely on a homogeneous sample without parental physical illness to see whether our findings generalize to families in which depression was not accompanied by physical illness. Ideally, a clinically determined diagnosis of depression on top of the BDI (Beck et al., 1961) ruling out a physical explanation of the symptoms (e.g. prospect of death or physical inability) should be part of the inclusion criteria). Alternatively, characteristics associated with the physical illness, such as illness duration (Sieh et al., 2012a) or unpredictability of parental health (Pakenham et al., 2006) should be added to the model, to control for the potential confounds accompanying the nature of our sample. Also, given the range of internalizing symptoms resulting from caregiver responsibilities in adolescents, that were outlined by Pakenham et al. (2006), considering the strain of young caregivers in families with parental physical illness in future studies might amplify the variance in internalizing symptoms explained by factors within the family system even further. Furthermore, future studies should take the possibility of same gender parents being more influential into account, as well as the different roles for fathers and mothers that were suggested by Roelofs et al. (2006) and Connell and Goodman (2002). Prospective research could additionally use a multilevel structural design, as counteracting the family cluster effect would increase accuracy of the predictive model. Finally, prospective studies should investigate the dynamic changes in quality of attachment and internalizing symptoms that occur in response to parental depression across adolescents' developmental stages by using a longitudinal design, in order to establish a firm timeline among the variables of interest.

Our study contributed to the field of research in the sense that we integrated quality of attachment to the ill and healthy parent into a conditional process model, and thereby gained insight into the complexity of the dynamics through which attachment influences the link

between parental depression and internalizing symptoms in families with parental physical illness. Furthermore, our findings support the integration of family systems theory and attachment theory as a framework for understanding the development of internalizing symptoms during adolescence in face of parental depression.

This brings along several practical implications. Even though the ability of parents with depression to focus on their adolescents' needs is likely to be restricted in light of their disabling symptoms (Beck et al., 1961; Dix & Meunier, 2009) our findings raise hope that other sources of support can be activated within the family system to encourage adolescents' healthy development and counteract the emergence of internalizing symptoms. Whereas in many families, the healthy parent automatically adopts a compensating role to satisfy adolescents' needs for a high quality of attachment (Goodman & Gotlib, 1999), we should not underestimate that often, the healthy parent might need psychoeducation about the importance of maintaining a high quality of attachment to the adolescent. Many parents believe that they have little influence in their children's life during adolescence (Moretti & Peled, 2004), even though a healthy transition from childhood to adulthood can be facilitated by a high quality of attachment to the parent (Ryan & Lynch, 1989). These parents need to be educated about the protective role of their continued support in terms of communication, conveyance of confidence, and prevention of alienation throughout this period. On top of that, the healthy parent may require professional help to develop the skills necessary to provide their adolescent children with ample support, as they also have to deal with spousal illness and a potentially high caregiver strain (Visser-Meily et al., 2005). Given that we found alienation from the healthy parent to be more closely related to internalizing symptoms than communication and confidence in the parent, interventions should at least partially aim at preventing this estrangement. For example, interventions could teach the healthy parent tools to stay responsive to the adolescents' needs despite a high caregiver strain resulting from

spousal illness (Visser-Meily et al., 2005). Nonetheless, interventions should also teach means to increase quality of communication with the adolescent, such as encouraging open discussion of conflicts or problems that naturally arise within the family system (Laursen & Collins, 2009). In addition, interventions could target the conveyance of confidence about mastering challenging life situations, such as dealing with parental illness or handling feelings of anxiety or depression. Even though research agrees on the notion that the most positive outcomes in adolescents are linked to a high quality of attachment to both parents (e.g. Al-Yagon, 2011), if this ideal is improbable to reach in face of parental illness, the insight gained from our findings provides promising suggestions for interventions focusing on the quality of attachment between adolescent and the healthy parent.

In sum, our findings highlight the importance of considering quality of attachment to both parents as potential risk or protective factors when trying to explain the development of adolescents' internalizing symptoms in response to depression in a parent with physical illness. We conclude that a high quality of attachment to the healthy parent the potential to alleviate the negative effects on adolescents' internalizing symptoms that are associated with parental depression and the accompanying decline in quality of attachment to the that parent. In light of preventive interventions, we suggest a family-centered approach with a shift of focus towards relational dynamics between healthy parent and adolescent, with the aim of increasing quality of attachment between them.

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