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ORIGINAL PAPER

Not to Worry? Parental Worry, Self-efficacy, and Parenting Behaviors in the Context of Adolescent Depression

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Abstract

Background & Objective Adolescent depression is impactful for adolescents and their parents. High parental worry and low parental self-efficacy may be rather prominent among parents with adolescents with depression, but how this is related to parenting behaviors, such as warmth and criticism, is not well known.

Methods In a sample of 58 parents (M_{age} = 50.10, SD_{age} = 5.30) of 34 adolescents with depression (M_{age} = 15.65, SD_{age} = 1.54) and 151 parents (M_{age} = 49.04, SD_{age} = 5.87) of 80 healthy control adolescents (M_{age} = 15.90, SD_{age} = 1.35), we estimated Gaussian graphical network models on adolescent-reported affect states (i.e., happy, relaxed, sad, & irritated), adolescent- and parent-reported parenting behaviors (i.e., warmth, understanding, listening, criticism, dominance), and parent-reported parental worry and self-efficacy.

Results Parents of adolescents with depression reported higher levels of worry compared to the control sample, but equal levels of self-efficacy. In both samples, parent-reported worry was positively related to adolescent-reported sadness and parent-reported parental criticism. Moreover, parent-reported self-efficacy was positively related to adolescent- and parent-reported parental warmth. Only in the depression sample, parent-reported worry was positively related to adolescent-reported parental warmth.

Conclusions Parental worry, self-efficacy, parenting behaviors, and adolescent affect were interrelated with considerable differences between the control and depression samples. As a next step, studies with more intensive daily assessments may yield individual family analyses, while also accounting for contextual factors, to further increase our understanding of the relation between parental worry, self-efficacy, and parenting behaviors in the context of adolescent depression.

Keywords Adolescent depression · Parental worry · Adolescent-parent contact · Parenting behaviors · Network

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Adolescent depression is a highly prevalent disorder (e.g., Barendse et al., 2023), including symptoms such as persistent negative affect (e.g., sadness and irritability) and affect variability. Adolescents with depression often experience comorbid psychological problems, such as anxiety and eating problems (Avenevoli et al., 2015; Santos et al., 2007) and are at risk for school dropout (Quiroga et al., 2013) and social issues (Schwartz-Mette et al., 2020). Family system theories describe how adolescents are affected by proximal factors in their environment, such as the interaction with their parents (Bowen, 1966; Bronfenbrenner, 1977, 1986). Following this idea, the influence of parents, in particular parenting behavior, on depression severity has been studied intensively (e.g., Sheeber et al., 2001; Smetana & Rote, 2019; Yap & Yorm, 2015; Weymouth et al., 2016).

Studies on parenting behaviors and adolescent depression found parental criticism (or aversiveness) and warmth to be important in particular (McLeod et al., 2007; Yap & Yorm, 2015). For example, parental criticism and also controlling behavior (here referred to as parental dominance) have both been found to be associated with more severe depressive symptoms (e.g., Bolton et al., 2009; Rapp et al., 2021; Silk et al., 2009; Soenens et al., 2008). On the other side, previous studies found that adolescents reported less sadness when parents were perceived as warmer and supportive (e.g., as expressed by parental listening and understanding; Arslan et al., 2024; Bai et al., 2017; Janssen et al., 2021a; Reynolds et al., 2016).

What drives this parenting behavior? A factor that might be related to parenting behavior is the increased parental worry that parents of adolescents with depression might experience. The conservation of resources (COR) theory argues that stress depletes emotional resources (Hobfoll, 1989; Hobfoll et al., 2018). Tian and Zhang (2025) combined the COR theory with the emotional-socialization framework (Eisenberg, 2000), explaining how adolescent burnout may induce parental stress, thereby impairing emotional health and adaptive parenting. Following this reasoning, parental worry related to the depression of the adolescent as a form of stress might, therefore, theoretically deplete parental emotional capacities and limit the adaptivity of parenting behavior. However, limited existing work exists on the impact of adolescent depression on parents, based on self-report and qualitative information of relatively small samples (predominantly mothers), found that parents of adolescents with depression, worry about their child's mood, behavior (e.g., staying in bed, not participating in any activities), safety (i.e., related to suicidality) and future (Armitage et al., 2020; Buus et al., 2023; Stapley et al., 2016). In these qualitative studies, parents reported great worry about their child with depression and changes in their parenting behaviors after the diagnosis of their child, for instance, more careful behavior and responses towards the child, and avoiding conflict (Armitage et al., 2020; Stapley et al., 2016). This indicates a relation between worry about the child and parenting behavior. For example, parents might become less critical and express more warmth towards their child when they worry about their child's mood or other problems. Limited work across fields, such as the medical field, has provided some support for the idea that parental worry is associated with greater parental involvement (Lundgren et al., 2023; Van Gampelaere et al., 2019). Tian and Zhang (2025) showed that parental worries about adolescent burnout were related to less parental warmth and overprotection. Therefore, one might speculate that chronic and extremely high levels of worry may also be linked to more maladaptive behavior, such as controlling behavior and/or criticism (Creswell et al., 2013; Koning et al., 2013; Rapee, 1997; Zhou & Li, 2022). However, the exact link between parental worry and parenting behaviors in daily life in the

context of adolescent depression has not been investigated yet. A better understanding of the interrelatedness of parental worry, parenting behaviors, and adolescent affect states can provide important information for interventions to reduce the potential negative influences of the parent on the child.

The potential relation between parental worry and parenting behaviors might be affected by parental self-efficacy (Tian & Zhang, 2025). With parental self-efficacy, we refer to parents' belief in their parenting (Ardelt & Eccles, 2001; Bandura, 1977; Coleman & Karraker, 1998; de Montigny & Lacharité, 2005; Wittkowski et al., 2017). In qualitative studies, parents of adolescents with depression reported lower parental self-efficacy, for instance, expressed by feelings of 'helplessness' (Armitage et al., 2020; Stapley et al., 2016). A feeling, also described and linked to self-efficacy regarding other adolescent psychopathology (Glatz & Stattin, 2013; Glatz et al., 2011). This feeling of helplessness may be related to the fact that parents often experience difficulties in contact with their children with depression, who tend to isolate themselves socially. Parenting stress in general, with adolescent depression as a likely stressor, has been related to lower parental self-efficacy (Albanese et al., 2019; Jones & Prinz, 2005; Tian & Zhang, 2025), hinting at a potential relation between parental worry and self-efficacy. More parental stress in the case of adolescent depression could, for instance, mean more parental worry, which is related to lower parental self-efficacy.

In contrast to parental worry, the link between parental self-efficacy and parenting behavior has been studied in more detail. Bandura (1986; 1977) describes how more self-efficacy stimulates a person to engage in more positive behavior, which can result in a positive outcome for the target that, in turn, leads to more self-efficacy. In this way, Bandura (1986; 1977) highlights reciprocal relations, such as the relation between adolescents and parents (Glatz & Buchanan, 2015). The theory by Bandura can be used to describe the relation between adolescent depression and self-efficacy, explaining how more parental self-efficacy could potentially stimulate positive parenting behavior, resulting in positive adolescent affect, which in turn may yield more parental self-efficacy. Multiple studies have indeed found a relation between parenting self-efficacy and parental behavior showing how higher levels of parental self-efficacy are related to more effective parenting behaviors as less parental criticism and more parental warmth (Albanese et al., 2019; Glatz et al., 2024). In addition, studies on the association between parental self-efficacy and adolescent behavior indicate that difficult adolescent behavior could potentially result in less parental self-efficacy (Glatz & Buchanan, 2015; Glatz et al., 2024; Slagt et al., 2012). However, it is unclear if self-efficacy is related to adolescent affect, as it is to adolescent behavior, from day to day.

Family Networks

Within family system theories (Bowen, 1966; Bronfenbrenner, 1977, 1986), which describe that family members are related, the question remains how or in what way exactly. Based on Bandura's theory (1986; 1997) and previous work on the reciprocal relations between adolescents and parents (e.g., Glatz & Buchanan, 2015; Glatz et al., 2024; Tian & Zhang, 2025), we can visualize the interrelation between adolescents and parents in the context of adolescent depression by looking at the interplay of adolescent affect (e.g., happy, relaxed, irritated, and sad), parent cognition (e.g., parental worry and self-efficacy), and parenting

behavior (e.g., warmth and criticism) as shown in Fig. 1. When studying parenting behaviors, parents and adolescents can have different perspectives on parenting behaviors, and agreement between both perspectives is generally low to modest (Boele et al., 2023b; Janssen et al., 2021b; Mastrotheodoros et al., 2019). This highlights the importance of including multiple perspectives for a better understanding of the relation between parenting behaviors and adolescent mental health (Boele et al., 2023a; De Los Reyes et al., 2015). For that reason, the adolescent perspective on parenting behavior was added to Fig. 1 as well. This study aimed to get more insight into how parental worry and self-efficacy are related to parenting behavior and adolescent affect, focusing on the pathways of Fig. 1.

Like the family system theories, the network approach argues that there is not one cause but the interrelation between variables (e.g., symptoms or family members) matters (Borsboom & Cramer, 2013; Borsboom et al., 2021), in line with the reciprocal relations between adolescents and parents as proposed by Bandura and others (1986, 1977; Glatz & Buchanan, 2015). With the network approach, we can integrate the different perspectives and explore the interrelatedness between parental worry, self-efficacy, parenting behaviors, and adolescent affect (i.e., the pathways in Fig. 1). So far, the network approach has been mainly applied to individual data or data of a group of individuals. However, this study shows how the network approach can be used to study family data.

In the first part of this study, we estimated daily networks exploring the relation between daily assessments of parental worry, parental warmth and criticism and adolescent affect reported by adolescents and parents using Ecological Momentary Assessment (EMA; Larson & Csikszentmihalyi, 1983; Stone & Shiffman, 1994; Trull & Ebner-Priemer, 2009) data of the RE-PAIR study (Janssen et al., 2021a, 2021b) in which 114 adolescents and 215 parents completed questionnaires for 14 days. We included both adolescent and parent perspectives to account for potential differences in their perspective. This enabled us to investigate how parenting behavior and adolescent affect are related, which role parental worry and self-efficacy play in this relation, and evaluate whether this is only according to

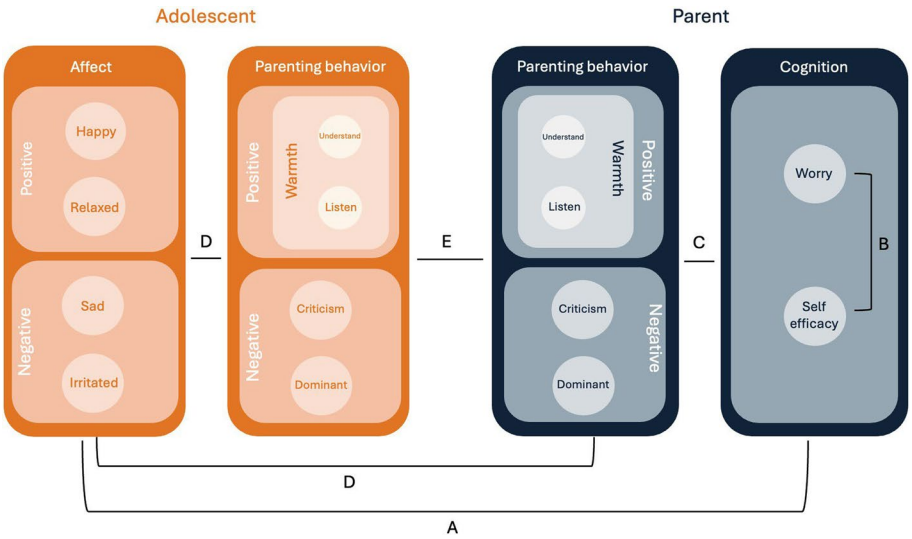

Fig. 1 Visual representation of the expected interplay between adolescent affect, parent cognition, and parent behaviour. Letters A to E represent the pathways of interest that this study focuses on.

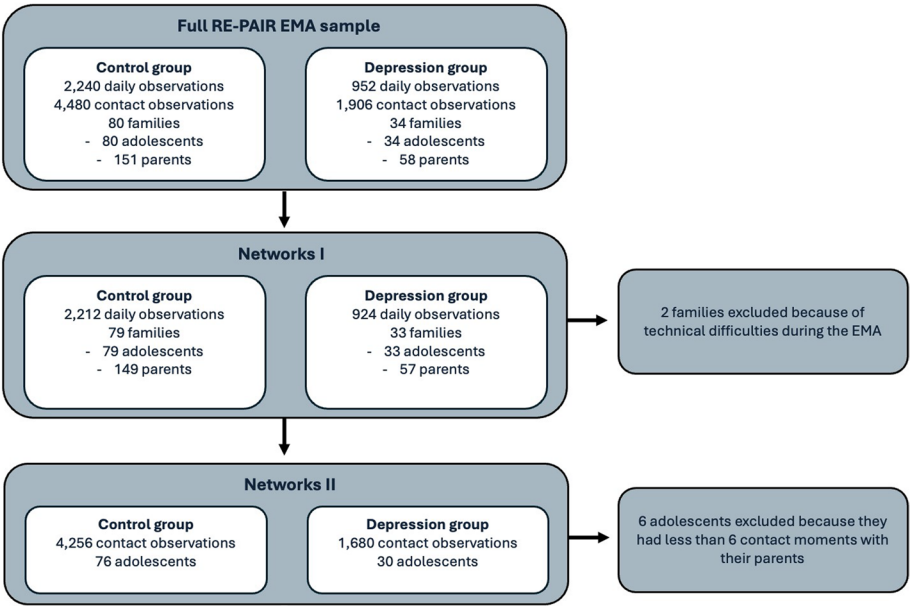

Fig. 2 Visual diagram of the data used for each network. Daily observations were used for networks I, and contact observations were used for networks II.

the parent perspective, adolescent perspective, or according to both adolescent and parent perspectives.

Daily assessments at the end of the day of parenting behavior might be influenced by recall bias. To obtain a closer look at parental warmth (i.e., listening, understanding), parental criticism, parental dominance, and the relation with adolescent affect, the second network analysis (i.e., contact networks) investigated relations between adolescent-reported affect and parenting behaviors from the adolescent perspective, closely after adolescent-parent contact, using different data from the RE-PAIR study. Due to methodological constraints (e.g., timing of the EMA and power issues) and our focus on more parenting behaviors after adolescent-parent contact, we limited ourselves to the perspective of adolescents only. However, this allowed us to check whether the findings of our first networks (daily assessments) hold up in the second networks (contact assessments by adolescents).As these network analyses are exploratory, we refrain from testing hypotheses.

Where previous studies have investigated one-on-one relations, we will explore how these relations play out when investigating them simultaneously in one model, focusing on the pathways of Fig. 1. Based on the COR theory (Hobfoll, 1989; Hobfoll et al., 2018), Bandura's theory (1986, 1977), and previous work (Armitage et al., 2020; Glatz & Buchanan, 2015; Stapley et al., 2016; Tian & Zhang, 2025), we expect parental worry to be higher and parental self-efficacy lower for parents of adolescents with depression, indicating that more negative affect is positively related to more parental worry and less parental self-efficacy (pathway A). Additionally, previous studies (Albanese et al., 2019; Jones & Prinz, 2005; Tian & Zhang, 2025) suggest a negative relation between parental worry and self-efficacy (pathway B). Based on previous studies showing how parental stress results in more negative parenting behavior (Creswell et al., 2013; Koning et al., 2013; Rapee, 1997; Zhou &

Li, 2022), we expect that parental worry will be positively related to more parental criticism (pathway C). In addition, for pathway C, we expect parental self-efficacy to be negatively related to parental criticism and positively to parental warmth (Albanese et al., 2019; Glatz et al., 2024). For pathway D, we expect parental criticism and dominance to be positively associated with negative affect, and parental warmth (listening and understanding) to be negatively associated with negative affect (Arslan et al., 2024; Bai et al., 2017; Reynolds et al., 2016). Here, we do not make a difference between adolescent and parent reports (pathway E), as results from previous studies are mixed (Boele et al., 2023b; Mastrotheodoros et al., 2019). Whereas parental worry is prevalent in a high proportion of parents with adolescents and may be associated with parental warmth, too much worry could theoretically lead to more controlling parenting behavior or criticism (Hobfoll, 1989; Hobfoll et al., 2018; Tian & Zhang, 2025). As a result, we expect the relations between parental worry, self-efficacy, and parenting behaviors to be different for parents of adolescents with depression compared to parents of the control sample. Therefore, for both types of networks (daily versus contact), we explored the relations between parental worry, parental self-efficacy, parenting behaviors, and adolescent affect, and potential differences between adolescents with depression and adolescents without depression and their parents (including mothers and fathers) by estimating separate networks for the groups.

Methods

Participants

Eighty adolescents (M_{age} = 15.90, SD_{age} = 1.35, n_{female} = 51, n_{male} = 29) and 151 parents (M_{age} = 49.04, SD_{age} = 5.87, n_{mother} = 79, n_{father} = 72) of the healthy control sample, and 34 adolescents (M_{age} = 15.65, SD_{age} = 1.54, n_{female} = 26, n_{male} = 8) and 58 parents of the depression sample (M_{age} = 50.10, SD_{age} = 5.30, n_{mother} = 34, n_{father} = 24) participated in the EMA of the RE-PAIR study.[1] In 13 families, only one of the parents participated. The ages of the adolescents ranged from 11 to 17 years. The 34 adolescents of the depression sample were screened for Major Depressive Disorder (MDD) or dysthymia using the Kiddie-Schedule for Affective Disorders and Schizophrenia – Present and Lifetime Version (K-SADS-PL; Kaufman et al., 1997; Reichart et al., 2000). The inclusion criteria for all adolescents (i.e., control and depression sample) to participate in RE-PAIR were that adolescents lived at home with at least one parent, went to high school or secondary vocational or higher education, and were fluent in Dutch. Additionally, for the control sample, the additional inclusion criteria to participate were that adolescents were not currently diagnosed with a mental disorder, did not have a history of major depressive disorder or dysthymia, and were not diagnosed with any other mental disorder in the last two years. Adolescents of the depression sample were not admitted when suffering from other primary (neuro)psychiatric disorders or comorbid psychosis, substance use disorder, or intellectual disability. The participating parents also had to be fluent in Dutch. They did not have to be biological parents, but they had to play a significant role in the upbringing of the adolescent.

[1] The EMA study of the RE-PAIR project is described in more detail by Janssen et al., (2021b; 2023) and. Veenman et al. (2024).

Two families were excluded from the analyses (one from the control sample and one from the depression sample) because of technical questionnaire issues resulting in unreliable responses. In addition, for the second networks, adolescents who reported less than six contact moments with their parents over the range of two weeks were excluded as their responses were considered to be too few to be reliable (see Fig. A7 of the online Appendix for more information), resulting in a total of 106 adolescents included for the analysis (see Fig. 2 for an overview, and Tables A1 and A2 in the online Appendix for more information about the sample).[2]

Procedure

Families in the control sample were recruited through social media and advertisements (e.g., flyers). Families in the depression sample were also recruited through Dutch mental healthcare institutions. Adolescents and parents both provided informed consent. If adolescents were below 16 years of age, parents also had to provide consent for their child. For the EMA study, adolescents and their parents received four standard questionnaires a day for 14 days: one in the morning, two in the afternoon, and one in the evening (see Veenman et al., 2024 for an overview of the schedule). For the EMA, participants used the smartphone app Ethica (https://ethicadata.com/) on their phones. Parents received €20, and adolescents €10, as compensation for their participation. In addition, participants had the chance of winning one of the four €75- gift cards. The study was approved by the Medical Ethics Committee of Leiden University Medical Center (LUMC) in Leiden, the Netherlands (NL62502.058.17).

Measurement

An overview of the Dutch items used for the EMA study is available on the Open Science Framework (OSF: https://osf.io/sevkq). Below, we describe the assessment of the items in greater detail.

Parental Worry and Self-efficacy

Parental worry and self-efficacy were reported by parents at the end of the day (i.e., evening questionnaire). Parents were asked "Did you worry about your child today?" and "How did you feel in the role as a parent today?" which they rated on a Likert scale from 1 (not [well] at all) to 7 (very [wel]). Higher scores indicated more worry and self-efficacy.

Parenting Behaviors

Parenting behaviors were measured in two different ways: 1) at the end of the day and 2) at moments during the day. At the end of the day (i.e., evening questionnaire), parents and adolescents were asked to report how warm/loving and critical the parent had been over the day. Parents were asked, “Considering the whole day, how critical were you towards your child?". Adolescents were asked to report the parenting behaviors of each parent separately, for instance, “Considering the whole day, how critical was your mother?". The items were

[2] For transparency, the results based on the full sample are presented in the Appendix.

rated on a Likert scale ranging from 1 (not at all) to 7 (very). Higher scores indicated more of the specific parenting behaviors.

In each of the four questionnaires during the day, adolescents and parents were asked to report to whom they last spoke. If the last contact before the beep was with their parent(s)/child, they were asked four questions on parenting behaviors during this contact, regarding listening, understanding, being critical, and being dominant. Adolescents were asked to rate the specific parent they spoke to on these four parenting behaviors during the contact on a Likert scale from 1 (not at all) to 7 (very). For instance, they were asked, "How well did your parent understand you?". Parents were asked to rate themselves on these four parenting behaviors during the contact as well. In cases where adolescents had more than two parents, only the evaluations of parents participating (i.e., a maximum of two parents) in the study were used for the analysis.

Affect States

Adolescents rated two positive affect states, happy and relaxed, and two negative affect states, sad and irritated, four times per day. As described in Janssen et al. (2021a), adolescents were asked to rate how happy/sad/relaxed/irritated they felt at that specific moment on a Likert scale from 1 (not at all) to 7 (very). The items were adapted versions of the Positive and Negative Affect Schedule for Children (PANAS-C; Ebesutani et al., 2012; Watson et al., 1988).[3]

Statistical Analysis

First, we compared parent-reported parental worry, parental self-efficacy, and adolescent-reported evaluation of adolescent-parent contact between the control and depression sample with separate multilevel models using the lme4 package (Bates et al., 2015) in R (R Core Team, 2024). Next, we estimated two types of networks based on reports at the end of the day (networks I) and reports after adolescent-parent contact (networks II). Although temporal networks, such as the multilevel vector autoregressive model (mlVAR; Bringmann et al., 2016), enable the estimation of relations over time while considering family variation, these models require a lot of data per family (Mansueto et al., 2023) and have stringent assumptions (e.g., equal time spans between observations). When applied, the models would have resulted in unreliable results with the type of family data in this study. That is why all networks were estimated with a Gaussian Graphical Model (GGM) with regularization using the estimateNetwork function from the bootnet package (Epskamp et al., 2018a) and visualized with the qgraph package (Epskamp et al., 2012) in R.

Networks I pertained to the question of how daily parental worry, parental self-efficacy, parenting behaviors, and adolescent affect were related. Consequently, we estimated the relations between 10 nodes: daily reported parental worry, parental self-efficacy, parenting by adolescents and parents (i.e., criticism and warmth), and daily averages of adolescent affect (i.e., happy, sad, irritation, and relaxation). For the first networks, parental worry, parental self-efficacy, and parenting behaviors rated at the end of the day were used as nodes in the networks. Moreover, the average per day (i.e., an average of a maximum of four time

[3] Adolescents were also asked how they felt during the contact. We did not use this information in the current study for different reasons (e.g., recall bias).

points) per affect state was calculated and used as a node. We combined observations for adolescents with both parents into one data set to maintain adequate power. This means that for each day of each family, there were two rows in the data set: one row containing observations for the adolescent and one parent, and the other row with the same observations for the adolescent and the other parent. This also means that adolescent affect was the same in both these rows (i.e., row 1 for parent p1 and row 1 for parent p2 contain adolescent's affect measured at day 1). Even if an adolescent had only one parent participating in the study, we included the affect states twice for consistency (i.e., using pairwise deletion for the analysis). For each network, 45 parameters had to be estimated, requiring at least 135 observations but ideally five times the number of parameters, equaling 225 observations for estimation power (Epskamp et al., 2018a; Epskamp & Fried, 2018b); this was the case here, with 2212 (control sample; 1329 complete rows) and 924 (depression sample; 482 complete rows) total observations (see the online Appendix for more information about missing data).

Networks II investigated specific contact moments in addition to daily reports and consequently contained eight nodes of adolescent-reported parenting behaviors (listening, understanding, criticism, dominance) and affect states (i.e., happy, sad, irritated, and relaxed) after adolescent-parent contact. For the second networks, we only used the adolescent perspective of parenting. It was not possible to include the parent reports in the second network or add separate parent networks because of differences in timing and setup for parents and adolescents. Based on the reports, we cannot be sure if the adolescent and parent refer to the same contact moment, meaning we cannot combine the adolescent and parents in one network. This also complicates the comparison to separate parent networks. The exact affect states reported at the time point after the parent-adolescent contact were used as nodes, asking how adolescents felt at the moment of reporting. In total, 28 parameters were estimated. At maximum, an adolescent reported 33 contact moments with a parent, which is not enough to estimate individual networks. Instead, we estimated a network for the control sample and one for the depression sample, as in Networks I. With 1434 complete observations for the control sample ($N_{total}=4256$) and 540 complete observations for the depression sample ($N_{total}=1680$), this indicated adequate power for network estimation (Epskamp et al., 2018a; Epskamp & Fried, 2018b). To evaluate the threshold for the required number of reported contact moments, we visualized the number of participants per number of reported contact moments in Figure A7. The figure shows that there would be a big jump in the number of excluded participants had we raised the number of required contact moments from the minimum of six contact moments. Therefore, to balance the reliability and exclusion of information, we decided to go with the criteria of a minimum of six contact moments for inclusion.

For networks I and II, we did not distinguish between mothers and fathers because of analysis power considerations in combination with our preference to include contact moments with both parents. For each type of network, we estimated two networks: one for the control sample and one for the depression sample. In the networks, the undirected edges represent partial correlations. No consensus has emerged on how to define small to strong edge weights (Burger et al., 2023), and standards developed for zero-order correlations might not be appropriate for network analysis based on conditional dependence relations. Therefore, we can only compare the edges to the findings of previous studies.

Regularization was chosen to limit the number of spurious edges (Epskamp & Fried, 2018b), especially for networks based on fewer observations, and applied to all networks for consistency. The 'least absolute shrinkage and selection operator' (LASSO; Tibshirani,

1996) was applied as regularization technique with model selection using the 'Extended Bayesian Information Criterion' (EBIC; Chen & Chen, 2008), together also referred to as 'EBICglasso' in network estimation (Epskamp & Fried, 2018b). The tuning parameter γ was set to the default 0.5 (Epskamp & Fried, 2018b; Foygel & Drton, 2010). The non-parametric bootstrap was applied to assess the accuracy of the edge weights of each network, using the default of 1000 bootstraps (Epskamp et al., 2018a; Fried et al., 2022) using the bootnet function. Pairwise deletion was used for missing data (see an overview of the missing data in Tables A3 and A5, and Figs A1, A2, A8, and A9 of the online Appendix).

There has not been consensus on specific values to conclude that edge weights are accurate. When the edge weights estimated on the original sample overlap with the average of the bootstrap edge weights, and the bootstrap confidence intervals (BCI) are relatively small, we conclude that the edge weights are stable.[4] Moreover, we compared the networks of the depression and control samples by the value of the edge weights.[5]

Results

Networks I: Parental Worry, Parental Self-efficacy, Parenting Behaviors, and Adolescent Affect

Panel A of Fig. 3 shows that parental worry was higher in the depression sample compared to parents in the control sample (Control: M = 2.02, SD = 1.06; Depression: M = 3.40, SD = 1.32, $p < .001$). Parental efficacy was not rated differently across the control and depression samples (Control: M = 5.27, SD = 0.84; Depression: M = 5.06, SD = 0.96, p = 0.082). Parenting behaviors were not rated differently by adolescents and parents across the control and depression sample. Aside from sadness, happiness, relaxation, and parental worry, the responses are skewed in both groups, indicating issues with normality.

Panel B of Fig. 3 shows the network of daily reported parental worry, parental self-efficacy, parenting behaviors, and adolescent affect. The thickness of the edge represents the edge weight (e.g., thicker edges representing larger edge weights). The results of the non-parametric bootstraps indicated that the networks can be considered stable (see Fig. A4 discussed in detail in the online Appendix). The corresponding edge weights and their BCI are presented in Table A4 of the online Appendix.

Parental worry was positively related to parent-reported parental criticism (Control: 0.31, 95% BCI [0.27, 0.36]; Depression: 0.18, 95% BCI [0.13, 0.30]), but negatively with adolescent-reported parental criticism and only in the depression sample (-0.04, 95% BCI [-0.13, 0]). An illustration of the reported parental worry and parent-reported criticism trajectories by two families is shown in Panel I of Fig. 4.[6]

Parental worry was negatively related to adolescent relaxation in both groups (Control: -0.01, 95% BCI [-0.05, 0]; Depression: -0.01, 95% BCI [-0.07, 0]), as well as to adolescent happiness in the control group (-0.04, 95% BCI [-0.08, 0]). Moreover, parental worry was

[4] The BCI does not provide information about the statistical significance of a relation within the network. For more information on the interpretation of the BCI, we refer to Fried et al., 2022.

[5] The supplemental materials, including the code for the statistical analyses, are available on the OSF: https://osf.io/c4sbt/

[6] The families were selected based on the criteria of having the greatest number of complete observations.

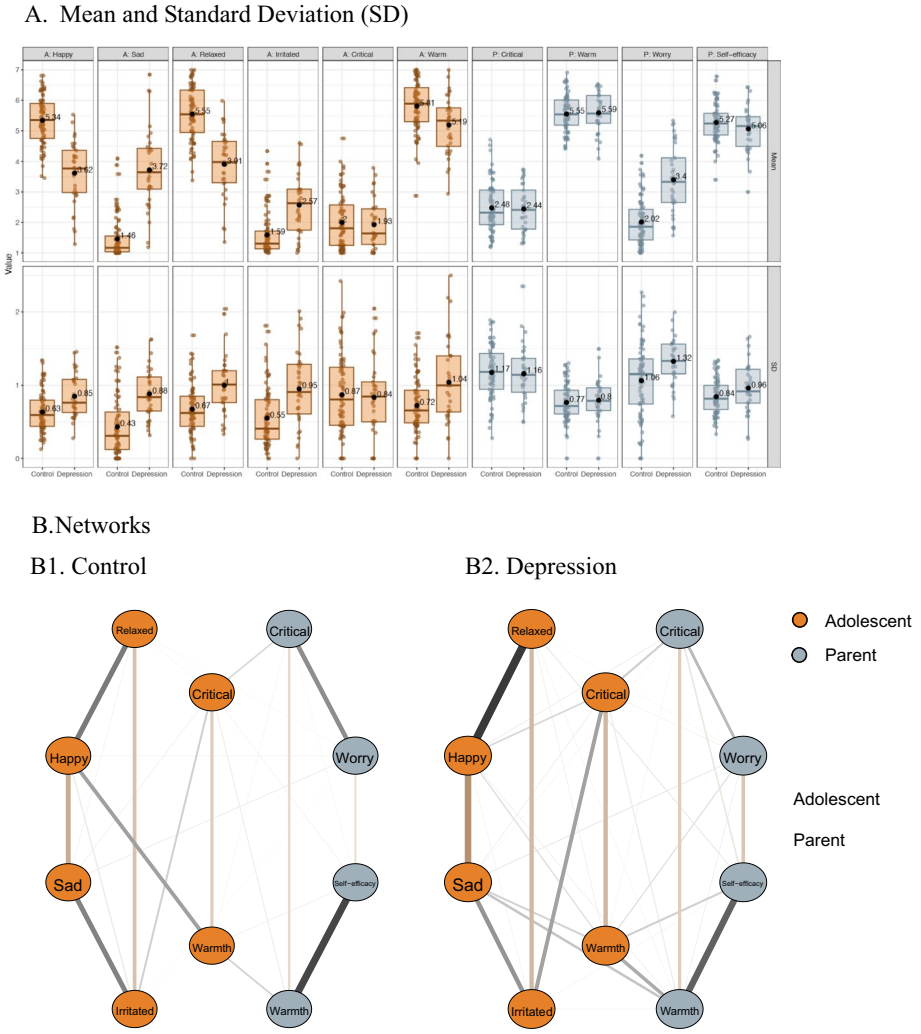

Fig. 3 In panel **A**, the mean and SD of variables reported per adolescent are depicted by orange points and box plots, while blue points and box plots show variables reported per parent. The solid points represent the mean of means and the mean SD of SDs with corresponding values. "A" refers to reports by adolescents and "P" to parent reports. For example, "P: critical" indicates parent-reported parental criticism, while "A: critical" refers to adolescent-reported parental criticism. In panel **B**, the network of the control sample (**B1**) and the network of the depression sample (**B2**) are shown. The black solid edges represent positive relations and red dashed edges negative relations. The maximum edge weight was set to 0.7 for visual comparison.

positively related to the sadness of adolescents in the control network (Control: 0.04, 95% BCI [0, 0.09]; Depression: 0.05, 95% BCI [0, 0.10]). However, the relations were small. We visualized the trajectories of adolescent sadness and parental worry of two individual families in both groups in Panel II of Fig. 4.[7]

[7] The families had at maximum two missing observations.

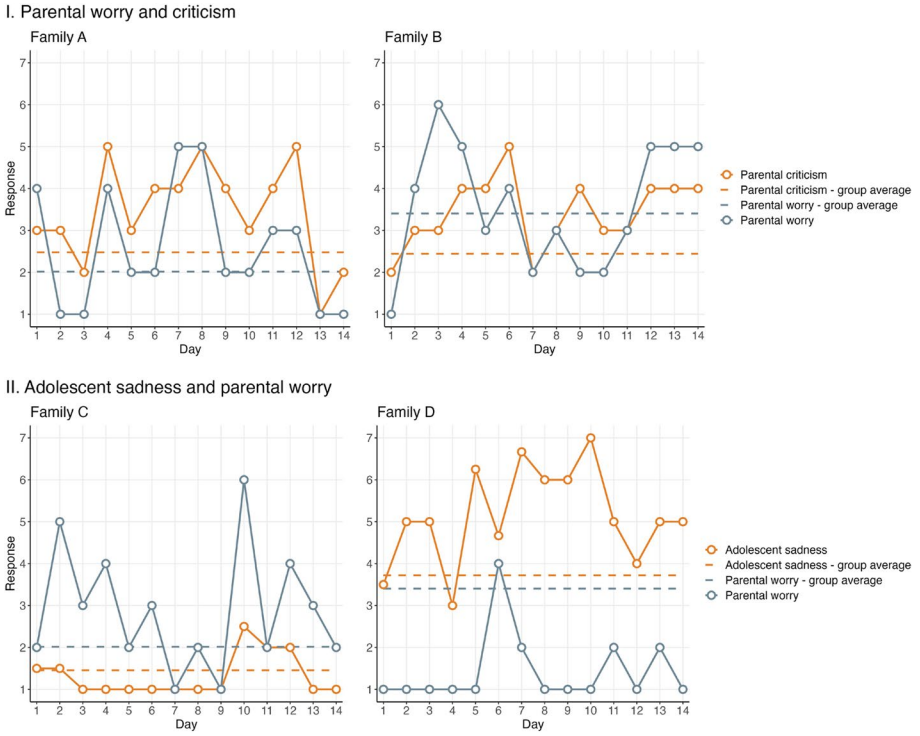

Fig. 4 Panel I shows parent-reported worry about their child and parent-reported criticism for a different family from the control sample (**A**) and a different family from the depression sample (**B**). Panel II shows parent-reported worry about their child and adolescent-reported sadness by one family in the control sample (**C**) and one family in the depression sample (**D**). Horizontal dashed lines represent the average reported adolescent sadness, parental worry, and parental criticism.

The networks of the control and depression sample contained negative relations between parental worry and self-efficacy (Control: -0.12, 95% BCI [-0.17; -0.08]; Depression: -0.21, 95% BCI [-0.30, -0.12]). In both groups, parental self-efficacy was positively related to parental warmth reported by adolescents and parents. The negative relation between parental self-efficacy and parent-reported criticism was slightly stronger in the depression group (-0.10, 95% BCI[-0.18, -0.02]) compared to the control group (-0.02, 95% BCI[-0.06, 0]).

The relations between adolescents and parent-reported parenting behaviors and adolescent affect were somewhat different between the groups. In both groups, adolescent-reported parental criticism was positively related to irritation of adolescents (Control: 0.13, 95% BCI [0.07, 0.19]; Depression: 0.25, 95% BCI [0.16, 0.32]), and adolescent-reported parental warmth was positively related to happiness of adolescents, which was stronger however in the control group (Control: 0.26, 95% BCI [0.22, 0.31]; Depression: 0.08, 95% BCI [0, 0.16]). In the control group, adolescent-reported parental criticism was also positively related to the sadness of adolescents (0.03, 95% BCI [0, 0.08]). Parent-reported parental warmth was positively related to adolescent-reported sadness in the depression group (0.12, 95% BCI [0, 0.21]).

Networks II: The Perspective of Adolescents on Adolescent-Parent Contact

Adolescents were predominantly positive about the contact with their parents in both groups, but somewhat lower in the depression sample (see Fig. 5; Control: M = 5.57, SD = 1.20; Depression: M = 4.78, SD = 1.30, $p < .001$). Panel A of Fig. 6 shows that adolescents in the depression group reported on average higher levels of negative affect (sadness and irritation) and lower levels of positive affect (happiness and relaxation). However, there were no differences in adolescent-reported parenting behaviors (Fig. A10 in the online Appendix presents the frequency of the responses). Aside from affect variables in the depression sample, the responses are skewed in both groups, indicating issues with normality. This means we have to be careful with the interpretation of the networks.

Panel B of Fig. 6 shows the relations between adolescent-reported affect and adolescent-reported parenting behaviors after adolescent-parent contact (the corresponding edge weights are presented in Table A5 of the online Appendix). According to the results of the non-parametric bootstraps, the networks can be considered stable (see Fig. A11 with a more detailed explanation in the online Appendix). Regarding positive affect, the happiness of adolescents was positively related to adolescent-reported parental dominance. However, the relations were of considerably less strength in the depression sample (0.01, 95% BCI [0, 0.09]) compared to the control sample (0.14, 95% BCI [0.09, 0.20]). In both groups, the relaxation of adolescents was positively related to adolescent-reported parental understanding (Control: 0.03, 95% BCI [0, 0.10]; Depression: 0.07, 95% BCI [0, 0.13]). The control

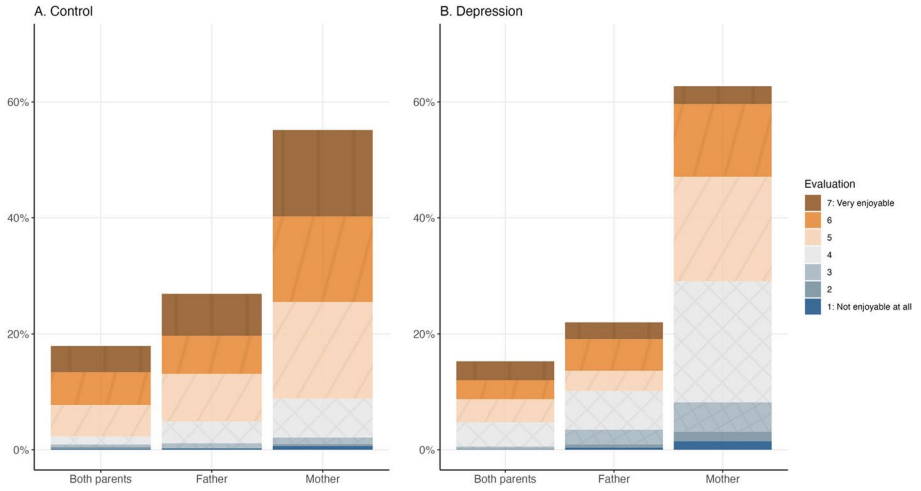

Fig. 5 The figure shows the evaluation of the last contact before the moment of reporting. The stacked bars represent the frequency of adolescent-parent contact evaluations by adolescents for the control sample on the left and the depression sample on the right. Orange-tinted bars represent more positive evaluations, while blue-tinted bars indicate less positive evaluations. The y-axis represents the number of contact moments that was evaluated on a scale from 1 (not enjoyable at all) to 7 (very enjoyable). In the control sample, adolescents reported a total of 1434 contact moments with their parents (i.e., last contact before the moment of reporting), ranging from a minimum of 6 to a maximum of 42 contact moments per adolescent and a median of 17 contact moments. In the depression sample, adolescents reported a total of 552 contact moments with their parents, ranging from a minimum of 6 to a maximum of 33 contact moments per adolescent and a median of 14 contact moments.

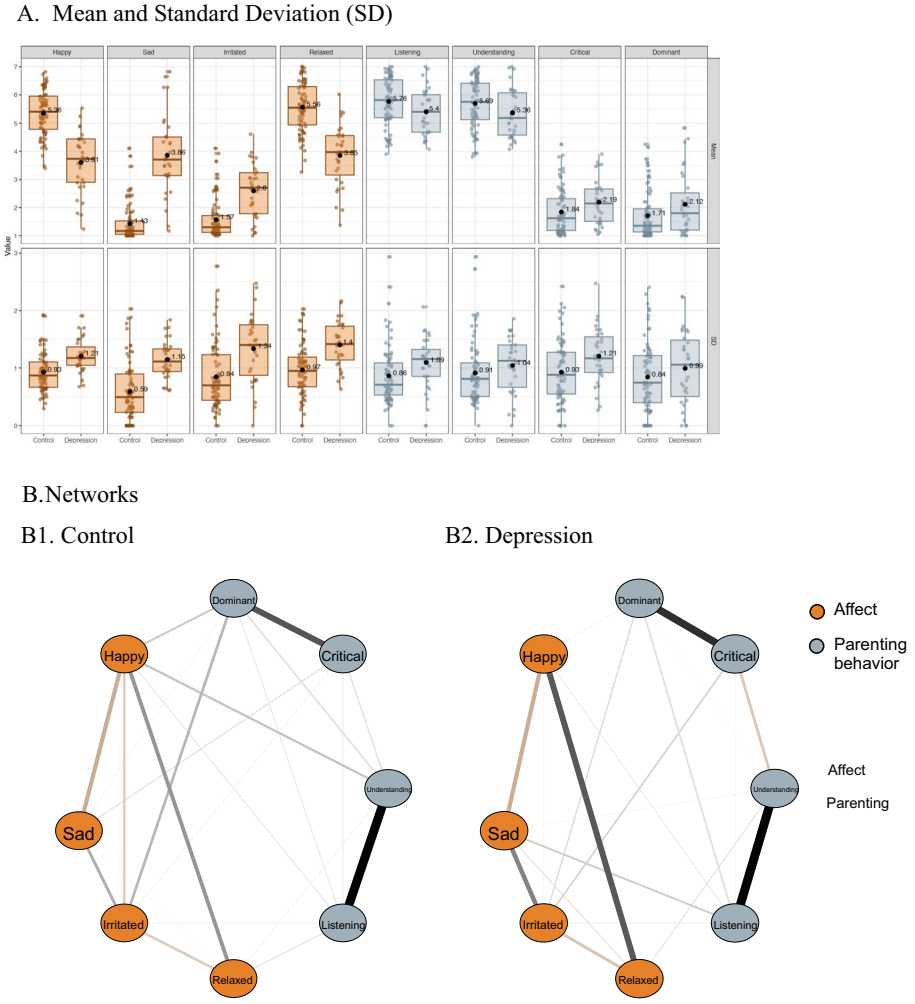

Fig. 6 In panel **A,** the mean and SD of affect variables per adolescent are depicted as orange points and box plots, while blue points and box plots represent parenting behaviors. The solid points represent the mean of means and the mean SD of SDs with corresponding values. Panel **B** contains the network of the control sample (**B1**) and the network of the depression sample (**B2**). Black solid edges represent positive relations, and red dashed edges negative relations. The thickness of the edge represents the edge weight (e.g., thicker edges representing larger edge weights). The maximum edge weight was set to 0.7 to allow for a visual comparison of the networks.

group contained two additional relations, namely between relaxation and listening (0.07, 95% BCI [0.02, 0.13]), and happiness and understanding (0.16, 95% BCI [0.10, 0.24]).

Regarding negative affect, the irritation of adolescents was positively related to adolescent-reported parental criticism and dominance in both groups. In the control sample, irritation of the adolescent was positively related to adolescent-reported parental listening (0.03, 95% BCI [0, 0.09]), while this was negatively related in the depression sample (-0.06, 95% BCI [-0.13, 0]). Sadness of adolescents was positively related to adolescent-reported

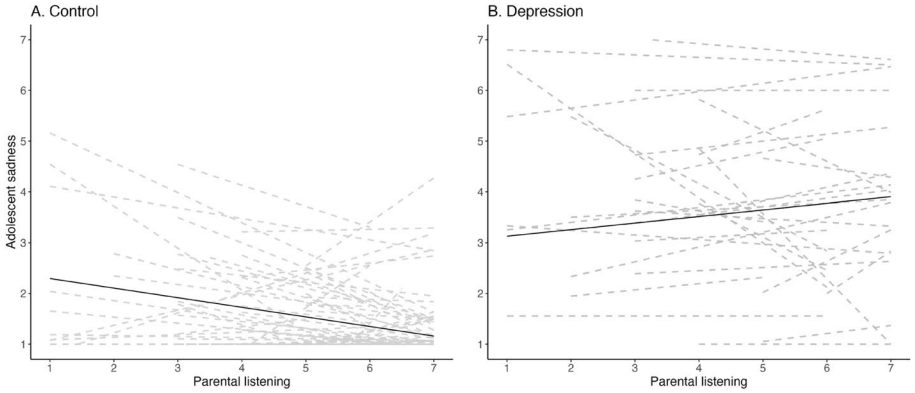

Fig. 7 Linear response trend of adolescent-reported sadness and parental listening after adolescent-parent contact in the control (**A**) and Depression (**B**) sample. Panel A shows the relations reported by adolescents in the control sample. Panel B represents the relations reported by adolescents in the depression sample. In each plot, dashed lines represent the linear trend of responses per individual. Solid lines represent the linear trends of all responses in the sample.

parental criticism and dominance in the control sample (Criticism: 0.08 95% BCI [0.01, 0.14]; Dominance: 0.02, 95% BCI [-0.02, 0.10]), but to adolescent-reported parental listening and understanding in the depression sample (Listening: 0.15, 95% BCI [0.06, 0.22]; Understanding: 0.02, 95% BCI [0, 0.14]). Except for the relations between affect states (e.g., happiness-sadness; Control: 0.32, 95% BCI [-0.37, -0.28]; Depression: -0.43, 95% BCI [-0.49, -0.37]) and parenting behaviors (e.g., listening-understanding; Control: 0.70, 95% BCI [0.65, 0.75]; Depression: 0.68, 95% BCI [0.61, 0.76]), the relations were relatively small (i.e., smaller than 0.2).

Group and Individual Differences

To explore group and within-group (i.e., individual) differences in the relation between adolescent-reported affect and parenting behaviors, we visualized linear trends of responses per adolescent separately in each group (see Fig. 7). The most prominent difference between the networks of the groups was in the relation between adolescent sadness and adolescent-reported parental listening (see Fig. 6).[8] In the depression network, there was a positive relation between adolescent-reported parental listening and adolescent sadness. However, this relation was absent in the control network. Instead, there was a positive relation between adolescent-reported parental criticism and adolescent sadness. However, when looking at the individual linear trends represented by the gray dashed lines in Fig. 7, we see that the individual trends varied widely across adolescents, especially in the depression sample (see Fig. A13 of the online Appendix for a visualization of all the relations between affect states and parenting behaviors).

[8] [8] The linear general trend does not represent the edge weight from the network. In the network, the relation between the two variables is estimated while controlling for the other variables in the network. That is not the case here, for the linear trend.

Discussion

This study aimed to obtain more insight into the relation between parental worry, self-efficacy, parental warmth, and criticism, and adolescent affect as 1) reported by parents and adolescents over the day and 2) as reported by adolescents after parent-adolescent contact. In what follows, we discuss the main findings.

Parental Worry & Self-efficacy

This study illustrates that worry and self-efficacy can play a role in the relation between parenting behavior and adolescent depression, as suggested by the COR theory (Hobfoll, 1989; Hobfoll et al., 2018), Bandura (1977, 1986), and previous studies (Armitage et al., 2020; Glatz & Buchanan, 2015; Stapley et al., 2016; Tian & Zhang, 2025). First, parents of adolescents diagnosed with depression indeed reported worrying more in comparison to parents of adolescents without depression. In the evaluation of pathway A of Fig. 1, for both the control and depression samples, we found a small positive relation between parental worry and adolescent sadness, suggesting that parents reported worrying more when adolescents reported being more sad (and vice versa). Interestingly, we found a positive relation between parental worry and parental criticism (pathway C), indicating that parents reported more criticism when they reported worrying more (or vice versa). Further research into the directionality of this relation is necessary to evaluate whether adolescent sadness yields more parental worry and an urge to change the behavior of their child, resulting in more parental criticism, as hypothesized from the COR theory (Hobfoll, 1989; Hobfoll et al., 2018) and by Tian and Zhang (2025). However, when focusing on the perspective of the adolescents on their parents' behavior, we found that in the depression sample, parental worry was positively related to adolescent-reported parental warmth. We will discuss differences between adolescent and parent perspectives in more detail below.

Furthermore, parental worry was negatively related to parental self-efficacy (pathway B of Fig. 1), extending previous findings on the link between parental stress and reduced self-efficacy (Albanese et al., 2019; Jones & Prinz, 2005; Tian & Zhang, 2025). In line with previous studies (Albanese et al., 2019; Glatz et al., 2024), self-efficacy was positively related to parent- and adolescent-reported parental warmth and had a small negative relation with parent- and adolescent-reported parental criticism (pathway C). Further studies should evaluate whether this indicates that parents express their parental worry through criticism and less warmth towards their child, which may also weaken their perception of parental self-efficacy.

In line with family system theories (Bowen, 1966; Bronfenbrenner, 1977, 1986) and previous studies (e.g., Boele et al., 2023b), we found direct relations between adolescent-reported affect and parenting behaviors (pathway D in Fig. 1), such as the positive relation between adolescent-reported parental warmth and adolescent happiness. Conform to previous studies indicating that adolescents with depression may be less sensitive to positive contact (i.e., reward sensitivity; Van Houtum et al., 2024; Wever et al., 2024), we found that this positive relation between adolescent-reported parental warmth and adolescent happiness was stronger in the control sample than in the depression sample. In addition to the relation between adolescent affect and adolescent-reported parenting behavior, there was also a positive relation between adolescent sadness and parent-reported parental warmth

in the depression sample. This implies that parents reported more parental warmth when adolescents reported feeling more sad, and vice versa. With the current approach, we cannot confirm whether the relations are reciprocal, going from adolescent to parents and from parents to adolescents, as argued by family system theories, Bandura (1977, 1986), and previous studies (Glatz & Buchanan, 2015; Tian & Zhang, 2025). As suggested by qualitative work, children's sadness could theoretically elicit more parental care and warmth (Armitage et al., 2020; Stapley et al., 2016). In addition, when parents show more warmth, adolescents with depression might experience more space to experience their sadness, which could, hypothetically, result in higher reports of adolescent sadness. Moreover, the relations were small and, therefore, should be interpreted with caution. Further studies are necessary to evaluate the directionality and reciprocality of the relations.

Adolescent Versus Parent Perspectives

In general, the perspective of adolescents on parental warmth and criticism was positively related to the perspective of parents for both groups, even though this was small (pathway E in Fig. 1). This is in line with extensive research on the (relatively low) agreement between parents and children on parental behaviors (Janssen et al., 2021b; Mastrotheodoros et al., 2019). Differences were found in the patterns of associations between the control and the depression sample. In both groups, we found a positive relation between parental worry and parental criticism, but in the depression sample, parental worry was negatively related to adolescent-reported parental criticism and positively related to adolescent-reported parental warmth. Our findings may reflect the idea that differences in the perception of parenting behavior may be related to depressive symptoms (Hou et al., 2018; Laird & De Los Reyes, 2013; Nelemans et al., 2016; Zheng & Chen, 2025). With adolescent reporting more parental warmth when their father reported more parental criticism and worry. This might also indicate that parents are more self-critical when they worry and are more negative about their parenting behaviors as compared to their children (Janssen et al., 2021b). Since parenting behavior may play out differently for mothers and fathers (e.g., Simons & Conger, 2007; Yaffe, 2023), we conducted sensitivity analyses for fathers and mothers separately. Although the sensitivity analysis did not reveal substantial differences between mothers and fathers in general, they did show that in the depression sample, whereas father-reported worry was positively related to adolescent-parental warmth, mother-reported worry was rather positively related to mother-reported parental criticism. However, our study lacks the power to draw any strong conclusions about mother-father differences in the depression sample.

Zooming in to a more detailed level on the perspective of the adolescent on parent-adolescent interactions in daily life, we found that parental warmth in the form of parental understanding and listening was positively related to positive affect, and parental criticism and dominance to negative affect in both groups (pathway D in Fig. 1). Only in the depression sample, listening and understanding were also positively related to adolescent sadness. This suggests that adolescents reported more parental listening and understanding when reporting feeling more sad (and vice versa), which might, hypothetically, indicate that adolescents feel more space to feel sad when they have the feeling parents are listening and showing more understanding, or that they have the feeling parents listen more and try to understand them better when the adolescent is feeling sad. While this is in line with the

findings of the first networks of the study, where adolescent sadness was related to parental warmth, this is in contrast to prior studies showing that more parental warmth was related to less adolescent sadness (Arslan et al., 2024; Bai et al., 2017; Reynolds et al., 2016). This difference might be explained by the timescale of the measures. In contrast to previous studies, we were directly referring to adolescent-parent contact instead of relations on a general level. However, the relations were small, and visualizing the relations per individual made it clear that we should be careful with general conclusions and consider individual variability.

Strengths, Limitations & Future Studies

This study applied an innovative method (i.e., networks) to study the relation between parenting behaviors and adolescent depression, including the role of parental worry and self-efficacy, using unique data on adolescents with depression and their parents. Furthermore, we combined information from adolescents and their parents on parenting on different levels, daily and moment-to-moment. However, family-structured data entails challenges regarding power.

Because of a difference in observations between the depression and control group, and between mothers and fathers, we did not conduct a direct group comparison but a visual comparison and sensitivity analyses, meaning we cannot conclude that there are substantial differences. The limited sample size in the depression sample, in addition to the decision to exclude adolescents with less than six contact moments with their parents and the lack of diversity, also limits the generalizability to other families dealing with adolescent depression, such as adolescents who are not living together with (one of) their parents.

In addition, the data used in this study did not have enough power for estimating multilevel or individual temporal network models (Mansueto et al., 2023). This means that we were not able to assess heterogeneity between families and adolescents, and account for the correlation between observations that is caused by the within-person design (Rouder & Lu, 2005). By considering both mothers and fathers in the same analysis, adolescent affect data was duplicated across rows. As a result, the relations may be an overestimation of the true effect, especially regarding adolescent affect. Although we did not find substantial differences when correcting for part of this dependency in the sensitivity analyses (see online Appendix), we should still be careful with the interpretation of these relations.

Moreover, with the current approach, we are not able to obtain information about the direction of the relations between variables (e.g., whether there is an effect from adolescent sadness to parental worry, or from parental worry to adolescent sadness). This means that we are unable to conclude whether the relations between adolescents and parents are reciprocal, as hypothesized by the family system theories (Bowen, 1966; Bronfenbrenner, 1977, 1986), Bandura (1986; 1977), and previous work (e.g., Glatz & Buchanan, 2015; Tian & Zhang, 2025). We can conclude that there is an association between variables, which is an important first step towards a better understanding of the relations between adolescent affect, parent cognition, and parenting behavior. However, the strength of the relations was relatively small (Cohen, 2013). This might be explained by the skewness of the variables (which in turn relates to lower variability), such as for adolescent- and parent-rated parental warmth and criticism. This can reduce power and lead to an underestimation of true relations (Epskamp & Fried, 2018b). The small magnitude of the relations may also reflect that

the effects are small and therefore warrant caution regarding the clinical interpretation of the results.

In sum, treating time series data as cross-sectional data limits the ability to interpret group differences, and the strength and direction of relations. Intensive measurement studies with larger clinical samples are necessary to assess group differences and the directionality of the relations. However, it should be noted that obtaining intensive assessments from adolescents with depression and their parents is rather challenging. Recently, studies have shown how personalized approaches could aid the collection of intensive measurement data (e.g., Riese et al., 2021), offering possibilities to collect more EMA data per individual family that provide deeper insight into adolescent-parent contact in the context of adolescent depression. These personalized approaches could also give more insight into contextual factors related to parental worry (e.g., lack of communication with their child, bullying, and socioeconomic status).

In this study, we looked at reports at the end of the day. Although this reduces recall bias compared to other studies, it still concerns some retrospective reporting of parental worry and parenting behaviors, which might have impacted the reliability of the responses. In addition, with the current design, in which we also used moment-to-moment reports after adolescent-parent contact took place, we were unable to consider the time duration between the contact and report moments. More studies are trying to collect data and invent new ways to collect this information closer or even during adolescent- parent contact. Within the RE-PAIR project, this was, for instance, done using Bluetooth (Janssen et al., 2024). However, these innovative methods can challenge reliability in other ways (e.g., technical issues; see Janssen et al., 2024). Therefore, we plead for combinations of these approaches in future studies on adolescent-parent contact.

Clinical Implications

Despite its limited power, this study illustrates the potential of the network approach for visualizing family dynamics. This may also have prospective future applications for clinical practice. First, by including the adolescent and parent perspectives, networks could illustrate vital differences in perspectives between adolescents and parents that are important to consider in the context of clinical interventions and may help to get a better understanding of the family dynamics (Logan & King, 2002; Orchard et al., 2019; Reardon et al., 2017). Once applied to single families, networks could potentially help outline within-family differences and be used as a tool to inform treatment goals (e.g., Burger et al., 2022; Levinson et al., 2021; Schemer et al., 2023; Scholten et al., 2025), for example, by focusing on situations where there is misalignment in the interpretation of adolescents and parents on parenting behavior. Moreover, future studies could explore how EMA or Ecological Momentary Intervention (EMI; Balaskas et al., 2021; Myin-Germeys et al., 2018) could be used to send family members instructions in daily life, for instance, on their phone, based on the data from the EMA, for example, as reminders for parents to be less self critical when they indicate that they worry a lot. This could potentially help parents and adolescents to become more aware of patterns within and between family members (e.g., Beames et al., 2021; Westrupp et al., 2025), and change this.

Second, including parental cognition, such as parental worry and self-efficacy, highlighted that the well-being of parents and adolescent depression are related. Parental well-

being is often overlooked in research and treatment of adolescent depression, even though the link between parental and children's well-being is well established and parental depression is one of the highest risk factors for child depression (e.g., Lieb et al., 2002). It should be evaluated if more focus on parental well-being during treatment, and even on family well-being more broadly, including also siblings, is beneficial for family members and could help to create a supportive atmosphere for adolescents with depression. This can be achieved in multiple ways, in family sessions with parents, adolescent and sibling, or with parents separately, given that including the family in treatment for the adolescent is not always desired, necessary, or feasible. This is where more low-scale and approachable help for the family, such as psycho-education for parents (e.g., Ong & Caron, 2008), could step in to help family functioning and indirectly hopefully support adolescents with depression. Further studies are necessary to evaluate the usefulness of proposed future applications for clinical practice.

Conclusion

This study showed that parental worry and self-efficacy are important factors in the relation between parenting behavior and adolescent depression. Parents of adolescents with depression worried more about their child, and their worry and self-efficacy were related to parental warmth and criticism perceived by parents and adolescents, and to adolescent affect. By applying a network approach that considers the perspectives of both parents and adolescents, this study demonstrates how a network approach can be used to map the reciprocal relations between adolescents and their parents. Future studies focusing on individual families that also consider more detailed contextual factors of parental worry and self-efficacy may provide a next step towards a better understanding of family dynamics in the context of adolescent depression.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s10566-026-09953-0.

Declarations

Conflict of interest The authors have no conflicts of interest to declare.

Ethical Approval The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

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