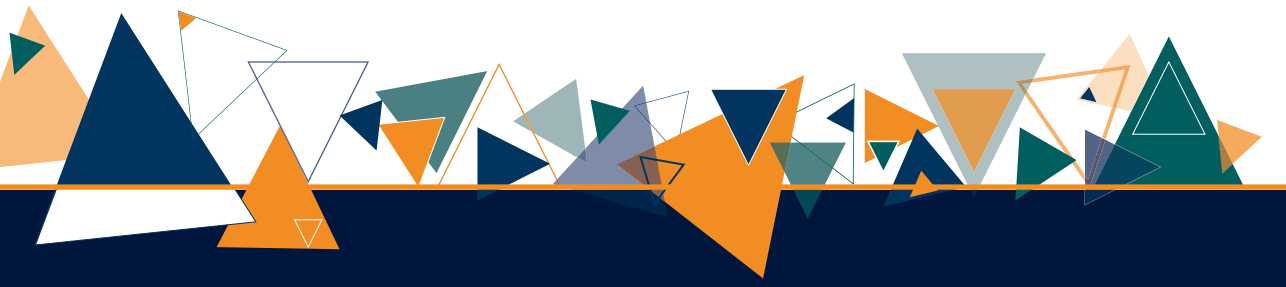
Changes in perspective: parenting and well-being of adolescents in daily life

Janssen, L.H.C.

CHANGES IN PERSPECTIVE

Parenting and well-being of adolescents in daily life



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Parenting and well-being of adolescents in daily life

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“We are not the survival of the fittest, we are the survival of the nurtured.”
Louis Cozolino

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General introduction

“The journey of a thousand miles begins with one step”
Lao Tzu

Adolescence is an important developmental period, broadly ranging from 10 years onwards until the early twenties, characterized by changes at the biological, cognitive, psychological, and social level (Dahl et al., 2018). Hall (1904), being the first to discuss adolescence as a distinctive period, already mentioned that mood disruptions are an important key aspect of adolescence, which has been supported by research. Adolescents generally experience more extremes of mood, more mood swings, and more frequent episodes of depressed mood (Arnett, 1999). These mood swings have been identified as precursor for the development of internalizing problems (Maciejewski et al., 2014). During adolescence, the prevalence of mental health disorders increases substantially with mood disorders being one of the most prevalent (Kessler et al., 2005). Worldwide more than 13% of adolescents between the ages of 10 and 19 are diagnosed with a mental disorder, with 40% of these youth experiencing anxiety and depression (Polanczyk et al., 2015; UNICEF, 2021). An early onset of disorders during adolescence has been associated with higher recurrence rates (Curry et al., 2011) and adverse psychosocial outcomes in adulthood (e.g., Clayborne et al., 2019). Despite the importance of early recognition and treatment, it can take several years before adolescents with a mental disorder reach out and receive treatment (Raven et al., 2017). In the Netherlands, the youth mental health care has been under a lot of pressure for years and the increasing requests for help and lack of capacity to handle these requests resulted in waiting lists that became even longer during the COVID-19 pandemic. To reduce the number of adolescents who need help from (specialized) youth mental health organizations it is therefore essential to focus on early detection and prevention of mental health problems by targeting modifiable factors that can foster adolescent mental well-being.

Parenting is one promising malleable factor to investigate since parents and the parent-adolescent relationship are essential for adolescent well-being (e.g., Bronfenbrenner & Morris, 2006; Sameroff, 2010). Despite decades of research on parenting, which indicate that warm and supportive parenting fosters adolescent well-being (e.g., Khaleque, 2013; Pinquart, 2017; Steinberg & Silk, 2002), translating these findings to the everyday lives of individual families remains a challenge. The dynamic process between parenting and adolescent well-being takes place in the daily flow of life within a family. Previous studies have not assessed the family dynamics at this level and hence it is still an open question whether previous findings represent actual processes in daily life. Therefore, in this dissertation, the aim is to gain insight into parenting processes in relation to affective well-being of adolescents in daily life to contribute to a better understanding of the day-to-day and moment-to-moment family dynamics. Ultimately, these insights may have important implications for prevention and clinical interventions for youth with depression.

The need to zoom in to parenting of adolescents in daily life

According to the ecological models of human development (Bronfenbrenner, 1979; Bronfenbrenner & Morris, 2006; Sameroff, 2010), which still dominate the field, the parent-adolescent relationship is considered to be one of the most proximal and important for adolescent development and well-being. Hall (1904) already described this relation as being characterized by increases in conflicts. Throughout the last century, research has shown that generally in early adolescence (10-13 years) the amount of conflict between parents and adolescents indeed increases (Meeus, 2018) and conflict intensity rises in middle adolescence (14-17 years; De Goede et al., 2009). Importantly, this is not the case for all adolescents to the same extent (Smetana & Rote, 2019). Since the transformation of the parent-

adolescent relationship revolves around themes of identity and autonomy (Laursen & Collins, 2009; Steinberg & Silk, 2002), conflicts with parents can be seen as normative and even functional, as a way to renegotiate the parent-adolescent relationship into becoming more egalitarian over time (Branje, 2018; Branje et al., 2012). This is a bidirectional process influencing the behavior of both adolescents and parents and their mutual interactions (e.g., Bronfenbrenner & Morris, 2006).

Even though developing a sense of self and becoming more autonomous are thus key developmental tasks for adolescents, the parent-adolescent relationship and parenting remains essential for adolescents' development and well-being (Steinberg & Silk, 2002). Numerous studies have empirically supported this and showed that a parent-adolescent relationship characterized by warmth and support fosters adolescent well-being, while parental control, hostility, and conflict negatively impact adolescents' well-being (e.g., Khaleque, 2013; Pinquart, 2017; Weymouth et al., 2016). Several empirical studies and reviews have also suggested that negative parenting may be a proximal cause of adolescent mental health problems (e.g., Pinquart, 2017; Sameroff, 2000). Moreover, this is also a transactional (i.e., bidirectional) process (Sameroff, 2010), with adolescents influencing the interactions and parents' behavior.

Notwithstanding the valuable insights these studies provided, the ecological validity and generalizability of these findings to the everyday lives of the individual families has been questioned. The majority of conclusions has been based on studies focusing on long time-intervals (i.e., years) and stable characteristics of families on average, while families are not alike nor stable over time (Boele et al., 2020; Keijsers & van Roekel, 2018). Ecological momentary assessment (EMA; Stone & Shiffman, 1994) provides the opportunity to zoom in to the parenting processes on a momentary (at this moment) and daily (at the end of the day) basis and assess changes in parenting within families. In the current dissertation, I aim to examine these momentary and daily fluctuations of parenting and investigate whether these relate to adolescent well-being using EMA.

Ecological momentary assessment

Ecological momentary assessment (EMA) – also known as the experience sampling method (ESM) or ambulatory assessment (AA) – is a research method in which participants receive multiple brief questionnaires throughout a day in the context of daily life. These assessments concern questions on for instance whereabouts, thoughts, feelings, and behaviors at that moment. The first studies using this method to examine parenting and adolescent well-being were already conducted in the 1980s with the use of paper-and-pencil questionnaires (Larson & Richards, 1991). Due to technological development and the common availability of smartphones, it nowadays has become more accessible and easier to use EMA in research. Several applications have been developed that can be installed on the smartphones of participants with push notifications alerting participants to complete a questionnaire. Using EMA to examine daily life processes such as parenting and adolescent well-being has several advantages. Most importantly, it enables researchers to gain information about both content and its context (Hektner & Csikszentmihalyi, 2002) in an ecologically valid way (Trull & Ebner-Priemer, 2009), with reduced recall bias (Schwarz, 2007). When using the classical questionnaires participants are asked to report retrospectively (e.g., about the last weeks, months or year) on their thoughts, feelings, and behaviors, which can be biased by for instance their current mood or most recent experience. Moreover, EMA allows for capturing the momentary daily life dynamic processes

by assessing certain phenomena on a short time-scale (Hektner & Csikszentmihalyi, 2002). For instance, feelings can be assessed every hour or multiple times per day for several consecutive days. These repeated assessments also enable zooming in to more person-specific or family-specific processes (Keijsers & van Roekel, 2018).

Although the increased availability of easy-to-use applications has made EMA research booming throughout the past years, not many studies have yet used this method to examine parenting in daily life and only few EMA studies assessed momentary parent-adolescent interactions (for review see Keijsers et al., 2022). With the current dissertation, I want to contribute to this new line of research in order to support families and foster adolescent well-being. Below, I will first outline what is currently known about parenting and adolescent well-being before addressing the gaps in parenting research in more detail and discussing how I aim to take some first steps in gaining a better understanding of the everyday lives of families.

Operationalization of parenting

Parenting, encompassing a wide range of thoughts, actions, and feelings related to raising children (Bornstein, 2015), has been studied extensively. Generally, two approaches of classifying parenting behavior have been adopted in the literature: a dimensional approach focusing on parenting dimensions and a categorical approach that combines dimensions into parenting styles (Maccoby & Martin, 1983; Pinquart, 2017). The dimensional approach distinguishes two broad dimensions, namely parental responsiveness and parental demandingness. Parental responsiveness refers to the degree parents are sensitive to the emotional and developmental needs and demands of their child and encompasses both sensitive behaviors such as being warm, supportive, and nurturing, as well as insensitive behaviors such as criticism and rejection (e.g., Maccoby & Martin, 1983). Parental demandingness refers to different forms of parental control, such as behavioral and psychological control (e.g., Maccoby & Martin, 1983; Pinquart, 2017). The categorical approach uses these two dimensions to distinguish four parenting styles. Originally, the following four have been defined: an authoritative style (high responsiveness and demandingness), an authoritarian style (low responsiveness and high demandingness), a permissive style (high responsiveness and low demandingness), and a neglectful style (low responsiveness and demandingness) (Baumrind, 1966; Maccoby & Martin, 1983). Both parenting dimensions as parenting styles have been related to adolescent well-being, concurrently but also (bidirectional) over time (e.g., Pinquart, 2017).

In line with a general focus in the field on parenting dimensions instead of styles (Smetana, 2017), this dissertation will focus on two aspects of parenting, parental warmth and parental criticism, that are both related to the important development task of developing a strong sense of self and identity during adolescence as proposed in the work of Erikson (1968). Previous studies have shown that warm and supportive parenting behavior contributes to the development of a positive self-view, while parental criticism and rejection induces more negative self-views (McCranie & Bass, 1984). These in turn may increase vulnerability to depression (Garber & Flynn, 2001). Parental warmth or support is conceptualized as showing acceptance, emotional closeness, and positive involvement toward the adolescent (Gladstone & Parker, 2005) and parental criticism as expressing negativity, dissatisfaction or less responsiveness to the adolescent (Harris & Howard, 1984).

Parent-adolescent discrepancies of parenting

The current knowledge on parenting is mostly based on the perception of one family member, usually the adolescent, while adolescents and parents may perceive or interpret parenting behavior differently. That is, a parent may for example think that he or she is supporting their adolescent, while the adolescent might perceive it as being too overprotective, or a parent may think he or she is 'just' asking a question, whereas an adolescent perceives it as criticism. Since differences between adolescents and parents can yield valuable information (De Los Reyes & Ohannessian, 2016) several multi-informant studies, including adolescent and parent reports of parenting, have been conducted the past years on these discrepancies. Results of meta-analyses have shown that parents generally are more positive about their own parenting than adolescents, with convergence between adolescent and parent reports being quite low (De Haan et al., 2018; Hou et al., 2020; Korelitz & Garber, 2016). How to interpret these discrepancies between adolescent and parent reports of parenting remains a topic for debate, however. These differences may indicate a normative process with adolescence developing an individual identity (Bowen, 1978; Grotevant & Cooper, 1986) and starting to re-evaluate family relationships (Smetana et al., 2006), which may lead to different perceptions. Discrepancies may also indicate dysfunctional family dynamics (De Los Reyes et al., 2019) or signal a misfit between adolescents' needs and parents' demands (Eccles et al., 1993; Lerner et al., 1986), possibly negatively impacting adolescents' and parents' well-being (e.g., De Los Reyes, 2011). Another factor that may play a role in the discrepancies is that adolescents' and parents' affect may influence the reports on parenting of parents and adolescents.

In relation to *differences* between adolescent and parent reports of parenting, some studies have already examined the link between discrepancies and adolescent well-being. Overall, differences between adolescents' and parents' reports of parenting were related to poorer adolescent well-being (Hou et al., 2020). Especially when adolescents were more negative about parenting behavior than parents, adolescents reported lower well-being (Hou et al., 2020; Rote & Smetana, 2016). Due to the use of interaction scores between adolescents' and parents' perception of parenting instead of difference scores, some studies were able to additionally examine overlap (i.e., congruence) between these reports. Results showed that congruence of negative perceptions of parenting were related to more adolescent maladjustment (Hou et al., 2020; Van Petegem et al., 2019). In line with ideas that the perspectives, behaviors, and affective states of family members interact and influence each other (Cox & Paley, 1997; Minuchin, 1985), it has been suggested that the discrepancies between adolescents' and parents perception can also undermine parents' well-being (De Los Reyes et al., 2019), but this has not yet been examined. Therefore, in this dissertation, adolescents' and parents' perception of parenting and discrepancies between them in daily life will be assessed and linked to both adolescents' and parents' affect.

Addressing the gaps of parenting research

Notwithstanding the wealth of information these abovementioned studies have provided and contributed to our understanding of parenting and its relation to adolescent well-being, the ecological validity of these findings has increasingly been questioned. More specifically, at least five concerns arise when interpreting previous work using retrospective methods, which will be addressed in this dissertation: 1) the focus on macro time-intervals; 2) the focus on associations at the between-person

level; 3) the focus on mothers; 4) the lack of taking into account heterogeneity; 5) the impact of adolescent depression.

Dynamic processes at the micro-level

With respect to the time scale of previous studies, according to the dynamic systems theories (e.g., De Ruiter et al., 2019; Kunnen et al., 2019; Smith & Thelen, 2003) processes can happen on multiple time scales, from specific behaviors (i.e., sighing, nodding the head) during an interaction to more macro changes in parenting related to developmental transformations across years (i.e., parent-adolescent relationship becoming more egalitarian). Most parenting studies to date have used cross-sectional or longitudinal designs with macro time-intervals and classical retrospective self-report measures, which resulted in insights about patterns and developments over longer periods of time. As the parent-adolescent relationship is gradually shaped by each single interaction (Hinde, 1976; Keijsers et al., 2022), investigating the short-term dynamics is essential to get a more complete understanding of the family processes.

To do so, one could rely on observational studies, which are considered the gold standard for assessing these fine-grained dynamics between parents and adolescents. Yet in this method, the focus is on seconds or minutes and ecological validity can be questioned. Parent-adolescent interactions in the lab are videotaped and their behavior is coded afterwards by independent observers. This should provide more objective data of short-term dynamic processes and rule out self-report bias. Although it has been indicated that these observations reflect natural behavior relative well (Gardner, 2000; McKee et al., 2013) and may grasp *subtle* affective and behavioral aspects of parenting that parents or adolescents themselves would not (be able to) report, the natural context in which these interactions occur is missing (Trull & Ebner-Priemer, 2009), as well as the frequency of these behaviors in daily life. Moreover, the subjective experiences of adolescents and parents are not taken into account, while each individual interprets behavior in its own way based on previous experiences and interactions (Hinde, 1976; Scheepers, 2021). There are, however – as already argued earlier in this chapter and as I will also outline below – ecological methods such as EMA that overcome these limitations and are also suited to assess short-term dynamics between parents and adolescents.

Within-person processes

With respect to the level of investigating associations between parenting and adolescent well-being, most previous studies have assessed the between-person level (i.e., average). By doing so, estimates relate to differences between families and do not contain information about the within-person level (i.e., individual) (Hamaker, 2012; Keijsers, 2016). The findings of these studies do not provide insights into how parenting and parent-adolescent interactions can fluctuate over time (i.e., days) within a family or person (Darling & Steinberg, 1993; Keijsers & van Roekel, 2018). Recent studies indeed showed that findings at the between-person level are not always similar to results at the within-person level (Hamaker et al., 2015; Keijsers, 2016), also known as a Simpson's paradox (Kievit et al., 2013). Evidence for this has for instance been provided in a study on parental autonomy support and adolescents' social anxiety (Nelemans et al., 2020). Results showed that, at the between-person level, mothers of adolescents with more social anxiety symptoms reported *lower levels* of autonomy support compared to mothers of adolescents with lower social anxiety symptoms. However, at the

within-person level, mothers reported *higher levels* of autonomy support at times when adolescents reported higher levels of social anxiety symptoms. A recent systematic review found that, to date, 46 studies examined the within-person fluctuations in parenting and adolescent adaptation, with only ten studies assessing parenting at the daily level (at the end of the day; Boele et al., 2020). Thus, crucial information on the dynamic and person-specific processes at the level where the actual parenting takes place, the daily flow of life, is missing.

Inclusion of fathers

Another concern is that, to date, most studies have focused on parenting of only mothers, while it has been suggested that mothers and fathers play a unique role in parenting (e.g., Lamb & Lewis, 2013) with mothers providing generally more warmth and support and fathers more instrumental care (Youniss & Smollar, 1985). This stresses the need to explicitly examine parenting of fathers. Although some studies already showed that parenting of mothers was more supportive and emotion-directed than parenting of fathers (De Goede et al., 2009; Mastrotheodoros et al., 2018), studies that include fathers are still scarce. In line with the family system theories (e.g., Cox & Paley, 1997; Minuchin, 1985) that state that families consist of interrelated subsystems such as the adolescent-mother and adolescent-father relationships, a key objective of this dissertation is to also include fathers and compare parenting of mothers and fathers.

Heterogeneity

Additionally, previous studies have mainly focused on general processes within a certain group or sample and did not take into account the fact that how parenting and adolescent well-being is related may be very different from person to person (i.e., heterogeneity). Due to the person-specific interactions between personal and contextual influences (e.g., Bronfenbrenner & Morris, 2006; Sameroff, 2010) adolescents may respond in different ways to parenting (e.g., Keijsers et al., 2016; Sameroff, 2010). That is, mental health problems may affect how parental behaviors, such as criticism, affect an adolescent's current mood. Although this heterogeneity has been acknowledged in for instance the differential susceptibility hypothesis (e.g., Pluess & Belsky, 2010), not many studies have investigated this in within-person processes (Boele et al., 2020), especially not in daily life. Most studies that did explicitly assess this heterogeneity found substantial variation between individuals (Boele et al., 2020) and some tried to explain these differences by testing the impact of stable characteristics related to the adolescent (i.e., gender, age), parent (i.e., gender, substance use) or family (i.e., socioeconomic status, family values). These first insights on how parenting may affect adolescents differently demonstrate the need to further investigate heterogeneity in family-specific parenting processes in daily life as well as trying to explain these individual differences.

Impact of adolescent depression

As depressive symptoms increase during adolescence and mood disorders are one of the most prevalent in adolescents (Kessler et al., 2005), depression is an important factor that may explain these individual differences and affect the association between parenting and affect in daily life. It has been observed that the within-person association between conflicts with parents and adolescent negative mood indeed was stronger for adolescents with more depressive symptoms compared to

adolescents with fewer depressive symptoms (Timmons & Margolin, 2015). However, more research is necessary that assesses positive aspects of parenting and elucidate whether adolescents with more depressive symptoms still benefit from for instance parental support or warmth. Moreover, this previous study (Timmons & Margolin, 2015) was based on a community sample and did not include adolescents with mood disorders. Thus far, no studies have examined the moment-to-moment experiences of parenting in families with adolescents with mood disorders. Although parenting has been consistently related to adolescent depression (Restifo & Bögels, 2009; Yap et al., 2014), the previously mentioned recall bias (Trull & Ebner-Priemer, 2009) may be more substantial in the case of a depression (Platt et al., 2017), with adolescents' perception of parenting being impacted by their low affect. For clinical practice, it is therefore imperative to additionally assess parents' own perception of parenting, thereby gaining more insight into these daily life family dynamics. Thus, a final key objective of this dissertation is to investigate the impact of adolescent depressive symptoms and depression on the experiences of parenting in relation to adolescent well-being in daily life.

To overcome these gaps and study parent-adolescent interactions and parenting with higher ecological validity and lower recall bias, EMA is a suitable method that has only scarcely been used in the field of parenting. Hence, in this dissertation, I will use this method to examine the dynamic and family-specific concepts of parenting (of both mothers and fathers) and parent-adolescent interactions at the micro-level, test individual differences, and investigate these interactions in the context of adolescent depression. By doing so, I aim to better understand the everyday life dynamics, contribute to the development of this fairly new research field, and also elucidate whether previously observed findings based on retrospective reports hold when using a different approach. Ultimately, the aim is to inform parents and clinicians and to provide suggestions for prevention and clinical interventions for adolescents with depression. Below I will outline how the studies in this dissertation will help to tackle these questions and concerns.

Steps towards filling the gaps concerning parenting processes in daily life

Larson, as one of the founding fathers of EMA, started using this method to describe adolescents' lived experiences in the daily life context. His studies and others that followed provided some first insights into the patterns and changes in affective states of adolescents (see for an overview Larson, 2019) and their parents (Larson & Richards, 1994). For instance, adolescents tend to experience more extremes of emotions than parents and greater mood disruptions than preadolescents (Larson & Richards, 1994), thereby supporting the claim already made by Hall (1904). Changes in the parent-adolescent relationship were also studied using EMA. For instance, as adolescents get older, they start spending more time with their friends whereas the time spent with families decreases substantially (Larson & Richards, 1991; Larson et al., 1996). As already mentioned, only few studies have yet examined parenting and parent-adolescent interactions in daily life (for reviews see: Boele et al., 2020; Keijsers et al., 2022). Most assessed parenting at the daily level, asking about parental behavior once a day at the end of the day, but not on the momentary level (at this moment). Overall, parenting on a given day was related to adolescent affect, which seems to indicate that the findings based on macro-scale retrospective reports can be generalized to daily life. However, more research is necessary that focuses on both positive and negative aspects of parenting of mothers and fathers as

well as positive and negative affective states in adolescents, at the daily and momentary level, which will be done in the current dissertation (chapter 3, 5, and 6).

Moreover, information on how parents themselves perceive their parenting in daily life is missing and it is still unknown whether the findings on discrepancies between adolescents' and parents' perceptions of parenting and its association with adolescent well-being also generalize to daily life. Previous studies examining these discrepancies mostly used difference scores, however, this approach has been criticized (e.g., De Haan et al., 2018). Using more sophisticated polynomial regression analyses including an interaction term between adolescents' and parents' reports is advised in order to examine whether differences between reports relate to the outcome, in addition to main effects of individual reports (Laird & De Los Reyes, 2013). However, this type of analysis has not yet been applied to a daily diary or EMA study, which will be done in this dissertation. Furthermore, although interrelatedness of parents' and adolescents' affect and behaviors has been proposed theoretically (Minuchin, 1985), ways to additionally include parents' affect as an outcome in these models are still missing. By using a novel hybrid statistical model (Iida et al., 2018), which enables including the individual perceptions and the difference score in one model, I aim to assess how individuals' perceptions of daily parenting and the difference between these relate to both adolescents' and parents' daily affect. Thus, by focusing on the daily discrepancies between adolescent-mother and adolescent-father dyads in relation to both well-being of adolescents and parents I aim to contribute to unravelling daily family dynamics (chapter 5 and 6).

Several other questions remain to be answered. As addressed above few studies have actually tested heterogeneity in the within-person associations between parenting and adolescent well-being in daily life and this will hence also be tested in this dissertation. Moreover, I aim to take some first steps in order to better understand who may benefit from parenting in order to contribute to the tailoring of interventions to the need of individual families (chapter 2 and 3). Family dynamics can become more challenging when an adolescent is experiencing a depression. Theoretically, it has been suggested that adolescents who perceive their parents and their parenting behavior as rejecting or less supportive are more likely to develop a depression (Rohner, 2016; Rohner et al., 2005) for instance by developing depressogenic schemas (Beck, 1967). However, as parents and adolescents influence each other bidirectionally (Coyne, 1976; Rudolph, 2009), adolescent depression also elicits responses from parents. This can either be adaptive, with parents increasing their support (Gottman et al., 1996), but could also result in becoming overprotective (Johnco & Rapee, 2018) or parents may show more criticism or less parental support (Coyne, 1976). To gain more insight into these dynamics I aim to investigate momentary affect and parenting in families with adolescents with a depression (chapter 3) and examine the extent to which the association between parenting and adolescent affect is influenced by adolescent depressive symptoms (chapter 2 and 3). More importantly, this information could possibly guide future interventions. The majority of interventions for adolescent depression (e.g., cognitive behavioral therapy or interpersonal psychotherapy) are still individually based and have received most attention in research, while involvement of parents has been found to contribute to effectiveness of the treatment (Oud et al., 2019).

In addition to the importance of the parent-adolescent relationship for adolescent well-being, the ecological models of human development propose that contextual influences at the macro-level affect adolescent development and the family dynamics (e.g., Bronfenbrenner & Morris, 2006;

Sameroff, 2010). While working on this dissertation, the COVID-19 pandemic created drastic changes to the daily lives of families since measures of social distancing were imposed in society. An important question that was raised was to what extent the COVID-19 pandemic and associated distancing measures influenced affect and parenting in families. I therefore will also examine the impact of the COVID-19 pandemic, as a macro-level influence on daily parenting and momentary well-being of adolescents and parents (chapter 4).

A final more methodological question is how to best measure parent-adolescent interactions. Generally, three types of sampling can be distinguished in EMA: 1) interval-contingent sampling, referring to participants reporting for instance at the end of every hour; 2) event-contingent sampling, referring to participants reporting after a certain event took place (i.e., rating a social interaction); 3) signal-contingent sampling, referring to participants receiving a notification to complete a questionnaire with either fixed, random or semi-random intervals. Parent-adolescent interactions are scattered over a day and random signal-contingent sampling schemes might miss impactful interactions. Asking parents and adolescents to indicate themselves when they interacted (i.e., event-contingent) may be prone to bias. Parents and adolescents may not think about or feel like completing a questionnaire when an interaction was for instance unpleasant. Gaining more objective information on physical proximity of adolescents and parents may therefore be informative which may be an objective marker that characterizes interactions (Gupte & Eliassi-Rad, 2012). By developing and applying a novel method using Bluetooth low energy (BLE) beacons and a smartphone application, I aim to objectively track proximity between adolescents and parents and trigger questionnaires based on this proximity. This not only allows for gaining more insight into frequency and duration (i.e., quantity) of parent-adolescent proximity, but also enables assessing quality of interactions at the moments that these occur (chapter 7).

Method

This dissertation is based on three studies that are briefly introduced below. The majority of studies (chapter 3, 4, 5, 6, and 7) is based on data from the Relations and Emotions in Parent-Adolescent Interaction Research (RE-PAIR). The two other datasets are from the Grumpy or Depressed project (chapter 2) and Family Life Optimizing Well-being (FLOW) study (chapter 6).

RE-PAIR

RE-PAIR is a Dutch multi-method, two-generation study developed to examine the bidirectional relation between parent-adolescent interactions and adolescent mental well-being by comparing families with an adolescent with a current major depressive disorder or dysthymia to families with an adolescent without psychopathology (see also Van Houtum et al., 2021; Van Houtum et al., 2022; Wever et al., 2021). This study was conducted at the Clinical Psychology Department of Leiden University from 2018 to 2022. In total, 115 families participated in the RE-PAIR study with 80 adolescents without psychopathology and their 153 parents, and 35 adolescents with a depression and their 63 parents.

The full RE-PAIR study consisted of four parts: 1) online questionnaires; 2) a research day at the lab in Leiden; 3) EMA; 4) an Magnetic Resonance Imaging (MRI)-scan session for the adolescent and one or both parent(s). For follow-up purposes, families received an invitation to complete online

questionnaires half a year, one year, and two years after the research day. Additionally, at the start of the COVID-19 pandemic (April 2020), families with an adolescent without psychopathology were invited to participate in a follow-up EMA study to investigate the impact of the pandemic on parenting and affect in both adolescents and parents.

All family members (adolescents, mothers, and fathers) who participated in the RE-PAIR study were invited to participate in the EMA. Participants installed the Ethica application on their own smartphone to fill out the questionnaires and carried around a BLE beacon to track proximity. In total, they received four questionnaires a day for fourteen consecutive days (56 in total) either on a set time (in the morning) or random within a specified time-range. Adolescents reported about parenting of their mothers and fathers separately and parents reported on their own parenting behavior. The current dissertation focusses on RE-PAIR data collected during the EMA and uses questionnaire data for descriptive purposes (chapter 3, 4, 5, 6, and 7).

Grumpy or Depressed

Grumpy or Depressed is a Dutch multi-method, longitudinal study aimed to differentiate normative grumpy behavior during puberty from the early signs of depression (Keijsers et al., 2015). This study was conducted at the Department of Adolescence at Utrecht University in 2014 and 2015. The study was composed out of a screening phase (N = 573 adolescents) consisting of questionnaires and a longitudinal study on a subsample (N = 244 adolescents and N = 235 parents) consisting of three waves of both questionnaires as EMA within one school year with 3-month intervals. The current dissertation focusses on the data collected during the longitudinal study (chapter 2).

Adolescents and parents who participated in the longitudinal study received the online questionnaire four weeks before the start EMA and were given seven weeks to complete this. Only adolescents completed the EMA and installed the MyPanel app on their own smartphone. Per wave, they filled out eight questionnaires a day, randomly divided, for seven consecutive days (56 in total).

FLOW

FLOW is an American multi-informant, multiple timescale study to capture family dynamics in two-parent households (e.g., Fosco & Lydon-Staley, 2019). In total, 150 parent-adolescent dyads participated, with parents being mostly mothers (95.3%). The study was conducted at the Human Development and Family Studies Department at the Pennsylvania State University from 2014 to 2017.

The FLOW study consisted of two parts: 1) online baseline questionnaires; 2) a daily diary protocol. For follow-up purposes, the parent-adolescent dyads received an invitation to complete online questionnaires after 12 months. Both the parent and adolescent completed the daily diaries surveys, which were sent via email at 7PM each night for 21 consecutive nights. The current dissertation includes the daily reports of parenting and affect of both the adolescent and parent (chapter 6).

Outline of thesis

The present dissertation used a multi-informant and multi-method approach to investigate fluctuations in parenting and parent-adolescent interactions in daily life and its associations with fluctuations in adolescent affective well-being at the within-person level.

Chapter 2 starts by investigating the association between experienced daily parental support and adolescent daily negative mood at the within-person level, based on adolescent reports from the sample of the Grumpy or Depressed project. To add to existing literature, individual differences in this association are tested as well as possible explanatory factors for this heterogeneity.

In *Chapter 3*, we build upon this by including adolescents with a current major depressive disorder or dysthymia to assess whether the within-person association between experienced parenting behavior and adolescent affective well-being during *momentary* parent-adolescent interactions is different for adolescents with a depression compared to adolescents without psychopathology. Moreover, the multi-informant approach enables to investigate differences in momentary affect and parenting between families with adolescents with a depression and families with an adolescent without psychopathology, from adolescents', mothers' and fathers' perspective.

Chapter 4 examines the impact of the COVID-19 pandemic on momentary affect of adolescents and parents as well as daily parenting behavior from both the perspective of adolescents and parents by comparing EMA during two weeks of the COVID-19 pandemic (April 2020) and a twee week baseline period pre-pandemic.

In *Chapter 5*, to gain more insight into adolescent-parent discrepancies in daily life adolescents', mothers, and fathers' perceptions of daily parenting are described and compared. As a next step, multilevel polynomial regression models and response surface analyses are applied to examine the extent to which adolescents' and parents' perceptions and discrepancies between these are related to adolescent daily positive and negative affect.

With the use of novel hybrid models *Chapter 6* extends these findings by including parents' daily affect in addition to adolescents' affect in relation to parent and adolescent perspectives of daily parental warmth and its discrepancies. Investigating this in two samples (FLOW and RE-PAIR) allows for replication of findings across samples of two different cultural contexts. Using the RE-PAIR sample also enables assessing differences between adolescent-mother and adolescent-father dyads.

In *Chapter 7*, the application of an innovative method to objectively assess parent-adolescent physical proximity using BLE beacons and a smartphone application is described. This provides more information on frequency and time spent together between adolescent-mother and adolescent-father dyads. The method is additionally used to trigger questionnaires based on the proximity to gain more insight into quality of parent-adolescent interactions.

In C*hapter 8*, the main results of the studies presented in this dissertation are discussed and put in a broader perspective from a theoretical, methodological, and clinical perspective. Directions for future research are also discussed.

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2

The link between parental support and adolescent negative mood in daily life: Between-person heterogeneity in within-person processes

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Abstract

Lack of parental support is related to more adolescent negative mood. However, little is known about how fluctuations of parental support relate to fluctuations of negative mood within adolescents in daily life. The current study aimed to elucidate these processes at a day to day micro-level and examined to which extent adolescents would differ in the association between perceived parental support and adolescent negative mood. The sample consisted of 242 Dutch adolescents (M_{age} = 13.82, 63.2% female) who completed ecological momentary assessments of 3 weeks 3 months apart. Results from the multilevel regression analyses showed that on average, adolescents experienced higher levels of negative mood on days when they perceived their parents to be less supportive. Substantial individual differences were found in this association, however, these were partially explained by the level of depressive symptoms and perceived parental intrusiveness. These findings suggest that advice on parental support should be tailored to the unique characteristics of the adolescent.

Keywords: experience sampling method (ESM), daily life, parental support, adolescent negative mood, heterogeneity, within-family level

Introduction

Adolescence is an important developmental period with several challenges and changes. Even though most adolescents cope successfully with the biological, psychological and social changes, it does make adolescence not only a window of opportunity, but also a vulnerable period for the onset of internalizing problems (Dahl et al., 2018). Empirical studies and reviews have suggested that a lack of parental support may be a proximal cause of internalizing problems (e.g., Pinquart, 2017), but how this process unfolds in daily life remains unclear. Mood swings and negative daily mood have recently been identified as a precursor for the development of internalizing problems (Maciejewski et al., 2014), and these day to day fluctuations in negative mood may be linked to parent-child interactions in daily life (e.g., Keijsers et al. 2016). The vast majority of research on parenting and adolescent well-being is based on analysis of data at the aggregate level, resulting from longitudinal designs with macro timescales (i.e., years) and classical retrospective self-report measures, while the underlying mechanisms of adolescent development and parenting processes more specifically, are dynamic, person-specific, and take place in the daily flow of life (Keijsers & Van Roekel, 2018). The results of existing studies with longer time intervals may therefore not provide us with information about how daily fluctuations of support and negative mood influence each other on a smaller time scale (Keijsers & Van Roekel, 2018). Investigating these underlying social processes at a more micro-level (i.e., hours, days) within persons may yield relevant insights into the building blocks of longer term mental health development (Boele et al., 2019). Therefore, by using ecological momentary assessments (EMA; Stone & Shiffman, 1994) the current study aimed to examine the more proximal associations between experienced parental support and adolescent daily negative mood within a person in the daily flow of life and assess individual differences. Furthermore, four factors were examined to explain possible heterogeneity (i.e., adolescent gender, severity of adolescent depressive symptoms, perceived intrusiveness of parents, and overall social support).

Parental Support and Adolescent Negative Mood

Parents are one of the more proximal factors affecting adolescent development (Sameroff, 2000). Even though friendships gain in importance during adolescence, parental support remains to be one of the key sources of emotional well-being for adolescents (e.g., Furman & Buhrmester, 1992). Many studies have been conducted on parental support and internalizing problems (e.g., Pinquart, 2017) and focused on relative differences between families. Recently, a systemic review of 46 studies found only two studies which investigated the micro processes between perceived parental support and adolescent negative mood at the within-person level (Boele et al., 2019). However, results of statistical analyses at the group level do not necessarily contain information on how processes operate at the level of the individual (e.g., Hamaker et al., 2015), and this is also true for parenting studies (Keijsers, 2016). In fact, because group level and individual level tap into different sources of variance, the two analytical levels answer different research questions: Whereas between-person associations at the group level shed a light on how individuals differ and who is at risk, the within-person associations at the individual level highlight when a given individual is at risk (Keijsers & Van Roekel, 2018). The two studies that assessed the within-person association between perceived parental support and negative mood used the same dataset of 8 weeks of daily diary data from 47

adolescents (aged 8 to 13 years old). The first study detected that more negative affect was associated with less parental support of mothers (Bai et al., 2016). The second study found that early adolescents reported more negative mood on days that they perceived their parents (both fathers and mothers) to be less supportive (Reynolds et al., 2016). It remains unclear whether this also applies to older adolescents. Furthermore, the two studies used daily diary data of both negative mood and parental support. Early adolescents had to indicate how they felt during a day at the end of each day. However, mood can fluctuate throughout the day and recall bias might have affected these negative mood scores. The current study therefore adds to the few within-person studies by including older adolescents and using a more intensive longitudinal data collection method EMA (Stone & Shiffman, 1994) 8 times a day during 3 separate weeks 3 months apart, to reduce adolescents' recall bias in reporting negative mood. The first aim was therefore to examine the micro processes of parenting and study whether and how fluctuations of parental support would be related to fluctuations of negative mood within adolescents in daily life.

Individual Differences in the Association between Parental Support and Adolescent Negative Mood

Theoretically, it is increasingly acknowledged that children and adolescents may respond in different ways to parenting (e.g., Keijsers et al., 2016; Sameroff, 2010). The association between parental support and adolescent negative mood thus may vary from adolescent to adolescent. Even though such heterogeneity in the processes has been acknowledged in several parenting theories (e.g., Pluess & Belsky, 2010), as well as the broader category of ecological theories (Bronfenbrenner & Morris, 2006; Sameroff, 2010), not many studies have investigated such hypotheses regarding differential effects (or heterogeneity) in the within-person processes (Boele et al., 2019). Assessing this heterogeneity in proximal processes requires more intensive longitudinal data, such as daily diaries or experience sampling, which have been relatively scarce (Van Roekel et al., 2019). By combining EMA with daily diary data and multilevel analyses, this study addressed whether adolescents differ in the association between daily parental support and daily negative mood. Moreover, to obtain a more in-depth understanding of why some adolescents respond positively to parental support, whereas other respond in terms of negative mood the current study tested four plausible moderating factors (gender, severity of adolescent depressive symptoms, parental intrusiveness, and general levels of social support).

A first factor that might explain these individual differences is gender. In general, girls are more likely to experience negative affect than boys (Zahn-Waxler, 2000) and it was tested whether lack of parental support affected negative mood more in girls than boys. Second, the association between parental support and negative mood in daily life may be different for adolescents with more depressive symptoms than for adolescents with less depressive symptoms. Negative behaviors (e.g., social withdrawal, excessive reassurance seeking) shown by adolescents with substantial depressive symptoms might result in parents withdrawing support, also known as support erosion (Slavin & Rainer, 1990), which may impact adolescent negative mood. Thirdly, adolescents can perceive parental support differently based on the intrusiveness (e.g., snooping or asking inappropriate questions; Hawk et al., 2008) of parents. When parents are perceived as intrusive, support may relate to negative, rather than positive outcomes for the adolescent (e.g., Dietvorst et al., 2017). Finally, the presence of social support of others (e.g., friends) might be another relevant factor (Furman &

Buhrmester, 1992) that could buffer against a lack of parental support. Whether or not adolescents can rely on a different source(s) of support than their parents might also affect how sensitive they are to parental support in daily life.

The Current Study

The current study aimed to elucidate the within-person association between perceived parental support and adolescent negative mood in daily life and examined individual differences in these within-person associations. Based on previous studies (Bai et al., 2016; Reynolds et al., 2016) and reviews (Boele et al, 2019), it was hypothesized that for the average adolescent, lack of parental support at a given day would be associated with more adolescent negative mood on that day. Secondly, substantial heterogeneity was expected to be found in these associations explained by moderators. It was expected that a lack of parental support would be more strongly related to adolescent negative mood in girls than boys; that the association between parental support and negative mood would be stronger for adolescents who show more depressive symptoms than adolescents who show less depressive symptoms; that the association between parental support and adolescent negative mood would be less strong, or even reversed, for adolescents who report more parental intrusiveness than adolescents who report less parental intrusiveness; and that relying on another source of support might buffer the negative effect of a lack of parental support on adolescent negative mood, making the association less strong among adolescents with more social resources.

Methods

Sample and Procedure

Data were used from the "Grumpy or Depressed" project (Keijsers et al., 2015), a Dutch multi-method, longitudinal study using both questionnaires as EMA to differentiate normative grumpy behavior during puberty from the early signs of depression. In the study, 604 adolescents of 21 second to fourth classes (preparatory secondary school for college and university) of a high school in the south of the Netherlands participated (province Limburg). The project was composed of two phases; a screening phase and a longitudinal study on a subsample and was approved by the ethics committee of the Faculty of Social Sciences at the University Utrecht in 2014.

In September 2014, all parents were informed about the study during information evenings of the school and were asked to provide passive informed consent for the screening phase. The screening (labeled T0) took place during school hours on computers, and included adolescents completing an extensive online questionnaire of approximately 45 minutes.

Subsequently, parents and adolescents were contacted to participate in the longitudinal study composed of three measurement waves within one school year (labeled T1, T2, T3; 3-month intervals). Each wave entailed online questionnaires for parents and for adolescents, and an EMA measurement burst (Nesselroade, 1991) among adolescents. The online questionnaire was sent four weeks before the start of the EMA and parents and adolescents were given seven weeks to complete this online questionnaire. Prior to the start of this longitudinal study, adolescents and their parents provided active informed consent, both for the assessments as for the use of the screening data.

Each EMA wave consisted of filling out questionnaires on their own smartphone using the mobile app MyPanel for seven consecutive days (21 days in total) between 8AM and 10PM. Written information on how to download and install the app was provided to adolescents on the last page of the online questionnaire. Before the start of each EMA week, researchers checked whether adolescents logged into the app and contacted adolescents via WhatsApp, phone or mail when this was not the case. Adolescents received eight questionnaires randomly per day (56 in total) signaled by a notification and were instructed to fill out the questionnaires as quickly as possible. All questionnaires included the same items on whereabouts, mood, and substance use. In the first questionnaire of each day two items were added on sleep, in the last questionnaire of each day nine items were added on feelings, delinquent behavior, and parenting throughout the day. The morning questionnaire expired after two hours and the evening questionnaire after four hours. The other six questionnaires throughout the day expired after 90 minutes. The questionnaires consisted of 23 items, including one open-ended question, and filling out the questionnaires took 1-2 minutes per questionnaire (average 2 minutes, *SD* = 6.2). The school gave permission for adolescents to fill out EMA questionnaires during school hours, yet, when it would interfere with their school tasks participants could silence their phone. Researchers monitored the EMA by checking daily whether adolescents completed questionnaires and sent messages regularly to the adolescents via WhatsApp on the project telephone to stimulate completing the questionnaires. Adolescents did not receive automatic reminders for the questionnaires, since this was not possible yet. As a token of appreciation, each adolescent received a gift voucher of €5,- for their participation and among these adolescents five iPad-mini's (worth approximately €250) were raffled.

Inclusion

Inclusion criteria were owning a mobile phone and speaking and understanding Dutch. Of the 604 adolescents, 573 adolescents participated in the screening of which 44.1% boys and 55.9% girls. Of the screened adolescents (*n* = 573), 46.9% agreed to participate (*n* = 269) in the EMA study. Twenty-five adolescents were not able to participate because of organizational problems (i.e., phone did not work; withdrawal of consent). In total 244 adolescents filled out the first EMA wave, at the second EMA wave 186 adolescents participated (76.2%), and at the last wave 186 adolescents participated (76.2%). Only data of adolescents who completed any daily diary (questionnaire in the evening) containing the item on daily parental support were selected for this study. Two adolescents did not complete any evening questionnaire throughout the EMA and were therefore deleted from the data resulting in a final sample of 242 adolescents, of which 89 boys (36.8%) and 153 girls (63.2%) with a mean age of 13.82 (*SD* = 0.92). Of the 242 adolescents, 213 (88.0%) indicated living together with at least their biological mother and father, 8 (3.3%) indicated living with mother, 2 (0.8%) indicated living with father, 18 (7.4%) indicated a different living situation (i.e., parent and stepparent, alternating between father and mother), and the living situation of one adolescent was unknown (0.4%). Most adolescents 216 (89.3%) reported having at least one sibling. Furthermore, the majority of adolescents was born in the Netherlands (98.3%), two were born in other countries within Europe (0.8%), and one was born in Asia (0.4%). Reports of parents (*n* = 235 parents; 44 males, 191 females) on educational level were used as indicator of socioeconomic status in the Netherlands. Of the 235

parents, 11.9% reported lowest levels (lower vocational education), 41.3% intermediate (higher vocational education), and 44.3% high levels (college/university education).

Compliance

Since daily parental support was only assessed in the evening questionnaire, compliance rates were focused on this questionnaire. At the first week, 231 adolescents filled out 972 evening questionnaires (60.1% of the possible evening assessments) leading to an average of 4.21 (*SD* = 1.93) diaries out of 7 days per adolescent. If a daily parental support score was missing, daily negative mood of that day was not used. The daily negative mood scores of the first week were based on 5109 assessments, with an average of 22.12 (*SD* = 13.44) completed questionnaires per adolescent and 4.97 per day per adolescent. At the second week, 169 adolescents filled out 611 evening questionnaires (51.6 % of the possible evening assessments) leading to an average of 3.62 (*SD* = 1.87) daily diaries out of 7 days per adolescent. The daily negative mood scores of the second week were based on 3394 assessments, with an average of 20.08 (*SD* = 14.76) completed questionnaires per adolescent and 5.00 per day per adolescent. At the third week, 156 adolescents filled out 618 evening questionnaires (56.6 % of the possible evening assessments) leading to an average of 3.96 (*SD* = 2.06) daily diaries out of 7 days per adolescent. The negative mood scores of the third week were based on 3434 assessments, with an average of 22.01 (*SD* = 16.59) completed questionnaires per adolescent and 4.99 per day per adolescent. No participants were removed from the data based on compliance rates.

Missing data analysis

Little's MCAR tests (1995) on the full data per wave (i.e., daily parental support, daily negative mood, depressive symptoms, perceived intrusiveness, and perceived social support) indicated that the pattern of missing data did not deviate from a MCAR pattern in each of the measurement waves (EMA T1, χ^2 = 544.34, *df* = 540, *p* = .440; EMA T2, χ^2 = 466.81, *df* = 484, *p* = .705; EMA T3, χ^2 =487.03, *df* = 490, *p* = .529; online questionnaires, χ^2 = 54.31, *df* = 45, *p* = .161). A more in-depth analyses of the missing data revealed that some missing EMA assessments were due to technical issues (i.e., signaling beep was not loud enough and therefore sometimes missed). Moreover, the level of EMA compliance was unrelated to the adolescent's depressive symptoms and level of perceived intrusiveness at T1, T2 and T3, and unrelated to social support at T0 (all *p*'s > .05). Little (1995) shows that multilevel models using ML estimation and including all available data results in unbiased estimates, already under conditions of MAR. Therefore, with a MCAR pattern of missing observations, and ML estimation, the proposed multilevel models should be able to result in unbiased estimates.

Measures

Daily negative mood

Momentary negative mood during the three EMA weeks (T1, T2, T3) was assessed with three items which were rated eight times a day with answer categories ranging from 1 (*not)* to 7 (*very*). These items were selected from items used in earlier EMA studies to assess negative mood (e.g., Morris et al., 2010; Riediger et al., 2014). Daily negative mood was measured by the items: "I feel sad", "I feel disappointed" and "I feel unhappy". A mean score per day of these three items was calculated to create scale scores reflecting daily negative mood, with a higher score indicating more negative mood.

A nested alpha for daily negative mood was calculated (Nezlek, 2017). The complete dataset was used and resulted in nested α = .787 for EMA T1, nested α = .882 for EMA T2, and nested α = .883 for EMA T3. These nested alphas indicated good between-person reliability of this novel instrument for assessing daily negative mood. The omega coefficient, a coefficient of within-person reliability (Schuurman & Hamaker, 2019), was additionally calculated per week by performing three multilevel confirmatory factor analyses in Mplus 8.3 (Muthén & Muthén, 1998-2017). For EMA T1, the omega coefficient was .812, for EMA T2 .807, and for EMA T3 .864. These omega coefficients indicated good within-person reliability.

Daily parental support

Adolescents rated parental support once at the end of each day during the three EMA weeks (T1, T2, T3) by answering the question which was developed for this study: "My parents were warm or supportive today". Answer categories ranged from 1 (*not)* to 7 (*very)*, and a higher score indicated more parental support that day. Confirmatory Factor Analyses (CFA) were performed in R (lavaan package) to assess the convergent validity of this novel daily parental support instrument against the subscale support of the well-established Network of Relationships Inventory (NRI; Furman & Buhrmester, 1985). Appendix 1 in the Supplementary Materials provides model fit information. As expected, there was a significant positive correlation between the latent factors capturing parental support measured by the NRI and the latent factor capturing the average of the daily assessments (standardized estimates: T1 =.563; T2 = .490; T3 = .621). The intraclass correlation (ICC) of daily parental support was .504 suggesting that 50.4% of the variance in adolescent daily parental support was due to differences between adolescents, and the remainder 49.6% due to within-person fluctuations over time.

Depressive symptoms

In the online questionnaires (T1, T2, T3), adolescent depressive symptoms were assessed using the Dutch version of the Children's Depression Inventory (CDI-I; Kovacs, 1992; Timbremont et al., 2008). The CDI-I consists of 27 items consisting of three statements graded in order of increased severity from 0 to 2 that described how they were feeling the last two weeks (e.g., "I get sad from time to time/I get sad often/I'm always sad"). Answers were summed to obtain a total score and some items were reversed to ensure that a higher score indicated more depressive symptoms. The Dutch version of the CDI has shown good validity and reliability (Timbremont et al., 2008). Cronbach's alphas in the three measurement waves for adolescent depressive symptoms ranged between .87-.89. A person-mean score of the CDI-I scores on all three waves was calculated to represent adolescent depressive symptoms. Based on CDI-I cut-off scores (Kovacs, 1992; Timbremont et al., 2008) at T1 90.1% of the sample reported no depressive symptoms (score 0-11), 4.5% subclinical (score 12-15) and 5.4% clinical (score >16), at T2 (89.1% reported no symptoms, 3.8% subclinical and 7.1% clinical), and at T3 (89.2% no symptoms, 4.8% subclinical and 5.9% clinical) respectively.

Perceived intrusiveness

Adolescent perceptions of parental intrusiveness were assessed in the online questionnaires (T1, T2, T3) with the Dutch translation of the intrusiveness subscale of the Level of Expressed Emotion scale

(LEE: Hale et al., 2007). For the purpose of the study, the subscale was shortened to the following three items that had the highest factor loadings in the study of Hale and colleagues (2007): "Are always nosing into my business", "Have to know everything about me" and "Are always interfering". Answer categories ranged from 1 (*true*) to 4 (*not true),* but were reverse coded before calculating a mean intrusiveness score per wave. A higher score indicated more perceived intrusiveness. A person-mean score on the intrusiveness subscale on all three waves was calculated to represent perceived intrusiveness. Between-person reliability, assessed with Cronbach's alphas in the three measurement waves for perceived intrusiveness ranged between .86-.92. Earlier studies in Dutch samples support the factorial validity of the full scale (e.g., Hale et al., 2007).

Perceived social support

In the screening questionnaire (T0), general social support perceived by adolescents was assessed using the subscale social support of the short version Utrecht Coping List (UCL; Schreurs et al., 1993). Adolescents indicated their reaction to bad things happening or having problems. The subscale consisted of six items (e.g., "Sharing their concerns with someone") and answer categories ranged from 1 (*seldom or never*) to 4 (*very often*). A person-mean score of these six items was calculated to represent perceived social support and a higher score indicated more social support. Cronbach's alpha for perceived social support was .86. Reliability and validity of the UCL in adolescents has been demonstrated in other studies (Schaufeli & Van Dierendonck, 1992).

Strategy of Analyses

Multilevel models (also known as linear mixed effects models; Hox et al., 2017) were specified in R (R Core Team, 2010) Version 3.6.1, using the multilevel version 2.6 (Bliese, 2016) package to test the hypotheses with ML estimation. Likelihood ratio tests were used to assess differences in fit of the models (following guidelines of Hox et al., 2017). For centering, guidelines proposed by Hoffman (2015) and Bolger and Laurenceau (2013) were followed. Level 1 predictors were person-mean centered and Level 2 predictors grand-mean centered.

A series of models were tested. First, an unconditional random intercept model was specified (Model 1) that splits the total variance in adolescent daily negative mood into stable between-person differences and within-person fluctuations. Second, to explain these within-person fluctuations in adolescent daily negative mood, a person-mean centered predictor (daily parental support) was added with fixed effects at the within-person level (Model 2) to the random intercept model (Model 1). This model captured the hypothesized within-person effects of daily parental support on daily negative mood for the average adolescent. Third, variation was allowed around the slope, to test the hypothesized heterogeneity between persons in the within-person effects of parental support on daily negative mood (Model 3). That is, instead of considering the within-person effect of daily parental support on daily negative mood to be the same across persons as in Model 2, it was modeled as a random effect that varies between persons in Model 3 and the association between the random intercept and random slope was also included in Model 3. To give insight into the effect sizes, the standardized effect (beta) per person was computed with the formula b*SD(X)/SD(Y) (Schuurman et al., 2016). Fourth, if such heterogeneity between persons was found based on improved model fit on Likelihood ratio tests, the level 1 random effects were predicted by

adding grand-mean centered predictors as main effect as well as in interaction with daily parental support, namely a grand-mean centered score of gender (Model 4a), a grand-mean centered score of adolescent depressive symptoms on all three waves (Model 4b), a grand-mean centered score of perceived social support (Model 4c) and a grand-mean centered score of perceived intrusiveness on all three waves (Model 4d). The hypothesized moderating effect of each predictor was tested separately by adding a main effect of the predictor and interaction of the predictor with daily parental support both to Model 3. Fifth, all predictors (main effect of predictor and interaction between predictor and daily parental support) that significantly improved the model fit were then added together to the model and this model was the final model (Model 5).

Correlation structure corAR1 was added to take into account the time intervals of the study (Singer & Willet, 2003). This structure was used since the days represent equally spaced time intervals. However, data from three waves with a three-month time interval was used and to correct for possible confounding influences thereof, the variable EMA week was added to the correlation structure in each model. Two-tailed tests with an $\alpha = 0.05$ were used.

Results

Descriptive Statistics

Table 1 provides descriptive statistics and correlations. Initial differences between boys and girls were tested. Girls reported significantly more depressive symptoms than boys ($t = -3.050$, $df = 231$, $p = .003$; boys: $M = 4.31$, $SD = 3.41$; girls: $M = 6.41$, $SD = 5.81$), and more perceived social support ($t = -4.867$, $df = 240$, $p < .001$; boys: $M = 2.15$, $SD = 0.50$; girls: $M = 2.54$, $SD = 0.65$). No significant difference between boys and girls was found in perceived intrusiveness ($t = 1.962$, $df = 231$, $p = .051$; boys: $M = 2.31$, $SD = 0.66$; girls: $M = 2.12$, $SD = 0.71$). In daily life, no significant differences between boys and girls were found in daily negative mood ($t = -1.426$, $df = 240$, $p = .155$; boys: $M = 1.29$, $SD = 0.52$; girls: $M = 1.41$, $SD = 0.68$), and in daily parental support ($t = -1.192$, $df = 240$, $p = .235$; boys: $M = 5.19$, $SD = 1.53$; girls: $M = 5.43$, $SD = 1.50$).

Baseline Model

Multilevel models were used to assess within-person fluctuations and heterogeneity of adolescent daily negative mood. In a first unconditional model (Model 1 – Table 2 provides the results), the total variance in adolescent daily negative mood was partitioned into within-person over-time fluctuations and stable between-person differences. The intraclass correlation of daily negative mood was .478, indicating that 47.8% of the variance in adolescent daily negative mood was due to differences between adolescents, and 52.2% due to within-person fluctuations over time.

Table 1. Descriptive statistics and bivariate correlations of study variables.

	Descriptives					Between-Person Correlations					
Variables	*n*	*M*	*SD*	Min	Max	1	2	3	4	5	6
Person level											
1. Gender	242	0.63	0.48	0.00	1.00						
2. Age	242	13.82	0.92	12.00	16.00	.008					
3. Depressive symptoms	233	5.65	5.16	0.00	27.00	.197**	.121				
4. Parental intrusiveness	233	2.19	0.70	1.00	4.00	-.128	.058	.280***			
5. Social support	242	2.40	0.63	1.00	4.00	.300***	-.020	-.188**	-.156*		
6. Person mean daily parental support	242	5.34	1.51	1.00	7.00	-.021	-.151*	-.329***	-.261***	.205**	
7. Person mean daily negative mood	242	1.36	0.63	1.00	4.58	.105	.074	.603***	.236***	.039	-.298***

*p < .05. **p < .01. ***p < .001.

Daily Parental Support and Daily Negative Mood

In Model 2, the association between adolescent daily negative mood and daily parental support at the within-person level was tested. Adding the predictor improved the model fit compared to Model 1 ($\chi^2(1) = 12.37$, $p < .001$). Appendix 2 in the Supplementary Materials provides information on the model comparisons. In support of the hypothesis, results showed that on average, adolescents report more negative mood on days when they perceived their own parents to be less supportive (*B* = -.031, *SE* = .009, *df* = 1958, *t* = -3.521, *p* < .001) as shown in Figure 1. Results are shown in Table 2.

Heterogeneity between Adolescents

To assess heterogeneity between adolescents, a random slope was added allowing variation around the within-person effects of parental support on negative mood (Model 3), which improved the model fit compared to Model 2 ($\chi^2(2) = 42.93$, $p < .001$). Again, as indicated in Table 2, a significant within-person association between daily parental support and daily negative mood was found (*B* = -.031, *SE* = .012, *df* = 1958, *t* = -2.585, *p* = .010). Moreover, in support of the hypothesis, across individuals variance (.008) was found around the association between daily parental support and adolescent daily negative mood. Figure 2 displays these bivariate within-person associations for nine randomly chosen adolescents with a minimum of 10 observations per person. Figure 3 shows the distribution of all unstandardized individual slopes ranging between -0.320 and 0.073. The majority of adolescents (*n* =218, 90.1%) reported more negative mood on days when they perceived their parents to be *less* supportive, while a minority of adolescents (*n* = 24, 9.9%) reported more negative mood on days when they perceived their parents to be *more* supportive. To provide a first insight into effect sizes, standardized effects (beta) per person were computed for adolescents with a minimum of 10 observations per person. These standardized effects ranged from -0.436 to 0.241. Following Cohen's guidelines (1992) for effect size interpretation, the effect was moderately negative (-.50 to -.30) in 7.92% of the adolescents, small negative (-.30 to -10) in 32.67%, small positive (.10 to .30) in 8.91 %, a weak effect was found (-.10 to .10) in 36.63%, and for 13.86% standardized effects were missing due to no variance.

Table 2. Results of Model 1, Model 2, and Model 3 on the relation between daily parental support and daily negative mood.

	Model 1	Model 2	Model 3
Fixed effects: estimate *(SE)*			
Intercept	1.337*** (.035)	1.337*** (.035)	1.338*** (.035)
Daily parental support		-0.031*** (.009)	-0.031*(.012)
Random effects			
Between person variance	0.231	0.230	0.231
Within person variance	0.252	0.250	0.244
Random effect variance			0.008
ICC	.478	.479	.486
N individuals	242	242	242
N observations	2201	2201	2201

*$p < .05$. **$p < .01$. ***$p < .001$

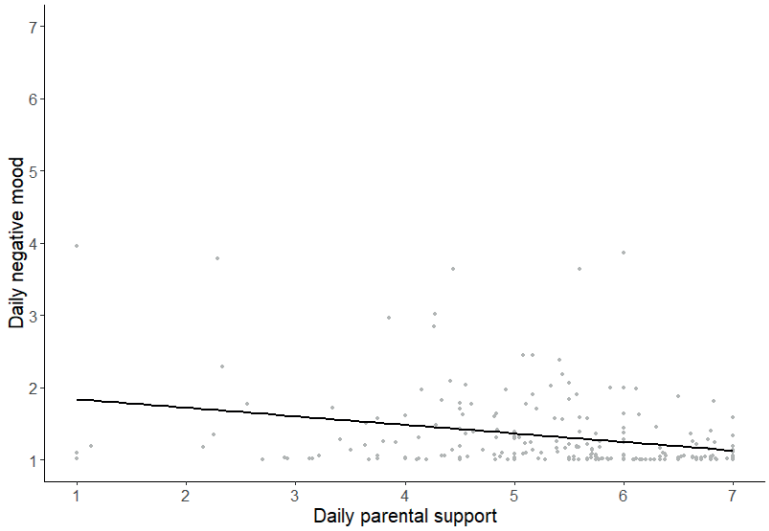

Figure 1. Between-person association between daily parental support and adolescent daily negative mood. Each dot represents one person, the line indicates overall association.

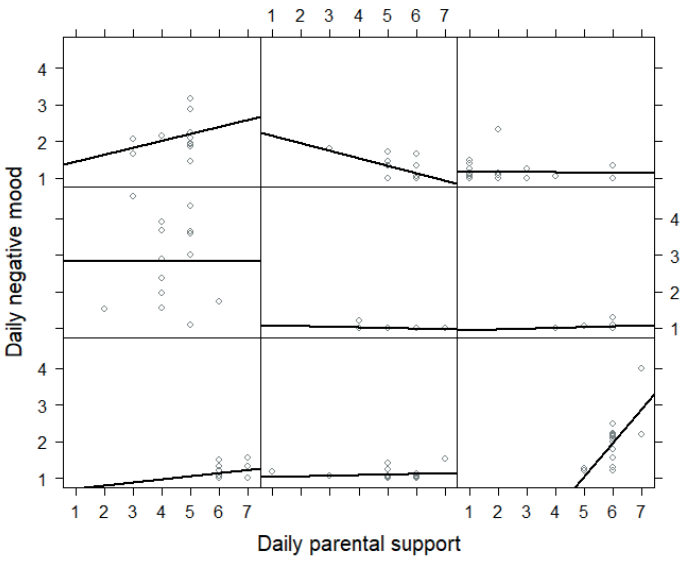

Figure 2. Within-person associations between daily parental support and adolescent daily negative mood of nine randomly chosen adolescents. Each panel represents one adolescent, each dot a measurement point.

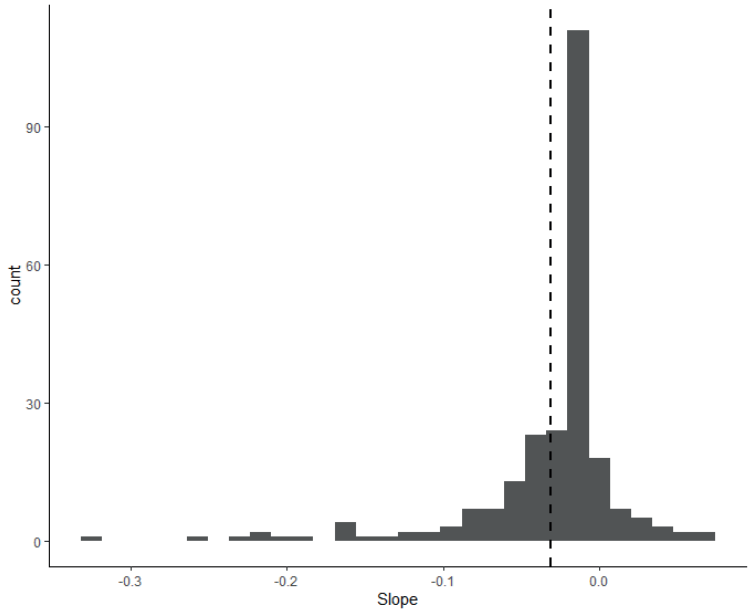

Figure 3. Range of unstandardized individual slopes of daily parental support related to daily negative mood in adolescents. Dashed line indicates the mean of the slopes.

Explaining Heterogeneity

To explain differences between adolescents with regard to the link between daily parental support and daily negative mood, gender (Model 4a), adolescent depressive symptoms (Model 4b), perceived social support (Model 4c), perceived parental intrusiveness (Model 4d) were added, and also an interaction term between these predictors and daily parental support. These models and model fit were compared to Model 3b. Some of the variables that were used to explain heterogeneity had missing values (96 observations of 20 adolescents) therefore these adolescents and observations were deleted from the data. Model 1 to Model 3 were repeated on the sample of n = 222 as Model 1b, Model 2b, and Model 3b to check whether deleting these observations influenced the results. This was not the case, results on the sample of n = 222 were comparable to the results on the sample of n = 242. Results of Model 1b to Model 3b can be found in Appendix 5 in the Supplementary Materials.

In contrary to the hypotheses, adding gender (Model 4a) and perceived social support (Model 4c) did not improve the model fit. Adding main and interaction terms of adolescent depressive symptoms (Model 4b) and perceived intrusiveness (Model 4d) did, which supported the hypotheses (model fit statistics are shown in Appendix 3 in the Supplementary Materials and model results are shown in Appendix 4 in the Supplementary Materials). Only main and interaction terms of adolescent depressive symptoms and perceived intrusiveness were therefore included in the final model (Model 5).

Final Model

The model fit of Model 5 was significantly better compared to Model 3b ($\chi^2(4) = 91.092$, $p < .001$) and Table 3 provides results of Model 5. Fluctuations at the within-person level in daily parental support (*B* = -.023, *SE* = .009, *df* = 1880, *t* = -2.490, *p* = .013) were still significantly linked to fluctuations in daily negative mood. The mean level of adolescent depressive symptoms (*B* = .063, *SE* = .006, *df* = 219, *t* = 10.926, *p* < .001) was also significantly linked to daily negative mood, but perceived parental intrusiveness was not related to daily negative mood after controlling for adolescent depressive symptoms. Thus, adolescents who reported more depressive symptoms also reported more negative mood in daily life, and adolescents reported more negative mood on days when they reported less parental support.

The severity of adolescent depressive symptoms (*B* = -.008, *SE* = .002, *df* = 1880, *t* = -4.527, *p* < .001) and perceived parental intrusiveness (*B* = .032, *SE* = .013, *df* = 1880, *t* = 2.434, *p* = .015) both moderated the within-person link between parental support and adolescent's negative mood in daily life and thus explained parts of why this association differed between adolescents, explaining almost all random variation in Model 5.

Simple slope analysis (based on SD) on moderating effects of depressive symptoms, shown in Figure 4, indicated that daily parental support was significantly related to daily negative mood for adolescents who reported depressive symptoms one standard deviation above the mean (*B* = -0.067, *p* < .001) or at the mean (*B* = -0.024, *p* = .009), but not for adolescents who reported depressive symptoms one standard deviation below the mean (*B* = 0.019, *p* = .185). However, when using the CDI-I cut-off scores to divide the sample into three groups: adolescents reporting little no none depressive symptoms, adolescents reporting subclinical depressive symptoms, and adolescents reporting clinically depressive symptoms (Kovacs, 1992; Timbremont, Braet, & Roelofs, 2008), results showed that even within these more homogeneous groups, there is still variation between adolescents in the linkages of daily parental support and daily negative mood. This is illustrated in Figure 5 in which individual associations between daily parental support and daily negative mood were plotted for the 11 adolescents in the sample reporting clinically depressive symptoms.

Figure 6 presents simple slope analysis to interpret the significant interaction between parental support and perceived intrusiveness. Daily negative mood was significantly related to daily parental support when adolescents reported perceived intrusiveness one standard deviation below the mean (*B* = -0.045, *p* < .001) or at the mean (*B* = -0.023, *p* = .014). For adolescents who score their parents' intrusiveness one standard deviation above the mean (*B* = -0.001, *p* = .970), no link was found between daily parental support and adolescent daily negative mood. Here as well, there was still variation between adolescents within the groups.

Table 3. Results of Final Model 5 on the relation Between daily parental support and daily negative mood and the moderating role of depressive symptoms, and perceived intrusiveness.

	Model 5
Fixed effects: estimate *(SE)*	
Intercept	1.334*** (.029)
Daily parental support	-0.023* (.009)
Depressive symptoms	0.063*** (.006)
Depressive symptoms*daily parental support	-0.008*** (.002)
Perceived intrusiveness	0.038 (.043)
Perceived intrusiveness* daily parental support	0.032* (.013)
Random effects	
Between person variance	0.124
Within person variance	0.250
Random effect variance	< .001
ICC	0.331
N individuals	222
N observations	2105

Note. Some adolescents had missing values on the moderator variables (96 observations of 20 adolescents) and were therefore deleted from the dataset. Model 1 to Model 3 were repeated on the remaining sample of N = 222 as Model 1b, Model 2b, and Model 3b and results indicated that deleting these observations did not influence the results. Results of Model1b to Model 3b are presented in Appendix 5 in the Supplementary Materials.
*p < .05. **p < .01. ***p < .001.

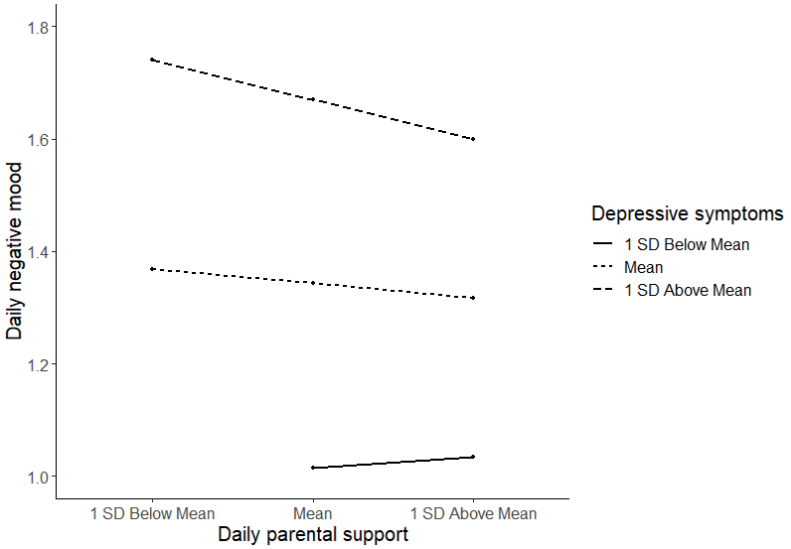

Figure 4. Simple slopes of daily parental support and daily negative mood for adolescents low or high in depressive symptoms based on (±1 Standard Deviation).

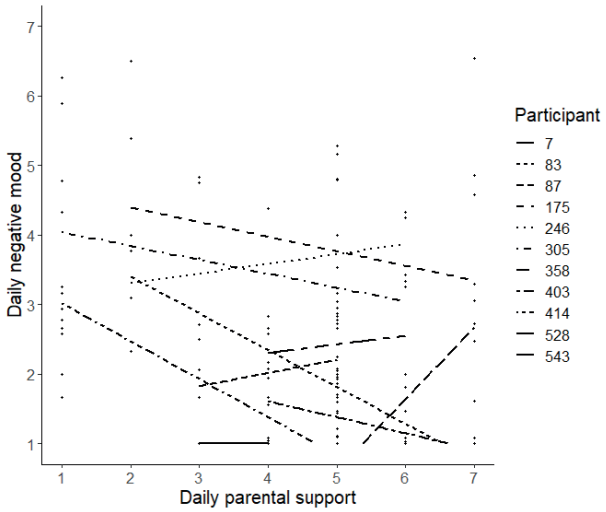

Figure 5. Individual-level associations between daily parental support and daily negative mood for adolescents reporting clinical levels of depressive symptoms (CDI > 16). Each line represents one person.

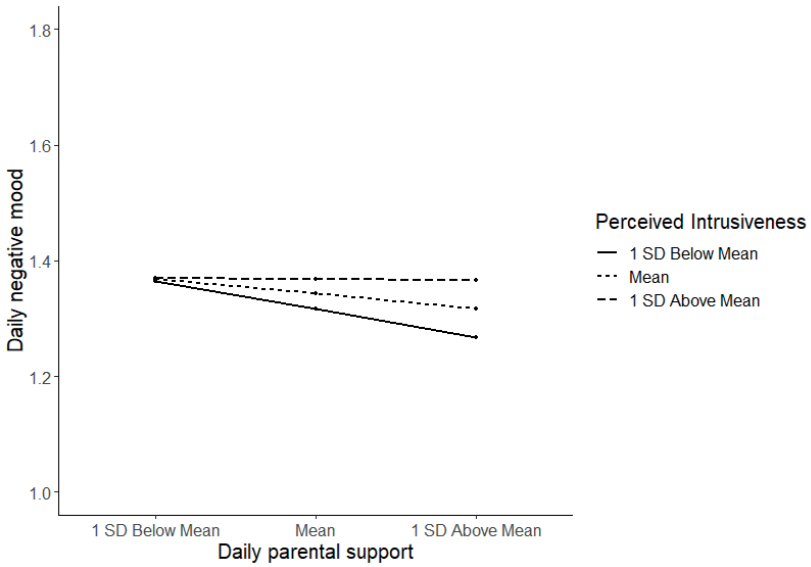

Figure 6. Simple slopes of daily parental support and daily negative mood for adolescents low or high in perceived intrusiveness based on (±1) Standard Deviation.

Discussion

During adolescence, parents and parental support remain to be of key importance for adolescents' emotional well-being (e.g., Furman & Buhrmester, 1992) and many studies have shown that a lack of parental support is related to internalizing problems (e.g., Pinquart, 2017). However, to date, most research used classical retrospective self-report measures, longitudinal designs, and focused on relative differences between persons, while parenting and adolescents' experiences of affective states, such as negative mood, are both dynamic and can co-fluctuate and influence each other (Heller & Casey, 2016; Pardini, 2008) in shorter time intervals such as days. It has been suggested that, in general, a lack of parental support is related to more negative affect in daily life (Bai et al., 2016; Reynolds et al., 2016), but individual differences have not yet been examined let alone explained. Investigating the social processes at a more day to day micro-level could provide more insight into the building blocks of longer term mental health development. The current study therefore examined the daily within-person associations between perceived parental support and adolescent negative mood. Furthermore, it was tested whether adolescents differed in the association and if four characteristics (i.e., gender, adolescent depressive symptoms, perceived parental intrusiveness, and social support) could explain these individual differences.

The results showed that, on average, adolescents reported more negative mood on days when they perceived their parents to be less supportive. This asscociation differed significantly between adolescents which could be partially explained by the degree of adolescent depressive symptoms and perceived parental intrusiveness. The negative association between daily parental support and daily negative mood was stronger for adolescents who reported more depressive symptoms and for adolescents who perceived their parents as less intrusive. These findings suggest that in daily life, adolescents' negative mood may be reduced by the provision of parental support, especially when adolescents experience depressive symptoms and when parents manage to respect the privacy needs of their child. Importantly, this study also provided the first insights into heterogeneity within sub-groups, which indicates that a group-differential approach to testing for explanations of heterogeneity does not suffice in understanding each adolescent's daily life.

Adolescent Negative Mood and Parental Support

Results of previous empirical studies and reviews showed that higher levels of parental support relate to less internalizing problems (e.g., Pinquart, 2017), but these are often based on the analyses of relative differences between adolescents (the between-person level) and macro time intervals. Recently, is has increasingly been questioned whether these relative differences between families can be used for obtaining insights into what is going on within a specific family and at a more micro-level such as days (Hamaker, 2012; Keijsers & Van Roekel, 2018). The current study therefore aimed to understand the micro-social processes as they occur within a person in daily life. The finding that day to day fluctuations in parental support were negatively associated with fluctuations in adolescent negative mood is in line with previous findings at the between-person level and with the few studies that already examined the link between parental support and emotional well-being at the within-person level (Bai et al., 2016; Reynolds et al., 2016). These results suggest homology over ecological levels and time scales, in that previous findings on the between-person longer-term link between

parental support and negative mood or internalizing problems do generalize to daily life within the average person.

Individual Differences

Theoretically, the idea that every adolescent develops differently due to the person-specific interaction of personal and contextual influences is already widely acknowledged (Bronfenbrenner & Morris, 2006; Sameroff, 2010). Despite a wealth on studies on between-person interactions, relatively few studies have actually tested this conceptual idea that there may be also heterogeneity in the underlying processes that link parenting to fluctuations in adolescents' affective well-being, let alone tried to explain these differences (e.g., Boele et al, 2019). Embracing the development and usage of methods in data collection (i.e., EMA) and new data analysis techniques (i.e., multilevel regression and random-intercept cross-lagged panel models) (Van Roekel et al., 2019), this study was able to detect that the association between fluctuations in daily parental support and fluctuations in daily negative mood differed between adolescents. This confirmed the hypothesis and hints that the broader theoretical idea of differential susceptibility (e.g., Pluess & Belsky, 2010) or ecological models of development (e.g., Sameroff, 2010) also apply to micro-social processes in daily life (Granic et al., 2003). For some adolescents, negative mood may be the result of a lack of support, while for others daily parental support may not have an impact on their daily negative mood. Although more studies are necessary to better understand this heterogeneity, it does highlight that it is a fallacy to assume that 'one size fits all' (Keijsers & Van Roekel, 2018), when it comes to such person-environment interactions. The use of (new) methods and techniques which allow to collect intensive longitudinal data (e.g., Molenaar, 2004) may enable us to gain more insight in the daily life processes and ultimately help clinical practice to better tailor prevention to the unique needs of a family, since adolescent daily negative mood can relate to internalizing problems (Maciejewski et al., 2014). The association between daily negative mood and adolescent depressive symptoms in the current study confirms this idea of negative mood being a precursor or even indicator of depressive symptoms.

Explaining Differences between Adolescents

Driven by a need to better understand who may benefit, in the short term, most (or least) from parental support, four theoretically plausible characteristics that may explain the observed differences between adolescents were also tested. Gender, although previously found to be related to adolescent negative affect (Zahn-Waxler, 2000), did not explain the differences between adolescents in the association between daily parental support and daily negative mood in this study. The current finding partly contradicts results of a previous study in which gender did moderate the association between family support and adolescent negative affect (Weinstein et al., 2006). However, this study examined gender in relation to the between-person association between family support and negative affect while the current study examined the within-person association between parental support and adolescent negative mood. Moreover, the previous study assessed family support on three time points, once per wave (Weinstein et al., 2006), instead of every day of the EMA as in the current study. The findings thus suggest that, when focusing on micro-social processes in daily life, adolescent negative mood of boys and girls is not affected differently by parental support. More research is necessary to validate this finding.

Social support of others did also not explain the heterogeneity in contrast to the expectations. The finding of this study seems to underline the idea that parents remain a key source of emotional well-being for adolescents (Furman & Buhrmester, 1992), independent of other sources. Although no sources of support were specified in the social support measure used in the current study and therefore could also include parents, friends may be another source for support since friendships become more important during adolescence (e.g., De Goede et al., 2009). A previous finding indicated that the association between family support and adolescent negative affect was stronger than the association between peer support and adolescent negative affect (Weinstein et al., 2006). Furthermore, the sample in the current study had a mean age of 14 years old and it is possible that social support of others would have had more impact if older adolescents were included. Developmental theories suggest that peers start having a stronger influence on adolescents from early to mid-adolescence and for instance peer support may become more protective with regard to adolescent depressive symptoms from mid adolescence onwards (Young et al., 2005).

Both adolescent depressive symptoms and perceived parental intrusiveness, however, did explain partly why the association between daily parental support and daily negative mood differed between adolescents, as expected. For adolescents who reported more depressive symptoms, daily parental support was more strongly related to daily negative mood than for adolescents who reported less depressive symptoms. This suggests that daily parental support is more beneficial for adolescents with depressive symptoms, but it may also indicate that the lack of parental support that day leaves especially adolescents who report depressive symptoms blue. However, as this study is correlational in nature, the reverse effect may also explain these results in that adolescents with higher levels of depressive feelings are more likely to have their own negative mood color the perception of parents as being less supportive. After having established a first indication of this within-person association between perceived parental support and adolescent negative mood, future research should assess the direction of effects, since many theories argue that parenting processes include bidirectional effects between parents and children (e.g., Bronfenbrenner & Morris, 2006), for instance by examining lagged within-person effects between parental support and negative mood in daily life. Additionally, conducting a similar study in a clinical sample of adolescents could further strengthen the interpretation. Despite the additional research needed, the current findings do suggest that parenting advice which is directed at the provision of parental support should be tailored to the unique characteristics of the adolescent (i.e., adolescent's level of depressive symptoms), as well as the processes within the specific family.

Above and beyond adolescents' depressive symptoms, parents perceived intrusiveness also explained differences between adolescents in the association between daily parental support and daily negative mood, as expected. Compared to adolescents who reported more parental intrusiveness, for adolescents with generally non-intrusive parents, daily parental support was more strongly related to daily negative mood, suggesting that these adolescents feel better at days with more parental support. For adolescents with perceptions of privacy invasive parenting, no association between daily parental support and daily negative mood was found. Parental intrusive behaviors, such as snooping or prying into a child business, may interfere with adolescents' normative developmental needs to establish a more autonomous position from their parents, establish privacy boundaries, and become emotionally more independent (e.g., Hawk et al., 2008). The provision of support by parents

might only be effective and contribute to adolescent well-being, when parents provide support in an autonomy supportive manner (e.g., Van der Giessen et al., 2014). In fact, a recent study suggested that privacy invasion may reduce the quality of the parent-child communication, and that children undertake active measures to keep an intrusive parent more distant (Dietvorst et al., 2017). Moreover, it aligns with theoretical ideas regarding overinvolved parenting showing negative, rather than positive outcomes for the child in the longer run (e.g., McLeod et al., 2007).

However, despite the fact that adolescent depressive symptoms as well as perceived intrusiveness may explain heterogeneity, this group-differential explanation was far from conclusive. Even within a group of adolescents reporting clinically depressive symptoms, there still were differences between adolescents, with some reporting more negative mood on days when their parents were perceived supportive and others reporting less negative mood. These differences emphasize the importance of acknowledging heterogeneity even more and support the recent call to start using a more person-specific, idiographic approach in research instead of the more established nomothetic approach (Molenaar, 2004), or group-differential approach when it comes to the study of parenting and adolescent well-being (Keijsers et al, 2016). With a multilevel method, this study sets one step in the direction of describing the factors that contribute to uniqueness of these processes, as well as visualizing the remaining uniqueness of each person within subgroups.

For a translation into clinical practice the current approach may open up some first insights into how to tailor interventions, but it may not suffice. Ultimately, to truly understand, each individual family may need to be studied as a unit by itself, for instance to personalize interventions to the family-specific dynamics. In the clinical practice, this more person-centered approach is already more often used (e.g., Wichers et al., 2011), leading to a burst of studies and clinical novel applications in clinical practice (e.g. Van Roekel, et al., 2017). However, there is a strikingly sparsity in studies on family-specific dynamics through which parenting affects adolescent well-being (Boele et al., 2019).

Limitations

Some limitations need to be taken into account. The sample of the study was rather homogeneous in terms of background characteristics because only adolescents of one preparatory secondary school in the south of the Netherlands participated, although the percentage of depressive symptoms in the sample aligned with prevalence percentages in the Netherlands (Statistics Netherlands, 2019). It is unknown whether the current findings generalize to more ethnically diverse samples and this should be addressed in future studies. Furthermore, the study focused on short term associations and was correlational in nature, so the direction of the association or long-term effects remain unclear. Moreover, the current study focused solely on adolescent reports and perceptual biases might have affected the findings. Adolescents who show more depressive symptoms might have a more negative way of looking at their environment, also known as a negativity bias (i.e., Platt et al., 2016). This can affect their way of reporting and explain stable between-person differences in perceived privacy invasion for instance. Also, viewpoints of adolescents and parents on parenting behavior can differ. A multi-method approach such as including parental reports or observations would enable us to examine this possible perceptual bias. In addition, a suggestion for future research would be to also assess possible discrepancies in reports of parents and adolescents on for instance parental support. It has been suggested that discrepancies on for instance parent-child negative interactions influence

depressive symptoms in adolescents (Nelemans et al., 2016). With regard to the measures, the measure of general social support did not differentiate between sources of social support and could also involve parental support. This could imply a possible overlap with the daily parental support measure. However, the content of the measures and the use of different time scales (daily or once) and the low correlation seem to indicate minimal overlap. Furthermore, the current study used a novel daily parental support measure that only used one item to reduce burden on the participants. To assess validity, a CFA was performed and results showed significant positive correlations with the subscale support of the NRI. Future research, using more extended scales for daily assessments would provide opportunities to examine the psychometric properties more in-depth. Lastly, parental support in general was examined instead of differentiating between maternal and parental support. According to the family system theory (Cox & Paley, 1997), the mother-adolescent relationship and father-adolescent relationship can be seen as separate subsystems within a family (Restifo & Bögels, 2009). Fathers and mothers might affect their adolescents differently, which could be assessed in future studies, to obtain a better understanding of the unique patterns and processes in each family.

Conclusion

Previous studies have suggested that a lack of parental support is related to more internalizing problems in adolescents and daily negative mood has been shown to be a precursor for the development of such problems. By using EMA and daily diaries, the current study aimed to elucidate the association between perceived parental support and adolescent negative mood at the within-person level in daily life and examined to which extent adolescents would differ in this association. For the average adolescent, more negative mood was reported on days when they perceived their own parents as less supportive, which was interpreted as a protective role of parental support in preventing negative mood. However, this within-person association differed between adolescents. The negative association between parental support and negative mood in daily life was stronger for adolescents who reported more depressive symptoms, and for adolescents who perceived their parents as respecting of their privacy. The current findings demonstrated that one size does not necessarily fits all and shed new light on when a certain adolescent might be at risk for a more negative mood. Ultimately, understanding the unique micro-social processes appear to be highly informative to tailor preventive interventions for families and adolescents.

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3

A closer look into the affect dynamics of adolescents with depression and the interactions with their parents: An ecological momentary assessment study

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Abstract

Background: Parental warmth and criticism have been related to depression in adolescents, but information on moment-to-moment experiences of parent-child interactions and adolescent well-being in clinical samples is lacking. The current study used ecological momentary assessment to examine momentary adolescent affect, parental warmth and criticism of mothers and fathers, and its associations in families with an adolescent with a depression versus adolescents without psychopathology.

Methods: A total of 114 adolescents (M_{age} = 15.8, *SD* = 1.41; 67.5% girls) and 209 parents (M_{age} = 49.3, *SD* = 5.73; 54.1% mothers) participated: 34 adolescents with depression and 58 parents and 80 healthy controls and 151 parents.

Results: Preregistered multilevel models showed that adolescents with a depression reported less positive and more negative affect compared to healthy controls. Whereas adolescents with depression and parents reported more negative parenting on retrospective questionnaires, no differences were found in momentary parenting. Perceived parenting of both mothers and fathers was related to adolescent affect, but these associations were not stronger for adolescents with a depression and differed between individuals.

Limitations: Although studies have shown that parenting impacts adolescent well-being, no claims can be made about direction of effects. Moreover, the sample and assessed interactions may be biased resulting in an underestimation of negative parent-adolescent interactions.

Conclusions: Our findings indicate that adolescents generally benefit from supportive parenting and that adolescents with depression may have a negativity bias in their retrospective recall. This highlights the need for more person-centered research to guide family interventions.

Keywords: Adolescents, depression, experience sampling method, parenting, parent-child interactions

Introduction

The prevalence of mood disorders increases substantially during adolescence (Kessler et al., 2005) and an early onset has been associated with higher recurrence rates (e.g., Curry et al., 2011) and adverse psychosocial outcomes in adulthood (e.g., Clayborne et al., 2019). One of the key interpersonal factors that affects adolescent well-being is the relationship with parents (Bronfenbrenner, 1979). Findings based on observational and retrospective self-report studies showed that a lack of warmth and critical parenting are related to depression in adolescents (e.g., Restifo & Bögels, 2009; Sheeber et al., 2001; Yap et al., 2014). These studies, however, mainly focused on averages over families (between-family level), while dynamic systems theories propose that each family is unique with distinct parent-adolescent dynamics (Granic et al., 2003; Kunnen et al., 2019). Detailed information on the moment-to-moment experiences of parent-adolescent interactions within families with an adolescent could provide more valuable insight into parent-adolescent daily life dynamics of these families. This information can ultimately be used for interventions with parenting being a potential malleable factor to target. By using ecological momentary assessment (EMA; Stone & Shiffman, 1994) we therefore aimed to examine adolescent momentary affect and momentary parental warmth and criticism of mothers and fathers (both from the perspective of the adolescent as of the parent) during parent-child interactions in daily life in families with adolescents with a depression (i.e., either a current major depressive disorder (MDD) or dysthymia) compared to families with adolescents without psychopathology (i.e., healthy controls). Additionally, we investigated within-person associations between adolescent perceived parental warmth and criticism of mothers and fathers and adolescent affect during momentary parent-child interactions, and assessed whether these were stronger for adolescents with a depression than healthy controls.

As part of adolescent development, the parent-adolescent relationship transforms to a more egalitarian one (Branje, 2018). Adolescents strive to become more autonomous and parents need to balance supporting this development and keeping their adolescent safe (Baumrind, 1987; Collins, 1997). This renegotiation may become even more challenging when an adolescent is experiencing a depression. Adolescents with a depression may elicit more negative parenting behavior, such as parental rejection or less parental support (e.g., Coyne, 1976). On the other hand, adolescents are also more prone to develop a depression when parenting is (perceived as) more rejecting and/or less supportive by contributing to the development of depressogenic cognitions and negative self-views (e.g., Beck, 1967).

Although parent-adolescent interactions characterized by lack of warmth and support and elevated levels of conflict and criticism have been consistently linked to adolescent depression (e.g., McLeod et al., 2007; Restifo & Bögels, 2009; Sheeber et al., 2001; Yap et al., 2014) and depression later in life (Gibb et al., 2001; Kullberg et al., 2020; Spinhoven et al., 2010), most previous studies were based on retrospective self-report questionnaires spanning large time intervals (e.g., last year or even years). This may involve recall bias (Trull & Ebner-Priemer, 2009) which may even be more substantial for adolescents with a depression (Platt et al., 2017). For clinical interventions, it is important to elucidate whether biases indeed influence adolescents' reports or if parent-adolescent interactions in daily life are actually characterized by a lack parental warmth and support. Including parents' own perception of parenting may contribute to unravel this. Importantly, previous work did not consider

that parenting fluctuates over time (i.e., hours or days) within a family or person (Boele et al., 2020; Darling & Steinberg, 2017; Keijsers & Van Roekel, 2018). EMA is a suitable method to gain more insight into the family-specific dynamics of parent-adolescent interactions and adolescent depression in daily life and assess parenting from both adolescent and parent perspective.

Research on daily life experiences of youth with a depression is still scarce. To date, only 12 EMA studies included adolescents with a clinical depression (see review Thunnissen et al., 2021). Some of these studies found that adolescents with mood disorders report lower levels of positive affect and higher levels of negative affect than healthy controls (Silk et al., 2007; Silk et al., 2011), but others did not find differences in affect between depressed and non-depressed adolescents (Cousins et al., 2011; Doane et al., 2013; Mor et al., 2010). Additionally, despite the unique insight EMA provides into the naturalistic context of adolescents' daily life, only three studies examined the social context (i.e., amount of time spent together or co-rumination with peers or family) of adolescents with a depression (Forbes et al., 2012; Silk et al., 2011; Waller et al., 2014). Quality of time spent together was, however, not assessed while previous studies based on retrospective questionnaires and observations indicated the importance of the quality of interactions on adolescent well-being (e.g. Restifo & Bögels, 2009; Sheeber et al., 2001). As an important next step, we examined momentary positive and negative affect as well as parental warmth and criticism (from both adolescents' and parents' perspective) during parent-adolescent interactions in families with an adolescent with a depression and tested whether these differed from families with an adolescent without psychopathology.

Previous studies have shown that on moments or days when adolescents (in community samples) perceived more perceived parental warmth and less parental conflict, they reported less negative affect and more positive affect, with depressive symptoms influencing this association (Bülow et al., 2022; Janssen et al., 2021; Timmons & Margolin, 2015). For adolescents who reported more depressive symptoms stronger associations were found between daily parental support and conflict and adolescent negative affect compared to adolescents who reported less depressive symptoms (Janssen et al., 2021; Timmons & Margolin, 2015). Since no data exists on clinical samples, the current study extends this work by examining whether the association between momentary perceived parental warmth and criticism of mothers and fathers and positive and negative affect during parent-adolescent interactions was stronger for adolescents with a depression.

The current study aimed to 1) examine whether adolescent momentary positive and negative affect (in general and during parent-adolescent interactions) and momentary parental warmth and criticism during parent-adolescent interactions differed between families with an adolescent with a depression and healthy controls, 2) assess the within-person momentary association between perceived parenting behavior and affect during parent-child interactions, and 3) examine whether this association is stronger for adolescents with depression. We preregistered the study (https://osf.io/qjyp5/?view_only=2d50bab7b908401798ae7694f26faeb0) including the following hypotheses): 1a) adolescents with a depression report less momentary positive and negative affect (in general and during parent-adolescent interactions) than healthy controls; 1b) adolescents with a depression and their mothers and fathers (1c) report less parental warmth and more parental criticism during momentary parent-child interactions than healthy controls; 2) more perceived parental warmth and less perceived parental criticism of mothers and fathers at a given moment is

associated with more positive and less negative affect at the same moment; 3) the associations between perceived parenting of mothers and fathers and adolescent affect during momentary parent-adolescent interactions are stronger for adolescents with a depression compared to healthy controls.

Methods

Sample

Data were used from RE-PAIR (Relations and Emotions in Parent Adolescent Interaction Research), which examines parent-adolescent interactions and adolescent mental well-being by comparing adolescents with a current depression (i.e., either major depressive disorder or dysthymia) and their parents to adolescents without psychopathology and their parents. The RE-PAIR study was approved by the Medical Ethics Review Committee (METC) of Leiden University Medical Centre (LUMC; research protocol: P17.241).

Families were included in the study in case the adolescent was aged between 11 and 17 years at the time of the screening for psychopathology, at least one of the primary caregivers wanted to participate in the study, and all had a good command of the Dutch language. Participation with two parents – if possible – was preferred but this was no requirement. Further inclusion criteria for adolescents were: living at home with at least one primary caregiver and having started secondary school. Adolescents with a depression were included if they met criteria for a current MDD or dysthymia as primary diagnosis. Adolescents who met criteria for a primary diagnosis of another (neuro)psychiatric disorder than depression, a comorbid psychosis, substance use disorder or mental retardation were excluded. For healthy controls the following exclusion criteria applied: having a current mental disorder, a lifetime history of MDD or dysthymia, or a history of psychopathology in the last two years. Adolescent psychopathology was assessed with a face-to-face or online Semi-Structured Interview, the Kiddie-Schedule for Affective Disorders and Schizophrenia – Present and Lifetime Version (K-SADS-PL; Reichart et al., 2000). All participants signed informed consent. If adolescents were younger than 16 years of age, parents with legal custody also signed informed consent for the adolescent.

In total, 114 families participated in the EMA of RE-PAIR. This concerned 80 healthy controls and their 151 parents, and 34 adolescents with a depression and their 58 parents. Current primary diagnosis was MDD for 28 adolescents (82.4%) and dysthymia for 6 adolescents (17.6%). See Appendix 1 for comorbidity of adolescents and psychopathology of parents. Due to a branching error in questionnaires of one healthy control adolescent, we excluded that family resulting in a final sample of 79 healthy controls and 149 parents. Table 1 provides sample demographics. The majority of adolescents (96.3% healthy controls; 91.2 % adolescents with a depression) and parents (94.6% parents of healthy controls; 82.8% parents of adolescents with a depression) were born in the Netherlands. For detailed information on sample recruitment and study procedure see Appendix 2.

EMA

All participants received four questionnaires a day (56 in total) on their own smartphone using the Ethica app for 14 consecutive days and were instructed to complete the questionnaires as quickly as possible. Questionnaires were triggered between 7AM and 9.30PM on weekdays and 9AM and

9.30PM on weekend days according to a standardized trigger schedule (see for detailed information Appendix 3 and full codebook of the EMA of RE-PAIR https://osf.io/dcemq/). The EMA of RE-PAIR was conducted in the period between September 2018 and March 2022. As compensation for EMA, parents received €20,-. Healthy controls received €10,- and adolescents with a depression did not receive compensation for the EMA since it was incorporated in their treatment. In addition, six gift vouchers of €75,- were raffled based on compliance.

Compliance

With regard to the healthy controls, adolescents fully completed 2930 (68.3%) of the delivered questionnaires. In 1426 cases (48.7% of answered questionnaires), adolescents indicated that they had interacted with one or both parents who participated in the EMA of RE-PAIR (*M* = 18.1 parent-adolescent interactions per participant, Range = 3-42). Parents fully completed 6582 (80.5%) of the delivered questionnaires.

With regard to adolescents with a depression, adolescents fully completed 1193 (63.8%) of the delivered questionnaires. In 554 cases (46.4% of answered questionnaires), adolescents indicated that they had interacted with one or both parents who participated in the EMA of RE-PAIR (*M* = 16.3 parent-adolescent interactions per participant, Range = 2-33). This did not differ significantly from healthy controls (*p* = .334). Parents fully completed 2329 (72.8%) of the delivered questionnaires. No participants were excluded based on missing data and all completed EMA data was retained for analyses.

Measures

Momentary positive and negative affect

Adolescents rated their momentary affect using an adapted and shortened four-item version of the Positive and Negative Affect Schedule for Children (PANAS-C; Ebesutani et al., 2012; Watson et al., 1988). Two positive affect states (happy and relaxed) and two negative affect states (sad and irritated) were assessed by asking “How do you feel at this moment?” followed by: “Happy”, “Relaxed”, “Sad”, and “Irritated”. Answers were given on a 7-point Likert type scale with answer categories ranging from 1 (*not at all*) to 7 (*very*). See Appendix 4 for within-person and between-person correlations of items. An average score of happy and relaxed was calculated to indicate for momentary positive affect. An average score of sad and irritated was calculated to indicate momentary negative affect.

Pleasantness of interaction

Adolescents indicated with whom they spoke to or with last since the previous beep. If they answered to have spoken to or with parent(s) last, follow-up questions were presented on pleasantness of interaction, affect, and parenting behavior. Adolescents answered the question “How was this contact?” on a 7-point Likert type scale with answer categories ranging from 1 (*very annoying*) to 7 (*very nice*).

Momentary positive and negative affect during parent-adolescent interaction

Adolescents rated their momentary affect during the interaction with an adapted and shortened five-item version of the Positive and Negative Affect Schedule for Children (PANAS-C; Ebesutani et al.,

2012; Watson et al., 1988). Two positive affect states (happy and relaxed) and three negative affect states (sad, irritated, and guilty) were assessed by asking "How did you feel during this contact?" followed by: "Happy", "Relaxed", "Sad", "Irritated", and "Guilty". Guilt, often part of or accompanying adolescent depression (Beck, 1967), was only assessed after interactions since parents and parenting can induce guilt during interactions (Sheeber et al., 2001). Answers were given on a 7-point Likert type scale with answer categories ranging from 1 (*not at all*) to 7 (*very*). For the current study, only answers about interactions with parents who participated in the EMA were included. See Appendix 4 for within-person and between-person correlations of items. An average score of happy and relaxed was calculated to indicate positive affect during the interaction. An average score of sad, irritated, and guilty was calculated to indicate negative affect during the interaction.

Parenting during parent-adolescent interaction

Adolescents rated parenting behavior during the interaction by answering the questions "How well did your mother/father listen to you?", "How well did your mother/father understand you?", "How critical was your mother/father towards you?", and "How dominant was your mother/father?". Answers were given on a 7-point Likert type scale with answer categories ranging from 1 (*not at all*) to 7 (*very*).

Similarly, if parents indicated that they spoke last to or with their adolescent since the last beep, they rated their own parenting behavior during the interaction. They answered the questions "How well did you listen to your child", "How well did you understand your child?", "How critical were you towards your child?", and "How dominant were you towards your child?". Answers were given on a 7-point Likert type scale with answer categories ranging from 1 (*not at all*) to 7 (*very*). Two subscales were created for parents and adolescents separately, parental warmth and parental criticism. See Appendix 4 for within-person and between-person correlations of items. An average score of listening and understanding behavior during the interaction was calculated to assess parental warmth. An average score of critical and dominant behavior during the interaction was calculated to assess parental criticism.

Depressive symptoms

The Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001) was used to assess depressive symptoms in the previous two weeks as part of the online questionnaires adolescents had to complete before the research day in the lab. The items are based on nine DSM-IV criteria for depression and are rated as 0 (*not at all)* to 3 (*nearly every day*). One item (item 8; moving or speaking slowly or being so fidgety or restless) was split in two items and the maximum score of these two items was included. Sum scores range from 0 to 27 and a score above 10 is suggestive of the presence of depression (Manea et al., 2012). Cronbach alpha was .94.

Preregistered analyses

Our analysis plan including power analyses was preregistered online (https://osf.io/qjyp5/?view_only=2d50bab7b908401798ae7694f26faeb0). As the amount of observations of interactions of adolescents with fathers was less than expected, we performed some sensitivity checks (see Appendix 5). For the analyses we used R version 4.0.1 (R Core Team, 2020) and

for the multilevel models multilevel package version 2.6 (Bliese, 2016) with ML estimation. Level 1 predictors were person-mean centered, following guidelines proposed by (Hoffman, 2015) and (Bolger & Laurenceau, 2013).

To account for the nestedness of the data (i.e., measurements nested in individuals) we used multiple multilevel models. To examine whether adolescent momentary positive and negative affect (in general and during parent-adolescent interactions) and momentary parental warmth and criticism during parent-adolescent interactions differed between families with an adolescent with a depression and healthy controls (aim 1) we tested eight models including adolescents' reports and four including parents' reports. To investigate the within-person association between perceived parenting behavior and adolescent affect during parent-adolescent interactions (aim 2), we added the person-mean centered scores of perceived maternal warmth, perceived maternal criticism, perceived paternal warmth, and perceived paternal criticism to the unconditional random intercept models of positive and negative affect separate (eight models). Next, in each model, variation was allowed around the slope to examine heterogeneity. Likelihood ratio tests were used to assess differences in fit of the models (following guidelines of (Hox et al., 2017). To assess whether the association between parenting and adolescent affect during parent-adolescent interactions was stronger for adolescents with a depression (aim 3), we added the binary variable clinical status (0 = healthy controls, 1 = adolescents with a depression) to the model as main effect and in interaction with perceived parenting. Lastly, we explored whether the association between parenting and adolescent affect during parent-adolescent interactions was stronger for adolescents with more depressive symptoms. This level 2 predictor was grand-mean centered.

Correlation structure corCAR1 was added in all models to take into account unequally spaced time intervals (Singer et al., 2003).

Results

Descriptive analyses

Table 1 provides information on parent-adolescent dynamics. Adolescents with a depression reported higher levels of emotional abuse and neglect during their childhood compared to healthy controls (p's < .001), and less care and more overprotection from mothers and fathers as well as a less secure attachment with mothers and fathers (p's < .01). On a daily level (assessed at the end of the day), adolescents with a depression reported lower levels of perceived parental warmth of mothers and fathers than healthy controls (p's < .05), whereas levels of perceived criticism did not significantly differ. Parents of adolescents with a depression also reported less care and more overprotection, but additionally perceived themselves as more autonomy granting compared to parents of healthy controls (p's < .05). Parents' self-reported daily parental warmth and criticism (assessed at the end of the day) did not significantly differ between the two groups of parents.

Table 1. Sample demographics and descriptive statistics.

		CON		DEP	Difference[a]
	N/obs		*N/obs*		*p*
Adolescents					
Sex, % Female, (*n*)	79	63.3 (50)	34	76.5 (26)	
Age (years), *M (SD)*	79	15.9 (1.33)	34	15.7 (1.53)	
Highest level of education, % (*n*)	79		34		
Vocational education		12.7 (10)		17.6 (6)	
Advanced secondary education		32.9 (26)		23.5 (8)	
Pre-university education		45.6 (36)		38.2 (13)	
Secondary vocational education		6.3 (5)		14.7 (5)	
Higher professional education		2.5 (2)		5.9 (2)	
Depressive symptoms (PHQ-9) *M* (SD)	79	4.77 (2.81)	34	20.21 (4.56)	< .001
CTQ					
Emotional abuse *M* (SD)	78	6.44 (2.27)	34	8.68 (3.72)	< .001
Emotional neglect *M* (SD)	78	7.94 (2.98)	34	10.94 (3.46)	< .001
PBI					
Care – mother *M* (SD)	78	31.91 (4.21)	34	27.03 (6.68)	< .001
Overprotection – mother *M* (SD)	78	3.51 (2.28)	34	5.88 (3.52)	< .001
Autonomy – mother *M* (SD)	78	3.59 (2.87)	34	4.71 (4.37)	.362
Care – father *M* (SD)	70	29.99 (5.17)	25	26.16 (6.10)	.004
Overprotection – father *M* (SD)	70	3.06 (2.33)	25	5.32 (3.48)	< .001
Autonomy – father *M* (SD)	70	3.59 (2.55)	25	4.92 (3.65)	.141
IPPA					
Attachment – mother *M* (SD)	78	42.45 (4.62)	34	36.29 (6.72)	< .001
Attachment – father *M* (SD)	70	39.03 (5.82)	25	33.84 (6.20)	< .001
Daily level					
Daily maternal warmth *M* (SD)	844	5.90 (1.04)	351	5.42 (1.47)	.007
Daily maternal criticism *M* (SD)	844	2.01 (1.32)	351	1.97 (1.27)	.698
Daily paternal warmth *M* (SD)	730	5.79 (1.20)	236	5.35 (1.44)	.030
Daily paternal criticism *M* (SD)	730	1.83 (1.27)	236	1.90 (1.26)	.755
Parents					
Sex, % Female, (*n*)	149	52.3 (78)	58	58.6 (34)	
Age (years), *M (SD)*[a]	149	49.2 (5.73)	58	50.1 (5.30)	
Highest level of education, % (*n*)	149		58		
No diploma		0.7 (1)		1.7 (1)	

Lower vocational education		6.7 (10)		17.2 (10)	
Intermediate vocational education		25.5 (38)		24.1 (14)	
Higher vocational education or scientific education (university)		67.1 (100)		56.9 (33)	
PBI	149		58		
Care *M* (SD)		31.37 (4.02)		29.47 (4.28)	.002
Overprotection *M* (SD)		3.93 (2.49)		5.24 (2.89)	.003
Autonomy *M* (SD)		3.92 (2.50)		4.91 (2.50)	.011
Daily level					
Daily maternal warmth *M* (SD)	948	5.70 (0.94)	406	5.73 (1.05)	.687
Daily maternal criticism *M* (SD)	948	2.44 (1.43)	406	2.39 (1.34)	.736
Daily paternal warmth *M* (SD)	785	5.38 (0.98)	252	5.40 (0.97)	.632
Daily paternal criticism *M* (SD)	785	2.46 (1.40)	252	2.55 (1.46)	.890

[a]Difference was tested by using appropriate non-parametric tests. To test differences on the daily level, we specified multilevel models.
PHQ-9 = Patient Health Questionnaire-9; CTQ = Childhood Trauma Questionnaire; PBI = Parental Bonding Inventory; IPPA = Inventory of Parent and Peer Attachment. See Appendix 4 for detailed explanation and psychometric properties of the measures in this table.

Main analyses

Descriptive statistics of the study variables and results of multilevel models are presented in Table 2, correlations can be found in Appendix 6. Adolescents with a depression reported significantly less momentary positive and more negative affect than healthy controls (*p'*s < .001, see Figure 1). With respect to the parent-adolescent interactions, overall, adolescents with a depression experienced the interactions with their parents to be less pleasant compared to healthy controls (DEP (552): $M = 4.77$, $SD = 1.29$; HC (1425): $M = 5.57$, $SD = 1.21$, $p < .001$). The majority of these interactions were face-to-face (97.9%) (rather than online or via a phone call). During parent-adolescent interactions, adolescents with a depression reported significantly less positive and more negative affect than healthy controls (*p*'s < .001). Adolescents with a depression did not differ from healthy controls in their perceptions of perceived parental warmth and parental criticism of mothers and fathers during parent-adolescent interactions (all *p*'s > .050). Similarly, mothers' and fathers' own perception of parental warmth and criticism did not differ between parents of adolescents with a depression and healthy controls (all *p*'s > .050, see Figure 2).

Table 2. Descriptive statistics of study variables and results of multilevel models to test differences between groups.

	HC		DEP		Difference[a]
	Obs	*M* (SD)	*Obs*	*M* (SD)	*Estimate* (*p*)
Adolescents					
Positive affect	2947	5.47 (1.13)	1212	3.77 (1.53)	-1.694 (< .001)
Negative affect	2946	1.47 (0.91)	1210	3.20 (1.54)	1.710 (< .001)
Positive affect during parent-adolescent interaction	1425	5.57 (1.15)	552	4.09 (1.40)	-1.483 (< .001)
Negative affect during parent-adolescent interaction	1425	1.33 (0.67)	551	2.50 (1.19)	1.183 (< .001)
Maternal warmth during parent-adolescent interaction	1053	5.79 (1.19)	438	5.47 (1.23)	-0.348 (.062)
Maternal criticism during parent-adolescent interaction	1053	1.74 (1.14)	438	2.01 (1.35)	0.289 (.118)
Paternal warmth during parent-adolescent interaction	624	5.79 (1.21)	194	5.72 (1.36)	-0.160 (.496)
Paternal criticism during parent-adolescent interaction	624	1.69 (1.09)	194	1.86 (1.29)	0.194 (.350)
Parents					
Maternal warmth during parent-adolescent interaction	798	5.75 (1.03)	446	5.64 (1.15)	0.002 (.991)
Maternal criticism during parent-adolescent interaction	798	2.10 (1.40)	445	2.21 (1.28)	0.081 (.658)
Paternal warmth during parent-adolescent interaction	449	5.65 (0.91)	163	5.26 (1.17)	-0.193 (.267)
Paternal criticism during parent-adolescent interaction	449	2.29 (1.30)	163	2.36 (1.35)	-0.002 (.993)

Note. Healthy controls (*n* = 79) and their parents (*n* = 149), adolescents with a depression (*n* = 34) and their parents (*n* = 58).

[a]Difference refers to results of multilevel model in which clinical status was entered as the predictor.

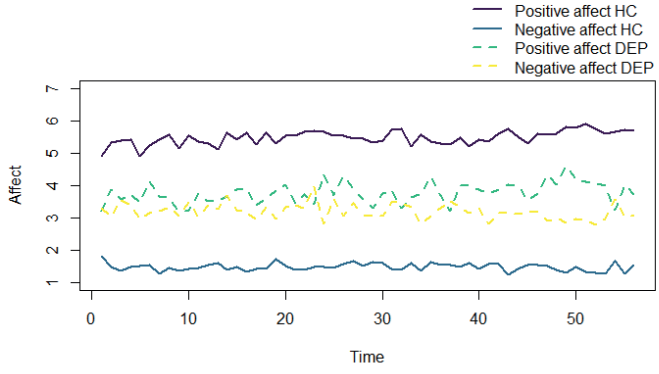

Figure 1. Average fluctuations of momentary positive and negative affect of adolescents over time per group (HC = healthy controls, DEP = adolescents with a depression).

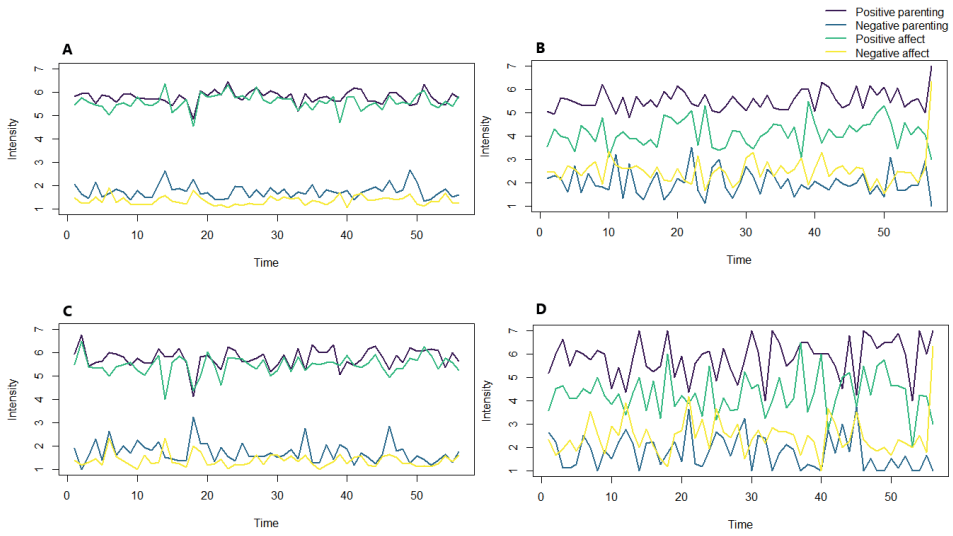

Figure 2. Average fluctuations of momentary adolescent affect and perceived parenting during parent-adolescent interactions per group over time (observations). Panel A and B represent interactions with mothers reported by HC adolescents and DEP adolescents respectively. Panel C and D represent interactions with fathers reported by HC adolescents and DEP adolescents respectively.

As indicated by the intraclass correlations (ICC) 57.4% of the variance in adolescent negative affect and 60.8% of the variance in adolescent positive affect was due to differences between adolescents, and 42.6% and 39.2% due to within-person fluctuations over time. Examination of the within-person association between perceived parenting behavior and affect during momentary parent-adolescent interactions (aim 2) showed that when adolescents perceived their mothers and fathers to show more warmth or less criticism during interactions, they also reported more positive and less negative affect (all *p*'s < .001, see Appendix 7). Next, we allowed variation around the slope of perceived parenting in each model and likelihood ratio tests indicated that this improved the model fits significantly (all *p*'s < .001), This indicates that adolescents differed substantially in the extent to which perceived parental warmth and criticism of mothers and fathers were associated with positive and negative affect.

To examine whether the association between perceived parenting and adolescent affect during momentary parent-adolescent interactions differed between adolescents with a depression and healthy controls (aim 3), we added clinical status (being diagnosed with a depression or not) to the models as well as an interaction of clinical status with perceived parenting. Results are displayed in Table 3. In all models, there was no significant interaction between perceived parenting and clinical status, indicating that the link between perceived parenting and adolescent affect did not differ between adolescents with a depression and healthy controls (see Appendix 8 for figures). Adolescents with a depression did report less positive affect and more negative affect during parent-adolescent interactions than healthy controls. Further inspection of these associations in adolescents with a depression indicated that even within this group, there are individual differences in how parenting and adolescent affect are related. An example is illustrated in Figure 3.

We furthermore explored whether the association between parenting and adolescent affect during parent-adolescent interactions differed based on severity of depressive symptoms instead of the clinical status. Findings were very similar compared to clinical status and indicated that the link between perceived parenting and adolescent affect during parent-adolescent interactions did not differ between adolescents based on the severity of depressive symptoms. Full model results are presented in Appendix 9.

Sensitivity analyses

In addition to our preregistered analyses, we conducted one post hoc sensitivity analysis to elucidate whether the association between perceived parenting and adolescent affect during parent-adolescent interactions differed between boys and girls. We included perceived parenting, clinical status (as main effect), sex, and an interaction between sex and perceived parenting in the models. The interaction between sex and perceived parenting was not significant, indicating that the link between perceived parenting and adolescent affect did not differ between boys and girls (see Appendix 10 for full model results). Sex itself was also not significantly related to adolescent positive and negative affect in the models including maternal warmth and criticism. However, when inspecting the models focusing on the interactions between adolescents and fathers, adolescent girls reported less positive and more negative affect than boys during interactions with their fathers (all p's < .050).

Table 3. Parental warmth and criticism and adolescent positive and negative affect during parent-adolescent interactions and the moderating role of depression.

	Adolescent positive affect			
	Parental warmth mothers	Parental warmth fathers	Parental criticism mothers	Parental criticism fathers
Fixed effects: estimate *(SE)*				
Intercept	5.457*** (0.102)	5.463*** (0.120)	5.460 *** (0.102)	5.465*** (0.120)
Perceived parenting	0.441*** (0.049)	0.447*** (0.061)	-0.280*** (0.049)	-0.351*** (0.069)
Clinical status	-1.436*** (0.186)	-1.472*** (0.238)	-1.434*** (0.186)	-1.472*** (0.238)
Perceived parenting*clinical status	-0.072 (0.087)	0.008 (0.121)	0.037 (0.085)	0.045 (0.140)
Random effects				
Between person variance	0.726	0.866	0.714	0.856
Within person variance	0.644	0.495	0.724	0.559
Random effect variance	0.076	0.103	0.065	0.118
	Adolescent negative affect			
	Parental warmth mothers	Parental warmth fathers	Parental criticism mothers	Parental criticism fathers
Fixed effects: estimate *(SE)*				
Intercept	1.413*** (0.077)	1.425*** (0.080)	1.414*** (0.077)	1.426*** (0.080)
Perceived parenting	-0.225*** (0.035)	-0.183*** (0.046)	0.257*** (0.036)	0.239*** (0.042)
Clinical status	1.155*** (0.140)	1.165*** (0.158)	1.154*** (0.141)	1.166*** (0.159)
Perceived parenting*clinical status	-0.076 (0.061)	-0.027 (0.091)	0.033 (0.064)	0.151 (0.084)
Random effects				
Between person variance	0.407	0.366	0.418	0.378
Within person variance	0.359	0.288	0.333	0.276
Random effect variance	0.036	0.059	0.043	0.035

Note. Models concerning adolescent-mother interactions *N* individuals = 112, *N* observations = 1491. Models concerning adolescent-father interactions *N* individuals = 90, *N* observations = 818.

*$p < .05$. **$p < .01$. ***$p < .001$.

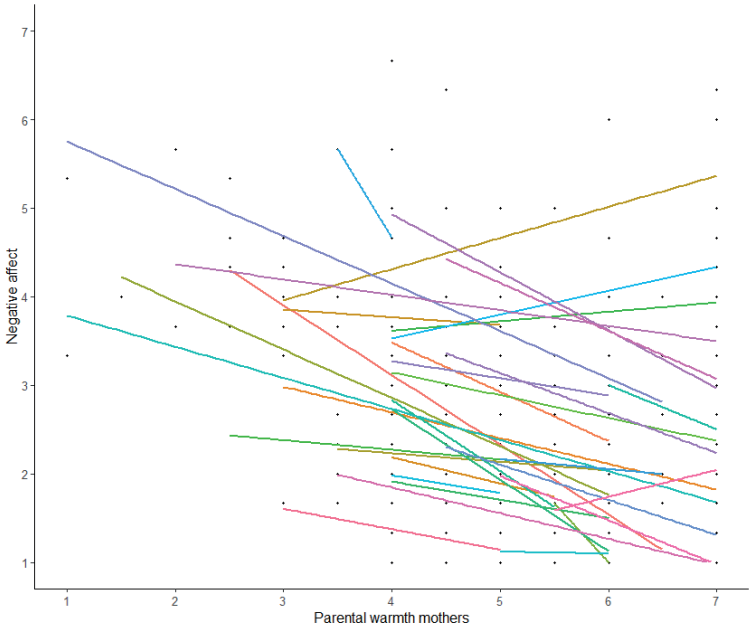

Figure 3. Individual-level associations between parental warmth of mothers and negative affect during momentary parent-adolescent interactions for adolescents with a depression. Each line represents one person.

Discussion

Insights into the daily life processes in families with an adolescent with a depression may generate valuable information for clinical practice. This study on the moment-to-moment experiences of adolescent affect and parenting during parent-adolescent interactions in a clinical sample of families with depressed adolescents indicate that adolescents with a depression experience lower levels of positive affect and higher levels of negative affect than healthy controls throughout the days as well as during parent-adolescent interactions, with differences being substantial. This is in line with our preregistered hypotheses and previous research (Silk et al., 2007; Silk et al., 2011), even though some EMA studies did not find differences in affect between depressed and non-depressed adolescents (Cousins et al., 2011; Doane et al., 2013; Mor et al., 2010). As illustrated in Figure 1, on average adolescents with a depression reported little below the middle of the scale (ranging from not at all to very) which may indicate a more flat or blunted affect. This seems to be partly in line with the Emotion Context Sensitivity theory that proposes that depression flattens emotions in general (Rottenberg, 2005).

Momentary levels of reported parental warmth and criticism during parent-adolescent interactions did not differ between the two groups, not from the perspective of the adolescent nor from the parent (i.e., mother and father). Interestingly, this deviates from our hypotheses and our other findings that adolescents with a depression perceive their relationship with mothers and fathers as more negative (e.g., less care and more overprotection) as indicated on the retrospective questionnaires compared to healthy controls. Parents of adolescents with a depression themselves

also reported less parental care and more overprotection on the retrospective questionnaires than parents of healthy controls. These discrepancies are intriguing, with the retrospective reports being in line with previous findings based on retrospective questionnaires (and observations in the lab) that also indicate that parent-adolescent interactions in families with adolescents with a depression are less supportive and more conflictual (e.g., Chapman et al., 2016; Sheeber et al., 2007) and lower in parental care (Kullberg et al., 2020; Valiente et al., 2014). This indicates that findings on one timescale do not necessarily apply to another (Keijsers & Van Roekel, 2018). Cognitive biases may play a role here: when adolescents are asked to report retrospectively on parenting, their memories may be negatively biased by their mood (Platt et al., 2017), while these biases may be reduced when using EMA to assess parenting at the momentary level, without a delay.

Our findings also indicate the importance of parenting for adolescent's well-being, also for depressed adolescents. When adolescents perceived their parents as more warm or less critical during interactions they also reported more positive and less negative affect, supporting previous findings in community samples at the momentary (Bülow et al., 2022) or daily level (Janssen et al., 2021; Timmons & Margolin, 2015). The momentary associations between parenting and affect in the current study did not differ between adolescents with and without a depression and was not associated with levels of depressive symptoms either. A recent study on parenting and affect during momentary parent-adolescent interactions, based on a community sample, reported similar results (Bülow et al., 2022). However, previous work in community samples did show that daily linkages between parenting and adolescent affect were stronger for adolescents with more depressive symptoms (Janssen et al., 2021; Timmons & Margolin, 2015). The abovementioned biases may play a role here as daily reports of parenting still involve some recollection, including the inherent biases, while these do not apply to momentary assessments.

Another important finding is that we found substantial variation between adolescents, indicating that the strength or direction of how warm or critical parenting is associated to adolescent affect differs between adolescents. Even within our sample of adolescents with a depression, this heterogeneity was observed. This aligns with previous findings that even siblings differ in patterns of parental bonding, and how this links to symptoms depression and anxiety, depending on their personality (i.e., locus of control and extraversion) (Kullberg et al., 2021). Studies using more person-centered and idiographic approaches are needed (Molenaar, 2004) to better understand these factors and translate them into implications for clinical practice.

A unique feature of the current study was that we assessed parental warmth and criticism of mothers and fathers separately. Despite family system theories proposing adolescent-mother and adolescent-father dyads being distinct subsystems (Cox & Paley, 1997; Restifo & Bögels, 2009) and suggestions that parenting roles of mothers and fathers may differ (e.g., Lamb & Lewis, 2013), not many studies have assessed parenting of both mothers and fathers. Our results suggest that perceived parental warmth and criticism of mothers *and* fathers are important for adolescent well-being. Interestingly, sensitivity analyses (in the supplementary materials) indicated that adolescents reported more positive affect when interacting with mothers and fathers at the same time compared to with fathers only. Moreover, girls reported more negative and less positive affect in interactions with fathers than boys. These findings highlight the need to assess family dynamics of mothers, fathers, and adolescents together, as well as taking into account sex of adolescents.

Taken together, a major strength of the current study is that momentary parent-adolescent interactions were monitored in a clinical sample of families with an adolescent with a depression and that we included not only adolescents' perceptions of parenting of mothers and fathers separately but also parents' own perceptions. This provided a unique insight into the everyday experiences of these families. Additionally, it allowed for linking perceived parental warmth and criticism of both mothers and fathers separately to adolescent affect, providing more insight into potential distinct influences of mothers and fathers during momentary parent-adolescent interactions.

These results also provide first insights into the momentary experiences of families with adolescents with a depression that are also relevant for clinical practice. Since adolescents with a depression do seem to benefit from parental warmth in daily life, and also report more negative on parenting in retrospective reports, which is in turn associated with more negative affect, interventions on adolescent depression may benefit from the involvement of parents, both mothers and fathers. A recent meta-analysis has shown that the involvement of parents in treatment can increase the efficacy of individual CBT (Oud et al., 2019). These family interventions could include psychoeducation to inform parents about how adolescents depression and cognitive biases influence adolescents' experiences of daily life, and foster a warm family climate, limiting parental rejection, and criticism. Moreover, given the substantial variation in how parenting and adolescent affect is related and previous findings that perceptions of adolescents and parents differ (Hou et al., 2020; Korelitz & Garber, 2016), exploring the needs of the adolescent in treatment and discussing them with parents also seems an important ingredient. This could yield more understanding of each other's perception and behavior as well as aligning what adolescents need or want and what parents can provide.

Some limitations should also be acknowledged that may provide directions for future studies. The sample of the study was fairly homogenous with regard to ethnic and educational background, with the majority of adolescents and parents being born in the Netherlands. Furthermore, our sample of families with an adolescent with a depression might be biased. Families who decided to participate in the study, focusing on parent-adolescent interactions and adolescent mental well-being, may not be families with harsh or neglecting parenting behavior, thereby resulting in an underestimation of negative parent-adolescent interactions. Although future studies may therefore strive to include a more diverse, representative sample of depressed adolescents, including families with a depression is very challenging. Moreover, although we were able to assess experiences of parent-adolescent interactions in their natural context due to the use of EMA, it may also have resulted in collecting data of interactions about mundane matters (e.g., who is unloading the dishwasher) that do not have a large impact on adolescents' affect. Future studies may benefit from gaining more information about the *content* of the interactions (i.e., topics that have been discussed). Lastly, as we focused on concurrent associations during momentary parent-adolescent interactions, due to limited power, no claims can be made about the direction of effects. Future work assessing the direction of effects could result in more specific implications for clinical practice.

Conclusion

Parenting has been consistently associated with adolescent depression, but most research to date has used retrospective questionnaires concerning macro-time intervals. To inform clinical practice, it important to investigate whether these findings represent actual moment-to-moment experiences in daily life. With the use of EMA and inclusion of families with an adolescent with a depression, we showed that adolescents with a depression overall reported more negative and less positive affect than healthy controls. Generally, perceived parental warmth and criticism and affect during parent-adolescent interactions co-fluctuated. This association did not differ between adolescents with a depression and healthy controls, even though adolescents with depression and their parents did indicate more negative parenting (e.g., less care and more overprotection) in the retrospective questionnaires. These findings indicate that these adolescents generally do seem to benefit from parental warmth, while the discrepant findings also support the idea that a negativity bias may have affected the retrospective reports of parenting. Clinicians should facilitate the communication of needs and perspectives between adolescents and parents. The study further supports the idea that the extent to which parenting processes relate to adolescent affect differs per family and therefore calls for a more person-centered and idiographic approach in research to guide family interventions.

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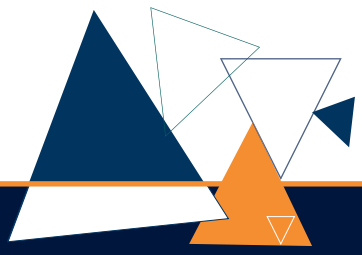
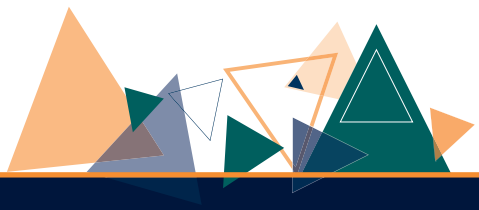


Does the COVID-19 pandemic impact parents' and adolescents' well-being? An EMA-study on daily affect and parenting



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Abstract

Due to the COVID- 19 outbreak in the Netherlands (March 2020) and the associated social distancing measures, families were enforced to stay at home as much as possible. Adolescents and their families may be particularly affected by this enforced proximity, as adolescents strive to become more independent. Yet, whether these measures impact emotional well-being in families with adolescents has not been examined. In this ecological momentary assessment study, we investigated if the COVID-19 pandemic affected positive and negative affect of parents and adolescents and parenting behaviors (warmth and criticism). Additionally, we examined possible explanations for the hypothesized changes in affect and parenting. To do so, we compared daily reports on affect and parenting that were gathered during two periods of 14 consecutive days, once before the COVID-19 pandemic (2018-2019) and once during the COVID-19 pandemic. Multilevel analyses showed that only parents' negative affect increased as compared to the period before the pandemic, whereas this was not the case for adolescents' negative affect, positive affect and parenting behaviors (from both the adolescent and parent perspective). In general, intolerance of uncertainty was linked to adolescents' and parents' negative affect and adolescents' positive affect. However, Intolerance of uncertainty, nor any pandemic related characteristics (i.e. living surface, income, relatives with COVID-19, hours of working at home, helping children with school and contact with COVID-19 patients at work) were linked to the increase of parents' negative affect during COVID-19. It can be concluded that on average, our sample (consisting of relatively healthy parents and adolescents) seems to deal fairly well with the circumstances. The substantial heterogeneity in the data however, also suggest that whether or not parents and adolescents experience (emotional) problems can vary from household to household. Implications for researchers, mental health care professionals and policy makers are discussed.

Introduction

Since March 2020, the coronavirus disease 2019 (COVID-19) is referred to as a pandemic by the World Health Organization (2020) . To slow the spread of COVID-19, national governments have taken radical measures to minimize social interactions by closing public places, demanding people to keep physical distance and stay at home and – in some countries – by enforcing 'full lockdown'. In the Netherlands, at March 15th 2020, measures of social distancing enforced all Dutch citizens to stay home and work remotely as much as possible, public spaces (e.g. schools, offices, parts of public transport, theatres) were closed and public gatherings were prohibited (see Fig 1 for a timeline). These measures of social distancing (a so-called 'lockdown') created drastic changes in daily social life; distinct domains such as family life, school, and work suddenly coincided and families faced an unforeseen increase in hours spent together under the same roof. Adolescents and their families may be particularly affected by this enforced proximity, as adolescents strive to become independent and focus more on socializing and spending time with friends rather than with their families (Steinberg, 2005; Steinberg & Silk, 2002). To that end, this study aimed to investigate well-being of adolescents and their parents and parenting behaviors during the COVID-19 pandemic and explored daily difficulties and helpful activities during the COVID-19 pandemic linked to their well-being.

For some families, spending more time together during a lockdown may bring family members closer towards each other and foster a sense of well-being. However, several factors that are emblematic for the COVID-19 crisis, such as financial insecurity, concerns about own and others' health, uncertainty about quarantine duration, lack of social and physical activities, and boredom have all frequently been shown to negatively affect a person's mood and mental well-being (Cava et al., 2006; Hawryluck et al., 2004; Jeong et al., 2016; Liu et al., 2012; Sprang & Silman, 2013). Moreover, parents and adolescents may also experience stress because they are faced with more daily hassles (e.g. a suboptimal work or school environment) and additional tasks (e.g. parents homeschooling their children or caring for significant others). Previous studies have shown that the impact of these quarantine related factors on mental health outcomes (e.g. depressive symptoms, anxiety, and PTSD) can be wide-ranging, substantial and long-lasting (see review of Brooks et al., 2020). As a consequence, these confinements may also lead to more tension, irritability, family conflicts, and at worse, domestic violence or child abuse (Bavel et al., 2020).

One of the key questions that have been raised by governmental agencies and health care workers is to what extent the COVID-19 pandemic and the associated distancing measures affect families' well-being and parenting behaviors. In this study, Dutch adolescents and their parents filled in 14 days of ecological momentary assessments (EMA; Stone & Shiffman, 1994) twice, *before* the COVID-19 outbreak (2018-2019) and also *during* the COVID-19 pandemic (14-28 April 2020). In addition, we asked parents and adolescents about daily difficulties and helpful activities during the COVID-19 pandemic that possibly influenced their affect in positive and negative ways. This enabled us to investigate how and to what extent well-being and parenting behaviors in daily life were impacted by the COVID-19 pandemic and the related social distancing measures. Gaining more insight into these processes, our findings can contribute to formulating recommendations for policy makers and mental health professionals.

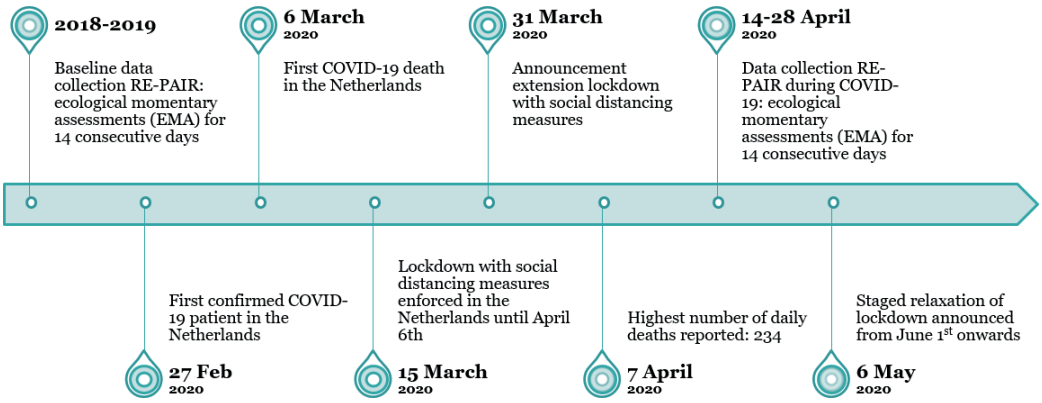

Figure 1. Timeline of study period.

Positive and negative affect in daily life

Individuals' affect states are not one-dimensional and static in nature, but can fluctuate from moment to moment in response to other individuals and external circumstances (e.g., Kuppens et al., 2010). Positive and negative affect reflect a persons' momentary mood state. Both positive and negative affect have implications for health and well-being over time for adults and adolescents (Carstensen et al., 2011; Eid & Diener, 1999; Granic et al., 2003; Houben et al., 2015; Maciejewski et al., 2014; Wilson et al., 2011). Positive affect predominantly generates action, motivation, social connectedness and cognitive flexibility, whereas negative affect might result in actions such as avoidance, attack, or expel (Bai et al., 2017; Fredrickson, 2001). Using momentary assessments enabled us to identify the potential impact of the pandemic on parents' and adolescents' positive and negative affect in daily life without the potential bias of retrospective recall.

Parenting

The COVID-19 pandemic and the related social measures might also impact parenting behaviors, such as the amount of expressed warmth and criticism. Parental warmth is typically considered as one of the primary dimensions of sensitive parenting behavior and can include acceptance , support, and positive involvement towards the child (Epkins & Harper, 2016). Parental criticism can be defined as expressing negativity, disapproval, or dissatisfaction to a child (Hickey et al., 2020). Psychological distress related to the COVID-19 pandemic may influence parenting behaviors, with parents being more emotionally withdrawn or critical and irritated, instead of being supportive, sensitive and encouraging to the child (Pottie & Ingram, 2008)

Previous studies have shown that especially positive mood of family members is closely related to warm family interactions, whereas negative mood is related to withdrawal from interactions (Bai et al,, 2017; Flook, 2011; Ramsey & Gentzler, 2015; Repetti et al., 2009). However, no prior studies have examined the effects of a situation comparable to the current COVID-19 pandemic on parenting. Therefore, in addition to its impact on affect, we also aimed to investigate the impact of the COVID-19 pandemic and its consequences on parental warmth and criticism in daily

life. Since parenting is a dynamic process (Granic et al., 2003), we will examine day-to-day parental warmth and criticism. Furthermore, as perspectives from parents and adolescents on parenting might differ (e.g., Korelitz & Garber, 2016), we examined both the parent and adolescent perspective on parental warmth and criticism.

Intolerance of uncertainty

A crucial aspect of unforeseen stressful situations, such as the COVID-19 pandemic, is uncertainty. Uncertainty is one of the key determinants of experienced levels of stress (Buhr & Dugas, 2006; Meeten et al., 2012; Ziomke & Young, 2009). Moreover, the ability to deal with uncertainty varies widely. While some people can tolerate uncertainty very well, others have difficulties tolerating uncertainty and try to avoid it at best (Dugas et al., 1998; Freeston et al., 1994; Rosen & Knäuper, 2009). Intolerance of uncertainty (IU) is described as a predisposition to negatively perceive and respond to uncertain information and situations, irrespective of its probability and outcomes (Ladouceur et al., 1998; Ladouceur et al., 2000). As the worldwide COVID-19 pandemic influenced daily life for all people, escaping from the accompanied uncertainty is deemed impossible. Consequently, parents and adolescents with higher levels of IU might experience greater distress under the current circumstances, which might in turn also impact their affect and parenting behaviors. No prior studies have investigated the relation between IU and daily affect and parenting behavior within the family context. This was pursued in the present study. In the light of the pandemic, it is also examined to what extent IU is related to a change in affect and parenting behaviors.

Present study

In the present study, we examined the impact of the COVID-19 pandemic on daily affect and parenting of both Dutch parents *and* adolescents. The aims were: (1) To explore parents' and adolescents' daily difficulties and helpful activities during the COVID-19 pandemic, (2) to examine and compare positive and negative affect of both parents and adolescents during 2 weeks of the COVID-19 pandemic and a similar 2-week period pre-pandemic (from now on referred to as baseline), (3) to examine and compare (perceived) parenting behaviors in terms of parental warmth and criticism towards the adolescent (as assessed by both the adolescent and the parent) during 2 weeks of the COVID-19 pandemic and a similar 2-week period pre-pandemic, (4) to examine whether parents' and adolescents' levels of IU at baseline are associated with affect and parenting behaviors in general, and (5) as well as with the hypothesized changes in affect and (perceived) parental warmth and criticism.

We expect an increase of negative affect and a decrease in positive affect for both parents and adolescents during the COVID-19 pandemic as compared to baseline. Regarding parenting behaviors, we expect lower levels of parental warmth and higher levels of parental criticism during the COVID-19 pandemic as compared to baseline, both from the perspective of parents and adolescents. With respect to IU, we expect that higher levels of IU predict higher levels of negative affect and lower levels of positive affect in parents and adolescents at both time points, as well as a greater increase in negative affect and decrease in positive affect during the COVID-19 pandemic compared to baseline.

Method

Sample

The current study was based on baseline data of the ongoing Dutch multi-method two-generation RE-PAIR study: '*Relations and Emotions in Parent-Adolescent Interaction Research*' and on the follow-up assessment 'RE-PAIR during the COVID-19 pandemic'. In RE-PAIR, we examine the relation between parent-child interactions and adolescent mental well-being. The study design and in- and exclusion criteria of the baseline assessment can be found in S1 Text. The current study included data from adolescents without psychopathology and their parents (i.e., healthy control families).

Inclusion criteria for the adolescents to participate in the current study at baseline were: being aged between 11 and 17 years, living at home with at least one primary caregiver, going to high school or higher education, and a good command of the Dutch language. Adolescents were excluded if they had a current mental disorder, a life-time history of major depressive disorder or dysthymia, or a history of psychopathology in the past two years. Adolescent psychopathology was assessed at baseline during a face-to-face interview using the Structured Interview of the Kiddie-Schedule for Affective Disorders and Schizophrenia – Present and Lifetime Version (K-SADS-PL; Reichart et al., 2000). For parents, no in- or exclusion criteria were specified, except for a good command of the Dutch language. To participate in the follow-up during the COVID-19 pandemic the adolescent had to still live at home with at least one caregiver. Adolescents and parents were allowed to sign up individually.

From the 80 adolescents and 151 parents who were contacted for the follow-up assessment during the COVID-19 pandemic, 51 individuals (14 adolescents and 37 parents) did not respond to any of the attempts of contact from the researchers. Of the individuals who did respond, 76 (31 adolescents and 45 parents) were not willing to participate. Reasons were: being busy and having other priorities (i.e., work, school, taking care of children or parents). The remaining 104 participants gave consent to participate. Two participants did not start the EMA and one participant did not complete the measures and hence, the final sample of the current study included 101 participants, consisting of 34 adolescents and 67 parents. Descriptive statistics of the current sample are described in the result section and in Table 1.

Table 1. Sample demographics.

Variables	*N*	Before COVID-19	During COVID-19
Parents			
Gender, % Female, (*n*)	67	56.7 (38)	56.7 (38)
Age (years), *M (SD)*[a]	67	48.23 (5.79)	49.12 (5.73)
Highest level of education, % (*n*)	67		
Lower vocational education		3 (2)	3 (2)
Intermediate vocational education		25.4 (17)	25.4 (17)
Higher vocational education or scientific education (university)	67	71.6 (48)	71.6 (48)
Depressive symptoms (PHQ-9), *M (SD)*	64	2.45(2.78)	2.87 (2.76)
Intolerance of Uncertainty (IUS), *M (SD)*	67	27.81 (6.51)	-
Positive affect[a], *M (SD)*		5.33 (0.65)	5.32 (0.73)
Negative affect[a], *M (SD)*		1.53 (.56)	1.65 (.62)
Parental warmth[a], *M (SD)*		5.64 (.70)	5.66 (.65)
Parental criticism[a], *M (SD)*		2.41 (1.01)	2.47 (1.02)
Adolescents			
Gender, % Girl, (*n*)	34	64.7(22)	64.7(22)
Age (years), *M (SD)*	34	16.00 (1.15)	16.95 (1.01)
Current education level, % (*n*)	34		
Lower vocational education		5.9 (2)	5.9 (2)
Advanced secondary education		32. 4(11)	20.6 (7)
Pre-university education		50.0 (17)	50.0 (17)
Secondary vocational education		5.9 (2)	8.8 (3)
Higher professional education		5.9 (2)	11.8 (4)
No current education		0.0 (0)	2.9 (1)
Depressive symptoms (PHQ-9), *M (SD)*	34	4.21 (2.54)	4.82 (3.42)
Intolerance of Uncertainty (IUS), *M (SD)*	32	30.28 (6.59)	-
Positive affect[a], *M (SD)*	34	5.56 (.66)	5.54 (.75)
Negative affect[a], *M (SD)*	34	1.40 (.48)	1.44 (.47)
Parental warmth – mother[a], *M (SD)*	34	5.80 (.86)	5.70 (1.11)
Parental warmth – father[a], *M (SD)*	34	5.73 (1.14)	5.81 (1.11)
Parental criticism – mother[a], *M (SD)*	34	2.01 (.91)	2.15 (1.10)
Parental criticism – father[a], *M (SD)*	34	1.92 (.92)	1.97 (1.15)

[a]person-mean

Procedure

Recruitment of the participants was done via social media, advertisements, and flyers, with a specific focus on the inclusion of *both* parents (i.e., mothers *and* fathers). The focus was on primary caregivers, so not only biological parents could participate, but also stepparents and guardians, as long as they played an important role in the upbringing of the adolescent. Interested families could sign-up for the study via the website or mail and received information letters. Approximately two weeks later families were contacted by phone by one of the researchers to provide them with more information and check the inclusion criteria. If all criteria were met, families could participate in the study. All participants signed informed consent (including consent to contact them to request to participate in follow-up

research). In addition, for adolescents younger than 16 years of age, both parents with legal custody signed informed consent.

The families completed the EMA in the period between September 2018 and November 2019 with EMA not taking place during holidays and exam weeks of the adolescent. Instructions on the EMA were given face-to-face prior to the baseline assessment and researchers assisted with installing the Ethica app (Ethica Data Service Inc, 2019) on the smartphone of the adolescent and both parents. Each family member also received written instructions and their individual account information. For participation in the EMA, parents received €20,- and adolescents €10,-. In addition, four gift vouchers of €75,- were raffled based on compliance.

All families who participated at baseline were invited for the follow-up in April 2020. The follow-up assessment was announced in a newsletter followed by a personal e-mail, and reminders were sent to parents and adolescents who had not responded yet. Parents and adolescents who agreed to participate were sent an online questionnaire on demographic characteristics and general mental well-being. Thereafter, participants received written instructions on how to download and reinstall the Ethica app. EMA data collection took place one month into the lockdown, from April 14th to April 28th. For participation in the follow-up assessment, parents received €20,- and adolescents €10,- in gift vouchers. The current study focusses on the EMA data of the baseline assessment (2018-2019) and the follow-up assessment (2020).

The RE-PAIR study was approved by the Medical Ethics Committee of Leiden University Medical Center (LUMC) in Leiden, the Netherlands (NL62502.058.17) and the follow-up assessment 'RE-PAIR during the COVID-19 pandemic' was approved by the Psychology Research Ethics Committee of Leiden University in Leiden, the Netherlands (2020-03-30-B.M. Elzinga-V2-2334).

EMA

The EMA procedures and set-ups were almost entirely similar at baseline and during the COVID-19 pandemic and consisted of filling out questionnaires at four timepoints per day, for 14 consecutive days on parents' and adolescents' own smartphones using the mobile app Ethica (Ethica Data Service Inc, 2019). At all timepoints participants completed questions about their affect and how they experienced contact with the last person they interacted with. Detailed information on the concepts in the questionnaires, triggering schedules, differences in set-up, number of items and completing time, and monitoring process can be found in S2 Text.

Compliance

The overall response rate at baseline was 81.0%. Adolescents completed 74.2% of the EMA questionnaires at baseline (M = 41.56 completed, SD = 9.21, Min/Max = 12/54). Parents completed 84.1% of the EMA questionnaires at baseline (M = 47.12 completed, SD = 6.32, Min/Max = 29/56). The overall response rate during the COVID-19 pandemic was 72.1%. Adolescents completed 64.6% of the EMA questionnaires during the COVID-19 pandemic (M = 36.18 completed, SD = 13.71, Min/Max = 8/54). Parents completed 75.9% of the EMA questionnaires during the COVID-19 pandemic (M = 42.49 completed, SD = 9.17, Min/Max = 21/56). No participants were excluded based on EMA compliance.

EMA measures

Affect

Momentary affect states of parents and adolescents were assessed four times per day with a slightly adapted and shortened four-item version of the Positive and Negative Affect Schedule for Children (PANAS-C; Ebesutani et al., 2012; Watson et al., 1988). At each timepoint participants were asked "How do you feel at the moment?" followed by two positive affect states "Happy" and "Relaxed", and two negative affect states "Sad" and "Irritated". Each affect state was rated on a 7-point Likert scale, ranging from 1 (*not at all*) to 7 (*very*). A mean score of the positive affect state was calculated per moment to create a momentary PA scale and a mean score of the negative affect state was calculated per moment to create a momentary NA scale. A higher score represented higher levels of PA or NA.

Daily parenting

In the last questionnaire of each day, adolescents were asked to indicate with whom they spoke during that day (i.e., mother, father, stepmother, stepfather), and if so, to rate each parent's warmth and criticism by answering the questions "Throughout the day, how warm/loving was your parent towards you?" and "Throughout the day, how critical was your parent towards you?" on a 7-point Likert scale ranging from 1 (*not at all*) to 7 (*very*). If adolescents only reported on mother and stepfather for instance throughout the EMA, scores about stepfathers were recoded as father. This was the case for two adolescents during the baseline and three adolescents during the COVID-19 pandemic. One adolescent reported on four caregivers (i.e. biological parents and stepparents) during both periods and we included scores about biological parents because these were mostly rated.

In the questionnaire at the end of each day parents also had to indicate whether they spoke to their child (i.e., the participating adolescent) and if so, to rate their own behavior towards their child by answering the questions "How warm/loving were you towards your child?" and "How critical were you towards your child?" on a 7-point Likert scale ranging from 1 (*not at all*) to 7 (*very*). Both for adolescent and parent report, a higher score represented more warmth and more criticism.

Daily difficulties and helpful activities

To assess the difficulties and helpful activities during the COVID-19 pandemic, at the end of each day, participants were asked to choose items from a list of potential activities. Parents and adolescents could select almost similar activities and it was possible to give multiple answers. The list of potential daily difficulties consisted of: boredom, fights/conflicts, work (for parents)/homework (for adolescents), irritations with family members, noise disturbance, loneliness, missing social contact with friends, worries about own health, worries about health of others, concerns about the coronavirus in general, coronavirus-related news items or 'anything else, namely…'. The list of potential helpful activities consisted of: work (for parents)/homework (for adolescents), watching series/television, listening to music, gaming, social media, reading a book, sports, chilling, online contact with relatives or friends, being together with the family, card or board games, DIY or crafts, cooking/dining, 'anything else, namely'. Based on the total number of observed responses a top 5 of daily difficulties and helpful activities was composed. Percentages were calculated by dividing the number of observed responses on one activity by the total of given answers.

Questionnaires

Intolerance of uncertainty

The 12-item version of the Intolerance of Uncertainty Scale (IUS; Carleton et al., 2007) was used to assess IU of parents and adolescents. Participants completed this questionnaire online prior to baseline. The 12 items of the IUS (e.g., "Uncertainty makes me uneasy, anxious, or stressed." or "I should be able to organize everything in advance.") were answered on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). A higher sum score represents higher levels of intolerance of uncertainty. Both the original and the 12-item version of the IUS appear to have satisfactory concurrent, discriminant, and predictive validity (Khawaja & Yu, 2010). Internal consistency of the scale was good with a Cronbach's alpha of .81 for adolescents and .83 for parents.

Depressive symptoms

The Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001)) was used to screen for the presence of depressive symptoms during the past two weeks. Depressive symptoms were assessed at both timepoints. The items are based on nine DSM-IV criteria for depression and are scored as 0 (*not at all*) to 3 (*nearly every day*). The PHQ-9 has been validated for use in primary care. Sum scores range from 0 to 27 and a score above 10 is suggestive of the presence of depression (Manea et al., 2012). For parents, the Cronbach's alpha at baseline was .79 and during the COVID-19 pandemic .73. For adolescents, Cronbach's alpha at baseline was .53 and during the COVID-19 pandemic .76.

Strategy of analyses

Parents and adolescents reported repeatedly on positive affect, negative affect, parental warmth, and parental criticism at baseline and during the COVID-19 pandemic. These repeated measures (Level 1) were nested within individuals (Level 2). Given this nested structure of the data, multilevel modelling (Hox et al., 2010) was used for the main analyses. Models were specified in R Version 3.6.1 (R Core Team, 2019), using the multilevel version 2.6 (Bliese, 2016) package to test our hypotheses with maximum likelihood (ML) estimation. Level 2 predictors were grand-mean centered, following guidelines proposed by Hoffman (2015) and Bolger and Laurencea (2013).

To evaluate within-person change in positive affect, negative affect, parental warmth, and parental criticism from baseline to the COVID-19 pandemic, a series of models were tested. Separate models were tested per outcome and per informant (adolescents and parents), resulting in a total of 8 models. Per model, several similar steps were taken. First, we specified an unconditional random intercept model with covariance structure (Model 1). For more information on the selection of covariance structure and results see S3 Text. Second, we added period as predictor (Model 2), which was scored 0 (baseline) and 1 (during the COVID-19 pandemic) to model change. For example, to model change in positive affect, we specified period as the predictor and positive affect as the outcome. The intercept of the model estimates is positive affect score at baseline and the slope of the model is the estimated change from baseline to during the COVID-19 pandemic. Fourth, we added a random effect (Model 3) indicating that the change from baseline to during the COVID-19 pandemic could vary between persons. Significant changes in model fit were tested with likelihood ratio tests (following guidelines of Hox et al. 2010). Fifth, we examined whether the changes were predicted by IU by adding a main effect of IU (Model 4). In the models on parental warmth and parental criticism

gender of parents was also added to the model as main effect to test for possible gender differences. In the final model (Model 5), we also added an interaction term of IU with period to test the possible moderating role of IU.

Since two parents of a same family could participate in the study, a third level (family) was specified in all models including parents (Model 1b). To not overcomplicate our models, we tested whether adding family level (Level 3) to Model 1 for parents improved the model fit based on the likelihood ratio tests. Only if these tests were significant, the third level remained in the model. Since adolescents could report on parenting of fathers and mothers, family was specified as extra level in the models concerning parental warmth and parental criticism reported by adolescents (Model 1b). For adolescents, answers on father and mother (Level 2) are nested within adolescents (Level 3). We tested whether adding parent level (Level 2) to Model 1 for adolescents improved the model fit based on the likelihood ratio tests. If these tests were significant, the second level remained in the model.
We used two-tailed tests with an $\alpha = 0.05$. The analytic plan for this study was uploaded to Open Science Framework prior to the analyses (preregistered at April 27th, osf.io/34ycu).

Results

Sample description

In the current study, 67 Dutch parents (age range during the COVID-19 pandemic: 36.25-71.04 years) and 34 adolescents (age range during the COVID-19 pandemic: 14.66-19.01 years) participated. Participant characteristics can be found in Table 1. The sample reported little to none depressive symptoms as measured with the PHQ-9. PHQ-9 scores of adolescents ranged between 0-9 at baseline and between 0-16 during the COVID-19 pandemic. PHQ-9 scores of parents ranged between 0-16 at baseline and between 0-16 during the COVID-19 pandemic. Levels of depressive symptoms did not differ between the two periods for adolescents ($t = 1.11$, $df = 33$, $p = .275$) and parents ($t = 1.24$, $df = 67$, $p = .221$). Information on household composition of participating families can be found in S3 Text. Correlations between study variables (gender, age, affect, parenting behavior, and IU) can be found in S5 Table (parents) and S6 Table (adolescents).

Situational description of the families during the COVID-19 pandemic

Parents

Of all parents, 91% ($n = 61$) were currently employed, 6% ($n = 4$) were unemployed and 3% ($n = 2$) were unable to work or lost their job due to the COVID-19 pandemic. During the 14 days of EMA, 53.7% of the parents who were employed worked more from home, 7.5% worked less from home and 38.8% worked just as much from home as compared to the period before the COVID-19 pandemic. All parents indicated owning a house with a garden and having a living surface >100m2. Of our sample, 17.9% ($n = 12$) of the parents reported having COVID-19 related symptoms during the 14 days of EMA.

During the COVID-19 pandemic, the most reported daily difficulties across the 14 days of EMA for parents were (1) missing social contact with friends (14.6%), (2) concerns about the coronavirus in general (13.5%), (3) irritations with family members (12.8%), (4) worrying about health of others (8.3%), and (5) coronavirus-related news items (8.0%). It was also asked daily which activities were helpful during the day. The top 5 of helpful activities reported by parents was (1) being together

with family (20.0%), (2) cooking/dining (14.4%), (3) watching television/series (9.9%), (4) work (7.4%), and (5) online contact with relatives or friends (6.2%).

Adolescents

Due to the COVID-19 pandemic all national final school exams were canceled and some high schoolers already graduated (or not) based on their prior school exams, 5 (21.7%) adolescents graduated promptly in March 2020 prior to the 14 days of EMA. Of our adolescent sample, one person reported having COVID-19 related symptoms during the 14 days of EMA.

For adolescents (n = 34) the top 5 daily difficulties was (1) boredom (22.9%), (2) missing social contact with friends (17.7%), (3) irritations with family members (13.1%), (4) homework (12.3%), and (5) worry about the health of others (6.4%). The top 5 helpful activities for adolescents were (1) chilling (12.9%), (2) watching television/series (11.4%), (3) online contact with relatives or friends (11.0%), (4) listening to music (10.8%), and (5) being together with the family (9.6%).

Affect during the COVID-19 pandemic versus baseline

Affect: parent reports

First, an unconditional means model of negative affect with the intercept only was built (referred to as 'Model 1'- complete model results of parents can be found in S7 Table, model fit statistics of parents can be found in S8 Table). The intraclass correlation coefficient (ICC) was .31 on the person level, indicating that moderate concordance of negative affect across time points within persons existed. Next, family was added as level to the unconditional means model (Model 1b). The ICC of the family level was .11, which indicates that some concordance of negative affect existed within families. However, the model fit did not improve significantly ($\chi2$(1) = 1.581, p = .209) and family level was therefore removed from the model.

Next, in Model 2, we tested change in negative affect from baseline to during the COVID-19 pandemic by adding period to the model. Parents reported more negative affect during COVID-19 pandemic as compared to the baseline (B = 0.096, SE = .025, df = 5982, t = 3.900, p < .001). Adding individual variance in Model 3 improved the model fit significantly ($\chi2$(2) = 56.613, p < .001). In Model 4, we added IU which was significantly associated with negative affect (B = 0.022, SE = .010, df = 62, t = 2.075, p = .042) indicating that more IU was related to more negative affect (main effect). Lastly, we added IU as moderator in Model 5 and results of this final model are presented in Table 2. No moderating effect of IU was found (B = 0.002, SE = .007, df = 5752, t = 0.225, p = .822) and IU was no longer significantly associated with negative affect (B = 0.021, SE = .011, df = 62, t = 1.960, p = .054), but period remained significantly associated with negative affect. Results are shown in Fig 2.

For positive affect, the same steps were followed. Model 1 showed an ICC of .32 and adding family level (Model 1b) did not significantly improve the model fit ($\chi2$(1) = 0.738, p = .390). Results of Model 2 showed that parents' positive affect did not differ across the two periods (B = 0.012, SE = .028, df = 5986, t = 0.404, p = .686). Adding individual variance in Model 3 improved the model fit significantly ($\chi2$(2) = 122.186, p < .001). In Model 4 IU was added as a main effect, but no significant association with positive affect was found. Lastly, IU was added as moderator in Model 5, but no moderating effect of IU was found (B = -0.008, SE = .009, df = 5756, t = -0.823, p = .411). Results of this final model are presented in Table 2.

Table 2. Results of Final Model 5 on the relation between period and affect and the moderating role of Intolerance of Uncertainty in parents.

	Model 5: negative affect				Model 5: positive affect			
	B	*SE*	*t*	*p*	*B*	*SE*	*t*	*p*
Intercept	1.539	.069	22.224	< .001	5.321	.081	65.657	< .001
Period (baseline vs COVID-19)	0.105	.043	2.422	.016	-0.002	.060	-0.040	.968
IU	0.021	.011	1.960	.054	-0.015	.013	-1.177	.244
IU*Period	0.002	.007	0.225	.822	-0.008	.009	-0.823	.411
Random effects								
Between-person variance	0.288				0.397			
Within-person variance	0.635				0.768			
Random effect variance	0.082				0.182			
N parents	64				64			
N observations	5818				5822			

Note. 64 parents are included in these models since 3 parents did not complete the IUS.

Affect: adolescent reports

In Model 1, the ICC of negative affect on the person level was .32 (complete model results of adolescents can be found in S9 Table, model fit statistics of adolescents can be found in S10 Table). Results of Model 2 showed that there was no significant change in adolescent negative affect (B = 0.016, SE = .027, df = 2618, t = 0.595, p = .552). Adding individual variance in Model 3 improved the model fit significantly ($\chi 2(2) = 39.759$, p <.001). In Model 4, we added IU as a main effect which was significantly associated with negative affect (B = 0.030, SE = .011, df = 30, t = 2.737, p = .010) indicating that more IU was related to more negative affect. IU was added as moderator in Model 5 and IU remained significantly associated with negative affect, but no moderating effect of IU was found (B = -0.006, SE = .008, df = 2463, t = -0.803, p = .422). Results of this final model are presented in Table 3. Results are shown in Fig 2.

For positive affect in Model 1, the ICC on the person level was .33. No significant change in adolescent positive affect (B = 0.025, SE = .043, df = 2618, t = 0.574, p = .566) was found in Model 2. Adding individual variance in Model 3 improved the model fit significantly ($\chi 2(2) = 103.798$, p < .001). In Model 4, we added IU as main effect, which was significantly associated with positive affect (B = -0.044, SE = .015, df = 30, t = -2.917, p = .007), indicating that more IU was related to less positive affect. IU was added as moderator in Model 5, IU remained significantly associated with positive affect, but no moderating effect of IU was found (B = -0.003, SE = .017, df = 2463, t = -0.199, p = .842). Results of this final model are presented in Table 3.

Table 3. Results of final Model 5 on the relation Between period and affect and the moderating role of Intolerance of Uncertainty in adolescents.

	Model 5: negative affect				Model 5: positive affect			
	B	*SE*	*t*	*p*	*B*	*SE*	*t*	*p*
Intercept	1.419	.078	18.201	< .001	5.516	.106	52.223	< .001
Period (baseline vs COVID-19)	0.032	.052	0.626	.532	-0.008	.111	-0.075	.940
IU	0.034	.012	2.827	.008	-0.043	.016	-2.626	.014
IU*Period	-0.006	.008	-0.803	.422	-0.003	.017	-0.199	.842
Random effects								
Between-person variance	0.183				0.333			
Within-person variance	0.391				0.675			
Random effect variance	0.060				0.339			
N adolescents	32				32			
N observations	2497				2497			

Note. 32 adolescents are included in these models since 2 adolescents did not complete the IUS.

Figure 2. Association between negative affect and IU grouped per period for parents (left) and adolescents (right).

Parenting: parent reports

In Model 1, the ICC of parental criticism on the person level was .39 (complete model results of parents can be found in S7 Table, model fit statistics of parents can be found in S8 Table). Adding family level (Model 1b) did significantly improve the model fit ($\chi 2(1) = 5.430$, $p = .020$) with an ICC of .20 at the family level and 'family' remained in the model. Results of Model 2 showed that no difference in parental criticism between baseline and during the COVID-19 pandemic was found ($B = 0.126$, $SE = .064$, $df = 1530$, $t = 1.963$, $p = .050$). Adding individual variance in Model 3 improved the model fit significantly ($\chi 2(4) = 39.527$, $p < .001$). In Model 4, we added IU and gender of the parent as main effects. Both were not significantly associated with parental criticism. IU was added as moderator in Model 5, but no moderating effect of IU was found ($B = -0.013$, $SE = .014$, $df = 1466$, $t = -0.944$, $p = .346$). Results of this final model are presented in Table 4.

For parental warmth in Model 1, the ICC on the person level was .46 and adding family level (Model 1b) did not significantly improve the model fit ($\chi 2(1) = 0.761$, $p = .383$). No significant change in parental warmth ($B = 0.010$, $SE = .038$, $df = 1530$, $t = 0.255$, $p = .799$) was found in Model 2. Adding individual variance in Model 3 improved the model fit significantly ($\chi 2(2) = 22.499$, $p < .001$). In Model 4, we added IU and gender of parent and both were not significantly associated with parental warmth. IU was added as moderator in Model 5, but no moderating effect of IU was found ($B = 0.004$, $SE = .008$, $df = 1466$, $t = .489$, $p = .625$). Results of this final model are presented in Table 4.

Table 4. Results of final Model 5 on the relation between period and daily parenting behavior and the moderating role of Intolerance of Uncertainty in parents.

	Model 5: parental criticism				Model 5: parental warmth			
	B	*SE*	*t*	*p*	*B*	*SE*	*t*	*p*
Intercept	2.363	.165	14.313	< .001	5.588	.110	50.808	< .001
Period (baseline vs COVID-19)	0.131	.112	1.169	.243	0.027	.055	0.499	.618
Gender	0.113	.178	0.636	.530	0.064	.157	0.405	.687
IU	-0.004	.018	-0.250	.805	-0.019	.013	-1.419	.161
IU*Period	-0.013	.014	-0.944	.346	0.004	.008	0.489	.625
Random effects								
Between-person variance	0.455				0.429			
Within-person variance	1.146				0.428			
Random effect variance	0.141				0.104			
Family variance	0.462							
Random effect variance	0.238							
N families	37							
N parents	64				64			
N observations	1532				1532			

Note. 64 parents are included in these models since 3 parents did not complete the IUS.

Parenting: adolescent reports

In Model 1, the ICC of parental criticism on the person level was .45 (complete model results of adolescents can be found in S9 Table, model fit statistics of adolescents can be found in S10 Table). Adding family level (Model 1b) did not significantly improve the model fit ($\chi 2(1) = 2.925$, $p = .087$). Results of Model 2 showed that the change in reports on parental criticism between baseline and during the COVID-19 pandemic was not significant ($B = 0.036$, $SE = .062$, $df = 1350$, $t = 0.576$, $p = .565$). Adding individual variance in Model 3 improved the model fit significantly ($\chi 2(2) = 53.931$, $p < .001$). In Model 4, we added IU and gender of parent as main effects. Gender of parent was significantly associated with reports on parental criticism ($B = -0.121$, $SE = .058$, $df = 1268$, $t = -2.099$, $p = .036$), indicating that adolescents reported more parental criticism of mothers than fathers. IU was not significantly associated with parental criticism. IU was added as moderator in Model 5, but no moderating effect of IU was found ($B = 0.028$, $SE = .021$, $df = 1267$, $t = 0.083$, $p = .934$). Results of this final model are presented in Table 5. Gender of parents remained significantly associated with parental criticism.

For parental warmth in Model 1, the ICC on the person level was .60 and adding family level (Model 1b) did significantly improve the model fit ($\chi 2(1) = 25.314$, $p < .001$) with an ICC of .05 at the family level and family remained in the model. No significant change in parental warmth ($B = 0.026$, $SE = .051$, $df = 1317$, $t = 0.500$, $p = .617$) was found in Model 2. Adding individual variance in Model 3 improved the model fit significantly ($\chi 2(4) = 74.831$, $p < .001$). In Model 4, we added IU and gender of parent and both were not significantly associated with parental warmth. IU was added as moderator in Model 5, but no moderating effect of IU was found ($B = 0.002$, $SE = .021$, $df = 1267$, $t = 0.083$, $p = .934$). Results of this final model are presented in Table 5.

Table 5. Results of final Model 5 on the relation between period and daily parenting behavior and the moderating role of Intolerance of Uncertainty in adolescents.

	Model 5: parental criticism				Model 5: parental warmth			
	B	*SE*	*t*	*p*	*B*	*SE*	*t*	*p*
Intercept	2.043	0.158	12.970	< .001	5.710	.170	33.528	< .001
Period (baseline vs COVID-19)	0.120	0.137	0.878	.380	-0.038	.113	-0.334	.738
Gender parent	-0.121	0.058	-2.099	.036	0.014	.077	0.186	.854
IU	0.028	0.024	1.172	.251	-0.031	.026	-1.203	.238
IU*Period	0.002	0.021	0.083	.934	-0.010	.017	-0.594	.553
Random effects								
Between-person variance	0.714				0.789			
Within-person variance	0.765				0.503			
Random effect variance	0.476				0.310			
Parent variance					0.110			
Random effect variance					0.026			
N adolescents	32				32			
N parents					63			
N observations	1302				1302			

Note. 32 adolescents are included in these models since 2 adolescents did not complete the IUS.

Post hoc analyses on increase in parents' negative affect during the COVID-19 pandemic

As IU did not explain why parents reported more negative affect during COVID-19 pandemic as compared to the baseline, we did some post hoc analyses to examine whether characteristics related to the lockdown and the COVID-19 pandemic were associated with the increase of parents' negative affect. Living surface, income, having suffered from COVID-19 symptoms, helping children with school at home, working from home, going to work, daily difficulties during the past two weeks of COVID-19, and working with COVID-19 patients were examined (see S11 Table and S12 Table for description of the EMA items). None of these characteristics were related to the increase of parents' negative affect during the COVID-19 pandemic as compared to the baseline (all *p*-values < .001).

Discussion

In this study we (1) explored parents' and adolescents' daily difficulties and helpful activities during the COVID-19 pandemic (2) examined positive and negative affect of both parents and adolescents during 2 weeks of the COVID-19 pandemic and compared them to a 2-week baseline period pre-pandemic, (3) examined parenting behaviors (assessed by both the adolescent and the parent) and compared parental warmth and criticism towards the adolescent during 2 weeks of the COVID-19 pandemic and a 2-week baseline period, (4) examined whether parents' and adolescents' levels of IU at baseline are associated with affect and parenting in general, and (5) as well as with the hypothesized changes in affect and (perceived) parental warmth and criticism .

Subjective experience of the COVID-19 pandemic

Most importantly, both parents and adolescents were bothered by a lack of social contact with friends, by irritations with family members, and worried about the health of others. This might be a logical consequence of the lockdown and social distancing. Remarkably, adolescents struggled with boredom whereas this was not the case for parents. Parents worried about the coronavirus in general, while this did not bother adolescents that much. In response to social distancing, online contact with relatives or friends aided both parents and adolescents to cope with the situation. In addition, watching tv-shows was also mentioned as a helpful activity by parents and adolescents. Other activities that helped to cope with the situation varied across parents and adolescents. While parents reported to benefit from being together with family and cooking and dining, adolescents reported chilling and listening to music.

Negative affect

Previous studies have shown that quarantine and quarantine-related issues (i.e., financial insecurity, fear of infection, uncertainty about duration) in general have a negative influence on adult mood and mental well-being (Brooks et al., 2020). Therefore, it was expected that the COVID-19 pandemic and lockdown would increase negative affect and decrease positive affect as compared with a period before the lockdown. Our results show that, indeed, parents' negative affect increased as compared to the period before the lockdown. Important to note is that we collected data during 5th and 6th week of the lockdown in the Netherlands with only minor prospects of easing regulations. We also explored whether other pandemic-related characteristics (i.e. living surface, income, relatives with COVID-19,

hours of working at home, helping children with school and contact with COVID-19 patients at work) were linked to the increase of negative affect in parents. This was not the case.

Our findings suggested however the presence of heterogeneity among individuals. All our models improved significantly when allowing the associations between period (2 weeks of the COVID-19 pandemic versus a similar 2-week baseline period) and affect and parenting behavior to vary across individuals, which is in line with the theoretical notion of differential susceptibility (e.g., Pluess & Belsky, 2010). Whether or not parents and adolescents experience (emotional) problems during lockdown can clearly vary from household to household, suggesting that in general families seem to be able to adapt to the circumstances, but that some families struggle. This is important to keep in mind for potential future measures of social distancing.

It was expected that the forced social distance during the COVID-19 pandemic and particularly the physical distance from friends and peers and the school closure would result in an increase of negative affect and decrease of positive affect in adolescents (see also Loades et al. [50]). Yet, in our study, no differences in adolescent reports on negative affect were found during the COVID-19 pandemic as compared to a baseline period. As for adults, the opportunities for adolescents of online social interaction might have buffered feelings of isolation or loneliness and bolstered mental well-being during the COVID-19 pandemic (Doré et al., 2017). Moreover, it should be noted that our sample is considered healthy on average, based on the PHQ-9 scores, and lived in relatively favorable circumstances (e.g., high socioeconomic status). Affect of adolescents with (subclinical) mental health issues (e.g. depressive or anxiety symptoms) or living under less fortune circumstances might be more influenced during the COVID-19 pandemic. Therefore, it is important to examine the effect of the COVID-19 pandemic in clinical samples to elucidate its effect on psychopathology. Moreover, it should be noted that our assessments were in the rather poignant phase of social lock down, when school closings may also have yielded relief for some adolescents. Even though individuals thrive to become independent during adolescence and start to explore the environment outside family household (Steinberg, 2005; Steinberg & Silk, 2002) this period of enforced proximity did not seem to affect adolescents on the short-term. Potentially, the endurance of the lockdown may have more detrimental effects on adolescent well-being.

Positive affect

Not for parents nor for adolescents, a change in positive affect was found. Despite the increase of stress and uncertainty around the COVID-19 pandemic, disasters such as a pandemic also might increase the sense of social connectedness and morality (Bavel et al., 2020). This sense of shared social identity and the feeling of 'we are all in this together' can be related to positive affect (Fredrickson, 2001), which could explain why positive affect did not decrease in the present study. In families, as in our sample, no one was home alone, and one could still have online social interactions with others outside the household. To that end, 'physical distancing' might be a better term for the imposed social isolation or social distance, as was previously suggested in literature (Bavel et al., 2020)

Parenting

As mentioned before, the COVID-19 pandemic and the related lockdown may lead to more tension, irritability, and family conflicts or worse (Bavel et al., 2020). Notably, parent' affect and parenting

behavior are interrelated and are both involved in giving comfort, expressing approval or expressing criticism (Dix, 1991; Rueger et al., 2011). For instance, parents who worry more, express more criticism towards their adolescents, indicating that a negative affect promotes insensitive and in more extreme cases abusive parenting behavior, whereas positive affect strongly relates to supportive parenting (Dix, 1991; Rueger et al., 2011). Regarding parenting behaviors, we therefore expected higher levels of parental criticism and lower levels of parental warmth during the COVID-19 pandemic as compared to baseline. We found, however, that parental warmth and criticism from both parent and adolescent perspective, did not differ between before and during the COVID-19 pandemic. Interestingly, even though negative affect of parents increased compared to the period before lockdown, this did not seem to affect parenting behavior (self-report and perceived by the adolescent). It should be noted that, in general, adolescents perceived their mothers as more critical compared with fathers, unrelated to measurement period. This might be due to the unique roles of mothers and fathers in caregiving and setting rules and boundaries (Lamb & Lewis, 2013; Van Lissa et al., 2019)

Intolerance of uncertainty (IU)

Results showed that IU was related to more negative affect in both parents and adolescents, independent of the period of assessment. Furthermore, in adolescents, IU was also linked to a decrease in positive affect, while for parents no link between IU and positive affect was found. It was expected that people with elevated IU levels might experience even greater distress under the COVID-19 circumstances as compared to baseline, however our results do not support this. IU is often described as a predisposition to negatively perceive and respond to uncertain information and situations, irrespective of its probability and outcomes (Ladouceur et al., 1998; Ladouceur et al., 2000). Apparently, it is negatively associated with affect in daily life, regardless of whether there are major threats and uncertainties, or more daily hassles. Future research could elucidate why IU may particularly dampen positive affect in adolescents and not in adults. Even though IU seems to relate to affect of parents and adolescents, it did not seem to spill over into parenting behaviors. These results give a first indication that IU also relates to more micro processes in daily life, for both adolescents and parents.

Strengths, limitations, and remarks

Firstly, the intensive longitudinal study design with multiple assessments per day enabled us to gain more fine-grained insights in affect and parenting behaviors in daily life and to consider individual differences. Secondly, assessment during two periods, before and during the COVID-19 pandemic, allowed us to detect changes due to the COVID-19 pandemic. Next to the strengths, it should be acknowledged that the sample (67 parents and 34 adolescents) was relatively small. Second, it should be noted that the study sample consisted of overall healthy, well-functioning parents and adolescents. That is, adolescents were screened at baseline and were excluded if they had a current mental disorder, a history of psychopathology in the past two years, or a lifetime history of major depressive disorder or dysthymia. Moreover, the PHQ-9 scores of adolescents and parents indicated few depressive symptoms. Therefore, findings might not be applicable to adolescents and parents with (sub)clinical mental health problems or at-risk populations (e.g. refugees, low socioeconomic status), since these groups might be at increased risk of problems such as loneliness, negative affect or

negative parenting practices during the COVID-19 pandemic. Lastly, it should be noted that information on long-term consequences of lockdown during the COVID-19 pandemic is lacking.

Prior research has suggested that the impact of stress can be altered by mindsets and appraisals of stressful events (Bavel et al., 2020; Dienstbier, 1989; Jamieson et al., 2018). These factors could possibly explain the individual variations we found. For instance, people with low expectations of the course of events might adapt relatively well to new situations and, therefore, experience little emotional problems. Moreover, adaptive mindsets about stressful events might increase positive emotions and reduce negative health symptoms (Crum et al., 2017). Considering these factors in future studies might be useful to elucidate individual differences in risk and resilience.

Conclusion

In our study parents, but not adolescents, showed an increase of negative affect in a two-week period (14-28 April 2020) during the COVID-19 pandemic compared with a similar two-week baseline period pre-pandemic. Positive affect and parenting behaviors 'warmth' and 'criticism' did not change. It can be concluded that, on average, parents and adolescents in our sample seem to deal fairly well with the circumstances. Individuals and families differed however to what extent the COVID-19 pandemic influenced their affect and (perspective of) parenting behavior. Living surface, income, having suffered from COVID-19 symptoms, helping children with school at home, working from home, going to work, difficulties during COVID-19, and working with COVID-19 patients did not explain the increase of parental negative affect.

Policy makers and mental health professionals working to prepare for potential disease outbreaks should be aware that the experience of being quarantined might affect individuals differently. Each parent and adolescent could therefore benefit from a different coping strategy, as 'one size does not fit all'. Providing easily accessible and safe ways to increase online contact for all ages and layers of society, recommending to search for distraction such as listening to music or watching television, and helping to accept the uncertain situation are for instance potential coping strategies. In this way, individuals can find ways that suit their own personal needs in order to benefit their well-being in times of a lockdown and social distancing measures.

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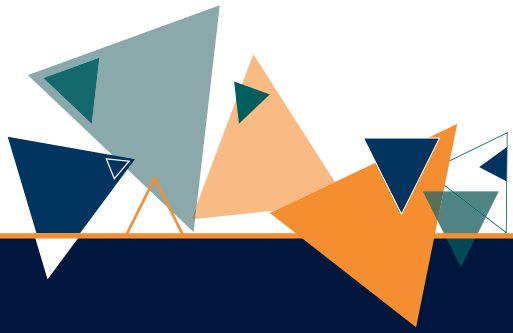
5

Perceptions of parenting in daily life: Adolescent-parent differences and associations with adolescent affect



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Abstract

Adolescents can perceive parenting quite differently than parents themselves and these discrepancies may relate to adolescent well-being. The current study aimed to explore how adolescents and parents perceive daily parental warmth and criticism and whether these perceptions and discrepancies relate to adolescents' daily positive and negative affect. The sample consisted of 80 adolescents (M_{age} = 15.9; 63.8% girls) and 151 parents (M_{age} = 49.4; 52.3% women) who completed four ecological momentary assessments per day for 14 consecutive days. In addition to adolescents' perception, not parents' perception by itself, but the extent to which this perception differed or overlapped with adolescents' perception was related to adolescent affect. These findings highlight the importance of including combined adolescents' and parents' perspectives when studying dynamic parenting processes.

Keywords: parenting, experience sampling method (ESM), daily life, discrepancies, adolescent affect, perception

Introduction

Although an important developmental task for adolescents is to become more autonomous and independent, a warm and supportive relationship with parents remains key for adolescent mental health (Steinberg & Silk, 2002). What a warm and supportive relationship with parents entails, however, is not so clear-cut, as adolescents and parents can perceive or experience parenting behavior quite differently. For instance, an adolescent might perceive the parent as critical or even rejecting, while the parent may experience his or her own behavior as constructive. Differences between these perspectives of parenting (also referred to as incongruence or discrepancies) have been found to relate to adolescent mental well-being (De Los Reyes et al., 2019; Hou et al., 2019). Most research on discrepancies in parenting in general as well as in relation to adolescent well-being, however, is based on retrospective self-report questionnaires, with recall bias possibly affecting these reports. Moreover, most previous studies focused on cross-sectional or longitudinal designs with macro time intervals (i.e., months or years), while parenting processes evolve dynamically within a family and may change in the daily flow of life (Keijsers & Van Roekel, 2018). It remains unclear to what extent adolescents' and parents' perspectives of parenting differ on a more micro-level (i.e., on a daily basis) and whether and how these relate to fluctuations in adolescent affect. While changes in mood, such as increases in negative mood and mood instability, can represent normative development for adolescents, it could also be a precursor for psychological problems such as internalizing problems (Maciejewski et al., 2019; Maciejewski et al., 2017). Therefore, the current study aimed to describe how adolescents and their parents (both mothers and fathers) perceive parenting behavior in daily life based on intensive longitudinal data collection, using ecological momentary assessments (EMA; Stone & Shiffman, 1994). Additionally, it was explored whether adolescents' and parents' perceptions of daily parenting and discrepancies between these perspectives were related to adolescent daily positive and negative affect.

Adolescent and Parent Perceptions of Parenting Behavior

Recent meta-analyses (Hou et al., 2019; Korelitz & Garber, 2016), based on studies using retrospective reports of parenting, have shown that differences between adolescents' and parents' perceptions of parenting are quite common. That is, convergence between parent and adolescent reports of several aspects of parenting behavior (i.e., warmth, psychological control) is generally low, with only small correlations between reports of adolescents and parents. Overall, parents view their own parenting behavior as more favorable (more supportive and less negative) than adolescents (De Haan et al., 2018; Hou et al., 2019; Korelitz & Garber, 2016). Moreover, parent-adolescent dyads can also vary substantially, with some dyads reporting only few differences while other dyads differ widely in their perceptions (e.g., De Los Reyes et al., 2010; De Los Reyes & Ohannessian, 2016; Lippold et al., 2013). To date, it is unclear to what extent the findings on discrepancies based on macro-scale retrospective reports can be generalized to daily life. Furthermore, most existing research has focused on the mother-adolescent dyad, while the family systems theory argues that adolescent-mother and adolescent-father dyads represent distinct but related subsystems (Restifo & Bögels, 2009). Research suggests also that mothers and fathers serve different and unique roles in parenting their adolescents (e.g., Lamb & Lewis, 2013). Mother-child relationships have been characterized by warmth and

support, whereas fathers seem to provide more instrumental care (Youniss & Smollar, 1985). Studies indeed showed that mothers are more emotion-directed and supportive than fathers during adolescence (De Goede et al., 2009; Mastrotheodoros et al., 2018). However, parenting studies including fathers are scarce, let alone research on daily parenting. Therefore, the first aim of the current study was to describe adolescents' and both mothers' and fathers' perceptions of parenting in daily life, and potential discrepancies between them. During adolescence, parenting characterized by warm and supportive behavior contributes to the development of a positive self-view, while parenting characterized by criticism and rejection engenders more negative self-views (McCranie & Bass, 1984), which might increase vulnerability to depression (Garber & Flynn, 2001). This study therefore assessed both positive and negative aspects of parenting with parental warmth referring to showing acceptance, emotional closeness, and positive involvement towards the adolescent (Gladstone & Parker, 2005) and parental criticism referring to expressing negativity, dissatisfaction or less responsiveness to an adolescent (Harris & Howard, 1984). Gaining insight into these fluctuating processes could contribute to a more comprehensive understanding of parenting and the discrepancies in daily life.

The Link between Discrepancies in Parenting and Adolescent Well-Being

Despite the fact that it is increasingly acknowledged that differences between adolescents' and parents' perceptions not just represent reporter bias or measurement error (De Los Reyes, 2011), but yield valuable information (De Los Reyes & Ohannessian, 2016), not many studies yet have investigated to what extent the discrepancies additionally relate to adolescent well-being. These discrepancies might either indicate a normative developmental process related to adolescent autonomy development (De Los Reyes & Ohannessian, 2016). In this process, adolescents start to re-evaluate family relationships (Smetana et al., 2006), which may lead to different perceptions in parents and adolescents. However, it may also indicate problems in family functioning processes (De Los Reyes & Ohannessian, 2016), such as a misfit between adolescents' needs and parents' demands as proposed in the theoretical models on goodness of fit (Eccles et al., 1993; Lerner et al., 1986). In this study, it was therefore tested if, and to what extent, discrepancies are related to adolescents' well-being, when assessed in daily life.

To date, the interpretation of the findings of the few studies that examined whether and how discrepancies relate to adolescent well-being has been hindered by the usage of different analytic approaches (i.e., difference scores, latent difference scores or interaction terms). A meta-analysis showed that, based on retrospective studies using difference scores, larger discrepancies between parents' and adolescents' reports of parenting behavior were related to more adolescent maladjustment (Hou et al., 2019). Specifically, if adolescents perceived parenting more negative (but not more positive) relative to parents, the discrepancy was related to more adolescent negative outcomes (Hou et al., 2019; Rote & Smetana, 2016). However, the difference score approach has been criticized for various reasons (see i.e., De Haan et al., 2018). The use of interaction terms in a regression analysis (also known as polynomial regression analysis) has been suggested as an alternative in order to examine not only whether differences between reports relate to outcome variables, but whether these differences relate to the outcome in addition to main effects of individual reports (Laird & De Los Reyes, 2013). Results of the retrospective studies that used this approach

focused on negative aspects of parenting and indicated for instance that *congruence* of more negative perceptions on parenting or family functioning was related to more adolescent maladjustment (Hou et al., 2019; Van Petegem et al., 2019), but also that high levels of adolescents' depressive symptoms were related to *incongruence* of father-adolescent reports of negative interactions, with adolescents reporting high and fathers low negative interaction (Nelemans et al., 2016). These results not only suggest that it is important to take into account both congruence and incongruence, but also to examine adolescent-mother and adolescent-father dyads separately. To facilitate the interpretation of the results, it can be insightful to combine polynomial regression with response surface analysis (RSA; Edwards, 2002). This approach uses a three-dimensional surface to assess and visualize the association between adolescents' and parents' reports of parenting and the outcome variables (see Schönbrodt et al., 2018). Thus, the second aim of this study was to explore whether and how congruence and incongruence between adolescents' and parents' reports of daily parenting relate to adolescent daily affect by combining multilevel polynomial regression analyses and RSA. Moreover, in contrast to the previous studies on discrepancies, the current study not only assessed adolescents negative affect, but also positive affect. More insight into the impact of discrepancies between adolescent-parent perceptions of day-to-day parenting on adolescent well-being might ultimately help to inform (preventive) interventions.

The Current Study

Previous studies on adolescents' and parents' perceptions of parenting, discrepancies, and its relation to adolescent well-being focused on cross-sectional or longitudinal designs with macro time intervals and retrospective questionnaires. By using EMA the current study, therefore, aimed to describe to what extent both adolescents and their parents (mothers and fathers) differ or overlap in their perceptions of parental warmth and criticism in daily life (Aim 1). Based on previous meta-analyses, it was expected that adolescents' and parents' perceptions of daily parental warmth and criticism would differ substantially, with parents reporting more positive about their own parenting (more warmth and less criticism) than adolescents (Hypothesis 1). The current study furthermore aimed to explore whether congruence and incongruence in adolescents' and parents' reports of daily parental warmth and criticism are related to adolescent positive and negative affect in daily life (Aim 2). Based on prior work, it was expected that, on average, *congruent* adolescent-parent reports on high parental criticism and low parental warmth on a given day would relate to more adolescent negative affect and less positive affect on that day (Hypothesis 2a). Moreover, it was expected that, on average, *incongruent* adolescent-parent reports with adolescent reporting more parental criticism and less parental warmth than parents on a given day would relate to more negative affect and less positive affect on that day (Hypothesis 2b). Daily parental warmth and criticism of mothers and fathers was examined separately.

Methods

Sample

Data were used from RE-PAIR (Relations and Emotions in Parent Adolescent Interaction Research), a Dutch multi-method two-generation study examining the bidirectional interplay between parent-child

interactions and adolescent mental well-being by comparing families with an adolescent with a current major depressive disorder or dysthymia to families with an adolescent without psychopathology. The complete RE-PAIR study consisted of four parts: online questionnaires, a research day at the lab, two weeks of EMA, and an Magnetic Resonance Imaging (MRI)-scan session with the adolescent and one parent. The current study used a subsample and only included families with an adolescent without psychopathology and focused on the EMA part of RE-PAIR.

Inclusion

Families were included in the study in case the adolescent and at least one of the primary caregivers wanted to participate in the study, and had a good command of the Dutch language. Further inclusion criteria for adolescents were: being aged between 11 and 17 years, living at home with at least on primary caregiver, and going to high school or higher education. Families were excluded if adolescents had a current mental disorder, a history of major depressive disorder or dysthymia, or a history of psychopathology in the last two years. Adolescent psychopathology was assessed at the research day during a face-to-face interview using the Semi-Structured Interview of the Kiddie-Schedule for Affective Disorders and Schizophrenia – Present and Lifetime Version (K-SADS-PL; Reichart et al., 2000). For parents, no other in- or exclusion criteria were specified.

Of the 187 families that were interested in participating in RE-PAIR, 87 families were eligible and agreed to participate and a research day was scheduled. Of these families, 4 families (4.6%) canceled the research day and did not participate, 3 adolescents (3.4%) were excluded based on psychopathology (2 adolescents), and still being in primary school (1 adolescent). The final sample of RE-PAIR consisted of 80 families with a total of 233 participants (80 adolescents, 153 parents). Two fathers (1.3%) did not participate in the EMA part of RE-PAIR, resulting in a final sample for the current study of 231 participants (80 adolescents, 151 parents). Sample demographics are presented in Table 1. The majority of adolescents (97.5%) and parents (94.7%) were born in the Netherlands. Adoptive, foster, and stepparents (n = 14) were allowed to participate if they were involved in the upbringing of the adolescent for at least 5 years and if adolescents perceived the parent as a primary caregiver. For reasons of clarity, they will be referred to as mothers and fathers from here onwards.

Procedure

Families were recruited via networks of employees of Leiden University, flyers at public places, and advertisements in (online) media. Families interested in participating could contact the RE-PAIR research team via the website, telephone, or mail. Information letters were sent to the families and subsequently researchers called parents and adolescents to provide more information and administer screening questions. If all inclusion and no exclusion criteria were met, an appointment was scheduled for a research day in Leiden. All participants signed informed consent. If adolescents were younger than 16 years of age, parents with legal custody also signed informed consent for the adolescent. During the research day, adolescents and parents received face-to-face instructions about the EMA procedure and researchers assisted in installing the Ethica Data application. Each family member also received written instructions and their individual account information. Generally, the EMA started the next Monday after the research day, however in case of holidays and exam weeks of adolescents EMA started the first Monday thereafter.

Table 1. Sample demographics.

Variables	*N*	
Adolescents		
Gender, % Female, (*n)*	80	63.8 (51)
Age (years), *M (SD)*[a]	80	15.9 (1.35)
Highest level of education, % (*n*)	80	
Vocational education		12.5 (10)
Advanced secondary education		33.8 (27)
Pre-university education		45.0 (36)
Secondary vocational education		6.3 (5)
Higher professional education		2.5 (2)
Living situation	80	
With biological mother		6.3 (5)
With biological mother and father		80.0 (64)
Other[b]		13.8 (11)
Parents		
Gender, % Female, (*n)*	151	52.3 (79)
Age (years), *M (SD)*[a]	151	49.0 (5.87)
Highest level of education, % (*n*)	151	
No diploma		0.7 (1)
Lower vocational education		7.3 (11)
Intermediate vocational education		25.8 (39)
Higher vocational education or scientific education (university)		66.2 (100)
Relationship with child - mother, % (n)	79	
Biological parent		94.9 (75)
Stepparent		-
Foster parent		1.3 (1)
Adoptive parent		3.8 (3)
Relationship with child - father, % (n)	72	
Biological parent		86.1 (62)
Stepparent		8.3 (6)
Foster parent		4.2 (3)
Adoptive parent		1.4 (1)

[a]Age at research day

[b]Other options were parent and stepparent, alternating between father and mother, or living with adoptive/foster parents

EMA

Participants filled out questionnaires on their own smartphone using the Ethica app for fourteen consecutive days between 7AM and 9.30PM on weekdays and 9AM and 9.30PM on weekend days according to a standardized trigger schedule. Participants received four questionnaires each day (56 in total), signaled by a notification, and were instructed to complete the questionnaires as quickly as possible. All questionnaires consisted of questions on their whereabouts, affect, and contact with others. The first questionnaire of each day was sent at 7AM on weekdays and 9AM during weekend days and expired after 120 minutes. The second and third questionnaires were sent at a random time

point, with the second between 12AM and 1PM, and the third between 4PM and 7PM. Both expired after 60 minutes. The last questionnaire of each day was sent to adolescents at a random time point between 8.15PM and 8.45PM and to parents between 9PM and 9.30PM, both expired after 180 minutes. The first questionnaire of each day additionally included questions about sleep and the last questionnaire of each day about self-image, parenting, and substance use (e.g., coffee, alcohol) throughout the day. The questionnaires consisted of minimal 14 items, 13 closed and 1 open, and maximal 45 items, 44 closed and 1 open. Number of items depended on role (parent or adolescent), branching, and type of questionnaire (morning, day, or evening). On average, filling out the questionnaires took adolescents 2.21 minutes per questionnaire (*SD* = 2.73), and parents 2.66 minutes per questionnaire (*SD* = 2.50). Researchers monitored the EMA by checking daily whether participants received and completed questionnaires and were available for questions or problems via WhatsApp, telephone, and mail. On day four, seven, and eleven of the EMA an update was sent to each participant about the personal adherence (percentage of completed questionnaires) as motivation. On the last day of the EMA, a message was sent to thank participants and remind them of the scheduled phone call after the EMA to evaluate. Participants did not receive automatic reminders for the questionnaires. The EMA of RE-PAIR was conducted in the period between September 2018 and November 2019. As compensation for EMA, parents received €20,- and adolescents €10,-. In addition, four gift vouchers of €75,- were raffled based on compliance.

Compliance

In the current study, a total of 4480 questionnaires were planned and 4348 (97.1%) were delivered to the 80 adolescents. Not all questionnaires were sent due to technical errors of the software application or smartphones of the participants. Adolescents fully completed 2954 (67.9%) of the delivered questionnaire (*M* = 36.92 completed, *SD* = 11.27, Min/Max = 3/55). Adolescent daily affect scores were based on these assessments. Daily parenting was only assessed in the last questionnaire of the day. A total of 1120 questionnaires were planned at the end of each day and 1085 (96.9%) were delivered to the 80 adolescents. Adolescents fully completed 885 (81.6%) questionnaires (*M* = 11.06 completed, *SD* = 3.10, Min/Max = 1/14). For parents, a total of 2114 questionnaires were planned at the end of each day and 2070 (97.9%) were delivered. Parents fully completed 1881 (90.9%) of the delivered questionnaires (*M* = 12.46 completed, *SD* = 1.93, Min/Max = 5/14). Several reasons for non-compliance were reported by participants in evaluation phone calls after the EMA part: being at school/work, sleeping late, studying or being on the road. Although some EMA studies use a minimum compliance rate for inclusion, recent evidence suggests that this may lead to inclusion biases. When using compliance thresholds in the analyses potentially valuable data could be omitted (Jacobson, 2020). Therefore, no participants were excluded based on missing data and all completed EMA data was retained for analyses.

Measures

Daily parenting

In the last questionnaire of each day, adolescents indicated whether they spoke to a parent during that day and with whom (i.e., mother, father, stepmother, stepfather). In 99.8% of the completed questionnaires, adolescents spoke to one or more parents during that day and these questionnaires

were used for the analyses. Adolescents rated parental criticism and parental warmth for each parent they spoke to by answering the questions "Throughout the day, how critical was your mother/father towards you?" and "Throughout the day, how warm/loving was your mother/father towards you?" Answers were given on a 7-point Likert type scale with answer categories ranging from 1 (*not at all)* to 7 (*very*). Only adolescents' answers about parents who participated in the EMA were included.

Similarly, parents indicated whether they spoke to the participating adolescent in the last questionnaire of each day. In 93.1% of the completed questionnaires, parents spoke to their adolescent and these questionnaires were used for the analyses. Parents rated their own behavior by answering the questions "Throughout the day, how critical were you towards your child?" and "Throughout the day, how warm/loving were you towards your child?" Answers were given on a 7-point Likert type scale with answer categories ranging from 1 (*not at all)* to 7 (*very*). Higher scores indicated more daily parental criticism and parental warmth for parents and adolescents.

Daily affect

Adolescents rated their own momentary affect states four times a day with an adapted and shortened four-item version of the Positive and Negative Affect Schedule for Children (PANAS-C; Ebesutani et al., 2012; Watson et al., 1988). Two positive affect states (*happy* and *relaxed)* and two negative affect states (*sad* and *irritated*) were assessed by asking: "How do you feel at this moment?" followed by: "Happy", "Relaxed", "Sad", or "Irritated". Answers were given on a 7-point Likert type scale with answer categories ranging from 1 (*not at all)* to 7 (*very*). A mean score per affect state per day was calculated. To create a daily positive affect scale, an average score of the two daily positive affect states was calculated, with the two items being strongly correlated with each other at the between person-level, $r(1051) = 0.667$, $p < .001$, and moderately at the within-person level, $r(1051) = 0.428$, $p < .001$. A mean score of the two daily negative affect states was calculated to create a daily negative affect scale, with the two items also being strongly correlated with each other at the between person-level, $r(1051) = 0.701$, $p < .001$, and moderately at the within-person level, $r(1051) = 0.351$, $p < .001$. Higher scores represented higher levels of daily positive and negative affect.

Strategy of Analyses

Descriptive information of study variables was provided on person-mean scores of daily parental warmth and criticism, and adolescent daily positive and negative affect. Between-person and -dyad correlations were calculated based on person-mean scores and within-person and -dyad correlations were calculated based on daily fluctuations around the mean. Normal distribution of variables and equality of variances was checked and when assumptions were not met, appropriate nonparametric test were used to examine to what extent adolescents' and parents' person-mean scores of parenting differed or overlapped (aim 1).

Given the nested structure of the data (repeated measures within persons), multilevel models were specified by using the multilevel package version 2.6 (Bliese, 2016) with ML estimation in R Version 3.6.1 (R Core Team, 2019). Multilevel models using ML estimation and including all available data should result in unbiased estimates (Little, 1995). A total of 8 models were built with separate models for mothers and fathers, daily parental warmth and criticism, and daily positive and negative affect. First, two intercept only models were specified to split the total variance in adolescent

daily positive and negative affect into stable between-person differences and within-person fluctuations (results in Appendix 1). Second, adolescents' and parents' reports of daily parenting were centered on the dyad level, in line with steps proposed by (Nestler et al., 2019). That is, per dyad, the average of the person-mean scores of adolescent and parent reports of parental warmth and criticism was calculated. The centered scores represent the deviation of individual scores from this dyad mean. Centering is important for interpretation of the results since the two predictors then have the same scale midpoint (Edwards, 2002). Based on these centered predictor scores, squared terms, and interaction terms between adolescent and parent reports were computed. The centered scores of daily parenting reported by the adolescent and parent were added to the model in the third step.

To examine whether congruence and incongruence in adolescents' and parents' reports of daily parental warmth and criticism related to adolescent positive and negative affect in daily life (aim 2), multilevel polynomial regression models were specified by adding the squared and interaction terms in addition to the centered scores of daily parenting of adolescents and parents. The regression coefficients of these models were used for the response surface analyses. In order to illustrate and promote interpretation of the model results, the response surface parameters were used to generate a response surface pattern plot which represents the three-dimensional relation between the two predictor variables (i.e., daily parental warmth reported by adolescents and mothers) and the outcome variable (i.e., adolescent daily negative affect) (Barranti et al., 2017; Nestler et al., 2019) by using the RSA package (version 0.10.4; Schönbrodt & Humberg, 2021). For instance, a graphical representation of the three-dimensional relation between fluctuations of adolescents' and parents' reports of daily parental warmth and fluctuations in daily negative affect include a line of congruence (i.e., where the values of the two predictor variables perfectly match) and a line of incongruence (i.e., where the values of one predictor are the opposite of the other predictor). The plots represent effects for the average dyads (without taking into account variation between dyads). The four response surface parameters (a1-a4) were calculated based on the unstandardized multilevel polynomial regression coefficients. Specifically, the first two coefficients evaluate statistically whether the slope of the line of congruence (LOC) is linear (a1), which would indicate a linear additive relationship between for instance adolescents' and parents' reports of daily parental warmth and daily negative affect, or curvilinear (a2), which would indicate that there is curvilinearity in the relationship between for instance adolescents' and parents' reports of daily parental warmth and daily negative affect. The other two coefficients evaluate whether the slope of the line of incongruence (LOIC) is linear (a3), which would indicate that there is a discrepancy effect on the outcome variable in one specific direction, or curvilinear (a4), which would indicate that there is a discrepancy effect on the outcome variable, regardless of the direction. All four parameters were used to examine whether congruence and incongruence between adolescents' and parents' reports of daily parenting related to adolescent daily affect. Again, these steps were followed for all 8 models.

Results

Preliminary analyses

Between-person

Table 2 provides descriptive statistics of study variables and between-person (i.e., adolescent reports of affect and parenting) and between-dyad correlations (i.e., adolescent and mother reports of daily parenting of mother) based on person-mean scores. Mothers reported on average significantly more daily parental warmth than fathers, but no significant difference was found between mothers and fathers in daily parental criticism (see Appendix 2 for results and differences between adolescent boys and girls). All between-person correlations between adolescents' reports of daily parental warmth and criticism of both parents and adolescent daily positive and negative affect were significant (all *p*'s < .01) and in the expected direction. For instance, adolescents who reported more daily parental warmth also reported more daily positive affect. As expected, adolescents' reports of daily parental warmth and daily parental criticism were significantly (negatively) correlated. Interestingly, no significant between-dyad correlations were found between parents' reports of daily parenting and adolescent daily affect.

Within-person

To gain more insight into the daily fluctuations in parenting and affect, within-person and within-dyad correlations were calculated (i.e., daily deviations from the person-mean) (see Table 3). Fluctuations in adolescents' reports of daily parenting of both mothers and fathers were significantly related to fluctuations in adolescent daily positive and negative affect in the expected direction, with the exception of daily parental criticism of fathers. This indicates, for instance, that on days when adolescents reported that their mothers showed more parental warmth, adolescents also reported more positive affect. The strength of the within-person correlations overall was weaker than the between-person correlations (i.e., almost all significant within-person correlations were low, $r <$ 0.300). Additionally, intradyad correlation coefficients were calculated to examine the associations between fluctuations of daily parenting at the dyad level (see Appendix 3). The correlation coefficients indicated that dyads differed with regard to both the direction as well as the strength of the intradyad correlation. To further illustrate the daily fluctuations per dyad in parenting reported by adolescent and parent and adolescent affect, plots per dyad were made (see Appendix 4).

Table 2. Descriptive statistics and bivariate correlations of study variables.

	Descriptives					Between-person and between-dyad correlations									
Variables	*n*	*M*	*SD*	*Min*	*Max*	1	2	3	4	5	6	7	8	9	10
1. Person mean daily positive affect AA	80	5.46	0.77	3.61	6.90										
2. Person mean daily negative affect AA	80	1.52	0.63	1.00	4.21	-0.621***									
3. Person mean daily parental warmth AM	79	5.88	0.81	3.62	7.00	0.553***	-0.375**								
4. Person mean daily parental criticism AM	79	2.06	0.99	1.00	5.00	-0.323**	0.443***	-0.535***							
5. Person mean daily parental warmth AF	72	5.77	0.98	1.38	7.00	0.559***	-0.302**	0.779***	-0.350**						
6. Person mean daily parental criticism AF	72	1.90	0.93	1.00	4.70	-0.317**	0.410***	-0.365**	0.824***	-0.398**					
7. Person mean daily parental warmth MM	79	5.68	0.68	3.67	7.00	0.077	-0.085	0.423***	-0.434***	0.223*	-0.357**				
8. Person mean daily parental criticism MM	79	2.47	0.94	1.07	4.90	-0.121	0.122	-0.226*	0.309**	-0.320**	0.240*	-0.488***			
9. Person mean daily parental warmth FF	72	5.36	0.76	3.50	6.92	0.215	-0.194	0.206	-0.234*	0.223	-0.310**	0.297*	-0.319**		
10. Person mean daily parental criticism FF	72	2.49	0.93	1.00	5.14	-0.213	0.041	-0.063	0.077	-0.232	0.117	-0.127	0.444***	-0.198	

The person means represent the average scores across all assessments per individual.

AA = adolescent about self, AM = adolescent about mother, AF = adolescent about father MM = mother about own behavior, FF = father about own behavior

* $p < .05$, ** $p < .01$, *** $p < .001$.

Table 3. Within-person and within-dyad correlations of study variables.

	1	2	3	4	5	6	7	8	9	10
1. Person mean daily positive affect AA										
2. Person mean daily negative affect AA	-0.568***									
3. Person mean parental warmth AM	0.100**	-0.083*								
4. Person mean parental criticism AM	-0.084*	0.081*	-0.218***							
5. Person mean parental warmth AF	0.119**	-0.183***	0.508***	-0.074*						
6. Person mean parental criticism AF	-0.067	0.043	-0.131***	0.512***	-0.259***					
7. Person mean parental warmth MM	0.016	-0.027	0.148***	-0.096**	0.114**	-0.095*				
8. Person mean parental criticism MM	-0.061	0.062	-0.160***	0.235***	-0.114**	0.088*	-0.258***			
9. Person mean parental warmth FF	0.095**	-0.058	0.098*	-0.122**	0.158***	-0.140***	-0.035	-0.067		
10. Person mean parental criticism FF	0.002	-0.041	0.078	0.041	-0.147***	0.171***	-0.083*	0.080*	-0.236***	

The person means represent the average scores across assessments per individual.

AA = adolescent about self, AM = adolescent about mother, AF = adolescent about father MM = mother about own behavior, FF = father about own behavior

* $p < .05$, ** $p < .01$, *** $p < .001$.

Main analyses

To examine the first aim, whether adolescents' and parents' person mean-level reports of daily parenting differed from each other, paired Wilcoxon's signed rank tests were used. In line with the expectations, reports of adolescents and parents of daily parental behavior differed significantly, however, not in the expected direction. Adolescents reported significantly higher levels of daily parental warmth than mothers (z = -2.300, p = .021) and fathers (z = -3.479, p < .001), and significantly lower levels of daily parental criticism of both their mothers (z = -3.640, p < .001) and fathers (z = -3.857, p < .001), see Fig. 1 and 2. Thus, in general, adolescents reported more positively on daily parenting of both their parents than mothers and fathers themselves. To describe the occurrence of these discrepant reports between adolescents and parents of parenting in daily life, adolescents' and parents' reports of parenting were compared per day and an aggregated mean difference score per dyad was calculated. These results showed substantial between-dyad variation. In some dyads, adolescents indeed reported more positively than their mothers and fathers on daily parenting, while in other dyads adolescent-parent reports were relatively similar or adolescents reported more negatively on daily parenting than mothers and fathers (see Appendix 5). There was also within-dyad variation representing daily fluctuations. That is, even though a parent-adolescent dyad may have relatively similar scores averaged across two weeks, there are also days on which they differed.

In order to examine the second aim of the study, assessing concurrently whether congruence and/or incongruence between adolescents' and parents' reports of daily parental warmth and criticism are related to adolescent daily positive and negative affect, multilevel polynomial regression analyses and RSA were used. Multilevel models including adolescents' and parents' reports of daily parenting were first specified (see Appendix 6). Adolescents' reports of daily parental warmth and criticism were significantly related to adolescent daily positive and negative affect (p's < .050), except adolescents' reports of daily parental criticism of fathers which were not related to daily negative affect. With regard to parents' reports, only fathers' reports of daily parental warmth were significantly related to adolescent daily negative affect (B = -0.057, p = .023) and daily positive affect (B = 0.078, p = .020), in addition to adolescents' reports of daily parental warmth of fathers. That is, adolescents reported on average more negative affect on days when not only adolescents perceived their fathers as showing less parental warmth, but also when fathers themselves reported showing less parental warmth. Mothers' reports of daily parenting were not related to adolescents' daily affect, when taking into account adolescents' reports. Next, the squared and interaction terms between adolescent' and parent' reports were added to the models. The unstandardized regression coefficients of these multilevel polynomial regression models were used to calculate the RSA parameters. These parameters in turn were used for the response surface plots to illustrate the results for interpretation. It is important to be cautious when interpreting these plots, since the corners are often extrapolations where no actual observations exist (Tufte, 2001).

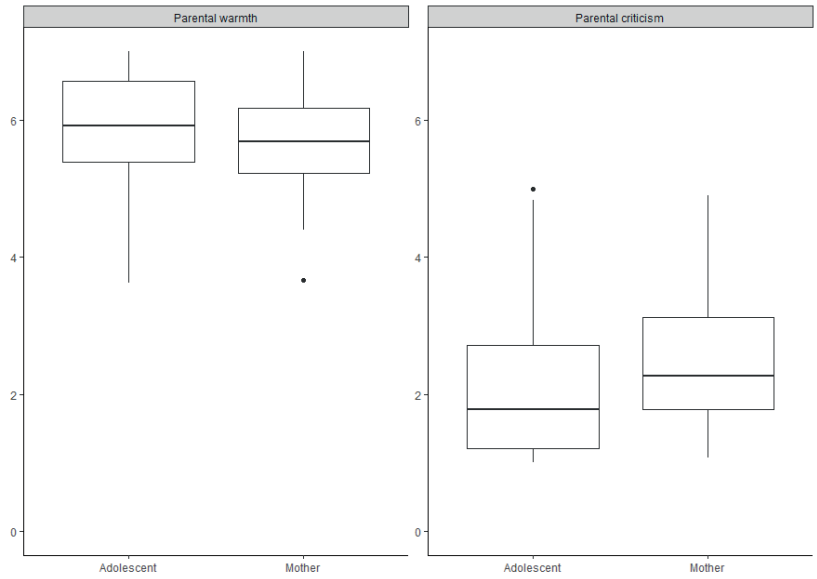

Figure 1. Box plots illustrating the significant differences between adolescents' and mothers' person-mean scores of daily parental warmth and criticism.

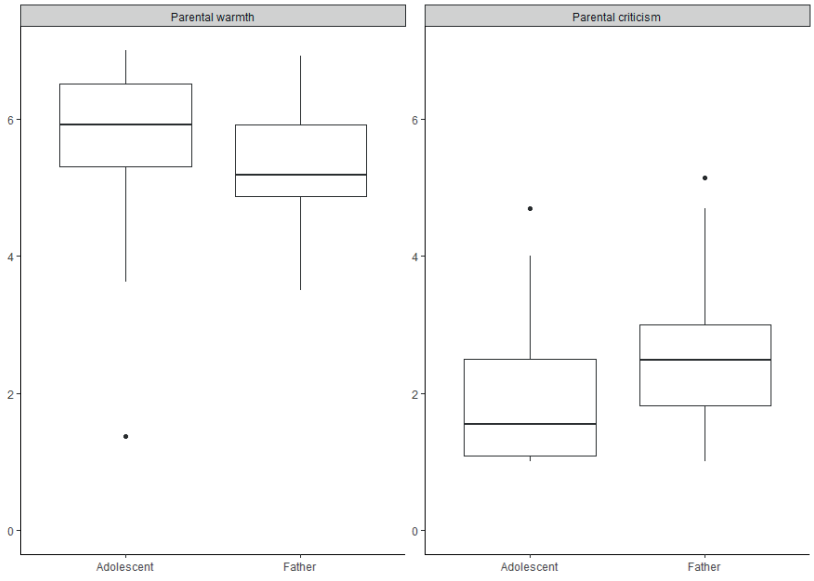

Figure 2. Box plots illustrating the significant differences between adolescents' and fathers' person-mean scores of daily parental warmth and criticism.

Daily negative affect

The results of the multilevel polynomial regression analyses on daily negative affect and response surface parameters are presented in Table 4.

Daily parental warmth. With regard to daily parental warmth of mothers (see Fig. 3A), the curvilinear coefficient related to the LOC was significant, indicating that adolescents reported the least negative affect on days when adolescents' and mothers' reports were congruent on average levels (around the dyad mean) of parental warmth. The slope coefficient along the LOIC was also significant, indicating that adolescents reported more negative affect on days when adolescents' indicated less parental warmth of mothers than mothers themselves. Regarding daily parental warmth of fathers (see Fig 3B), both the slope and curvilinear coefficient of the LOC were significant, indicating that adolescents reported higher levels of negative affect on days when both fathers and adolescents reported lower levels of parental warmth. This association seems to flatten out at higher levels of parental warmth. In addition, there was also a significant slope coefficient of LOIC. This indicated that adolescents reported more negative affect on days when adolescents' indicated less parental warmth of fathers than fathers themselves.

Daily parental criticism. With regard to daily criticism of mothers, only the slope coefficient of the LOC was significant (see Fig 4), indicating that adolescents reported higher levels of negative affect on days when both mothers and adolescents reported higher levels of parental criticism. No significant coefficients were found with regard to daily parental criticism of fathers.

Table 4. Results of multilevel polynomial regression analyses and response surface parameters of adolescent-reported and parent-reported daily parenting related to daily negative affect.

	Parental warmth mothers	Parental warmth fathers	Parental criticism mothers	Parental criticism fathers
Multilevel polynomial regression coefficients				
b^1 - adolescent report	-0.067*	-0.079**	0.043*	0.027
b^2 - parent report	0.026	0.000	0.020	-0.034
b^3 - adolescent report^2	0.033	0.006	-0.005	-0.005
b^4 - adolescent*parent report	0.046	0.020	-0.005	0.007
b^5 - parent report^2	0.043*	0.052***	0.002	0.004
Response surface parameters				
a^1 - slope along LOC (x = y)	-0.041	-0.078*	0.064**	-0.007
a^2 - curvature along LOC (x = y)	0.122***	0.078*	-0.008	0.007
a^3 - slope along LOIC (x = - y)	-0.092*	-0.079*	0.023	0.061
a^4 - curvature along LOIC (x = - y)	0.029	0.038	0.003	-0.008

Non-standardized coefficients are presented

Note. * indicates $p < .05$. ** indicates $p < .01$, *** indicates $p < .001$.

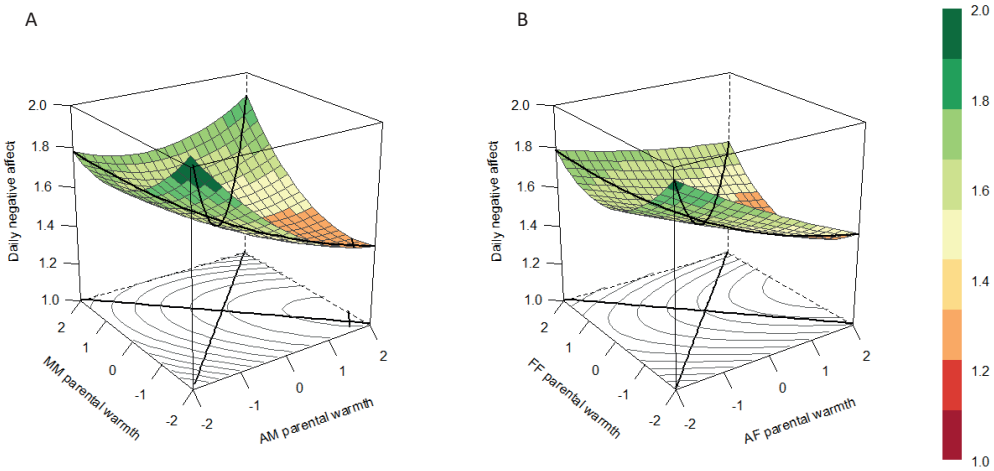

Figure 3. Response surface plots illustrating the association between adolescents' and mothers' reports (A) and adolescents' and fathers' reports (B) of daily parental warmth and adolescent daily negative affect with a significant line of congruence, and line of incongruence for the average dyad.
Note. Centered scores of daily parental warmth of adolescents and parents are presented on the x-axis and y-axis respectively, daily negative affect is presented on the z-axis. The colors in the legend represent the amount of daily negative affect which is also shown in the figure.

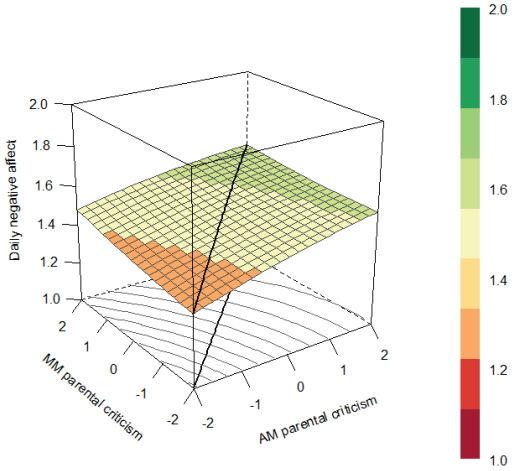

Figure 4. Response surface plot illustrating the association between adolescents' and mothers' reports of daily parental criticsm and adolescent daily negative affect with a significant line of congruence for the average dyad.
Note. Centered scores of daily parental warmth of adolescents and mothers are presented on the x-axis and y-axis respectively, daily negative affect is presented on the z-axis. The colors in the legend represent the amount of daily negative affect which is also shown in the figure.

Daily positive affect

The results of the multilevel polynomial regression analyses on daily positive affect and response surface parameters are presented in Table 5.

Daily parental warmth. The slope coefficients of the LOC and LOIC were both significant regarding daily parental warmth of mothers (see Fig. 5). This indicates that adolescents reported more positive affect on days when both mothers and adolescents reported higher levels of parental warmth. Moreover, adolescents reported more positive affect on days when adolescents' indicated more parental warmth of mothers than mothers themselves. No significant coefficients were found with regard to daily parental warmth of fathers.

Daily parental criticism. The slope coefficient of the LOC was significant concerning daily parental criticism of mothers (see Fig. 6), indicating that adolescents reported lower levels of positive affect on days when both mothers and adolescents reported higher levels of parental criticism. Again, no significant coefficients were found with regard to daily parental criticism of fathers.

Table 5. Results of multilevel polynomial regression analyses and response surface parameters of adolescent-reported and parent-reported daily parenting related to daily positive affect.

	Parental warmth mothers	Parental warmth fathers	Parental criticism mothers	Parental criticism fathers
Multilevel polynomial regression coefficients				
b^1 - adolescent report	0.137***	0.061	-0.068**	-0.058*
b^2 - parent report	-0.021	0.030	-0.020	0.018
b^3 - adolescent report^2	0.017	0.014	0.001	0.018
b^4 - adolescent*parent report	-0.021	-0.038	-0.015	-0.017
b^5 - parent report^2	-0.001	-0.045*	-0.001	0.007
Response surface parameters				
a^1 - slope along LOC (x = y)	0.116*	0.091	-0.088**	-0.040
a^2 - curvature along LOC (x = y)	-0.005	-0.070	-0.026	0.008
a^3 - slope along LOIC (x = - y)	0.158**	0.031	-0.048	-0.075
a^4 - curvature along LOIC (x = - y)	0.036	0.007	0.014	0.043

Non-standardized coefficients are presented

Note. * indicates $p < .05$. ** indicates $p < .01$, *** indicates $p < .001$.

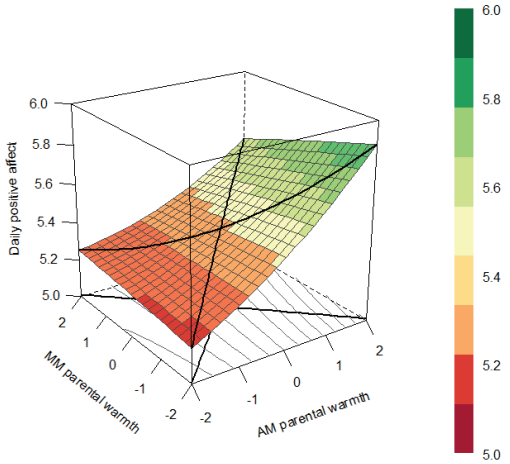

Figure 5. Response surface plot illustrating the association between adolescents' and mothers' reports of daily parental warmth and adolescent daily positive affect with a significant line of congruence and line of incongruence for the average dyad.

Note. Centered scores of daily parental warmth of adolescents and mothers are presented on the on the x-axis and y-axis respectively, daily positive affect is presented on the z-axis. The colors in the legend represent the amount of daily positive affect which is also shown in the figure.

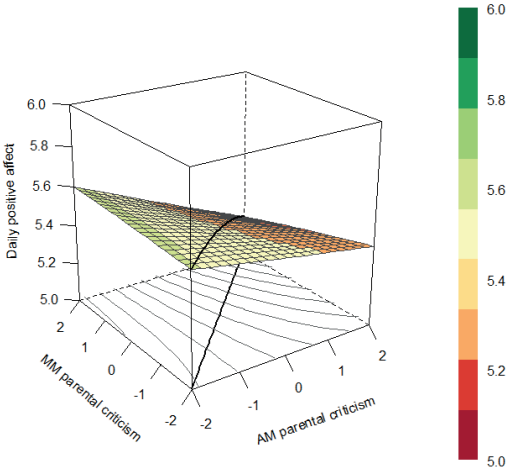

Figure 6. Response surface plot illustrating the association between adolescents' and mothers' reports (A) of daily parental criticism and adolescent daily positive affect with a significant line of congruence for the average dyad.

Note. Centered scores of daily parental criticism of adolescents and mothers are presented on the on the x-axis and y-axis respectively, daily positive affect is presented on the z-axis. The colors in the legend represent the amount of daily positive affect which is also shown in the figure.

Discussion

Even though an important developmental task for adolescents is to become more autonomous and independent, a warm and supportive relationship with their parents remains essential for their well-being (Steinberg & Silk, 2002). Adolescents and parents can perceive their relationship and behavior quite differently, with for instance adolescents perceiving their parents to be less critical than parents see themselves. These discrepancies have been found to relate to adolescent well-being (De Los Reyes et al., 2019; Hou et al., 2019), but previous studies focused solely on classical retrospective reports, while parenting is a dynamic concept that can change in the daily flow of life within a family (Keijsers & Van Roekel, 2018). In addition, the majority of studies so far focused on negative aspects of parenting and parenting of mothers. The current study therefore aimed to describe adolescents' and both mothers' and fathers' perceptions of parental warmth and parental criticism in daily life. Additionally, it was examined whether these daily perceptions, congruence, and incongruence between reports were related to adolescent daily positive and negative affect.

Overall, the results showed that not parents' perspective of daily parenting by itself, but differences and overlap with adolescents' perspective in addition to adolescent individual reports were of importance for adolescent daily well-being. This was not only the case for negative aspects of parenting but also regarding parental warmth. Considering, for instance, mothers' perspective and the discrepancy with adolescents' perspective of daily parental warmth helped to understand why some adolescents showed more daily negative affect and less positive affect. Using more sophisticated methodology such as multilevel polynomial regression analyses and RSA, as suggested by previous studies (Edwards, 2002; Schönbrodt et al., 2018), contributed to a more comprehensive understanding of risk factors for more negative and less positive affect in daily life.

Perceptions of Parenting in Daily Life

Previous studies have shown that generally parents report more positive on their own parenting behavior than adolescents (de Haan et al., 2018; Hou et al., 2019), but these studies focused on retrospective self-reports. The current study aimed to explore the extent to which adolescents and their parents differ or overlap in their perceptions of parental warmth and criticism when zooming in on the daily level. In contrast to the previous findings, results showed that adolescents reported more positively on daily parental warmth and criticism of their mothers and fathers than parents themselves. It should also be noted, however, that there was substantial variation between dyads. In some adolescent-parent dyads (34% adolescent-mother dyads; 50% adolescent-father dyads) adolescents did report more daily parental warmth than their parents, while other adolescent-parent dyads adolescents (20% adolescent-mother dyads; 17% adolescent-father dyads) reported less daily parental warmth criticism compared to their parents. Previous studies already indicated that dyads differ in the specific patterns of divergence (e.g., De Los Reyes et al., 2010; De Los Reyes & Ohannessian, 2016; Lippold et al., 2013) and the current findings support this and more importantly show that this is also the case when zooming in to a micro-level (i.e., days).

Associations of Congruence and Incongruence in Daily Parenting Related to Adolescent Affect

While it is increasingly acknowledged that differences between adolescents' and parents' perceptions of parenting yield valuable information (De Los Reyes & Ohannessian, 2016), not many studies have yet investigated whether and how the differences and overlap between these perceptions relate to adolescent well-being. The current results indicated that, in line with previous studies, adolescents' perceptions of parenting were more strongly related to adolescent well-being than parents' perceptions (Hendriks et al., 2018). Overall, parents' perceptions of daily parenting were only related to adolescent daily affect when combined with adolescents' perceptions, but not by itself. With regard to parental criticism, it was found that if adolescents and mothers (but not adolescents and fathers) *agreed* on elevated levels of daily parental criticism this was associated with more daily negative affect and less daily positive affect in adolescents which is in line with a previous study (Nelemans et al., 2016). *Disagreement* between adolescent-mother and adolescent-father reports of daily parental criticism, however, was not related to adolescent daily affect in the current study. This is in contrast to the expectations since discrepancies between adolescent and father reports of negative interactions were related to more adolescent depressive symptoms (Nelemans et al., 2016). A possible explanation for these contradicting findings may be that the previous study retrospectively measured negative interactions in general at a certain time point while the current study included a more fine-grained aspect of negative parenting in daily life. Parental criticism was assessed on multiple consecutive days and therefore takes into account the dynamic process of parenting and adolescents' affect in daily life (Keijsers & Van Roekel, 2018).

The current study additionally examined whether congruence and incongruence between reports of a positive aspect of daily parenting, parental warmth, were also related to adolescent daily affect. As expected, on days when adolescents and mothers (but not adolescents and fathers) *agreed* on lower levels of daily parental warmth adolescents reported lower levels of adolescent positive affect. In contrast to the hypotheses, adolescents reported the least negative affect on days when adolescents and mothers agreed on average levels of parental warmth. This finding might seem somewhat counterintuitive, however, since the current study included daily assessments the results concern daily fluctuations in parenting and affect. Congruent scores at average levels of parental warmth may refer to a certain consistency or stability in parental warmth of mothers. Since inconsistent parenting may impact adolescent well-being negatively (De Los Reyes & Ohannessian, 2016), the findings of the current study that consistency (i.e., adolescent-mother agreement on average levels around the dyad mean of parental warmth) related to less adolescent negative affect seems plausible. Moreover, the current study included healthy adolescents and their parents who reported rather high levels of parental warmth. It might be that these average levels of parental warmth are good enough and that more parental warmth may be perceived and experienced as smothering. The results regarding *congruent* adolescent-father reports on daily parental warmth are largely in line with adolescent-mother dyads, but here the curve flattens at higher levels of parental warmth. That is, agreement of adolescents and fathers on lower levels of parental warmth is more strongly related to adolescent negative affect than agreement on higher levels of parental warmth.

With regard to *incongruence* between reports of parental warmth, adolescents reported more daily negative affect on days when fathers and mothers reported more parental warmth than

adolescents did. Moreover, adolescents reported more daily positive affect on days when mothers reported less parental warmth than adolescents reported themselves. These results are in line with findings of previous studies using both difference scores (Laird & De Los Reyes, 2013) and interaction terms (Nelemans et al., 2016), and support the theoretical models on goodness of fit (Eccles et al., 1993; Lerner et al., 1986). That is, when adolescents' reports of parental warmth of fathers and mothers are lower than parents' reports it may indicate that the parental behavior does not fit the needs of an adolescent and this seems to result in more negative affect. Alternatively, a negative mood of adolescents may also have influenced the perception of parenting.

Overall, differences and overlap between adolescents' and mothers' perceptions of parenting were more related to adolescent affect in daily life than adolescents' and fathers' perceptions. Even though adolescents and fathers in the current study reported to speak to each other a on daily basis, it might be that adolescents spend more time with their mothers than fathers and are thus more affected by mothers (Larson et al., 1996). Moreover, it has been suggested that the quality of relationship between adolescents and mothers and fathers might be different with mothers providing more emotional support and fathers giving more instrumental care (Youniss & Smollar, 1985). Interestingly, incongruence and congruence between adolescents' and fathers' reports of daily parental warmth were only related to adolescent negative, and not to daily positive affect. Although most studies on adolescent-parent discrepancies focused on negative outcomes or solely included mother-adolescent dyads, the current findings are in line with a prior study, which showed that father-child discrepancies only related to adolescent maladjustment (Hou et al., 2018). Mother-child discrepancies of parenting did relate to positive psychological measures in adolescents, which supports findings of the current study. Despite the additional data needed to strengthen this interpretation, these findings suggest that discrepancies with mothers are of more relevance for adolescent positive well-being than with fathers.

The current study demonstrated the importance of taking into account differences and overlap between adolescents' and parents' perceptions in of parenting (both positive and negative aspects of parenting) in addition to individual reports for understanding daily fluctuations in adolescent well-being. This may also provide some first useful insights for preventive interventions. More understanding of how both parents and adolescents perceive certain parental behavior may help them to become more aware of the fact that these perceptions may differ. This could result in a realization for parents that their often well-intended behavior may not suit the needs of an adolescent, but also enable adolescents to better understand their parents' behaviors and intentions. Becoming more attuned to each other might affect adolescent well-being in a positive manner.

Strengths, Limitations, and Future Research

The current study used ecologically valid measures of parenting and adolescent affect that minimized recall bias and provided insights into the daily dynamic family life processes. The use of EMA and including both perceptions of adolescents and parents further enabled a more fine-grained exploration of parent-adolescent differences and overlap in perceptions of parenting. This provided some first insights into the substantial between-dyad and within-dyad variation regarding the discrepancies. Moreover, in addition to negative aspects of parenting and adolescent well-being, positive aspects such as parental warmth and adolescent positive affect were also taken into account.

The current results supported the importance of including a wider range of parenting behaviors. By using sophisticated analyses, the current study was able to examine whether congruence and incongruence between adolescent-parent reports of daily parenting related to adolescent daily affect in addition to main effects of individual reports. This provided a more detailed representation of daily life of families. Furthermore, fathers were included in the study which enabled assessing these processes in both adolescent-mother and adolescent-father dyads.

The study also has some limitations that generate ideas for future approaches. While the relatively high levels of adolescent daily positive affect and low levels of adolescent negative affect are in line with previous studies (Beyens et al., 2020; Janssen et al., 2021), the sample consisted of a fairly homogeneous sample of healthy adolescents in the Netherlands with highly educated parents. It is therefore unknown to what extent the current findings generalize to more diverse or clinical samples. This should be addressed in future studies. Additionally, it should be acknowledged that the current sample of 80 families was relatively small. Nevertheless, based on a rule of thumb that 550 observations should be sufficient for detecting small effect sizes in RSA (Barranti et al., 2017), the sample is not underpowered with at least 600 observations. Moreover, performing a multilevel model with a sample size of at least 50 units at level 2 should result in unbiased estimates (Maas & Hox, 2005) which should to apply to multilevel RSA as well (Nestler et al., 2019). This seems to imply that the minimum of 72 units at level 2 in the current study would suffice, but future research in larger samples is needed to strengthen the findings. Moreover, the discrepancies between adolescents' and parents' reports of daily parenting might represent differences between psychometric properties of adolescent versus parent reports (De Los Reyes et al., 2016) and measurement invariance between these reports was not tested in this study. Parents and adolescents, however, answered the exact same questions regarding parenting in the family context, so the discrepant reports are not due to different item content, response options, or context. In addition, the response surface analyses represent effects for the average dyad without taking into account the between-dyad variation, while the current study showed that discrepancies between adolescents' and parents' reports varied between-dyads and even within-dyads. However, it was beyond the scope of this study to test this heterogeneity. Future studies should include this as it might provide insights into which adolescents might be affected most by congruence and incongruence between adolescent-parent reports on daily parenting. Another suggestion for future research would be to include person-mean levels of daily parenting as well as the fluctuations in order to gain more understanding of the importance of the stability of parenting for adolescent well-being. Although the current study assessed both adolescent-mother and adolescent-father dyads, since these should be seen as distinct but related subsystems according to the family system theory (Restifo & Bögels, 2009), the interrelatedness of these dyads within one family was not taken into account due to the already complex models. Future studies should aim to include adolescents-mother and adolescent-father dyads in a family model to obtain a better understanding of the unique processes within each family. This would also enable testing explicitly for differences between adolescent-mother and adolescent-father dyads. Moreover, it would be interesting to also take into account the actual time spend together by adolescents and their mothers and fathers in order to examine whether this influences the impact of discrepancies on adolescent well-being. A final recommendation for future studies is to assess whether adolescents

and parents are aware of the fact that their perceptions of parenting behavior differ, and whether this awareness can be related to adolescent well-being. This knowledge may provide valuable insights that ultimately could inform prevention strategies or interventions in clinical practice.

Conclusion

It is increasingly acknowledged that differences between adolescents' and parents' perceptions of parenting yield valuable information, but few studies have actually examined to what extent the discrepancies relate to adolescent well-being. Moreover, whether earlier findings using retrospective questionnaire data generalize to dynamic daily life processes remains unclear. By using EMA, multilevel polynomial regression analyses and RSA, the current multi-informant study showed that in addition to adolescents' perspective, not parents' perspective of own parenting in daily life by itself, but the extent to which this perspective corresponded to or differed from adolescents' perspective was of importance for adolescent well-being. Both congruence and incongruence between adolescents' and parents' reports of daily parental warmth were related to adolescent daily affect. Variation was found between adolescent-mother and adolescent father dyads, with differences and overlap between adolescents and fathers being only related to adolescent daily negative affect. Incongruence and congruence between adolescents and mothers was related to both daily positive and negative affect. If adolescents and mothers agreed on higher levels of daily parental criticism, adolescents reported more negative and less positive affect. The current study furthermore showed that adolescents' and parents' reports of daily parenting differed substantially and varied between- and within-dyads. Taken together, the findings highlight the importance of taking into account the overlap and differences between adolescents' and parents' reports of parenting in daily life in relation to adolescent daily affect. Not only to gain more insight into the micro-social processes and fluctuations in adolescent daily affect, but also to ultimately use this valuable information in preventive interventions for families to make parents and adolescents become more attuned to each other.

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6

In the eye of the beholder: Towards a better understanding of how parents' and adolescents' affect relates to discrepant perceptions of parental warmth in daily life

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Abstract

The current study aimed to evaluate how adolescents' and parents' perceptions of daily parenting - and their discrepancies - relate to daily parent and adolescent affect. Daily parental warmth and affect were assessed using electronic diaries in 150 American adolescent-parent dyads (61.3% females, M_{age} = 14.6, 83.3% White; 95.3% mothers, M_{age} = 43.4; 89.3% White) and in 80 Dutch adolescents with 79 mothers and 72 fathers (63.8% females, M_{age} = 15.9, 91.3% White; M_{age} = 49.0, 97.4% White). Results of preregistered models indicated that individuals' affect may be more important for perceptions of parenting than discrepancies between parent-adolescent reports for affect, stressing the need to be aware of this influence of affect on parenting reports in clinical and research settings.

Keywords: daily diary, parental warmth, divergence

Introduction

Adolescence represents a time when developing youth begin to gain independence outside of the family, negotiating new rules, freedoms, and relationships (Branje, 2018). During this period, changes to the parent-adolescent relationship are common and normative, often resulting in increased adolescent-parent conflict (Steinberg & Morris, 2001). Despite these increases in conflict, warm and supportive parenting remains important for adolescent well-being throughout adolescence. In general, adolescents from families characterized by higher levels of parental warmth are at lower risk for internalizing and externalizing problems (Pinquart, 2017; Rothenberg et al., 2020). Studies examining the daily dynamics of adolescents and their families, which have the power to elucidate within-person processes (i.e., individual changes over time), have converged on similar findings: on days when adolescents report more warmth or support from parents, adolescents also report higher positive and lower negative affect (Bai et al., 2017; Flook, 2011; Janssen, Verkuil et al., 2021; Robles et al., 2016). However, exclusively relying on adolescent reports of parenting ignores the fact that family dynamics are the result of multiple family members' perspectives, attitudes, and behaviors, as well as the interactions among them (Minuchin, 1985; Cox & Paley, 1997). Recent multi-informant studies (e.g., using both adolescent and parent reports) have indicated that parents' perception of their own parenting behavior can differ from adolescents' perceptions (Hou et al., 2018, 2020; Korelitz & Garber, 2016; Brinberg et al., 2017), and started to examine the impact that parent and adolescent perceptions of parenting behaviors, as well as differences between reports, have on adolescent affect. Despite the theorized interrelatedness of family members and their behaviors (Minuchin, 1985), and empirical evidence that parental affect and parenting are related (Rueger et al., 2011), studies have not yet addressed how parents' affect may be linked to fluctuations in daily parenting. In this paper, we aim to examine whether fluctuations in daily affect of both parents and adolescents are related to adolescents' and parents' perceptions of parenting and discrepancies between them. More insight into these family dynamic processes might ultimately help to inform (preventive) interventions to promote positive family and individual well-being.

Implications of informant discrepancies for adolescent well-being

Although implications of divergent adolescent and parent reports of parenting for adolescent well-being have been discussed, empirically testing these suggestions is a fairly new line of research. One hypothesis is that divergence in parent and adolescent reports of parental warmth, with adolescents reporting more negative than parents, may signify that the adolescent is gaining an individual identity and experiencing a normative decline in closeness to the family (Bowen, 1978; Grovetant & Cooper, 1985). Some empirical work has supported this idea, by documenting that divergence in parent and adolescent reports of their relationship quality is associated with higher adolescent self-competence and lower risk for adolescent behavior problems and externalizing problems (Reidler & Swenson, 2012; Brinberg et al., 2017; Carlson et al., 1991). In contrast, divergence in perceptions of parental warmth has also been hypothesized to serve as a marker for dysfunctional family dynamics that threaten adolescent well-being (De Los Reyes et al., 2019). For example, divergence in reports of parenting and parent-adolescent relationship quality may indicate that the family is poor in communication or overall cohesion, which contribute to risk for poorer adolescent development (Tein

et al., 1994). Additionally, divergent perspectives may signal a misfit between adolescents' needs and parents' demands (Eccles et al. 1993; Lerner et al. 1986). The majority of empirical evidence, using retrospective questionnaire data, has tended to support this hypothesis, with discrepancies in parent-adolescent reports of warmth corresponding to poorer adolescent well-being in general (e.g., Hou et al., 2020).

As individuals' feelings and perceptions may vary considerably from day-to-day (e.g., Fosco et al., 2019) assessing these processes on the daily level is necessary. Importantly, a recent study by Janssen, Verkuil and colleagues (2021) focusing on these within-person fluctuations found that in addition to individual perceptions of the adolescent, discrepancies in parent and adolescent reports of daily warmth (with adolescents reporting less parental warmth than their parents) was related to adolescents' elevated negative affect and reduced positive affect on the same day. This study provides initial evidence that divergent adolescent-parent reports of daily parental warmth may pose a risk for diminished adolescent affect, or that negative affect may influence reports of parenting. Moreover, discrepancies can undermine both adolescents' and parents' well-being (e.g., De Los Reyes, 2011), but most studies have solely focused on adolescents' well-being. Therefore, the current study aims to add value by understanding the implications of parent-youth discrepancies for parent well-being in daily life.

Interrelatedness between adolescents and parents

It is established that parental affect and parenting behaviors are interrelated (Dix, 1991; Rueger et al., 2011), however, the majority of studies on parenting have focused on adolescent-reported parenting behavior. The few studies that did assess this in daily life have highlighted that both adolescent and parent perceptions of the quality of their relationship are influential for the well-being of both dyad members (LoBraico et al., 2020; Fosco et al., 2021), but information on whether and how well-being of parents relates to the differences between parents' own and adolescent perspectives is lacking. Moreover, not only do adolescents' and parents' perspectives and behaviors interact, also their affect can influence each other. Few studies have examined this interrelatedness of family members' affect and found modest correlations between parents' and adolescents' affect on the daily level (Larson & Richards, 1994). More research is necessary to examine whether parents' and adolescents' affect is interrelated on a daily basis and specifically in relation to parenting behavior. By using intensive longitudinal methods the current study aims to provide more insight into the dynamic processes around individual perceptions of parenting and discrepancies within a family and its relation to affect in daily life. This moreover allows individuals to be compared to their own averages across time, in order to assess the implications of having a day with relatively more or less positive or negative affect compared to a usual day for that individual.

Additionally, our understanding of the relations between parenting and parent and adolescent affect so far is rather limited, because research is mainly based on reports about mothers. Although mothers and fathers might serve different and unique roles in parenting their adolescents (e.g., Lamb and Lewis, 2013), with mothers being more emotion-directed and supportive than fathers during adolescence (De Goede et al. 2009; Mastrotheodoros et al. 2018), parenting studies that include fathers remain scarce. Interestingly, the limited available data suggests that fathers' affect may be more strongly associated with child affect than mothers' affect in daily life, at least on average

(Almeida et al., 1999; Larson & Richards, 1994). Regarding parenting, one recent study found that discrepancies between adolescents' and mothers' reports of parental warmth were more consistently related to adolescent positive affect than discrepancies between adolescents and fathers (Janssen, Verkuil et al., 2021). Further investigation is warranted. Therefore, in addition to including both adolescents and parents, examination of possible parent gender differences in the implications of daily informant discrepancies is a key direction for research that we aim to assess.

Utilizing multiple informants and rigorous statistical methods fit for intensive longitudinal designs can move the field toward a more solid understanding of the interplay between daily adolescent and parent perceptions of the family and daily well-being. Recently, a hybrid (combined) statistical model, which enables including both the difference score and individual perceptions in one model, was proposed (Iida et al., 2018). This model combines advantages of the Actor Partner Interdependence Model (APIM; Kashy & Kenny, 1999) and Dyadic Score Model (DSM; Iida et al., 2018). Using the hybrid model, researchers are able to not only assess the extent to which a pair of exploratory variables (i.e., adolescent and parent perceptions of parental warmth) affect a pair of outcome variables (i.e., adolescent and parent affect), as with APIM, but also include a variable that characterizes a dyadic relationship, such as the discrepancy between adolescent and parent reports, as with DSM. The use of differences scores alone - that is, without taking into account each informant's actual report of the construct, for example the degree of parental warmth - is insufficient to understand the impact of degree of divergence between two informant reports as the individual perceptions are ignored (see Laird & De Los Reyes, 2013). We therefore aim to use the hybrid model to assess how both the difference score and individual perceptions of daily parental warmth of parents and adolescents are related to adolescents' and parents' daily affect.

The current study

The current study aims to investigate two research questions: 1) whether and how adolescents' and parents' perceptions of parental warmth, and discrepancies in adolescent-parent reports, are related to daily adolescent and parent affect, and 2) whether these associations differ between adolescent-mother and adolescent-father dyads. These questions are evaluated in two samples: one sample of 150 American parent-adolescent dyads (sample I - Family Life Optimizing Well-being (FLOW) study, *n* = 143 mother-adolescent and *n* = 7 father-adolescent dyads), and a second sample of 80 Dutch families in which in almost all cases both mothers and fathers completed the study (sample II - Relations and Emotions in Parent Adolescent Interaction Research (RE-PAIR), *n* = 79 adolescent-mother and *n* = 72 adolescent-father dyads). Capitalizing on a two-sample design allows for replication of findings across samples with two different cultural contexts (i.e., testing research question 1 in both samples), as well as analysis of parental gender differences in effects which is only possible in sample II.

Both samples utilized a daily diary design to assess parenting that enabled us to assess how daily variability in perceptions of parental warmth and parent-adolescent discrepancies are related to adolescent and parent affect and vice versa. Previous single time point studies have examined the implications of parenting and divergence in parent-youth reports at a between-family level (e.g., the implications of being in a family characterized by high vs low discrepancies or high vs low parental warmth); the current study adds to this by examining within-family associations between perceptions,

discrepancies, and parent and adolescent affect (e.g., the implications of having a higher than usual discrepancy score on a given day). Therefore, this study represents an important adjunct to the current literature about parent-adolescent discrepancies.

Based on the current understanding of perceptions, parent-adolescent discrepancies, and their relationship with adolescent and parent affect, we registered the following hypotheses (https://osf.io/akr8j/):

H1: Adolescents' reports of daily parental warmth will be positively related to adolescents' reports of daily happiness and negatively to daily sadness and daily irritation.

H2: Parents' reports of daily parental warmth will be positively related to parents' reports of daily happiness and negatively to daily sadness and daily irritation.

H3: Both on the between- and within-family level, adolescent-parent divergence in reports of parental warmth will relate to adolescents' elevated negative affect and reduced positive affect. Due to lack of information from previous studies, we refrain from making hypothesis about the associations between discrepancies and parents' affect but will examine the relationship in an exploratory way.

H4: Adolescents' and parents' daily affect will be positively associated.

We also refrain from stating hypotheses about differences between adolescent-mother and adolescent-father dyads as previous information is lacking.

Method

Method sample I (FLOW)

Participants

Participants of sample I consisted of 150 parent-adolescent dyads who participated in the Family Life Optimizing Well-being (FLOW) study, a daily diary study of families in central Pennsylvania, USA. Participants were recruited through local high schools, data collection occurred from 2014 to 2017. The FLOW study was approved by the Institutional Review Board at the Pennsylvania State University (STUDY00000472). Participants completed an eligibility screening to assess their eligibility. In order to be eligible, families had to meet the following criteria: 1) they were a two-caregiver family, 2) the adolescent lived in the house continuously, 3) the family had internet access, 4) participants were fluent in English, 5) the participating adolescent was in 9th or 10th grade, and 6) one parent and one adolescent consented (parent) and or assented (adolescent) to participate. Participating caregivers and adolescents completed baseline surveys before completing a daily diary protocol. Demographics are presented in Table 1. Families' annual household income ranged from "less than $10,000" to "$125,000 or more," with a median income between $70,000 - $79,000 per year.

Table 1. Sample demographics

	FLOW		RE-PAIR	
Variables	*N*		*N*	
Adolescents				
Gender, *n* Females (%)	150	92 (61.3%)	80	51 (63.8%)
Age (years), *M (SD)*	150	14.6 (0.8)	80	15.9 (1.4)
Race/ethnicity % (n)	150		80	
White		83.3 (125)		91.3 (73)
Black/African American		2.7 (4)		1.3 (1)
Asian/Asian American		4.7 (7)		2.5 (2)
Native American/American Indian		0.7 (1)		-
Multiracial		6.7 (10)		3.8 (3)
Hispanic/Latino/a		2.0 (3)		-
Other[a]		0.7 (1)		1.3 (1)
Parents				
Gender, *n* Females (%)	150	143 (95.3%)	151	79 (52.3%)
Age (years), *M (SD)*	150	43.4 (6.9)	151	49.0 (5.9)
Race/ethnicity, *n* (%)	150		151	
White		134 (89.3%)		147 (97.4%)
Black/African American		4 (2.7%)		1 (0.7%)
Asian/Asian American		5 (3.3%)		-
Native American/American Indian		1 (0.7%)		-
Multiracial		4 (2.7%)		2 (1.3%)
Hispanic/Latino/a		2 (1.4%)		-
Other[a]		1 (0.7%)		1 (0.7%)
Relationship with child - mother, *n* (%)	143		79	
Biological parent		139 (97.2%)		75 (94.9%)
Stepparent		2 (1.4%)		-
Foster parent		1 (0.7%)		1 (1.3%)
Adoptive parent		-		3 (3.8%)
Aunt		1 (0.7%)		
Relationship with child - father, *n* (%)	7		72	
Biological parent		7 (100%)		62(86.1%)
Stepparent		-		6 (8.3%)
Foster parent		-		3 (4.2%)
Adoptive parent		-		1 (1.4%)

[a]Includes Antillean/Surinamese, & Kurdish (RE-PAIR), and West Indian (FLOW). Participants in FLOW could choose multiple values for race/ethnicity, n=2 did not complete information about their own or their child's race/ethnicity

Procedure

After parents and adolescents consented and assented to participation, they were sent a web-based baseline survey. After completion, a 21-day daily diary protocol was initiated in which the caregiver and adolescent each received a brief (5 minute or less) survey via email at 7PM each night for 21 consecutive nights. Participants also received phone call or text message reminders (based on preference) after receiving surveys. Parents and adolescents were compensated separately, earning

a $25 Amazon or Wal-Mart gift card (based on preference) for completion of the baseline surveys. For the current study, baseline surveys are only used for measurements of demographic characteristics. For daily surveys, each participant earned $2.50 for the first four days of each week, and $5.00 for the last three days, for a total of up to $25 per week. Compliance with daily surveys was high, with adolescents completing an average of 19.0 daily surveys (90.4%; SD_{Days} = 2.53) and parents completing an average of 20.3 daily surveys (96.5%; SD_{Days} = 1.28).

Measures

Daily parental warmth. Adolescents were asked two items each day about their perceptions of parental warmth that day, "How warm and affectionate was your [Parent 1] with you," and "How much did your [Parent 1] care about your feelings?" The text "Parent 1" in each question was replaced with text specific to the participating caregiver for each family (e.g., mother, father, step-mother). Adolescents responded using a digital slider scale from 0 (Not at All True) to 10 (Very True), and responses could be adjusted by .10 increments. Parents responded about their own warmth using parallel items, "I was loving and affectionate with my child," and "I tried to understand my child's point of view." Parent items used the same response scheme as adolescent items.

Daily affect. Adolescents and parents responded to the same items measuring daily affect. Three facets of daily affect were used in the current study: happiness, sadness, and irritation. Two items assessed each facet. The question stem "How much of the time today did you feel…" was followed by the options "happy" and "content" for happiness, "depressed" and "sad or blue" for sadness, and "angry" and "annoyed" for irritation. Responses ranged from 0 [None of the Time] to 10 [All of the Time] and could be adjusted by .10 increments. The two items for each construct were averaged for a daily score.

Method sample II (RE-PAIR)

Participants

Participants of sample II consisted of 80 families who participated in RE-PAIR (Relations and Emotions in Parent Adolescent Interaction Research). RE-PAIR is a Dutch multimethod two-generation study examining the bidirectional interplay between parent-child interactions and adolescent mental well-being by comparing adolescents with a current major depressive disorder or dysthymia and their parents to adolescents without psychopathology and their parents. The complete RE-PAIR study consisted of four parts: online questionnaires, a research day at the lab, 2 weeks of EMA, and a Magnetic Resonance Imaging (MRI)-scan session with the adolescent and one or both parents. Adolescents and one or two parents (if possible) participated. The RE-PAIR study was approved by the Medical Ethics Review Committee (METC) of Leiden University Medical Centre (LUMC; research protocol: P17.241). The current study only used EMA data of the 80 adolescents without psychopathology and their 151 parents. For a detailed description of the in- and exclusion criteria and recruitment of RE-PAIR and this subsample see Janssen, Verkuil et al., 2021. Demographics are presented in Table 1. Parents indicated monthly family income and reported an income of more than €4.500 (*n* = 79), between €2.500-€4.500 (*n* = 67), and less than €2.500 (*n* = 5).

Procedure

All participants signed informed consent. If adolescents were younger than 16 years of age, parents with legal custody also signed informed consent for the adolescent. The Ethica Data application on their own smartphones was used for the EMA, which lasted 14 consecutive days. Participants received four surveys a day (total of 56 questionnaires). The EMA of RE-PAIR in the subsample used in the current study was conducted in the period between September 2018 and November 2019. As compensation for EMA, parents received €20 and adolescents €10. In addition, four gift vouchers of €75 were raffled based on compliance. For detailed information on EMA procedure, time schedule of questionnaires, and compliance see Janssen, Verkuil et al., 2021.

Measures

Daily parental warmth. Adolescents indicated in the last questionnaire of each day whether they spoke to a parent during that day. If this was the case, they indicated with whom (i.e., mother, father, stepmother, stepfather). Adolescents rated parental warmth for each parent they spoke to by answering the question: "Throughout the day, how warm/loving was your [mother or father] towards you?" Only adolescents' answers about parents who participated in the EMA were include in the current study. Similarly, parents indicated in the last questionnaire of the day whether they spoke to their adolescent participating in RE-PAIR. Parents rated their own parental warmth by answering the question "Throughout the day, how warm/loving were you toward your child?". Answers were given on a seven-point Likert type scale with answer categories ranging from 1 (*not at all*) to 7 (*very*).

Daily affect. Adolescents and parents rated their own momentary affect states in every questionnaire (four times a day) with an adapted and shortened version of the Positive and Negative Affect Schedule for Children (PANAS-C; Ebesutani et al. 2012; Watson et al. 1988). In the current study, three affect states were used separately: happiness, irritation, and sadness. These were assessed by asking: "How do you feel at this moment?" followed by: "Happy", "Sad", or "Irritated". Answers were given on a seven-point Likert type scale with answer categories ranging from 1 (*not at all*) to 7 (*very*). A daily mean score of each affect state was calculated.

Preregistered analysis plan

Data preparation

Before performing preregistered (https://osf.io/akr8j/) hybrid models in R Studio version 2022.2.1 (build 461; RStudio Team, 2022) for sample I and R version 4.0.1 (R Core Team, 2020) for sample II, we followed guidelines for centering as presented by Bolger & Laurenceau (2013) and in order to account for the fact that parents' and adolescents' ratings of warmth had different ranges, we centered adolescent and parents scores separately. We subtracted the sample mean from the raw score for centering (a slight deviation from what was presented in the preregistration, in which the raw score was described as being subtracted from the sample mean). To calculate the between-person (or grand mean-centered) score, the sample mean was subtracted from the person mean score. To calculate a within-person centered score, the person mean was subtracted from the daily raw score. Next, we calculated the difference score between adolescent and parent reports of daily parental warmth by subtracting parents' self-reported warmth from adolescents' rating of parental warmth on the same day. Because of this directional score calculation, positive discrepancies

indicated that adolescents perceived relatively higher parental warmth than parents self-report that day, and negative discrepancies indicated days on which parents perceived their own warmth as relatively higher than what adolescents perceived.

Hybrid models

For model building, steps presented by Bolger & Laurenceau (2013) were followed. Three separate hybrid models were estimated using sample I with the different affect states (daily happiness, daily irritation, daily sadness) as outcomes. The models included fixed effects of adolescent perception of daily parental warmth (between and within-person), parent perception of daily parental warmth (between and within-person), and the difference between adolescent and parent perceptions of daily parental warmth (between and within-person). Day of study was included in the models as predictor. Six separate models were estimated using sample II with the different affect states (daily happiness, daily irritation, daily sadness) as outcomes, and mother-adolescent and father-adolescent models run separately. The models included fixed effects of adolescent perception of daily parental warmth (between and within-person), mother or father perception of daily parental warmth (between and within-person), and the difference between adolescent and mother or father perceptions of daily parental warmth (between and within-person). Day of study was included in the models as predictor. For all models, the *p*-values of the unstandardized estimates were interpreted to indicate significance of effects (two-sided, alpha = 0.05). We do not report effect sizes since there is a lack of consensus on methods to calculate standardized effect sizes in multilevel models (e.g., Wang & Rhemtulla, 2021)
In the result section, we discuss the within-person (daily level) findings. Full information and description of between-person results can be found in the supplementary materials.

Results

Results sample I (FLOW)

Preliminary analyses

Descriptive statistics of the study variables are shown in Table 2; correlations can be found in Appendix 1. To gain insight into the occurrence of discrepancies between parents' and adolescents' reports of parental warmth, we compared their reports at the within-person (i.e., daily) and between-person (i.e., average) level (see Appendix 3 for detailed information on calculation and results at the between-person level). Substantial variation was found with regard to discrepancies between adolescent and parent perceptions of daily parental warmth. Based on a cut-off of a discrepancy of more than half SD adolescents and parents had similar perceptions of parental warmth on 55.7% of the days, whereas adolescents reported more parental warmth than parents on 23.1% of days, and on 19.3% of days parents reported more parental warmth than adolescents.

Main analyses

In order to examine the first aim of the study, whether and how adolescents' and parents' perceptions of parental warmth and discrepancies in adolescent-parent reports are related to adolescent and parent affect, three hybrid models were specified. The main results of these models are presented in Figure 1A, 2A, and 3A (see Appendix 4 for full model results). As expected, adolescents' and parents'

affect were positively associated. In line with the hypotheses, daily fluctuations in parental warmth were related to fluctuations in adolescent affect. On days when adolescents reported higher levels of parental warmth than usual, they reported more happiness (*Est* = 0.36, $p < .001$), less irritation (*Est* = -0.39, $p < .001$), and less sadness (*Est* = -0.19, $p < .001$). Similar effects were found for parents. On days when parents reported more parental warmth than usual, they also reported more happiness (*Est* = 0.43, $p < .001$), less irritation (*Est* = -0.35, $p < .001$), and less sadness (*Est* = -0.19, $p < .001$). Of particular interest was whether the adolescent-parent discrepancies in parental warmth were associated with adolescent and parent affect. On days when this discrepancy was larger than usual in magnitude, adolescents reported less happiness (*Est* = -0.07, $p = .005$) and more irritation (*Est* = 0.10, $p < .001$). No association was found with adolescent sadness. As expected, the direction of effects was the opposite for parents, consistent with the directional calculation of the difference score (parent report subtracted from adolescent report). On days when the discrepancies were larger than usual, parents reported more happiness (*Est* = 0.11, $p < .001$), less irritation (*Est* = -0.14, $p < .001$), and less sadness (*Est* = -0.10, $p < .001$).

Results sample II (RE-PAIR)

Preliminary analyses

Descriptive statistics of the study variables are shown in Table 2; correlations can be found in Appendix 2. We compared adolescent-mother and adolescent-father reports of parental warmth at the within-person and between-person level (see Appendix 3 for detailed information on calculation and results at the between-person level). Substantial variation was found with regard to discrepancies between adolescent and parent perception of daily parental warmth. Based on a cut-off of a discrepancy of more than half SD adolescents and parents had similar perceptions of parental warmth on 37.0% and 25.2% of the days for mothers and fathers respectively, whereas adolescents reported more daily parental warmth than mothers and fathers respectively on 38.5% and 51.7% of days, and on 24.5% and 23.0% of days mothers and fathers reported more daily parental warmth than adolescents.

Table 2. Descriptive statistics FLOW and RE-PAIR sample

	FLOW (sample I)		RE-PAIR (sample II)			
			Adolescent-mother dyads		Adolescent-father dyads	
	M	*SD*	*M*	*SD*	*M*	*SD*
Adolescent happiness	8.11	2.26	5.37	1.05	5.36	1.04
Adolescent irritation	1.65	2.23	1.57	0.95	1.58	0.98
Adolescent sadness	1.13	2.17	1.44	0.87	1.45	0.88
Parent happiness	7.61	2.30	5.06	0.93	5.08	0.91
Parent irritation	1.55	2.07	1.61	0.88	1.67	0.91
Parent sadness	0.96	1.80	1.57	0.88	1.62	0.90
Adolescent warmth	8.45	2.14	5.91	1.04	5.80	1.20
Parent warmth	8.07	2.00	5.71	0.94	5.38	0.98

Note: for FLOW, parental warmth ranged from 0 (not at all true) to 10 (very true) and indicators of affect ranged from 0 (none of the time) to 10 (all of the time). For RE-PAIR, parental warmth and indicators of affect ranged from 1 (not at all) to 7 (very).

Main analyses

In order to examine the first aim, replicate findings of sample I as well as the second aim of the study, i.e., whether the associations differ between adolescent-mother and adolescent-father dyads, a total of six hybrid models were specified.

Maternal warmth. Main results of the three models concerning maternal warmth are presented in Figure 1B, 2B, and 3B (see Appendix 5 for full model results and description of between-person results). As expected, adolescents' and mothers' affect were positively associated. Most findings regarding the associations between parental warmth and parents' and adolescents' affect in the sample I were replicated in sample II. On days when adolescents reported higher levels of maternal warmth than usual, they also reported more happiness (*Est* = 0.16, *p* = .004) and less sadness (*Est* = -0.11, *p* = .037); however, no relations were found with irritation. Regarding mothers' affect, on days when mothers reported more parental warmth than usual, they also reported more happiness (*Est* = 0.19, *p* < .001), less irritation (*Est* = -0.17, *p* = .001), and less sadness (*Est* = -0.14, *p* = .001). Regarding mother-adolescent discrepancies in maternal warmth, daily variation in discrepancies score was not associated with adolescent daily affect, but it was associated with mothers' affect. On days that the discrepancy between adolescent and mother report of parental warmth was larger than usual in magnitude, mothers reported more happiness (*Est* = 0.07, *p* = .037), less irritation (*Est* = -0.09, *p* = .027), and less sadness (*Est* = -0.09, *p* = .002).

Paternal warmth. Main results of the three models concerning paternal warmth are presented in Figure 1C, 2C, and 3C (see Appendix 6 for full model results and description of between-person results). As expected, adolescents' and fathers' affect were positively associated. Our analyses evaluating paternal warmth also largely replicated findings from sample I. On days when adolescents reported higher levels of paternal warmth than usual, they reported also more happiness (*Est* = 0.17, *p* = .004), less irritation (*Est* = -0.14, *p* = .019), and less sadness (*Est* = -0.17, *p* = .001). On days when fathers reported more parental warmth than usual, they also reported more happiness (*Est* = 0.14, *p* = .010) and less irritation (*Est* = -0.19, *p* = .001); however, no relation was found with sadness. Regarding the discrepancies between adolescents and fathers concerning daily paternal warmth, only one association was significantly related to adolescent affect. That is, on days when the discrepancy was larger than usual in magnitude, adolescents reported more sadness (*Est* = 0.09, *p* = .002), but discrepancies were not associated with happiness or irritation. Discrepancies were more consistently related to fathers' affect. On days when the discrepancy was larger than usual in magnitude, fathers reported less irritation (*Est* = -0.08, *p* = .012) and less sadness (*Est* = -0.07, *p* = .015).

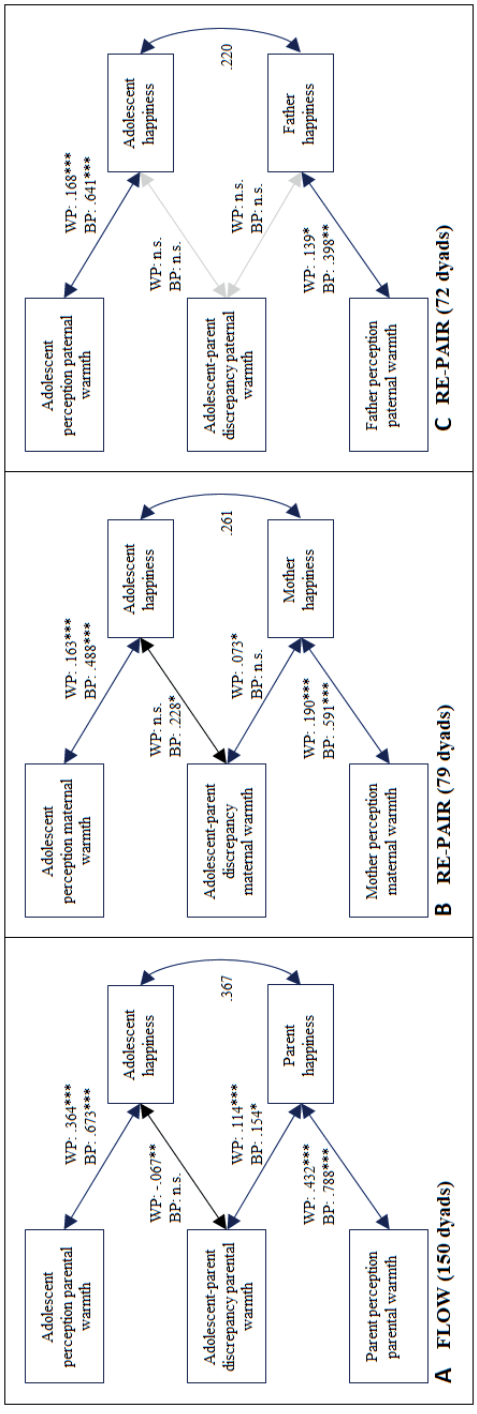

Figure 1. Model results of hybrid models of daily parental warmth and happiness. Panel A shows results for sample I (N = 150 adolescent-parent dyads). Panel B shows model results for adolescent-mother dyads of the sample II (n = 79 dyads). Panel C shows model results for the adolescent-father dyads of the sample II (n = 72 dyads). Unstandardized estimates are shown.
* $p < .05$; ** $p < .01$; *** $p < .001$.

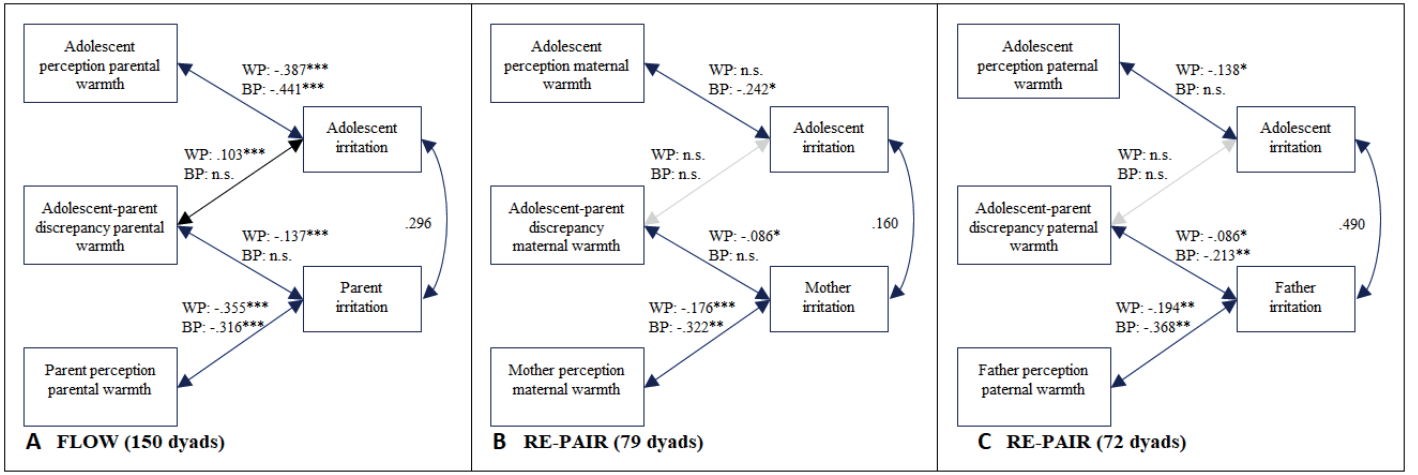

Figure 2. Model results of hybrid models of daily parental warmth and irritation. Panel A shows results for sample I (*N* = 150 adolescent-parent dyads). Panel B shows model results for adolescent-mother dyads of the sample II (*n* = 79 dyads). Panel C shows model results for the adolescent-father dyads of the sample II (*n* = 72 dyads). Unstandardized estimates are shown.

* $p < .05$; ** $p < .01$; *** $p < .001$.

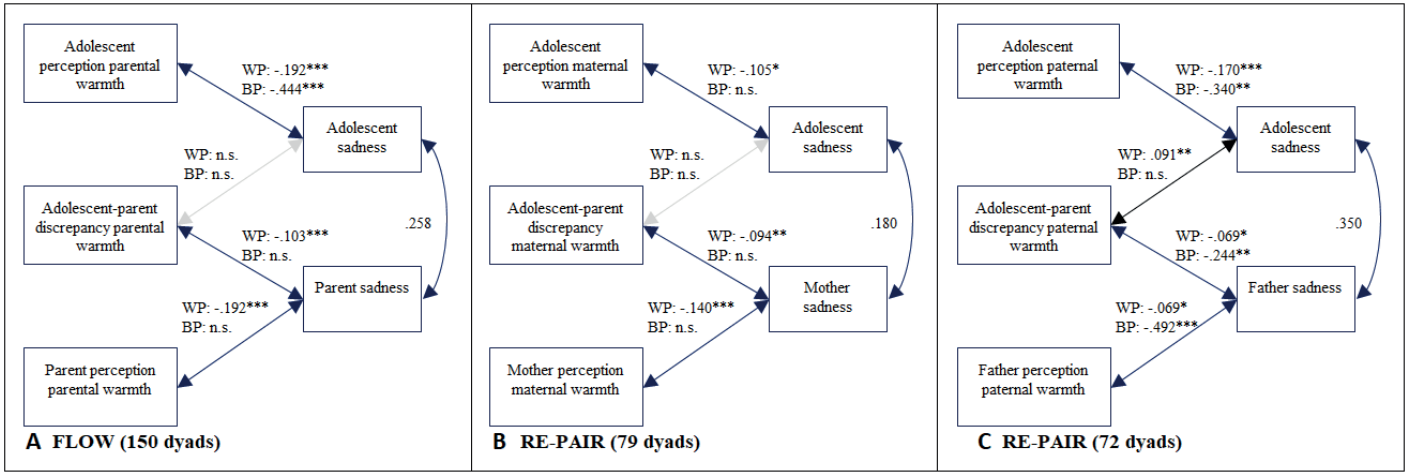

Figure 3. Model results of hybrid models of daily parental warmth and sadness. Panel A shows results for sample I (*N* = 150 adolescent-parent dyads). Panel B shows model results for adolescent-mother dyads of the sample II (*n* = 79 dyads). Panel C shows model results for the adolescent-father dyads of the sample II (*n* = 72 dyads). Unstandardized estimates are shown.
* $p < .05$; ** $p < .01$; *** $p < .001$.

Sensitivity analysis

Interaction terms have been suggested as alternative means of capturing discrepancies in two informants' reports (Laird & De Los Reyes, 2013; De Los Reyes et al., 2013; Ohannessian et al., 2016). To address concerns regarding the potential redundancy of evaluating difference scores in combination with each of the two informants' individual scores in a multilevel regression analysis (Laird & De Los Reyes, 2013; Laird & Weems, 2011), we therefore conducted exploratory sensitivity analyses in addition to the preregistered analyses of the hybrid models using only sample I (due to larger sample size). Although it is unclear whether past criticisms of discrepancy analyses apply to multilevel hybrid models (including two outcomes and not regressing both individual reports on both outcomes) as used in this study, we chose to re-compute our hybrid models using interaction scores to replace discrepancy scores for comparison to our original results. An interaction score was calculated by multiplying parent and adolescent daily reports of parental warmth. Instead of centering on the individual level, we now centered on the dyad level to facilitate interpretation of the interaction score. We centered the interaction score at the within-person level by subtracting the person-mean interaction score from the daily raw score, and at the between-person level by subtracting the sample mean interactions score from the person-mean score (see e.g., Laird & De Los Reyes, 2013 for similar method).

Three hybrid models were specified in which adolescent and parent individual daily and average perceptions of warmth, as well as the interactions between adolescent and parent reports of parental warmth, were associated with each of the three parent and adolescent daily affective states (see Table in Appendix 7 for full model results). Regarding parents' and adolescents' individual reports of parental warmth, the patterns of results were similar to findings using difference scores, reported above. Interaction scores between adolescent and parent reports of daily parental warmth were associated with daily adolescent happiness (*Est* = 0.01, p = .017). As shown in Figure 4, adolescent happiness was highest on days when parents and adolescents converged on high reports of parental warmth (e.g., low discrepancy), whereas it was lowest on days when adolescents reported low parental warmth and parents reported high parental warmth. Similar findings were found for irritation, with higher levels of irritation when parent and adolescent both report low parental warmth, whereas irritation was lowest on days when parental warmth was rated low by adolescents, regardless of parental ratings (*Est* = -0.01, p < .001). No interaction was found for sadness, however (*Est* = -0.00, p = .449).

Interaction scores of daily parental warmth were associated with parents' happiness (*Est* = 0.01, p < .001), irritation (*Est* = -0.01, p < .001), and sadness (*Est* = -0.01, p < .001) the same day (see Figure 4). For daily happiness of parents, a similar pattern was shown as for adolescent happiness. For daily sadness, parents' daily sadness was lowest when both parents and adolescents converged on high parental warmth, and parental sadness was highest when parents and adolescents converged on low parental warmth. Parents' daily irritation was highest when both informants converged on low reports of parental warmth.

It should be noted that the plots in Figure 4 do not fully represent our model results. Due to the required data structure for the hybrid models (e.g., separate rows for each individual), interactions could not be easily probed using traditional methods. Therefore, in order to better understand the interactions, we ran separate models for parent and adolescent outcomes where parent daily and

average reports of parental warmth were treated as moderators of adolescent daily and average reports, and vice versa. These were run using the nlme package in R (Pinheiro & Bates, 2022) and were similar to typical multi-level models with level-one and level-two interactions. We present plots (Figure 4) for each of the interactions at the within-person level, treating parent reports as moderators of adolescent reports for adolescent outcomes models, and treating adolescent reports as moderators of parent reports for parent outcomes.

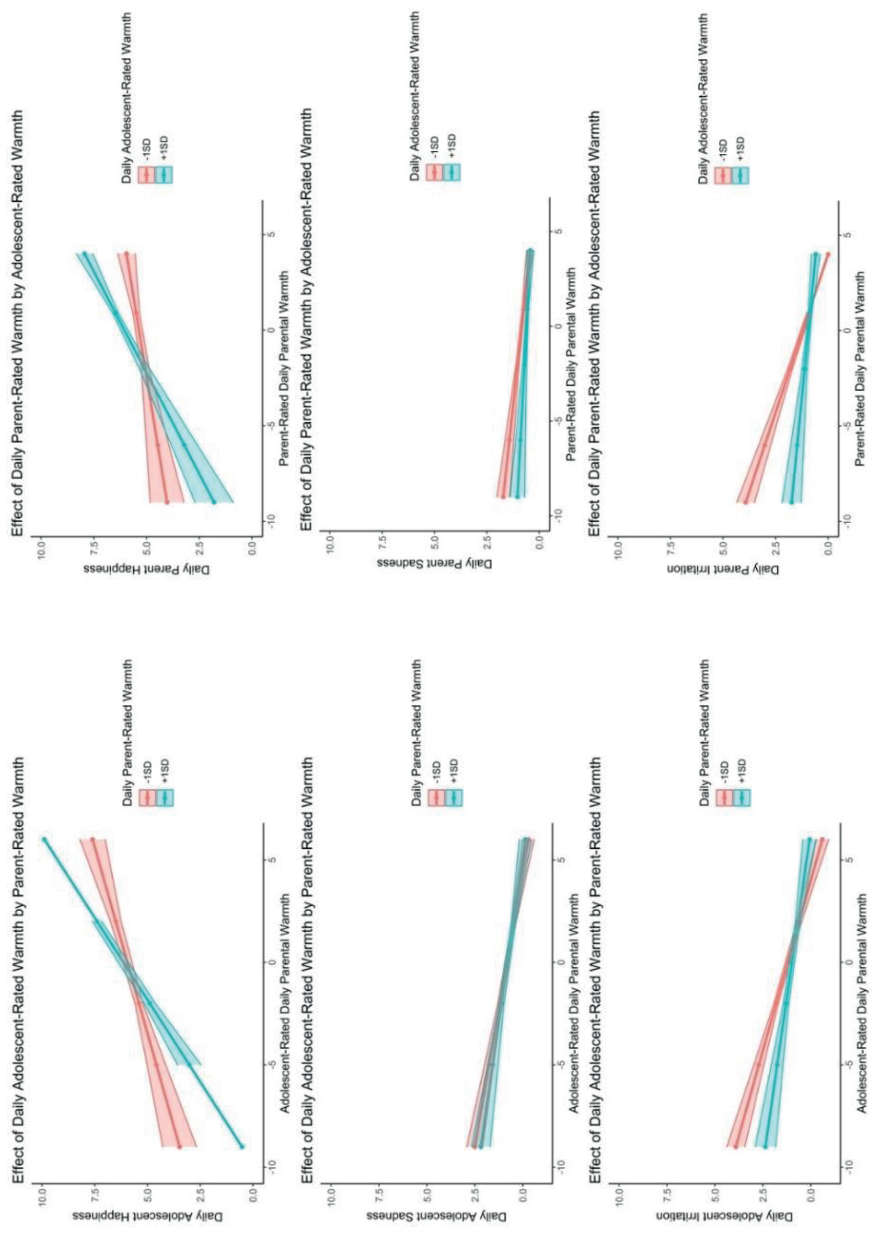

Figure 4A, B, C. Associations between adolescent-rated warmth as a function of parent-rated parental warmth (+1SD vs -1SD) (left panel) and parent-rated parental warmth as a function of adolescent-rated parental warmth (+1 SD vs -SD) (right panel) on daily happiness (A), irritation (B), and sadness (C).

Discussion

Since family dynamics stem from perceptions and behaviors of family members that influence each other and interact (Minuchin, 1985; Cox & Paley, 1997), studies increasingly include both adolescent and parent reports on parenting behavior. Results of these studies showed that these perceptions can differ (Hou et al., 2018,2020; Korelitz & Garber, 2016) and that the differences between perceptions of parents and adolescents are associated with adolescent general well-being (Hou et al., 2020) as well as daily affect (Janssen, Verkuil et al., 2021). However, no studies to date have taken into account parents' affect, disregarding interrelatedness of affect between family members. In the current study, we therefore aimed to investigate whether adolescents' and parents' perceptions of daily parenting and differences between them relate to daily affect of both adolescents and parents by using novel hybrid models and analyzed parental gender differences.

Our findings, which utilized repeated measures designs assessing adolescents and parents across samples of families from two different cultural contexts, were largely consistent with our preregistered hypotheses. Generally, adolescents' reports of daily parental warmth were positively related to adolescents' reports of daily happiness and negatively related to daily sadness and irritation. This was the case both on the between-person and within-person level and in both samples supporting our first hypothesis. Similarly, consistent with our second hypothesis, parents' reports of daily parental warmth were positively related to their own reports of daily happiness and negatively related to daily sadness and irritation. However, with respect to the third hypothesis, testing the relation between discrepancies in reports of parental warmth and adolescent affect, the results were less consistent. For sample I, on days when discrepancies were larger than usual (indicating that parent report diverged more from adolescent report than on other days), adolescents also reported less happiness and more irritation. These findings were not replicated in sample II as divergence in perceptions of maternal warmth was not associated with adolescents' affect. Adolescents only reported more sadness on days when adolescent-father discrepancies were larger. Divergence in adolescent-parent reports of parental warmth was more consistently related to *parents'* affect on the within-person level than with adolescent affect. On days that parents differed more from adolescent report of parental warmth than usual, parents reported more happiness, less irritation, and less sadness, which generally was also the case for mothers and fathers in sample II. Lastly, our findings also supported our fourth hypothesis in showing that parents' and adolescents' affect were positively associated in the models.

Adolescent-parent discrepancies and affect in daily life

Most multi-informant studies, including both parents' and adolescents' reports of parenting behavior, have supported the idea that divergence in parent-adolescent reports of warmth relate to poorer adolescent well-being in general (e.g., Hou et al., 2020). Although, it has been suggested that divergence in perceptions of the family can undermine both adolescents' and parents' well-being (e.g., De Los Reyes, 2011), the relation between parent-adolescent discrepancies and parents' affect has not yet been evaluated. By using repeated measures designs and novel hybrid models (Iida et al., 2018), we were able to gain more insight into the daily dynamic processes of adolescents' and parents' perceptions of parenting, discrepancies between them and its relation to adolescent and parent affect

in daily life. Overall, our results indicated that divergence between adolescents' and parents' reports of parental warmth was more consistently related to parents' daily affect than adolescents' daily affect. A possible explanation for this is common informant effects (Laird & de Los Reyes, 2013; Laird & Weems, 2011). While both adolescents' and parents' reports of parenting behavior are influenced by their own affect, parents report on their own affect and behavior which may therefore be more strongly related than adolescents' reports.

Results from our sensitivity analysis, using interaction scores, converged with those from the difference score analysis and strengthen our findings. Moreover, using interaction scores allowed for a more directed and nuanced interpretation of the findings as it provides information on whether high (or low) scores from one informant are more or less strongly associated with the outcome when scores from the other informant are also high (or low) (Laird & De Los Reyes, 2013). For instance, adolescents' happiness was lowest on days when adolescents reported less warmth than parents. Similarly, for parents, happiness was lowest on days that they reported less parental warmth than adolescents. Convergence on more daily parental warmth was generally related to more happiness, less daily irritation, and sadness for both parents and adolescents. Interestingly, by taking into account both adolescent and parent affect, our results seem to suggest that it may be that discrepancies in itself do not affect mood, but rather that mood has an impact on the perception of parental behavior.

These findings do not suit the proposed implications of discrepancies on adolescent well-being, with discrepancies either indicating a normative developmental process related to adolescent autonomy development (Bowen, 1978; Grotevant & Cooper, 1985) or being a marker for dysfunctional family dynamics (De Los Reyes et al., 2019). To date, most studies focused on concurrent associations between discrepancies and adolescent well-being and few studies examined the predictive effect of adolescent-parent discrepancies in parenting over time (years; Hou et al., 2020). Results of one of these studies, examining adolescent-parent discrepancies of the parent-adolescent relationships in relation to adolescent depressive symptoms, showed that discrepancies were concurrently linked to more adolescent depressive symptoms but not over time (a year later) when controlling for adolescent depressive symptoms (Nelemans et al., 2016). Future studies examining concurrent as well as over time processes are therefore needed to further elucidate the role affect of informants plays when assessing discrepancies. Importantly, our findings highlight the importance of assessing not only perceptions of parenting of adolescent-parent dyads, but also include well-being of both members of the dyad.

Differences in findings for adolescent-mother and adolescent-father dyads

Our findings furthermore indicate differences between adolescent-mother and adolescent-father dyads in the extent to which discrepancies of parental warmth relate to adolescents' and parents' affect. Although in sample I, a greater degree of divergence was related to less daily happiness and more daily irritation in adolescents, this was not the case in sample II. For adolescent-mother dyads, the discrepancies of parental warmth were not related to adolescent affect and for adolescent-father dyads it was only related to adolescent daily sadness. Differences in design may play a role here. Affect and parenting were both assessed daily in sample I while in sample II parenting was assessed daily but affect was reported four times a day and a mean score was used in the analyses. Moreover, sample I is almost twice the size of sample II and warmth and affect were assessed for 21 consecutive days

instead of 14 days. As the hybrid models are fairly complex, future studies with larger samples are therefore needed.

Additionally, in line with the family systems theories (Minuchin, 1985) adolescents' and parents' daily affect were related, but differences between adolescent-mother and adolescent-father dyads were found. Happiness of adolescents and mothers was more strongly related compared to adolescents and fathers, while sadness and irritation in adolescent-father dyads were more strongly related compared to adolescent-mother dyads. This supports previous studies showing stronger processes of transmission of affective states between fathers and children (Almeida et al., 1999; Larson & Richards, 1994). It has been suggested that this might have to do with the position of power in the family. Traditionally, fathers often use more power-assertive parenting strategies with children (Youniss & Smollar, 1985), emotions of people with more power may thus impact the family and other family members more. Our findings may also reflect more compartmentalization of affect in mothers compared to fathers (Erel & Burman, 1995; Krishnakumar & Buehler, 2000). Mothers are seen as being more emotion-directed than fathers (De Goede et al. 2009; Mastrotheodoros et al. 2018), and mothers may also be more cautious in showing their irritation or sadness to their children resulting in less transmission of affect. This seems to correspond with other findings indicating that fathers are more likely than mothers to spillover tension from the marital dyad to the parent-child dyad (Almeida et al. 1999).

Limitations and future directions

Even though this study is the first to apply hybrid models to assess the extent to which parent-adolescent discrepancies in daily parental warmth relate to both adolescent' and parents' daily affect, several limitations should be acknowledged. The samples of both studies were fairly homogeneous regarding ethnicity and family constellation. The majority of participants were White and almost all adolescents lived in a two-parent household in both samples. Also, ratings of parental warmth were generally quite high. Therefore, findings cannot be generalized to more ethnic diverse samples or families with different family constellations. Moreover, although the current study takes into account fluctuations throughout days, heterogeneity between families was not assessed despite the fact that several previous studies have indicated that these daily life dynamic within-person processes differ between families (e.g., Boele et al., 2020; Janssen, Elzinga et al., 2021). Future studies should aim to include more racially and socioeconomically diverse samples and assess this heterogeneity to gain more insight. Furthermore, as the analyses concern concurrent associations, no claims can be made about the direction of the effects. That is, larger differences between adolescents' and parents' reports of parental warmth could result in less adolescent happiness, but also the other way around, with less happiness yielding larger differences between adolescent-parent reports of parental warmth. Research is therefore needed to examine direction of effects. Furthermore, although the current study separately examined adolescent-mother and adolescent-father dyads, it has been suggested that these dyads are subsystems of a larger system, the family (Restifo & Bögels, 2009). Future studies should aim to include the family as a whole in one model to gain more insight into of the family dynamics. Such studies should include larger samples to ensure sufficient power due to model complexity.

Conclusion

This study represents the first of its kind to examine parent and adolescent perceptions of daily warmth, as well as discrepancies in reports, in relation to daily parent and adolescent affect. The use of repeated measures in daily life and novel hybrid multilevel models revealed that adolescent-parent discrepancies of parental warmth were more consistently related to parents' affect than adolescents' affect in both samples. Our findings imply that the impact of individual affect is more important for perceptions of parenting behavior than the discrepancies between adolescent-parent perceptions for affect. Moreover, differences in interrelatedness of affect between adolescent-mother and adolescent-father dyads support ideas that fathers are less likely to compartmentalize their affect. Future work with larger and more diverse samples should further investigate and unravel the concurrent and over time implications of daily convergence and divergence in parent-adolescent reports in relation to the mood of both adolescent and parents.

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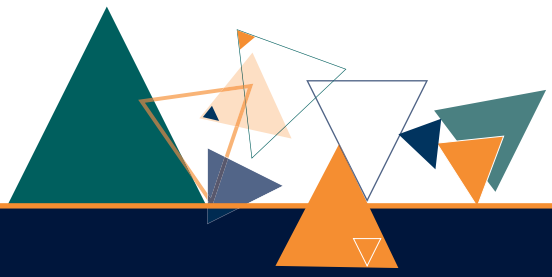
7

Tracking real-time proximity to assess parent-adolescent interactions in daily life



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Abstract

We present a novel method, using Bluetooth low energy beacons and a smartphone application, to examine frequency and duration of adolescents and parents time spent together in daily life by objectively tracking proximity in 77 Dutch families (77 adolescents (M_{age} = 15.9) and 145 parents (M_{age} = 48.9) for 14 consecutive days. Quality of parent-adolescent interactions was assessed using proximity triggered questionnaires. Overall, adolescents and mothers were more often in proximity and spent more time together than adolescents and fathers. Interactions and parenting behavior were generally rated as pleasant, but large differences between families were found in frequency and duration. This innovative method seems a promising tool to generate a deeper understanding of social interactions in daily life.

Keywords: proximity, ecological momentary assessment, Bluetooth beacon, parent-adolescent interaction, daily life

Introduction

Humans are social beings with a basic need to connect. Interpersonal relationships and social connectedness are of fundamental importance for human development and physical and mental health throughout the lifespan (e.g., Umberson & Karas Montez, 2010). During adolescence, one of the most proximal and important relationships for development and well-being is the one between parents and children (Bronfenbrenner, 1979; Sameroff, 2000). Various methods have been used to examine this relationship and the interactions between parents and adolescents, such as questionnaires, observations in the lab, computer tasks, and fMRI tasks. Although family processes in daily life were already assessed thirty years ago (Larson & Richards, 1991), the common availability of smartphones nowadays enables researchers to assess these daily interactions in more detail by using ecological momentary assessment (EMA; Stone & Shiffman, 1994). In addition to subjective reports, that have substantially improved our understanding of the daily lives of families, information on objective behavioral patterns may generate important additional insights into the interactions between parents and adolescents in daily life. Especially when objective patterns can be related to the quality of interactions. Smartphone features that can be used to passively capture data on proximity to other persons, such as Bluetooth, are potentially perfect tools to achieve this.

In the current study, we aimed to use a novel method with Bluetooth low energy (BLE) beacons and a smartphone application to track proximity of adolescents and parents and assess the frequency and duration of being close to each other in the daily flow of life. In order to yield new insights into the *quantity* of the interactions (i.e., time spent together) and whether this is indicative of the *quality* of interactions (i.e., warm/loving vs cold/rejecting), we also explored how parents and adolescents experienced these interactions with proximity triggered questionnaires after having been close to each other.

Assessing Social Interactions

Research has studied the interactions between parents and adolescents and their relationship quite extensively and demonstrated its importance for adolescent development and well-being (e.g., Smetana & Rote, 2019; Weymouth et al., 2016). While most studies focus on either subjective retrospective reports using questionnaires or on coded interactions in the lab (i.e., coded behavior), EMA is increasingly used to assess adolescents' and/or parents' subjective experiences of the interactions in an ecologically valid way in daily life (Trull & Ebner-Priemer, 2009) with reduced recall bias (Schwarz, 2007). Although this has enhanced our understanding of the dynamic interactions between adolescents and parents (Keijsers et al., 2021), this method is not without limitations. For example, impactful interactions can be missed when random sampling schemes are used (i.e., questionnaires triggered randomly throughout the day), whereas instructing families to indicate themselves when they interacted (i.e., event-contingent sampling) may be prone to bias. Especially when interactions are heated or unpleasant, parents and adolescents may not think about or feel like reporting this. To overcome these limitations and investigate patterns of interpersonal contact more objectively, it has been suggested to passively assess 'objective' markers that characterize interactions such as the physical proximity of people (Gupte & Eliassi-Rad, 2012).

Bluetooth Proximity Tracking

Proximity between people can be detected by several passive sensors (WiFi, GPS, or Bluetooth) that are currently available on almost all smartphones. The use of Bluetooth seems most promising in providing ecologically valid data on face-to-face proximity as it can measure proximity of people with an accuracy of 0 to 5 meters even indoors, depending on settings of the device (Liu & Striegel, 2011). With accuracy ranging between 3 and 50 meters, GPS and WiFi are less specific. Recently, researchers in the field of social sciences have started to test different approaches of using Bluetooth as a method to track proximity and assess social networks or dyadic proximity. Broadly three different methodological approaches can be distinguished. A first approach is detecting proximity between persons by only using (wearable) Bluetooth devices such as ActiGraph accelerometers that can either send or receive a Bluetooth signal. Studies showed that this approach is valid and reliable in a controlled and real-life setting both indoor and outdoor (Dlugonski et al., 2019; Kuzik & Carson, 2018). In a second approach, participants are provided with a research smartphone that detects proximity of others' phones or BLE beacons. Research showed that detecting proximity between dyads or larger networks with this approach is also promising and feasible (Maharjan et al., 2021; Van Woudenberg et al., 2020). The third approach involves installing an application on participants' own smartphones. One previous study piloted and tested an intervention for expressing gratitude, using proximity to other persons (i.e., social proximity) to trigger notifications (Ghandeharioun et al., 2016), and another study showed that proximity registered by badges was more related to self-report than registered by a designed smartphone app (Boonstra et al., 2017).

These studies have shown that proximity between persons can be tracked using smartphone Bluetooth with or without BLE beacons. The majority of studies, however, included small sample sizes (ranging between two devices and 40 participants) and the few studies that included larger samples in real life settings used a research smartphone (e.g., Stopczynski & Lehmann, 2018; Stopczynski et al., 2014; Van Woudenberg et al., 2020). While this has certain advantages (e.g., similar phone type and up-to-date software), it may also be burdensome for participants to carry two smartphones throughout the day. Moreover, when only using Bluetooth of the smartphone, combining different smartphone operating systems (i.e., iOS and Android) can be complicated. Hence, using a combination of BLE beacons with a smartphone application seems to be most reliable and feasible. The current study therefore aimed to explore a novel method to assess patterns of proximity between adolescents and parents (i.e., frequency and duration) in their daily life by using BLE beacons combined with an application installed on their own smartphone.

Proximity Triggered Questionnaires

Even though *quantitative* features of social interactions in daily life (e.g., being alone vs with people, being with friends vs partner) are important and have been found to relate to positive and negative affect in daily life, *qualitative* aspects (e.g., pleasantness of interaction, perceived support, or criticism) are more strongly linked to well-being in daily life (Liu et al., 2019). Thus, to advance the understanding of interactions between parents and adolescents in daily life and the impact on their well-being, we combined quantitative information of time spent together with assessments of how parents and adolescents perceived the quality of interactions and each other's behavior. The current study explored the value of using proximity triggered questionnaires to further improve our

understanding of the thoughts, feelings, and behaviors of both adolescents and their parents during an interaction. Moreover, we explored whether frequency and duration of proximity was indicative of the quality of interactions.

The Current Study

The current study aimed to enhance our understanding of parent-adolescent interactions in their natural daily life setting by: 1) exploring a novel method to assess frequency and duration of parent-adolescent physical proximity with BLE beacons; 2) examining how both parents and adolescents experienced the quality of interactions by using proximity triggered questionnaires, and 3) exploring whether the quantitative aspects of being in proximity (e.g., frequency and duration) are indicative of the quality of interactions. Since previous self-report studies reported that mothers spent more time with adolescents than fathers (Larson & Richards, 1991; Phares et al., 2009; Van Lissa & Keizer, 2020), we examined proximity between adolescents and their mothers and adolescents and their fathers separately. Given the innovative nature, no specific hypotheses were formulated and descriptions are provided on quantitative aspects of being in proximity (i.e., frequency and duration), experienced quality of parent-adolescent interactions (i.e., pleasantness, affect, and parenting behavior during interaction), and the associations between quantity and quality of interactions.

Methods

Sample

A subsample was used from RE-PAIR (Relations and Emotions in Parent Adolescent Interaction Research), a Dutch multi-method two-generation study examining the bidirectional interplay between parent-child interactions and adolescent mental well-being by comparing adolescents with a current major depressive disorder (MDD) or dysthymia and their parents to adolescents without psychopathology and their parents. The RE-PAIR study consisted of four parts: online questionnaires, a research day at the lab, two weeks of EMA, and a functional magnetic resonance imaging (MRI)-scan session with the adolescent and one parent. The subsample in the current study included families with an adolescent without psychopathology and focused on the EMA part of RE-PAIR.

Inclusion

Families were included in the study in case the adolescent and at least one of the primary caregivers wanted to participate in the study and had a good command of the Dutch language. Further inclusion criteria for adolescents were: being aged between 11 and 17 years, living at home with at least one primary caregiver, and having started secondary school. Families were excluded if adolescents had a current mental disorder, a history of MDD or dysthymia, or a history of psychopathology in the last two years. Adolescent psychopathology was assessed at the research day during a face-to-face Semi-Structured Interview, the Kiddie-Schedule for Affective Disorders and Schizophrenia – Present and Lifetime Version (K-SADS-PL; Reichart et al., 2000). Adoptive, foster, and stepparents (n = 14) were allowed to participate if they were involved in the upbringing of the adolescent for at least five years and if adolescents perceived the parent as a primary caregiver. For reasons of clarity, they will be referred to as mothers and fathers from here onwards.

For a detailed description of the recruitment procedure see (Janssen, Verkuil et al., 2021). Adolescents and their parents provided written active informed consent on the research day. For adolescents younger than 16 years of age, both parents with legal custody signed informed consent for participation of the adolescent. The final sample of RE-PAIR consisted of 80 families with a total of 233 participants (80 adolescents, 153 parents). Two fathers (1.3% of parents) did not participate in the EMA part of RE-PAIR due to too much time investment, resulting in a final sample for the EMA of 231 participants (80 adolescents, 151 parents). Since the BLE beacon cards did not work in three families (3.8% of families), the final sample for the current study consisted of 77 families (77 adolescents, 145 parents). For detailed information on the data cleaning process and missing data see Appendix 1. Sample demographics are presented in Table 1. The majority of adolescents (97.4%) and parents (94.5%) were born in the Netherlands.

Procedure

Adolescents and parents received face-to-face instructions during the research day about the EMA procedure, proximity tracking, and proximity triggered questionnaires. Next, researchers assisted participants with installing the Ethica Data application on their smartphones for the EMA and each family member received a personal BLE beacon for proximity tracking. Each family member also received written instructions and their individual account information of the Ethica app. Participants were instructed to keep the BLE beacon (in the size of a credit card) in their own phone case throughout the EMA period (14 consecutive days) or in the sticky card holder case provided by the researchers. Participants were additionally asked to carry their smartphone with them as much as possible, also inside their homes. A power bank was offered to participants if the battery life of their phones was impaired. Generally, the EMA started the next Monday after the research day, however in case of holidays and exam weeks of adolescents EMA started the first Monday thereafter. In addition to proximity tracking and proximity triggered questionnaires, participants received four EMA questionnaires a day (see Janssen, Verkuil et al., 2021 for detailed information).

Proximity

The Kontakt BLE Card Tags CT16-2 (i.e., BLE beacons) were used to track proximity (see Appendix 2 for detailed specifications and settings). The Ethica app scanned for BLE beacons in proximity. Due to smartphone manufacturer constraints scanning took place approximately every 5 minutes. Proximity data was logged by the Ethica app when at least one family member was carrying one's smartphone (with the Ethica app installed on it) and another family member was carrying one's BLE beacon and were close to each other within the specified range. We specified a maximum of approximately 4 meters distance within the same room. Each smartphone scanned independently for BLE beacons. In order to scan for BLE beacons, the Ethica app had to be active (in the background), had to have permission to access location services, and Bluetooth had to be turned on. Turning off the smartphone, retracting permission to access location services, switching Bluetooth off, manually terminating the Ethica app, using battery saving modus, and using night or flight mode blocked the scanning process.

Table 1. Sample demographics

Variables	*N*	
Adolescents		
Gender, % Female, (*n)*	77	64.9 (50)
Age (years), *M (SD)*[a]	77	15.9 (1.38)
Highest level of education, % (*n*)	77	
Vocational education		13.0 (10)
Advanced secondary education		33.8 (26)
Pre-university education		44.2 (34)
Secondary vocational education		6.5 (5)
Higher professional education		2.6 (2)
Living situation	77	
With biological mother		6.5 (5)
With biological mother and father		77.9 (60)
Other[b]		15.6 (12)
Daily positive affect[c], *M (SD)*	77	5.47 (0.76)
Daily negative affect[c], *M (SD)*	77	1.51 (0.63)
Parental warmth – mother[c], *M (SD)*	76	5.88 (0.81)
Parental warmth – father[c], *M (SD)*	69	5.76 (0.99)
Parental criticism – mother[c], *M (SD)*	76	2.03 (1.00)
Parental criticism – father[c], *M (SD)*	69	1.86 (0.92)
Parents		
Gender, % Female, (*n)*	145	52.4 (76)
Age (years), *M (SD)*[a]	145	48.9 (5.93)
Highest level of education, % (*n*)	145	
No diploma		0.7 (1)
Lower vocational education		7.6 (11)
Intermediate vocational education		26.2 (38)
Higher vocational education or scientific education (university)		65.5 (95)
Parental warmth – mother[c], *M (SD)*	76	5.68 (0.69)
Parental warmth – father[c], *M (SD)*	76	5.38 (0.73)
Parental criticism – mother[c], *M (SD)*	69	2.45 (0.95)
Parental criticism – father[c], *M (SD)*	69	2.47 (0.91)

[a]Age at research day

[b]Other options were parent and stepparent, alternating between father and mother, or living with adoptive/foster parents

[c]Person mean

Proximity triggered questionnaires

Participants received questionnaires based on proximity tracking as described above. If adolescents and parents departed from each other, after being in proximity for at least 10 minutes, a proximity questionnaire was triggered 10 minutes after departure. Adolescents received separate questionnaires regarding interactions with mothers and fathers and could thus receive two questionnaires after being in proximity of both mother and father. At first, the questionnaires expired after 10 minutes, but this was changed to 30 minutes after participation of three families. If a proximity questionnaire was triggered, it was blocked for the next 4 hours to limit the potential

number of questionnaires. See Figure 1 for graphical presentation of the proximity tracking process to trigger questionnaires.

Researchers monitored proximity tracking and proximity triggered questionnaires by actively checking real-time data in Ethica on a daily basis and were available for questions or problems via WhatsApp, telephone, and mail. If problems arose with proximity tracking or participants reported not receiving proximity triggered questionnaires, researchers inspected available proximity data and logs via the Ethica dashboard. Participants were asked to check and possibly change settings. On the last day of the EMA, a message was sent to thank participants and remind them of the scheduled phone call after the EMA to evaluate the EMA and to remind them to send the BLE beacons back to the researchers. The EMA of RE-PAIR, including adolescents without psychopathology and their parents, was conducted in the period between September 2018 and November 2019. As compensation for EMA, parents received €20,- and adolescents €10,-.

Measures

Frequency proximity

The frequency of physical proximity between adolescents and parents during the day was calculated per dyad by counting the number of occurrences that either the Ethica app on the adolescent's smartphone detected their parent's BLE beacon or parent's smartphone detected their adolescent's BLE beacon. If the smartphones of both the adolescent and parent detected each other's BLE beacon around the same time (within a time interval of 2.5 minutes), it was counted as one occurrence. Rationale for the specified time interval of detecting each other's BLE beacon is provided in Appendix 3.

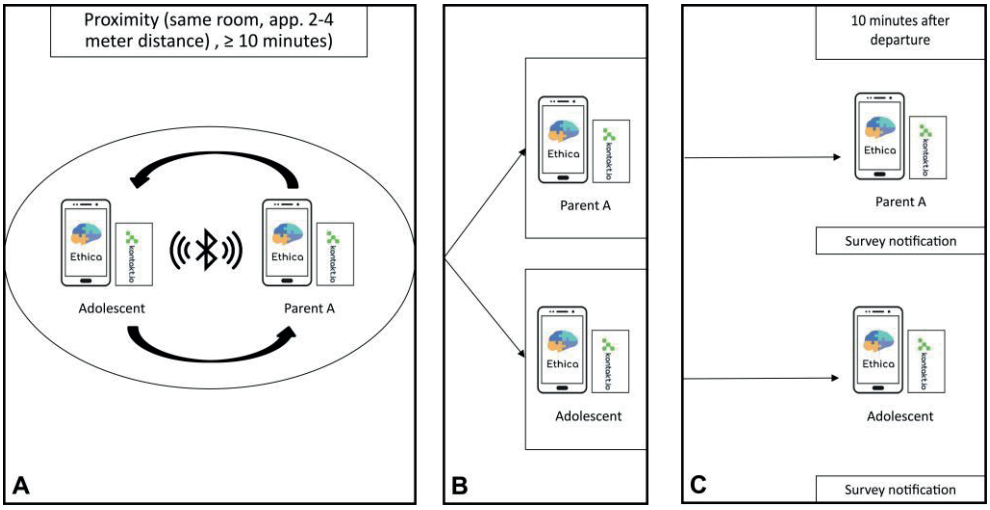

Figure 1. Graphical representation of proximity triggered questionnaires. Panel A shows proximity tracking with an adolescent and one parent (with their phones and BLE beacons) being in the same room in proximity (i.e., within a range of approximately 2 to 4 meters distance). Adolescent and parent depart from each other (Panel B). If the adolescent and parent were in proximity for at least 10 minutes, they received a proximity triggered questionnaire in Ethica 10 minutes after departure (Panel C).

Duration time spent together

Time spent together during the day (in minutes) was calculated when proximity was detected in two (or more) consecutive scanning intervals. Time intervals between the scans were summed when: i) the adolescent was in proximity of the parent for two or more scans, ii) the parent was in proximity of the adolescent for two or more scans, and iii) when adolescent and parent were in proximity of each other around the same time (within a time interval of 2.5 minutes) for two or more scans. Since scanning behavior is impacted by the smartphone and can be irregular, a cut-off of a maximum of 7 minutes per scan was used (see Appendix 4 for rationale for this cut-off).

Pleasantness of interaction

If a proximity questionnaire was triggered, adolescents and parents first indicated whether they actually had spoken to each other. If this was not the case, no follow-up questions were asked. If they did spoke to each other, they received follow-up questions about the interaction (i.e., pleasantness of interaction, affect, and parenting behavior). Adolescents and parents indicated the pleasantness of the interaction by answering the question "How was this contact?" on a 7-point Likert type scale with answer categories ranging from 1 (*very annoying*) to 7 (*very nice*).

Affect

Adolescents and parents rated their own affect states during the interaction with an adapted and shortened five-item version of the Positive and Negative Affect Schedule for Children (PANAS-C; Ebesutani et al., 2012; Watson et al., 1988). Two positive affect states (happy and relaxed) and three negative affect states (sad, irritated, and guilty) were assessed by asking "How did you feel during this contact?" followed by: "Happy", "Relaxed", "Sad", "Irritated", and "Guilty". Answers were given on a 7-point Likert type scale with answer categories ranging from 1 (*not at all*) to 7 (*very*). To create a score for positive affect per interaction, an average score of happy and relaxed was calculated for adolescents and parents separately. To create a score for negative affect per interaction, an average score of sad, irritated, and guilty was calculated for adolescents and parents separately.

Parenting

Adolescents rated parenting behavior of their parent during the interaction by answering the questions "How well did your mother/father listen to you?", "How well did your mother/father understand you?", "How critical was your mother/father towards you?", and "How dominant was your mother/father?". Answers were given on a 7-point Likert type scale with answer categories ranging from 1 (*not at all*) to 7 (*very*). Parents rated their own parenting behavior during the interaction by answering the questions "How well did you listen to your child", "How well did you understand your child?", "How critical were you towards your child?", and "How dominant were you towards your child?". Answers were given on a 7-point Likert type scale with answer categories ranging from 1 (*not at all*) to 7 (*very*). Two subscales were created, parental warmth and parental criticism. An average of listening and understanding behavior per interaction was calculated for adolescents and parents separately to assess parental warmth. An average of critical and dominant behavior per interaction was calculated for adolescents and parents separately to assess parental criticism.

Strategy for descriptive analyses

R version 4.0.1 (R Core Team, 2020) was used for the descriptive analyses. To explore the use of this novel method to assess parent-adolescent physical proximity with BLE beacons (aim 1), frequency of proximity between adolescents and mothers and between adolescents and fathers during the day was calculated by counting the occurrences of being in proximity throughout the 14 days, on average per day, and on average per week and weekend day. Duration of time spent together between adolescents and mothers and between adolescents and fathers during the day was calculated on average throughout the 14 days, on average per day, and the average duration of time spent together per moment. Normal distribution and equality of variances were checked and when assumptions were not met, appropriate nonparametric tests were used to examine differences between adolescent-mother and adolescent-father dyads in frequency and duration. To explore how parents and adolescents experienced the quality of interactions by using proximity triggered questionnaires (aim 2), we described adolescents' and parents' subjective experiences (i.e., affect and parenting) of parent-adolescent interactions. Lastly, to explore whether the frequency and duration measures were indicative of experienced pleasantness, parenting behavior, and adolescent affect (aim 3), Pearson correlations were used.

Results

Since some families reported that adolescents were not allowed to take their smartphones to their bedrooms during nighttime and smartphones were placed elsewhere, data collected during nighttime was removed from the dataset. The specification of nighttime was based on self-report EMA data of participants in RE-PAIR about bed- and risetime from the morning questionnaires of the standardized trigger schedule (see Appendix 5 for rationale). This resulted in using data collected from Monday until Friday between 7AM and 9.30PM as well as data collected on Saturday and Sunday between 9AM and 11PM, data outside this time interval was removed.

Description of parent-adolescent proximity

Frequency

Table 2 provides descriptive information on the average frequency of proximity between adolescents and parents throughout two weeks. To examine whether the frequency of being in proximity differed between adolescents and mothers and between adolescents and fathers, a paired Wilcoxon's signed rank test was used. Throughout the two weeks, adolescents were more often in proximity to mothers than to fathers (z = -5.079, p < .001). To gain more insight into the times during the day when adolescents and parents were together, the frequency of being in proximity was plotted throughout the days, see Figure 2. On weekdays, proximity between adolescents and parents started to increase from 1PM with a peak around 4PM, followed by a short decrease and then a peak again around 7PM or 8PM. A different pattern can be observed during the weekend when adolescents and parents seemed to be more often in each other's proximity throughout the day with a peak around 5PM on Saturday between adolescents and mothers and around 6PM between adolescents and fathers and around 7PM on Sunday. On average, proximity was detected 23 times per day between adolescents

and their mothers (*Min* = 1, *Max* = 199) and 16 times per day between adolescents and their fathers (*Min* = 1, *Max* = 177).

Duration of time spent together in proximity

Descriptive information on the duration of time spent together averaged over the two weeks between adolescents and parents is presented in Table 2. To examine whether the duration of time spent together throughout the two weeks differed between adolescents and mothers and between adolescents and fathers, a Paired Wilcoxon's signed rank test was used. Overall, adolescents spent more time together with mothers than fathers throughout the two weeks (z = -5.019, p < .001). On average, adolescents spent 74.83 minutes per day (*Min* = 4.17, *Max* = 653.23) together with their mothers and 51.02 minutes per day (*Min* = 4.93, *Max* = 563.62) with their fathers). When assessing weekdays and weekend days separately, adolescents spent on average 65.45 minutes per weekday (*Min* = 4.17, *Max* = 580.04) together with their mothers and 49.85 minutes per weekday (*Min* = 4.93, *Max* = 563.62) with their fathers. Regarding weekends, adolescents spent on average 93.91 minutes per weekend day (*Min* = 5.14, *Max* = 653.23) together with their mothers and 56.55 minutes per weekend day (*Min* = 5.19, *Max* = 542.69) with their fathers. To gain more insight into the average duration of a moment of spending time together, we calculated per individual how long each moment of spending time together lasted and provided the median. Overall, a moment of spending time together between adolescents and mothers lasted 19.63 minutes (*Min* = 2.08, *Max* = 320.59) and between adolescents and fathers 16.34 minutes (*Min* = 2.82, *Max* = 229.02). Results on frequency and duration time spent together based on one-sided and combined data are presented in Appendix 6.

Table 2. Descriptive statistics of the frequency and duration of adolescent-parent proximity during the two weeks

					Paired Wilcoxon's signed rank test	
	N	*Mdn*	Min	Max	*z*	*p*
Frequency						
Adolescent - mother	75	334	41	1108		
Adolescent - father	68	232.5	9	893	-5.079[a]	< .001
Duration (in minutes)						
Adolescent - mother	75	823	104.26	3715.36		
Adolescent - father	67	508.38	54.14	3677.11	-5.019[b]	< .001

Note. The median was reported since frequency and duration of proximity between adolescents and parents was non-normally distributed (all *p*'s < .001).

[a] n = 66

[b] n = 65.

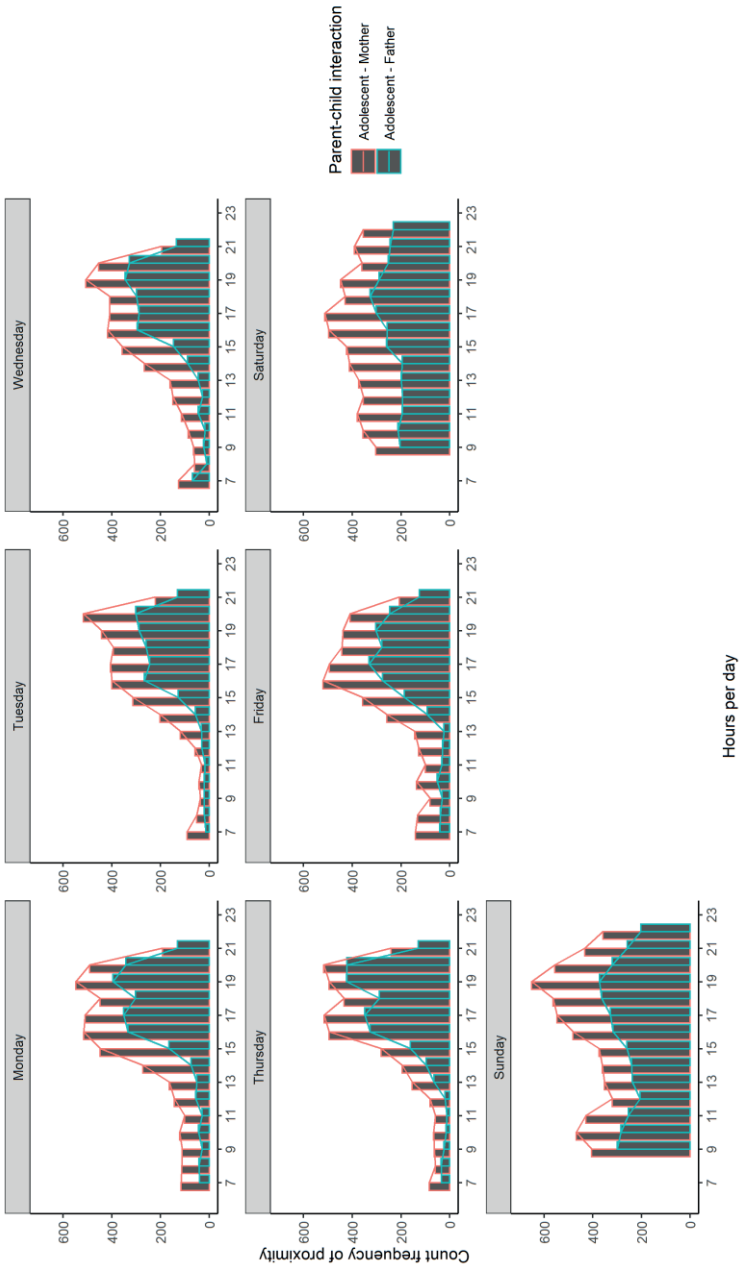

Figure 2. Frequency of proximity of adolescents and parents throughout days of the week per hour, separated for adolescent-mother and adolescent father dyads.

Description of experienced quality of interactions

A description of the number of proximity triggered questionnaires and compliance of these questionnaires are provided in Appendix 7. In 555 of the 844 answered questionnaires (65.8%) adolescents reported that they had an interaction with their parent. In 793 of the 986 answered questionnaires (80.4%) parents reported that they had an interaction with their adolescent. Detailed descriptive statistics of the subjective quality of the interactions between adolescents and their mothers and fathers are presented in Table 3. Overall, adolescents rated the interactions with their parents as rather pleasant, reported high on positive and low on negative affect, and were positive on parental warmth and reported low levels of criticism by both mothers and fathers. A similar pattern of results was found for parental reports.

To explore whether frequency and duration of proximity was indicative of the quality of interactions, we first calculated person-mean scores of the experienced quality. Next, frequency and duration of time spent together over the two weeks per dyad were calculated. Subsequently, Pearson correlation analyses were conducted to examine associations between quantity of proximity and quality of the interaction for adolescent-mother and adolescent-father dyads separately. Results are presented in Table 4. Frequency of proximity was not associated with adolescents' nor parents' affect, nor with the quality of parenting behavior. Duration of time spent together between adolescents and mothers did relate to parental criticism as reported by mothers, with more time spent together (between adolescents and mothers) being associated with less parental criticism (reported by mothers).

Results furthermore showed that in general adolescents who reported more positive and less negative affect also reported more parental warmth and less parental criticism of mothers and fathers. Interestingly, adolescents' positive and negative affect was also related to mothers' parenting behavior reported by mothers, with more positive affect and less negative affect being associated with more (mother self-reported) maternal warmth and less maternal criticism. Adolescent affect was not related to fathers' parenting behavior reported by fathers.

Table 3. Descriptive statistics of experienced quality of interactions for adolescents, mothers, and fathers

	N[a]	*Obs*	*M*	*SD*	Min	Max
Adolescent report						
Pleasantness interaction mother	49	319	5.66	1.10	1	7
Pleasantness interaction father	50	236	5.56	1.09	1	7
Positive affect interaction mother	49	319	5.65	1.11	1	7
Positive affect interaction father	50	236	5.70	1.05	1	7
Negative affect interaction mother	49	318	1.32	0.67	1	7
Negative affect interaction father	50	236	1.27	0.65	1	7
Parental warmth mother	49	318	5.88	1.09	1	7
Parental warmth father	50	236	5.80	1.21	1	7
Parental criticism mother	49	318	1.56	1.00	1	7
Parental criticism father	50	236	1.53	0.99	1	7
Parent report						
Pleasantness interaction mother	61	472	5.72	1.02	2	7
Pleasantness interaction father	54	319	5.59	1.03	2	7
Positive affect interaction mother	61	472	5.53	1.02	1	7
Positive affect interaction father	54	319	5.47	0.87	1.5	7
Negative affect interaction mother	61	472	1.31	0.69	1	5.33
Negative affect interaction father	54	319	1.32	0.62	1	4.67
Parental warmth mother	61	466	5.88	0.88	1	7
Parental warmth father	54	316	5.61	0.85	3	7
Parental criticism mother	61	466	1.94	1.30	1	7
Parental criticism father	54	315	2.11	1.27	1	6

Note. Obs = total number of observations

[a]Not all parents and adolescents received or completed proximity triggered questionnaires, therefore *N* is smaller than the sample size

Table 4. Correlations of experienced quality of interaction based on proximity triggered questionnaires and frequency of being in proximity and time spent together for adolescent-mother and adolescent-father dyads separately

	1	2	3	4	5	6	7	8	9	10
1. Frequency		0.936***	-0.084	0.128	-0.119	0.083	-0.139	-0.111	-0.127	-0.174
(*n*)		(67)	(50)	(50)	(50)	(50)	(54)	(54)	(54)	(54)
2. Duration time spent together	0.923***		-0.166	0.124	-0.064	0.046	-0.078	-0.114	-0.136	-0.179
(*n*)	(75)		(49)	(49)	(49)	(49)	(54)	(54)	(54)	(54)
3. Positive affect AA	-0.029	-0.100		-0.454***	0.746***	-0.371**	0.437**	-0.464**	0.157	-0.183
(*n*)	(49)	(49)		(50)	(50)	(50)	(41)	(41)	(41)	(41)
4. Negative affect AA	0.063	0.149	-0.671***		-0.525***	0.481***	-0.471**	0.342*	-0.265	0.070
(*n*)	(49)	(49)	(49)		(50)	(50)	(41)	(41)	(41)	(41)
5. Parental warmth AP	-0.027	-0.088	0.769***	-0.583***		-0.616***	0.515***	-0.454**	0.241	-0.058
(*n*)	(49)	(49)	(49)	(49)		(50)	(41)	(41)	(41)	(41)
6. Parental criticism AP	0.115	0.182	-0.505***	0.599***	-0.826***		-0.456**	0.384*	-0.375*	0.205
(*n*)	(49)	(49)	(49)	(49)	(49)		(41)	(41)	(41)	(41)
7. Positive affect PP	0.242	0.233	0.530***	-0.269	0.385*	-0.128		-0.487***	0.711***	-0.378**
(*n*)	(61)	(61)	(42)	(42)	(42)	(42)		(54)	(54)	(54)
8. Negative affect PP	-0.236	-0.214	-0.223	0.257	-0.191	0.142	-0.664***		-0.426**	0.492***
(*n*)	(61)	(61)	(42)	(42)	(42)	(42)	(61)		(54)	(54)
9. Parental warmth PP	0.110	0.129	0.485**	-0.367*	0.418**	-0.295	0.565***	-0.485***		-0.604****
(*n*)	(61)	(61)	(42)	(42)	(42)	(42)	(61)	(61)		(54)
10. Parental criticism PP	-0.245	-0.278*	-0.483**	0.340*	-0.366*	0.188	-0.509***	0.520***	-0.615***	
(*n*)	(61)	(61)	(42)	(42)	(42)	(42)	(61)	(61)	(61)	

Note. Correlations adolescent-mother dyads are presented under the diagonal, correlations adolescent-father dyads are presented above the diagonal.
AA = adolescent about self, AP = adolescent about parent, PP = parent about own behavior

Discussion

The common availability of smartphones and use of EMA have generated a new line of research focusing on adolescent and parent reports of well-being, parenting behavior, and interactions in daily life. In addition to subjective reports, information on objective patterns of parent-adolescent proximity obtained by smartphones features such as Bluetooth may provide important additional insights. In the current study, we therefore used a novel method to objectively assess the frequency and duration of parent-adolescent proximity with BLE beacons and a smartphone application. Additionally, we integrated this with questionnaires triggered by proximity to explore how parents and adolescents experienced interactions and whether quantity of interactions is indicative of the quality of interactions. Results showed that throughout the two weeks adolescents and mothers were more often in proximity and spent more time together than adolescents and fathers. Overall, both adolescents and parents generally rated the interactions and parenting behavior as positive. Findings also showed that when adolescents and mothers spent more time together, mothers reported less parental criticism during interactions. Our main finding is that this unobtrusive, innovative method is indeed able to objectively assess the quantity of parent-adolescent proximity in the daily flow of life. Moreover, the method enabled measuring subjective experiences of interactions based on proximity and relating these assessments to each other, which may have important implications for research and clinical practice.

Novel Method for Proximity Tracking

Researchers have proposed Bluetooth as a promising tool to provide ecologically valid data on proximity between persons indoors (Liu & Striegel, 2011) and previous studies broadly tested three different approaches of tracking proximity. Several factors however limited the broader and practical use of this method, such as burdening participants with a research phone or selective inclusion of participants with an Android smartphone. To overcome these limitations, the current study combined the use of BLE beacons with a smartphone application that could be installed on *any* smartphone which enabled gathering information on parent-adolescent proximity in daily life from both adolescents' and parents' smartphones. By using this innovative and unobtrusive method, the current study was able to objectively and continuously assess the frequency and duration of parent-adolescent proximity in daily life, which has not been assessed before.

Frequency and Duration

Our findings showed that adolescents and mothers were more often in proximity and spent more time together than adolescents and fathers which is in line with previous research (Larson & Richards, 1991; Phares et al., 2009; Van Lissa & Keizer, 2020) and validate these as we used an objective measure to assess proximity instead of using self-reports. Moreover, the current study and method gave a first glimpse into the specific patterns of parent-adolescent proximity throughout the week. On a weekday, proximity increased from 1PM onwards with a peak around 7PM and this pattern seems to resemble a typical school- and workday for families. At the weekend, proximity between adolescents and parents was more equally distributed and peaked on Saturday around 5PM and on

Sunday around 7PM. Interestingly, this peak on Sunday may be related to a typical Dutch habit of eating together while watching sports on television (weekly broadcasted at 7PM).

This novel method also provided an opportunity to calculate the duration of time adolescents and parents spent together. Although we may have slightly underestimated time spent together due to only including time of two or more consecutive scanning intervals, we found that adolescents and mothers spent on average approximately 75 minutes per day together and adolescents and fathers 51 minutes. This differed from a self-report study in which parents reported on time they spent in direct interaction (e.g., talking, playing a game) with their adolescent child. Mothers indicated to interact with their adolescents for almost 3.5 hours on an average weekday and almost 6 hours on an average weekend day. Fathers reported to interact with their adolescents on average for 2.5 hours per day during the week and 4.5 hours per day in the weekend (Phares et al., 2009). These different findings may in part be due to the age of the adolescents. In the current study, the mean age of adolescents was almost 16 years while in the self-report study this was 13.5 years. As adolescents get older, the time they spent with their families decreases substantially due to work and/or spending more time alone or with peers (Larson & Richards, 1991; Larson et al., 1996). Nevertheless, self-report bias may play a role here as well, since parents may overestimate the time they interact with their adolescent. Large discrepancies between objective and self-report measures have also been found in other areas of research, such as sedentary behavior (Chastin et al., 2018). Our objective measure of time spent together overcomes self-report bias and may therefore provide a more accurate reflection of the actual time spent together.

It should also be noted that we did find substantial variation between dyads in how often adolescents and parents were in proximity and the time they spent together which may represent actual differences between dyads. As mentioned above, variation in time spent together could be related to the age of the adolescent, as the age in this sample ranged from 11-18 years. Time spent together could, however, also be a valuable indicator of family cohesion (e.g., enmeshed, normal, disengaged) or quality of the relationship which may be highly interesting for future studies. For instance, a self-report study showed that adolescents who spent more time with parents perceived their parents to be more accepting (Desha et al., 2011). Moreover, in romantic partners it was found that more time spent together perceived by the women was related to a lower likelihood of divorce for women, while for men the opposite was found (Gager & Sanchez, 2003). This method may pave the way for future studies to further develop and validate the current method and yield novel insights into predictors and outcomes related to these objective measures of being close to each other.

Experienced Quality of Parent-Adolescent Interactions

By using proximity tracking to trigger questionnaires, the method enabled measuring adolescents' and parents' subjective experiences of their interactions in daily life shortly after they were in each other's proximity and exploring whether the quantity was indicative of the quality of interactions. Adolescents and parents sometimes indicated in these triggered questionnaires that they did not speak with one another (20% for parents, 35% for adolescents) which indicates that being in proximity does not have to imply that there was an actual interaction. Adolescents and parents could for instance be together, but each focused on an individual activity, or could be watching television together without actively speaking to each other (i.e., "interacting"). More in-depth investigation is necessary to further validate

the proximity triggered questionnaires. When adolescents and parents spoke to each other and rated their interactions, they indicated that overall it concerned rather pleasant interactions and they reported positively about their own affective states as well as parenting behavior. Previous studies also showed that Dutch adolescents and parents rated parenting behavior quite positively on a daily level (Janssen, Elzinga et al., 2021) and momentary level (Bülow et al., 2022).

We furthermore found that subjective experiences of parental criticism and warmth were related to adolescent positive and negative affect, but that frequency and duration were not related to adolescent affect experienced during an interaction. This differs partly from results of a previous EMA study that showed that both qualitative and quantitative aspects of social interactions were related to daily well-being (Liu et al., 2019). However, the different way of conceptualizing and assessing quantity as well as the type of social interaction (parent-child, intimate partner, friends) may play a role here. While we used passively captured data to objectively assess proximity between adolescents and parents, the previous self-report study assessed quantity of interactions by asking if participants were alone or with a friend. Another recent study that also objectively assessed quantity of social interactions by coding audio recorded snippets of 30 seconds every 10 minutes as interaction or not, did find a positive association between quantity of social interactions and well-being (Sun et al., 2020). In that study, however, social interactions were assessed every 10 minutes and included all social partners, while in our study proximity was continuously assessed and focused only on adolescents and parents.

Despite not finding an association between the objectively measured quantitative aspects of parent-adolescent interactions and adolescent well-being, quantity was related to some self-reported quality of interactions. When adolescents and mothers spent more time together throughout the two weeks, mothers reported less parental criticism during interactions. This seems to be in line with the findings based on self-report that greater involvement of parents in childcare activities (of children aged between 6 to 12 years old) were related to more desirable parenting behaviors (i.e., more warmth and consistency) (Sabattini & Leaper, 2004; Van Lissa & Keizer, 2020), at least for maternal criticism. While our finding is based on a small subsample (n = 61) and replication is necessary, it does provide a first insight into the interplay between objectively assessed quantity and experienced quality of parent-adolescent interactions in daily life.

Scientific and Clinical Implications

Although in in animal research tracking the frequency and duration of social behavior in the wild – by using proximity or other objective measures such as radio trackers – is rather common practice (e.g., Hunt et al., 2012) much less is known about this in our own species. Our method could provide a more objective, fine-grained, and ecologically valid assessment of being close to one another in general, not only of parent-adolescent dyads but also of other dyads (i.e., romantic partners) or larger groups (i.e., families, friends, peers, colleagues). Social science researchers may also use the method to examine the objective patterns of proximity in direct or indirect relation to for instance well-being. Some self-report studies have shown that more time spent together between adolescents and parents is related to better adolescent adaptation (Boele et al., 2020) and to fewer depressive symptoms through parental acceptance (Desha et al., 2011). Such associations based on self-report have not only been found in community samples, but also in clinical samples. Adolescents with a depressive disorder

seemed to spend less time with their families compared to healthy controls (Silk et al., 2011) and more time spent together was predictive of less depressive symptoms (Manczak et al., 2019).

Importantly, the method itself and the opportunity it provides to zoom in to the perceptions related to these social interactions could also be used as a diagnostic or intervention tool in clinical practice. Since proximity tracking happens in real-time it could help mapping the social network and interactions of a person in treatment. When relating this information to how this person reports to feel during or following these interactions and how behavior during interactions is perceived can be insightful for treatment such as system therapy or couples therapy. Thus, both aspects of our novel method (i.e., proximity tracking and proximity triggered surveys) have the potential to contribute to providing tailored feedback. Moreover, the proximity triggered questionnaires might also be useful for interventions. For instance, if parents are in proximity of their child and indicate that they think their child is feeling blue, a message could be sent on how to express empathic parenting.

Strengths, Limitations, and Future Directions

By using a novel method with BLE beacons and a smartphone application, the current study was able to objectively and ecologically valid assess frequency and duration of parent-adolescent proximity in daily life. By using an existing and easy to use application that can be installed on any smartphone, this method can easily be applied to assess daily social interactions between for instance friends or romantic partners. As a first validation of the method, we showed that tracking of proximity indicated that adolescents and mothers had more frequent and longer daily contact compared to adolescents and fathers. We furthermore successfully applied the technique of triggering questionnaires based on proximity between adolescents and parents, providing the opportunity to gain a better understanding of how both adolescents and parents experienced an interaction, without a bias of event-contingent sampling. Moreover, by combining these two features we managed to generate some first insights into the relation between objectively assessed quantity of being together and experienced quality of parent-adolescent interactions.

The development of a new method generally comes with several methodological and conceptual challenges that can guide future studies. Even though the use of Bluetooth has been shown to be most promising in providing ecologically valid data with great accuracy indoors (Liu & Striegel, 2011), other Bluetooth devices or WiFi can affect the accuracy of smartphones' BLE signal detection. Moreover, several types of BLE beacons are available that may differ in accuracy. More research is necessary on the differences between the BLE beacons and the impact of other signals on the accuracy. Furthermore, due to rapid technological development of applications and phones, software systems are updated regularly which can impact the scanning intervals or settings. Future research might want to control for this or ask participants explicitly to not update their phones. Additionally, our objective measures and the found variation between families may be impacted by factors such as using flight modus or turning off Bluetooth which blocked the scanning process. Participants were instructed to not change settings but not all adhered to these instructions at all times. Since the data logs did not provide information on all settings, we tried to reduce the impact of participants' behavior by combining information of proximity tracking by the smartphones of both adolescents and parents. We also reminded them of the correct settings when monitoring, but future studies could possibly use data donation methods (i.e., ask participants to share the logs of their

smartphone) to gain more exact insight into the use of these settings and correct for it. Lastly, although frequency and duration of adolescent parent-proximity were conceptually different, they were highly correlated in our study. It could therefore be argued that using one measure might be best and future studies could decide which measure to use based on their research question.

Conclusion

The use of EMA has enhanced our understanding of the parent-adolescent relationship and interactions in daily life based on self-report and obtaining objective information on behavioral patterns of proximity may generate important additional insights. By using a novel method with BLE beacons and a smartphone application, we were able to unobtrusively track proximity between adolescents and parents, calculate frequency and duration, and trigger questionnaires based on this proximity to assess quality of parent-adolescent interaction in daily life. Results showed that adolescents were more often in proximity and spent more time together with mothers than fathers. For mothers, the duration of interactions with their adolescent child was negatively related to parental criticism, with more time spent together being related to less parental criticism. In sum, this method seems a promising tool to quantify social behaviors that can be applied to enhance the understanding of social interactions in daily life and in clinical practice.

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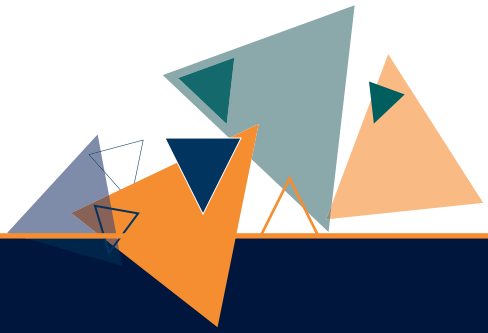
8

General discussion

“Grown-ups never understand anything by themselves, and it is exhausting for children to have to provide explanations over and over again. That’s the way they are. You must not hold it against them. Children should be very understanding of grown-ups.”
Le Petit Prince



Throughout the transformational phase of adolescence, during which young people start to develop their identity and become more autonomous, parents remain key for the development and socialization of their children (Soenens et al., 2019; Steinberg & Silk, 2002). Decades of research have consistently shown that parenting characterized by warmth and support and few conflicts is associated with adolescent well-being (Pinquart, 2017; Weymouth et al., 2016), with adolescents' and parents' behavior affecting each other reciprocally (Pinquart, 2017). Ecological validity of these findings however has been questioned as most studies were based on self-report questionnaires with relative long time-intervals that focused on differences between persons. In this dissertation, a first step was taken towards measuring parenting processes in daily life over time within persons and families by investigating parent-adolescent interactions (separate for mothers and fathers) in relation to daily positive and negative affect of adolescents and assess differences between individuals and families, in particular in the context of adolescent depression. In this closing chapter, I will summarize the main findings of this dissertation and discuss how they contribute to the field. I will end by presenting some important clinical implications and suggestions for ways to move forward.

Summary of main findings

In *Chapter 2,* we started by investigating the within-person association between experienced daily parental support and adolescent daily negative mood, based on adolescents reports from the Grumpy or Depressed project. In addition, we examined four factors that might explain individual differences in this link between parental support and adolescent negative mood: adolescent gender, severity of adolescent depressive symptoms, perceived intrusiveness of parents, and overall social support. Results demonstrated that, on average, adolescents reported more negative mood on days when they perceived their parents to be less supportive. Moreover, the association between daily parental support and daily negative mood was stronger for adolescents who reported more depressive symptoms and for adolescents who perceived their parents as less intrusive. Adolescent gender and perceived social support did not explain differences between adolescents.

In *Chapter 3*, we built upon these findings and examined whether adolescent positive and negative affect and parental warmth and criticism during momentary parent-adolescent interactions differed between families with an adolescent with a depression and families with an adolescent without psychopathology based on the sample of RE-PAIR. In this study, parenting was not only assessed at the end of the day (as in the Grumpy or Depressed project), but also at the momentary level, and both adolescents and their parents reported on parenting. We found that adolescents with a depression reported less positive and more negative affect in general as well as during parent-adolescent interactions than adolescents without psychopathology. The levels of momentary parental warmth and criticism during these parent-adolescent interactions did not differ between the groups, not from the perspective of the adolescent nor from the mother or father. Interestingly, these findings deviated from adolescents' and parents' reports on retrospective questionnaires, where adolescents with a depression and their parents reported more negative on their relationship (i.e., less care, more overprotection) than adolescents without psychopathology and their parents. Perceived parental warmth and criticism were related to adolescent positive and negative affect during parent-adolescent interactions, but the association did not differ between adolescents with and without a depression. Substantial differences between individuals, even within the group of adolescents with a

depression, indicated that the direction and strength to which momentary parenting and affect are related differs between adolescents, regardless of their clinical status.

The imposed social distancing measures due to the COVID-19 pandemic provided a unique opportunity to examine whether family dynamics are impacted by such a macro-level influence. In *Chapter 4*, we compared momentary positive and negative affect of adolescents and both parents and daily parental warmth and criticism (assessed at the end of the day) from both the perspective of adolescents and parents of the RE-PAIR study during two weeks of the COVID-19 pandemic (end of April 2020) and a similar two-week period pre-pandemic. Findings showed that positive affect of adolescents and parents as well as parental warmth and parental criticism from perspectives of adolescents and parents did not change due to the COVID-19 pandemic. Parents did show an increase in negative affect in a two-week period during the first lockdown of the COVID-19 pandemic compared with a similar period pre-pandemic. Intolerance of uncertainty and other COVID-19 related factors (i.e., living surface, income, working from home) did not explain this increase of parental negative affect. Although parents and adolescents on average seemed to deal fairly well with the circumstances at that time, substantial differences between individuals were found, with some parents and adolescents reporting a decrease in positive affect, while others reported an increase.

In *Chapter 5*, we aimed to describe how adolescents perceive daily parental warmth and criticism (reported at the end of the day) and compared this to their mothers' and fathers' perception of parenting to gain more insight into discrepancies between them. Moreover, we did not only test whether adolescents' and parents' perceptions of daily parenting were independently related to adolescent daily affect, but also whether discrepancies between these perceptions were related to adolescent affect by using multilevel polynomial regression models and response surface analyses. Generally, we observed that adolescents' and parents' (both mothers and fathers) reports of daily parenting differed significantly, with adolescents reporting more parental warmth and less parental criticism than their mothers and fathers. Moreover, in addition to adolescents' own reports of parenting, not parents' perspective of daily parental warmth and criticism by itself, but differences and overlap with adolescents' perspective were of importance for adolescent daily affect.

As adolescents' and parents' behaviors and affect interact and influence each other, a next step was to take into account the role of parents' affect. In *Chapter 6*, we therefore examined whether adolescents' and parents' individual reports of daily parental warmth and discrepancies between them related to daily affect of both parents and adolescents using novel hybrid models. We investigated this in two samples, which provided the opportunity to replicate the findings across two different cultural contexts: American (FLOW sample) and Dutch (RE-PAIR sample). Moreover, we explicitly examined differences between adolescent-mother and adolescent-father dyads in the RE-PAIR sample. Overall, in both samples, we found that parents' and adolescents' individual reports of daily parental warmth were related to their own daily happiness, irritation, and sadness. The discrepancies between adolescent-parent reports of parental warmth were more consistently related to parents' affect, indicating that parents' own affect may be more important for their perceptions of their own parenting than discrepancies between parent-adolescent reports may have on the affect states of adolescents or parents. Moreover, we found that interrelatedness of irritation and sadness was stronger between adolescent-father than adolescent-mother dyads.

Besides examining ecological validity of previously reported associations between parenting and adolescent well-being, in *Chapter 7*, we aimed to explore the use of an innovative method using Bluetooth low energy (BLE) beacons and a smartphone application to objectively assess parent-adolescent physical proximity in daily life (i.e., frequency and duration). We used this method to trigger questionnaires to investigate whether the quantity of time spent together is indicative of the quality of their interactions. By using this unobtrusive, novel method we were able to objectively assess frequency and duration of parent-adolescent proximity in the daily flow of life. Results showed that adolescents were more often in proximity with their mothers than fathers and spent more time together throughout two weeks. Furthermore, the method also enabled relating the frequency and duration of proximity with subjective experiences of interactions. This showed for example that when adolescents and mothers spent more time together, mothers reported less parental criticism during their interactions (or otherwise put; when mothers reported less parental criticism, adolescents and mothers spent more time together).

Describing the everyday experience of parenting and affect

Our results indicated that what we currently know about parenting based on retrospective questionnaires (e.g. about the last weeks, months, or year), may paint a somewhat different picture than what is going on at the momentary (at this moment) or daily (at the end of the day) level within-persons. Adolescents generally reported less parental criticism of mothers and fathers compared to their parents, which was true for adolescents with and without depression. With respect to parental warmth, adolescents without psychopathology reported also more daily parental warmth than parents, while adolescents with a depression reported less maternal warmth compared to their mothers, while reports on warmth of fathers were the same as father reports (chapter 5 and additional analyses).

Interestingly, these findings are in contrast to results based on retrospective questionnaires, where parents are generally more positive about their own behavior than adolescents (De Haan et al., 2018; Hou et al., 2020). Thus, parenting assessed retrospectively does not necessarily translate to the daily level. Parents may report more favorable about their own behavior retrospectively due to wanting to conform to social norms (Janssens et al., 2015). However, adolescents' retrospective reports can also be biased, for instance by adolescents' (negative) mood at the time of reporting (Rudolph, 2009). Assessing parenting daily in a short questionnaire may result in less biased reports. Nevertheless, asking how parents and adolescents experienced parenting throughout the day at the end of the day, as we did in some studies included in this dissertation, is still based on some recollection and does not completely rule out recall bias (Robinson & Clore, 2002). Peak and end effects may be a relevant source of bias here, referring to individuals' daily retrospective reports being affected by the most intense or recent affect (Fredrickson, 2000). We therefore also measured parenting at the momentary level if parents and adolescents interacted with each other, but parents and adolescents did not receive questionnaires at the exact same time to prevent discussion on their ratings. Testing differences in adolescent-parent perceptions of parenting at the same time-point was therefore hindered. Future studies might consider aligning the prompting of questionnaires in parents and adolescents, despite the disadvantages this may have.

We were able to compare parenting at the momentary level between families with an adolescent with a depression and families with an adolescent without psychopathology (chapter 3). Unexpectedly, reported parental warmth and parental criticism during parent-adolescent interactions in families with an adolescent with a depression did not differ from families with an adolescent without psychopathology, not from the perspective of the adolescent nor from the perspective of the mother and father. As the adolescents with a depression reported lower levels of positive affect and higher levels of negative affect during these interactions than adolescents without psychopathology, one would expect that affect influenced their perception of parenting and resulted in more negative parenting reports. However, this was not the case, at least not at the momentary level. Based on retrospective questionnaires, that were also part of the RE-PAIR study, adolescents with a depression and their parents overall *did* perceive parenting as more negative (i.e., less care, more overprotection) than adolescents without psychopathology and their parents. This finding corresponds to previous work in adolescents and adults with a depression (e.g., Kullberg et al., 2020; Sheeber et al., 2007; Valiente et al., 2014). It moreover supports the idea that cognitive biases may play a role here, at least for adolescents, with for instance negative attention or recall bias influencing their retrospective reports of parenting (Platt et al., 2017; Trull & Ebner-Priemer, 2009).

In addition, parental mood can also be negatively impacted by the depression of their child. In a previous qualitative study, parents of adolescents with a depression indicated for instance that they felt more worried and distressed, partly blamed themselves for the struggles of their adolescent, and questioned their parenting abilities (Stapley et al., 2016). Additional analyses in the RE-PAIR sample, based on multilevel models, confirmed this suggestion. Parents of adolescents with a depression on average reported lower levels of positive affect and higher levels of negative affect on the momentary level as well as during interactions with adolescents compared to parents of adolescents without psychopathology (all p's < .01). Considering that our study was the first to assess parenting at the momentary level in a clinical sample, more research is necessary to replicate these findings. More generally, taking into account parents' experiences of adolescence, parenting, and their own affect deserves more attention in future studies, as adolescence is not only a challenging period for adolescents, but also for parents.

Objectively assessing parent-adolescent proximity in daily life

To overcome having to rely on time-based sampling and to assess parent-adolescent interactions at the moments that these occur, we developed a new method that tracks the proximity between adolescents and parents. As this proximity may be a sensitive marker of actual parent-adolescent interactions, we used this information to trigger questionnaires including questions on how they experienced their interactions (chapter 7). To do so, we developed and tested an innovative method that combined BLE beacons and a smartphone application (Ethica) to track proximity between adolescents and parents and to prompt questionnaires after proximity measures had indicated a possible interaction. Our results demonstrated that adolescents generally spent more time with mothers than with fathers – a finding that had also been observed in previous work using questionnaires and hence served as a validation (Larson & Richards, 1991; Phares et al., 2009; Van Lissa & Keizer, 2020). Moreover, based on the questionnaires triggered after signaled proximity parents and adolescents indicated a fair amount of parent-adolescent interactions: adolescents

indicated an interaction with parents in 66% of the questionnaires and parents reporting an interaction with adolescents in 80% of the questionnaires. Parents and adolescents, however, did not always receive the questionnaire at the same time or answered the questionnaire both. It was therefore not possible to analyze differences between parents' and adolescents' perceptions of parenting at the momentary level based on the proximity measures. So far, our unobtrusive method thus enabled gaining more insight into proximity of parents and adolescents and relating this to the individual experiences of quality of interactions. Future studies are necessary to further develop and validate this method in various social domains to enhance our understanding of social interactions in daily life.

Micro-level processes between perceived parenting and adolescent affect

Although *how* parenting is perceived may differ between levels of assessment, our findings regarding the within-person associations between parenting and adolescent affect at the micro-level were similar to previous studies using retrospective questionnaires assessing these associations at the between-person level. Results of our studies showed that, on average, on days or moments that adolescents perceived more warmth, more support, and less criticism from their parents they also reported more positive and less negative affect (chapter 2, 3, and 5). The importance of perceived parenting for adolescents' well-being in everyday life is further demonstrated by the robustness of these findings after adding parents' perception of parenting (chapter 5) or personal characteristics such as gender (chapter 2 and 3). Combined with previous studies that used retrospective questionnaires at the macro-level our results point towards a certain homology over time scales when it comes to the relation between parental warmth and adolescent affect (e.g., Pinquart, 2017; Weymouth et al., 2016). This supports the idea that, despite a key developmental task for adolescents is to become more autonomous, their development and well-being benefits the most if this strive for independence happens in the context of a close and secure relationship with parents (Soenens et al., 2019; Steinberg & Silk, 2002). However, using EMA to assess the association between parenting and adolescents' affect at the within-person level has an important added value as it enables taking into account momentary or daily fluctuations and hence study this for a specific person or family.

Since parents and adolescents in the RE-PAIR and FLOW study were both asked about parenting behavior at the end of the day, we were able to shed some light on how discrepancies between these perspectives related to affect in daily life (chapter 5 and 6). We applied polynomial regression models and response surface analyses to assess associations between our daily assessments of parenting and affect, which enabled including parents' and adolescents' individual perceptions of parenting and the interaction between perceptions (chapter 5). Results showed that in addition to adolescents' or parents' own individual perspective, the extent to which this perspective corresponded to or differed from the other perspective was of importance for daily well-being of adolescents. Our findings seem to align with the proposed and supported maladaptive hypothesis in retrospective studies at the macro-level (De Los Reyes et al., 2019; Hou et al., 2020), indicating that divergence in parent-adolescent reports is associated to poorer adolescent well-being, especially when adolescents report more negative about parenting than their parents. However, as previously mentioned, adolescents' negative mood may also influence the perception of parenting (Rudolph, 2009). As a next step, we included parents' affect in addition to adolescents' affect (chapter 6) to test

the idea that divergence between perceptions may also undermine parents' well-being (De Los Reyes, 2011). Our results indicated that divergence between adolescents' and parents' reports of parental warmth was more consistently related to parents' daily affect than to adolescents' daily affect. Interestingly, by including both adolescents' and parents' affect, our findings seem to suggest that it is mood that impacts the perception of parenting instead of the discrepancies affecting mood. To date, only few studies, focusing on adolescent affect, have examined the predictive effect of adolescents-parent discrepancies of parenting and did not find support for these effects over time (e.g., Nelemans et al., 2016). More work is needed to gain insight into the direction of effects and the role informants' mood plays when assessing these discrepancies.

Taken together, previous findings at the group level on the associations between parenting, discrepancies, and (adolescent) affect do seem to generalize to person-specific daily life processes. Parenting and affect in a family context are dynamic, can co-fluctuate and influence each other on a daily and momentary basis and the current data illustrate how valuable it is to assess these processes on the within-person level.

One size does not fit all adolescents and families

By assessing parenting and affect repeatedly at the momentary and daily level, we were able to test the idea that processes between parenting and adolescent affect differ between individuals and families as suggested in ecological models of development (e.g., Sameroff, 2010) and differential susceptibly hypothesis (e.g., Pluess & Belsky, 2010). Based on our findings, as well as other recent studies (e.g., Bülow, Van Roekel, et al., 2022; De Vries et al., 2022), heterogeneity in daily life processes seems to be the rule rather than the exception. Not only the amount of time spent together by parents and adolescents (chapter 7) or the impact of the COVID-19 pandemic on daily family life (chapter 4) differed between individuals, but also the direction and extent to which parenting and affect are related in daily life (chapter 2 and 3) – even within a subgroup of adolescents, for instance adolescents with a depression (both in a community and clinical sample - figures in chapter 2 and 3). Importantly, our results further illustrated that even within an adolescent or family there is substantial variation. That is, adolescent A may benefit from a certain level of parental warmth and support at a given day, while this behavior influences adolescent A negatively at another day. Similarly, also parent-adolescent discrepancies varied between- and within-dyads (chapter 5 and 6). Taken together, this supports the notion that psychological processes are heterogeneous (Bolger et al., 2019) and is a warning against the 'one size fits all' fallacy (Keijsers & Van Roekel, 2018; Keijsers et al., 2016). Moreover, it highlights the importance of focusing more on the unique interactions of a person or family and its environment in everyday life, which can be captured relatively easily with EMA.

To contribute to a better tailoring of preventions and interventions to the needs of an individual or family, we took some first steps to better understand the individual differences. General social support (chapter 2) and adolescent sex (chapter 2 and 3) did not explain differences between individuals in how parenting and adolescent affect in daily life are related. Furthermore, although parental support seemed to be more beneficial for adolescents' affect in adolescents with more depressive symptoms at the *daily* level (chapter 2), we were not able to replicate these findings in adolescents with a clinical diagnosis of depression and assessing parental warmth and criticism at the *momentary* level (chapter 3). Time scale of measurement may play a role here and previous findings

align with our seemingly contrasting findings. That is, depressive symptoms explained individual differences in the link between parenting and adolescent affect when examining this association at the daily level (Timmons & Margolin, 2015), but not at the momentary level (Bülow, Van Roekel, et al., 2022). Although our findings indicated substantial individual differences, more sophisticated methods and statistics, such as person-specific *N* = 1 models, on larger amounts of data per individual or family are necessary to better understand the individual processes and variation as well as investigating personal characteristics or contextual factors explaining these differences (e.g., Bülow, Neubauer, et al., 2022; Valkenburg et al., 2021). This type of work would not only yield more insight into individual differences but could also contribute to formulating more general parenting principles, that work for (almost) all adolescents. A recent study shed some first light on this by showing that parental warmth and autonomy support had positive effects on adolescent well-being in almost all families (91-98%). Although strength of the association differed, direction of effects were universal (Bülow, Neubauer, et al., 2022).

The importance of parenting of mothers *and* fathers

An important and unique aspect of the RE-PAIR study is that we included fathers in addition to mothers. According to the family system theory (Cox & Paley, 1997), the mother-adolescent relationship and father-adolescent relationship represent distinct but related subsystems within the family (Restifo & Bögels, 2009). Although research suggests that mothers and fathers serve unique roles in parenting their adolescents (e.g., Lamb & Lewis, 2013), few studies have included fathers, let alone in studies on parenting in everyday life. In 95 of the 114 participating families, two parents participated in the EMA of the RE-PAIR study. This enabled us to gain insight into the daily life parenting processes of mother-adolescent dyads and father-adolescent dyads, from the perspective of the adolescent as well as from the perspective of mothers and fathers themselves. Although not explicitly reported in our studies, multilevel analyses indicated that at the *daily* level adolescents without psychopathology reported that their mothers showed generally more warmth *and* more criticism than fathers (*p*'s < .01), even though reports of adolescents with a depression indicated no differences between parental warmth and criticism of mothers and fathers. Concerning the association between parenting and adolescent affect, we found that perceived parental warmth and criticism of both mothers and fathers is relevant for adolescent positive and negative affect at the momentary and daily level (chapter 3 and 5). Generally, adolescents' positive affect seemed to be somewhat more affected by their mothers than fathers. For instance, whereas for adolescents the discrepancies with their mothers' perceptions regarding parental warmth were related to adolescent daily positive affect, this was not the case regarding discrepancies with fathers (chapter 5 and 6). Moreover, adolescents reported more positive affect when interacting with mothers and fathers at the same time compared to with fathers only (chapter 3).

Additionally, we were also able to assess whether interrelatedness of affect differed between adolescent-mother and adolescent-father dyads (chapter 6). We found that daily happiness of adolescents and mothers was more strongly related compared to adolescents and fathers, while daily sadness and daily irritation in adolescent-father dyads were more strongly related compared to adolescent-mother dyads. These findings may reflect more compartmentalization of affect in mothers (Erel & Burman, 1995; Krishnakumar & Buehler, 2000), with mothers being more cautious in showing

their negative emotions to their children. In line with this, previous work has found that fathers were more likely than mothers to spillover tension from the marital dyad to the parent-child dyad indicating a difficulty of fathers to compartmentalize their affect (Almeida et al., 1999).

These findings point towards an important next step in research, including adolescent-mother-father triads in one model. A recent study shed a first light on the inter-individual dynamics of affect in the family sphere by simultaneously including affect states of mothers, fathers, and adolescents (Veenman et al., 2022). Results of the network models showed that affect of adolescents, mothers, and fathers influence each other, also over time. Moreover, as previous research showed that siblings may experience parenting in a unique way, and that experiences of siblings has been related to mental health of the individual, over and above the individual experience of parenting (Kullberg et al., 2021), it seems essential to study the family as whole.

Strengths & limitations

The studies included in this dissertation contribute to the understanding of parenting and well-being of adolescents and parents at the level where the actual parenting takes place, i.e., everyday life. By utilizing EMA, we were able to zoom in to the dynamic person- and family-specific processes in an ecological valid way. Due to the unique multi-informant sample and by using novel statistical techniques, we demonstrated the importance of not only taking into account adolescents' affect and perception of parenting of both mothers and fathers, but also mothers' and fathers' own daily life experiences. Additionally, designing and implementing a novel method to track proximity of adolescents and parents yielded some exciting first insights into time spent together in the family context. This method is a promising tool to enhance the understanding of social interactions in daily life, also outside the family context. Repeatedly assessing parenting and affect also enabled providing evidence for the ideas (e.g., Pluess & Belsky, 2010; Sameroff, 2010) that the direction and extent to which parenting relates to affect differs between individuals and provided some first insights on characteristics that may account for these differences. Lastly, the inclusion of adolescents with a depression and their parents in addition to adolescents without psychopathology and their parents yielded valuable information to guide parenting interventions in clinical practice. Although recruitment of families with an adolescent with a depression was challenging, as is often the case with clinical samples, EMA compliance of these adolescents (64%) and parents (72%) was only slightly lower than from the families with an adolescent without psychopathology (adolescents: 68% and 82%) and were still largely in line with previous work in adolescents (Van Roekel et al., 2019) and adults (Wrzus & Neubauer, 2022).

Notwithstanding the contribution of this dissertation to the field, several limitations should also be taken in consideration. A first remark concerns the samples. All studies (Grumpy or Depressed, RE-PAIR, and FLOW) in this dissertation included WEIRD (White, Educated, Industrialized, Rich, and Democratic) samples which limits generalizability of our conclusions. We tried to be inclusive in the recruitment for the RE-PAIR study, by recruiting nation-wide, offering to plan the research day in the lab on a weekend day, and providing arrangements with a hotel. Ultimately, however, 66% of parents in the RE-PAIR sample completed higher vocational school or university while this is approximately 35% of adults in the general Dutch population (Statistics Netherlands, 2021). Second, the sample size of the RE-PAIR study on which most chapters were based, was relatively small. In total, 115

adolescents and their parents participated (of which 114 families participated in the EMA). Power, however, is not only based on sample size but also on the amount of observations, which was quite large in our study. In total, adolescents and parents received 56 questionnaires during 14 consecutive days (i.e., a total of 6384 questionnaires for adolescents and 11884 for parents). We accounted for this nestedness of observations in appropriate multilevel analyses that were cross-sectional in nature. Future studies should aim for larger sample sizes, however, or increase the amount of observations. This would also enable an exploration of the bidirectional nature of parenting processes and application of more idiographic approaches. A third concern relates to the instruments that we used to measure parenting. Parental warmth and criticism in the EMA of RE-PAIR were measured by one (i.e., daily level) or two items (i.e., momentary level). We specified these items based on theories and questionnaires as no parenting questionnaire suited for EMA was validated at the start of RE-PAIR. Although the use of single-item measures has been debated (Allen et al., 2022), they may be quite suited for EMA research as this reduces the burden on participants and increases compliance of questionnaires (Eisele et al., 2022). More research needs to be done to gain more consensus on which items to use to assess parenting and affect as well as to test validity and reliability. A promising step was taken by starting an item repository by Kirtley and colleagues (Kirtley et al., 2020).

Clinical implications

Based on our findings I like to specify a number of important clinical implications and recommendations. First, our findings highlight the need for including mothers *and* fathers in treatment, as involving parents already has been shown to result in better treatment outcomes for children with a depression (Dowell & Ogles, 2010; Oud et al., 2019). Clinical interventions should for instance include psychoeducation to inform and support parents. During qualitative interviews in the RE-PAIR study, parents of adolescent with a depression mentioned feeling helpless, not knowing how to best support their adolescent as they had trouble relating to what the adolescents was going through. This has also been reported in an earlier qualitative study (Stapley et al., 2016). Thus, parents could be provided with more information on for instance how a depression may present itself in daily life (i.e., adolescent can be irritated) and how low affect of their adolescent may impact how they experience events or (parenting) behaviors (i.e., cognitive bias). As parents also indicated that they questioned their parenting abilities (Stapley et al., 2016), another aspect to address is the important role parents still play for adolescents' well-being and that adolescents generally benefit from receiving warmth and support. Recently, a course has been developed for parents with an adolescent with a depression or depressive symptoms in the Netherlands, Samen Sterk (Samen Sterk, 2022). The course aims to inform parents about depression in adolescents, provide tools to improve communication with their children, and parents are encouraged to also formulate their own goals suiting their family, thereby facilitating tailoring the intervention to the needs of a family's specific situation. Although effectiveness of the intervention has not been tested empirically, parents indicated that they felt very much supported by the intervention. Hence, it seems a promising direction to follow.

Second, although it is developmentally appropriate for adolescents to develop their own perspective and disclose less information to their parents (Keijsers et al., 2009; Smetana et al., 2006), the differences between perceptions of parents and adolescents of parenting may also indicate that behavior of parents does not always fit the needs of an adolescent (Eccles et al., 1993; Lerner et al.,

1986) and that this can negatively impact adolescents' well-being. Thus, parents' often well-intended behavior may not suit the needs of an adolescent at that specific moment. This advocates for (more) communication between adolescents and parents to better understand each other's intentions and behaviors. To foster more open communication, designing an easy accessible intervention (i.e., a game or an app) with tools to carve out time for each other and have fun or constructive conversations may help parents and adolescents to become more attuned to each other.

Third, how parents react to and coach their children's emotions is based on the awareness, acceptance, expression, and regulation of parents' own emotions (Gottman et al., 1996). Better emotional awareness, acceptance, and regulation of negative emotions by parents as well as adolescents has been related to lower levels of depression (e.g., Hunter et al., 2011; Larsen et al., 2013; Schwartz et al., 2018). Thus, with mood swings being seen as typical part of adolescence (Arnett, 1999) and being a possible indicator of mental health problems (Maciejewski et al., 2014), addressing parents' attitudes and behaviors towards emotions may be of vital importance. In a recent qualitative study, Dutch adolescents who experienced mental health problems mentioned that they felt concerned to share their feelings with their family for instance because they feared a lack of understanding (Leijdesdorff et al., 2021), which was also discussed by adolescents in the RE-PAIR study. Some adolescents also mentioned that their parents never shared their emotions and felt that parents did not know how to express them themselves (Leijdesdorff et al., 2021). This supports our suggestion to develop interventions that aim to help parents to develop an emotion coaching style of parenting. Some studies already showed that parents' emotion communication improved after completing an emotion-focused intervention (Shaffer et al., 2019). It may even be taken a step further, by additionally implementing emotion coaching at the meso (i.e., school) and macro (i.e., society) level. Ultimately, this might contribute to detecting mental health problems earlier or maybe preventing them in some cases by affecting the discourse about emotions at the societal level.

A final clinical implication and recommendation concerns the use of EMA. Applying this method to assess parenting and well-being in the family context can also be valuable outside of research. After completing the EMA of RE-PAIR parents often mentioned they became more conscious of how they felt (e.g., almost never irritated) and how they behaved (e.g., lacking sport activities) indicating that keeping track of feelings and activities in itself can raise awareness (see also Runyan et al., 2013). In clinical practice, monitoring feelings, whereabouts, and activities of a client or family could provide relevant information for diagnostics and treatment, especially when this is discussed with clients (Van Os et al., 2017). Patterns in affect fluctuations and (discrepancies in perceptions of) family interactions may become visible and may be a valuable point of departure for further explorations. Our novel method of tracking proximity between individuals, which still needs further development, may ultimately also contribute to the diagnostic or treatment process. It could help mapping the social network of a person, which in turn could be linked to a person's experienced or reported feelings. Although monitoring thoughts and behaviors could already be seen as an intervention, clinical practice may also use EMA to actually provide real-time feedback, also known as ecological momentary interventions (EMI; Heron & Smyth, 2010). EMIs in adults generally have been shown to affect mental health and positive psychological well-being, with the effect being larger when additional support was provided by a mental health professional (Versluis et al., 2016). The use of our method could potentially contribute to a more targeted intervention. For instance, if adolescents

report to feel more stressed or to experience more parental criticism than usual in several consecutive assessments when being close to their parents, they could receive a notification with the advice to discuss this with their parents.

Future directions

Since a lot of questions remain to be answered regarding parenting and adolescents' well-being, I would like to close this chapter by proposing some ways to move forward. The first suggestion concerns what we measure, when examining interactions in daily life. Although we asked parents and adolescents how pleasant the interaction was, the topic of the interaction and its relevance remains unclear. Therefore, including additional open-ended questions or qualitative aspects on experiences of parenting and well-being in EMA therefore seems important. More generally, involving adolescents or families in research through participatory methods, such as participatory action research (Loewenson et al., 2014), may contribute to for instance translating or implementing research findings more easily to the everyday life. The importance of participatory research with a bottom-up approach is increasingly being acknowledged in grants and seems as a promising direction for research.

Another important next step is to elucidate the direction of effects regarding the dynamic daily life processes between parenting and affect as well as examining these associations on various timescales. The dynamic systems perspective (e.g., Kunnen et al., 2019; Smith & Thelen, 2003) proposes that development is shaped by dynamic processes interrelating at different time scales. However, to date, we know little about which parenting processes happen on a specific timescale. Recent studies provided some interesting first insights for instance by showing that parental support did not predict adolescent depressive symptoms on different levels (i.e., days, weeks, months, and years), while adolescent depressive symptoms predicted decreases in parental support two weeks and three months later (Boele et al., 2022). At the micro-level (i.e., hours), it was found that perceived parental warmth predicted adolescent negative affect three hours later, but not six hours later. In turn, negative affect did not predict perceived parental warmth three hours later (Bülow, Van Roekel, et al., 2022). More work needs to be done to uncover the reciprocal dynamic patterns. Designing studies that include data collection at both micro and macro time intervals could help to gain more insight into these dynamic patterns.

Another direction for future work concerns applying a person-specific idiographic approach (Molenaar, 2004). Knowing more about the characteristics or environmental contexts that impact adolescents' development negatively could contribute to detecting at-risk individuals or families early and possibly preventing worsening of the situation or symptoms. Also, gaining more information on characteristics that contribute to adolescents' resilience would foster the development of preventive strategies and parenting advice. More work needs to be done here, in order to ultimately develop interventions that include general parenting principles with specific directions on how to tailor the intervention to the specific needs of an adolescent or family.

Furthermore, the daily life experiences of adolescents with a depression and their families deserve more investigation. Numerous factors can be taken into account in this line of work, but an important one might be negative self-evaluations (e.g., Beck, 1967; Orchard & Reynolds, 2018). This was often mentioned by parents of adolescents with a depression in RE-PAIR and adolescence is an essential period for the development of the self is (Erikson, 1968). Thus, how adolescents perceive

and evaluate themselves on a daily basis may be important to include in future studies. This would also enable possibly disentangling whether negative self-evaluation precedes negative mood or that it is the other way around, which could be valuable information for clinical practice.

Several of our suggestions for future research would require larger sample sizes or following (full) families for a longer period of time. However, assessing parenting and affect for a longer period of time may be burdensome for the family and hence be not realistic. Moreover, including siblings would not only complicate the recruitment of families but also the design of the study. For instance, different age-appropriate questionnaires may be needed to measure parenting, complicating comparing the different perceptions. Furthermore, the currently available statistical methods are not yet suited to analyze such complex data. The need for larger sample sizes or inclusion of the family as a whole seems especially challenging when aiming to recruit at-risk or clinical samples, which is already challenging when focusing on one individual. A possibility to partly overcome these issues would be to encourage researchers to use a similar research design and collaborate more worldwide. The open science practices already facilitate combining datasets, but especially for EMA research, more consensus on for instance items or sampling schemes is necessary.

A final remark I would like to discuss is that as researchers we may not be able to ever completely grasp and unravel the dynamic parenting processes between parents and adolescent in daily life. Although EMA enables gaining more insight into the interplay between persons including everyone's perspective in its natural context, it always concerns a simplified version of a specific interaction. Even though combining this information with for instance physiological measures such as heartrate and qualitative interviews can provide more insight, 'the sum is more than its parts' as Aristotle said. Human behavior might always be partly immeasurable and incomprehensible (Scheepers, 2021) and reality may be more or different than what we can perceive, touch, and measure (Klein, 2018). This implies that not knowing or not understanding something (fully) remains part of our life. In my opinion, this is not a pessimistic viewpoint, but an inspiring one that keeps researchers ambitious and curious.

Conclusion

The current dissertation aimed to investigate parenting processes in relation to affective well-being in families in the daily flow of life from different perspectives (i.e., adolescent, mother, father), on different levels (i.e., objective, momentary, and daily), and in a clinical sample (families with an adolescent with a depression) in addition to community samples. Our findings conform the notion that on an everyday basis parenting of mothers and fathers is important for adolescents' well-being. Moreover, we showed that adolescents, parents, and their perceptions of parenting influence each other and that becoming more attuned to each other's intention and needs is essential. Importantly, we consistently demonstrated that not only the extent and direction of the dynamic processes between parenting and affect in daily life differs between, but also within persons and families. This stresses the need for research focusing on individual processes and combining quantitative with qualitative measures on how individuals perceive and make sense of events, relationships, and the self. The use of more idiographic approaches would not only enable gaining more insight into these differences between individuals, but also contribute to identifying parenting practices that work for

almost all adolescents. This would facilitate the development of interventions combining universal parenting principles with suggestions for tailoring it to individual- or family-specific situations.

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A

Appendices

Nederlandse samenvatting

De adolescentie is een belangrijke ontwikkelingsfase die van ongeveer het 10e levensjaar tot begin twintig duurt. Deze periode wordt gekenmerkt door veranderingen op biologisch, cognitief, psychologisch en sociaal gebied. Al deze veranderingen bieden de mogelijkheid tot groei en ontwikkeling, maar maken het ook een kwetsbare periode voor jongeren (Dahl et al., 2018). Tijdens de adolescentie neemt de prevalentie van psychische problemen toe, waarbij stemmingsstoornissen een van de meest voorkomende zijn (Kessler et al., 2005). Wereldwijd kampt meer dan 13% van de jongeren tussen de 10 en 19 jaar met een mentale stoornis, waarbij 40% van deze jongeren een depressieve of angststoornis ervaart (Polancyzk et al., 2015; UNICEF, 2021). Ondanks dat het belangrijk is om symptomen tijdig te herkennen en te behandelen, duurt het vaak enkele jaren voordat jongeren met een mentale stoornis behandeling krijgen (Raven et al., 2017). Om het aantal jongeren die hulp nodig heeft van de (specialistische) geestelijke gezondheidszorg te verminderen is het daarom essentieel om onderzoek te doen naar factoren die de mentale gezondheid van jongeren kunnen bevorderen, waar preventie en interventie zich op kan richten.

Opvoeding is een van deze factoren. Ondanks dat de ouder-kind relatie tijdens de adolescentie verandert en jongeren meer autonomie en een eigen identiteit beginnen te ontwikkelen, blijft de relatie met ouders essentieel voor het welzijn van jongeren (bijv., Bronfenbrenner & Morris, 2006; Sameroff, 2010; Steinberg & Silk, 2002). Opvoeding is veelvuldig onderzocht en tot op heden is gebleken dat een ouder-kind relatie gekenmerkt door warmte en steun het welzijn van jongeren bevordert, terwijl kritiek en controle van ouders het welzijn van jongeren negatief beïnvloeden (bijv., Khaleque, 2013; Pinquart, 2017; Weymouth et al, 2016). Een gebrek aan steun en warmte en meer conflict en kritiek worden ook gerelateerd aan depressie bij jongeren (bijv., Restifo & Bögels, 2009; Yap et al., 2014). Bovendien is het geen eenzijdig proces, maar dynamisch en beïnvloeden jongeren en ouders elkaar bidirectioneel (Pinquart, 2017). De ecologische validiteit van deze eerdere bevindingen wordt echter in toenemende mate in twijfel getrokken aangezien de meeste studies gebruik hebben gemaakt van zelf-rapportage vragenlijsten op één of meerdere tijdspunten met grote tijdsintervallen (bijv. jaren) waarbij resultaten betrekking hadden op “het ‘gemiddelde’ gezin”. In hoeverre deze bevindingen daadwerkelijk de interacties tussen ouders en jongeren binnen specifieke gezinnen in het alledaagse leven representeren is de vraag, aangezien de dynamiek tussen ouders en jongeren op dit microniveau (van dag-tot-dag of moment-tot-moment) amper is onderzocht. Het doel van dit proefschrift was daarom om onderzoek te doen naar oudergedrag en interacties tussen jongeren en hun moeders en vaders in relatie tot de stemming van jongeren in het dagelijks leven, met daarbij aandacht voor mogelijke verschillen tussen personen en gezinnen. Alleen wanneer we ook inzicht hebben in de gezinsdynamiek op microniveau kunnen interventies ontwikkeld worden die maximaal afgestemd kunnen worden op de behoeftes van jongeren en gezinnen. Dit heeft niet alleen betrekking op preventie, maar ook op klinische interventies voor jongeren met depressieve klachten.

Methode om opvoeding en welzijn in het dagelijks leven te onderzoeken

Het gebruik van dagboekmetingen, ook wel bekend als ecological momentary assessment (EMA) of experience sampling method (ESM) is een veelbelovende manier om opvoeding en welzijn te meten binnen gezinnen in het dagelijks leven. Met deze onderzoeksmethode krijgen deelnemers meerdere

keren per dag korte vragenlijsten met vragen over hun ervaringen in de context van het dagelijks leven, bijvoorbeeld over hoe ze zich voelen, hoe ouders zich gedragen tijdens interacties en waar deze interacties plaatsvonden. EMA is relatief makkelijk in te zetten; deelnemers dienen een applicatie op hun smartphone te installeren en ontvangen via deze app diverse notificaties per dag om vragenlijsten in te vullen. Het gebruik van EMA stelt onderzoekers in staat om informatie uit te vragen over zowel inhoud als context (Hektner & Csiksentmihalyi, 2002) op een ecologisch valide manier (Trull & Ebner-Priemer, 2009) en die minder gevoelig is voor een herinneringsbias (Schwarz, 2007). Met klassieke vragenlijsten rapporteren deelnemers retrospectief over bijvoorbeeld opvoeding in de afgelopen weken, maanden of soms jaren. De antwoorden kunnen echter beïnvloed worden door iemands stemming of door recente of intense ervaring(en). Door het gebruik van EMA en te vragen naar ervaringen 'op dit moment', 'in het afgelopen uur' of 'de afgelopen dag' is die bias minder. Bovendien biedt het verzamelen van herhaalde metingen de mogelijkheid om in te zoomen op persoons- of gezin specifieke processen (Keijsers & Van Roekel, 2019). In het huidige proefschrift hebben we EMA gebruikt om meer inzicht te krijgen in hoeverre oudergedrag en stemming van jongeren binnen personen en gezinnen van moment-tot-moment en dag-tot-dag met elkaar samenhangen, zowel vanuit het perspectief van de jongeren als vanuit het perspectief van moeders en vaders.

Belangrijkste bevindingen

In **Hoofdstuk 2** hebben we allereerst gekeken in hoeverre de negatieve stemming van 242 jongeren van dag-tot-dag samenhing met de steun die ze van hun ouders ontvingen met gegevens verzameld binnen het Nederlandse Grumpy or Depressed project. In deze studie ontvingen jongeren tussen de 12 en 16 jaar binnen één schooljaar drie keer zeven dagen lang acht vragenlijsten op hun smartphone, met aan het einde van iedere dag een vraag over de steun die ze kregen van hun ouders. Uit de resultaten bleek dat jongeren over het algemeen een meer negatieve stemming rapporteerden op dagen dat ze hun ouders als minder steunend ervoeren. Daarnaast vonden we dat de associatie tussen ervaren steun van ouders en negatieve stemming verschilde tussen jongeren, zowel in richting als in sterkte. Hoewel de meeste jongeren een meer negatieve stemming rapporteerden op dagen dat ze hun ouders als *minder* steunend ervoeren, waren er ook jongeren die een meer negatieve stemming rapporteerden op dagen dat ze hun ouders als *meer* steunend ervoeren. Vervolgens hebben we vier factoren onderzocht die mogelijk deze verschillen konden verklaren. De negatieve relatie tussen ervaren steun en negatieve stemming was sterker voor jongeren die meer depressieve symptomen rapporteerden en jongeren die hun ouders minder opdringerig vonden. Sekse en ervaren sociale steun werden ook getoetst maar verklaarden de verschillen tussen de jongeren niet. Echter, zelfs binnen de groep jongeren die depressieve symptomen rapporteerden die wezen op een klinische depressie zagen we nog steeds verschillen tussen jongeren in hoe ervaren steun en negatieve stemming met elkaar samenhing.

Als volgende stap hebben we, in **Hoofdstuk 3**, ouder-kind interacties en de stemming van jongeren onderzocht in gezinnen met een jongere met een klinische depressie en vergeleken met gezinnen met een jongere zonder mentale stoornis. We onderzochten in deze studie specifiek in hoeverre positieve en negatieve stemming van jongeren en warmte en kritiek van ouders tijdens ouder-kind interacties in het dagelijks leven verschilden tussen deze gezinnen. Hiervoor hebben we gebruik gemaakt van

gegevens van de Nederlandse RE-PAIR studie waarbij opvoedgedrag niet alleen aan het einde van de dag werd gemeten (zoals in het Grumpy or Depressed project), maar ook op momenten dat jongeren en ouders contact met elkaar hadden gedurende de dag. Deelnemende families ontvingen 14 achtereenvolgende dagen vier vragenlijsten per dag. Bovendien vulden zowel jongeren als ouders vragenlijsten in en gaven jongeren apart antwoord over het opvoedgedrag van moeders en vaders.

Allereerst vonden we dat jongeren met een depressie een minder positieve en meer negatieve stemming rapporteerden dan jongeren zonder mentale stoornissen, zowel van moment-tot-moment als tijdens interacties met hun moeders en vaders. De mate van warmte en kritiek van ouders tijdens de ouder-kind interacties verschilde echter niet tussen de groepen, niet vanuit het perspectief van de jongere, maar ook niet vanuit het perspectief van moeders of vaders zelf. Dit was een opvallende bevinding en is in tegenstelling tot eerdere bevindingen gebaseerd op retrospectieve vragenlijsten (bijv., Kullberg et al., 2020; Sheeber et al., 2007; Valiente et al., 2014). Interessant was dat jongeren met een depressie en ook hun ouders binnen RE-PAIR hun relatie in de vragenlijsten wel negatiever beoordeelden (met name minder zorg en meer overbescherming) dan jongeren zonder mentale stoornissen en hun ouders.

In aanvulling op het onderzoeken van deze verschillen, onderzochten we ook de associatie tussen ervaren warmte en kritiek en stemming van jongeren en toetsten we of deze relatie verschilde tussen jongeren met of zonder een depressie. Over het algemeen rapporteerden jongeren een meer positieve en minder negatieve stemming op momenten dat ze meer warmte en minder kritiek van hun moeders en vaders ervoeren tijdens een interactie. Deze relatie verschilde niet tussen jongeren met en zonder een depressie, maar wel vonden we weer substantiële verschillen tussen individuen, ook binnen de groep jongeren met een depressie.

De gezinsdynamiek kan ook beïnvloed worden door factoren op macroniveau. De COVID-19 pandemie en de bijbehorende maatregelen om sociaal contact te beperken waren voor gezinnen heel ingrijpend en boden een unieke kans om te onderzoeken in hoeverre dit het geval was. In **Hoofdstuk 4** vergeleken we met behulp van EMA zowel de stemming van jongeren en ouders en hun beoordelingen van het gedrag van de ouders tijdens twee weken in de COVID-19 pandemie (eind april 2020) met twee weken voor de pandemie. Hieruit bleek dat positieve stemming van jongeren en ouders en warmte en kritiek vanuit het perspectief van jongeren en ouders niet waren veranderd tijdens het begin van de COVID-19 pandemie ten opzichte van een eerdere periode voor de pandemie. Ouders gaven wel aan meer negatieve stemming te ervaren tijdens het begin van de pandemie in vergelijking met voor de pandemie. Deze toename in negatieve stemming van ouders werd niet verklaard door intolerantie voor onzekerheid en andere COVID-19 gerelateerde factoren (bijv. woonoppervlakte, inkomen, wel/niet werken vanuit huis). Ondanks dat de deelnemende ouders en jongeren op dat moment over het algemeen redelijk goed leken om te gaan met de omstandigheden, vonden we ook hier weer grote verschillen tussen individuen. Sommige ouders en jongeren rapporteerden bijvoorbeeld wel minder positieve stemming tijdens de pandemie dan voor de pandemie.

Door het uitvragen van *dagelijks* oudergedrag vanuit het perspectief van jongeren en hun moeders en vaders konden we ook de mate waarin ouders en jongeren op elkaar afgestemd zijn onderzoeken,

en of de stemming van jongeren geassocieerd is met het wel of juist niet overeenkomen van de perspectieven (bijv. een groot verschil in hoe warm ouders zichzelf vinden versus hoe warm de jongere zijn/haar ouders beleeft). Dit onderzochten we in **Hoofdstuk 5**. Jongeren bleken over het algemeen positiever te zijn over het opvoedgedrag van hun ouders waarbij ze meer warmte en minder kritiek rapporteerden dan moeders en vaders over zichzelf. Echter, dit verschilde *tussen* ouder-kind paren en ook *binnen* ouder-kind paren van dag tot dag (bijv. de ene dag was de jongere positiever over warmte van de moeder, terwijl de volgende dag moeder positiever was dan de jongere). Daarnaast onderzochten we in hoeverre de verschillen en overeenkomsten tussen de percepties van jongeren en hun ouders samenhingen met de dagelijkse stemming van jongeren. Onze bevindingen toonden aan dat naast de perceptie van de jongeren, niet de perceptie van ouders, maar juist de verschillen en overeenkomsten tussen de percepties van jongeren en hun ouders belangrijk waren voor de dagelijkse stemming van jongeren.

Omdat de stemming van jongeren en ouders elkaar wederzijds kunnen beïnvloeden, namen we als volgende stap ook de stemming van ouders mee. In **Hoofdstuk 6** hebben we onderzocht in hoeverre de stemming van jongeren én ouders samenhingen met individuele percepties van jongeren en ouders over *dagelijkse* warmte van ouders. Ook hier keken we niet alleen naar de individuele percepties, maar ook naar de verschillen tussen de percepties. We hebben dit onderzocht in twee datasets, waardoor we bevindingen konden repliceren in twee verschillende culturele contexten: Amerika (FLOW) en Nederland (RE-PAIR). In de FLOW-studie vulden jongeren en één ouder (voornamelijk moeders) 21 dagen lang een dagboek in aan het einde van de dag over onder andere hun stemming en warmte van de deelnemende ouder. We deden voor beide datasets aparte analyses zodat we binnen RE-PAIR (waaraan veel meer vaders hadden meegedaan dan binnen FLOW) konden onderzoeken of er verschillen waren tussen jongere-moeder en jongere-vader paren. De resultaten in zowel FLOW als RE-PAIR lieten zien dat percepties van jongeren en ouders van dagelijkse ouderlijke warmte samenhingen met dagelijkse blijdschap, irritatie en somberheid. De verschillen tussen de percepties van jongeren en ouders met betrekking tot warmte van ouders hingen meer samen met de stemming van de ouders dan stemming van de jongeren. Dit lijkt erop te wijzen dat stemming mogelijk belangrijker is voor de perceptie van opvoedgedrag, dan andersom. Daarnaast vonden we, met betrekking tot de samenhang tussen stemmingen, dat irritatie en somberheid sterker met elkaar samenhing tussen jongeren en vaders dan tussen jongeren en moeders.

Ten slotte ontwikkelden we een nieuwe methode om met behulp van Bluetooth beacons en een smartphone app de fysieke nabijheid tussen jongeren en hun ouders objectief te meten. In **Hoofdstuk 7** onderzochten we of we met behulp van deze methode konden meten hoe vaak en hoe lang jongeren en ouders tijd met elkaar doorbrachten. Bovendien onderzochten we of vragenlijsten die op basis van de Bluetooth gegevens werden aangeboden (nadat ouders en de jongere dichtbij elkaar waren geweest) inzicht konden geven in de kwaliteit van de interacties. Met gebruik van deze objectieve maat vonden we dat, in een periode van twee weken, jongeren vaker en langer in de buurt van hun moeders waren dan vaders. Daarnaast werden er op basis van nabijheid diverse vragenlijsten verstuurd en beantwoord over de kwaliteit van interacties. Hoewel de methode nog doorontwikkeld

dient te worden, is het een veelbelovende manier om sociaal gedrag en sociale interacties in kaart te brengen.

Samengenomen laten de resultaten van de studies in dit proefschrift zien dat de kennis die we momenteel hebben over opvoeding gebaseerd op retrospectieve vragenlijsten over de afgelopen weken, maanden of jaren niet direct inzicht bieden in wat er van moment-tot-moment of dag-tot-dag gebeurt binnen personen en gezinnen. Zo concludeerde eerder onderzoek dat ouders positiever waren over hun eigen opvoedgedrag dan jongeren (De Haan et al., 2018; Hou et al., 2020), terwijl wij vonden dat jongeren over het algemeen positiever waren over het dagelijkse opvoedgedrag van hun moeders en vaders dan ouders over zichzelf. Verder vonden we in onze vergelijking tussen gezinnen met een jongere met een depressie en gezinnen met een jongere zonder mentale stoornissen dat opvoedgedrag tijdens ouder-kind interacties niet verschilde tussen de twee groepen, niet vanuit het perspectief van de jongeren, maar ook niet vanuit het perspectief van de ouders. Echter, uit de retrospectieve vragenlijsten bleek dat de jongeren met een depressie en hun ouders hun relatie als negatiever ervaren, wat ook in eerder onderzoek is gevonden (bijv., Kullberg et al., 2020; Sheeber et al., 2017; Valiente et al., 2014). Dit lijkt bovendien te suggereren dat de antwoorden op de retrospectieve vragenlijsten beïnvloedt kunnen zijn door een herinneringsbias, wat in het geval van jongeren met een depressie een grote(re) rol kan spelen. Het gebruik van EMA voor het meten van oudergedrag lijkt daarom een veelbelovende manier om deze bias te verminderen en in te zoomen op de dagelijkse processen.

Wat betreft de samenhang tussen oudergedrag en de stemming van jongeren in het dagelijks leven sloten onze resultaten wel aan bij eerder onderzoek. Jongeren rapporteerden meer positieve en minder negatieve stemming op momenten of dagen dat ze hun ouders warm, ondersteunend en niet zo kritisch vonden. Dit sluit aan bij het idee dat ouders nog steeds belangrijk zijn voor het welzijn van jongeren en dat jongeren erbij gebaat zijn om meer autonomie te ontwikkelen vanuit een warme en veilige relatie met ouders (Soenens et al., 2019; Steinberg & Silk, 2002), zowel met moeders als vaders. Een vernieuwend aspect van dit proefschrift was dat we, naast het perspectief van de jongeren, ook het perspectief van ouders over hun eigen opvoedgedrag hebben gemeten. De stemming van jongeren bleek niet alleen samen te hangen met hoe jongeren het opvoedgedrag van hun ouders ervaren, maar ook met de mate waarin deze overeenkwam met of verschilde van hoe ouders zelf dachten zich te gedragen. Vervolgens, rekening houdend met de stemming van ouders, zagen we dat stemming mogelijk meer van invloed is op (ervaren) opvoedgedrag dan andersom.

Een laatste belangrijke bevinding die consistent terugkwam in al onze studies was dat er verschillen waren tussen jongeren en gezinnen in oudergedrag en de samenhang van dit gedrag met stemming. Zowel de richting als sterkte verschilden substantieel, zelfs binnen een groep jongeren met een depressie. Dit pleit niet alleen voor het belang van onderzoek naar de unieke interacties van een jongere binnen een gezin in de natuurlijke context, maar onderschrijft ook de noodzaak voor gepersonaliseerde preventie en interventies.

Op basis van onze bevindingen hebben we enkele implicaties voor de klinische praktijk geformuleerd. Aangezien (ervaren) opvoedgedrag van zowel moeders als vaders samenhing met de stemming van

jongeren is het essentieel om beide ouders te betrekken bij preventie en interventies gericht op stemming of depressieve klachten van jongeren. Ook voor ouders kan de adolescentie, met fluctuaties in stemming en de ontwikkeling van een eigen identiteit, een uitdaging zijn. Opvattingen tussen ouders en jongeren kunnen verschillen en het vaak goedbedoelde gedrag van ouders sluit mogelijk niet (meer) aan bij de behoeften van jongeren op dat moment. Het is daarom van belang dat ouders en jongeren (meer) met elkaar praten over elkaars behoeften, intenties en gedrag. Het bevorderen van deze communicatie zou kunnen bijdragen aan meer afstemming tussen jongeren en hun ouders. Aanvullend zouden preventie en interventies zich kunnen richten op hoe ouders en jongeren omgaan met emoties. Hoe ouders reageren op de emoties van hun jongeren en deze al dan niet ondersteunen blijkt van belang voor het welzijn van jongeren en is gebaseerd op hoe ouders met hun eigen emoties omgaan (bijv., Hunter et al., 2011; Larsen et al., 2013; Schwartz et al., 2018).

Natuurlijk blijven er ook nog veel vragen onbeantwoord. Deze vragen kunnen richting geven aan toekomstig onderzoek. Gezien onze statistische power hebben wij ons enkel gericht op de samenhang tussen opvoeding en welzijn, daardoor kunnen we geen uitspraken doen over de richting van het effect: zorgt meer warmte en minder kritiek van ouders op tijdstip 1 voor een betere stemming van jongeren op tijdstip 2, is het andersom, of werkt het beide richtingen op? Meer onderzoek met grotere datasets is nodig om hier meer inzicht in te krijgen. Daarnaast weten we nog weinig over hoe de dynamische processen tussen opvoeding en stemming zich ontwikkelen over tijd: wat ontwikkelt zich over minuten, uren, dagen, weken, maanden of jaren? Ook is het van belang om een meer persoonsgerichte benadering toe te passen waarbij de verschillen tussen individuen beter onderzocht kunnen worden en er aandacht is voor factoren die de verschillen kunnen verklaren.

Conclusie

In het huidige proefschrift hebben we onderzoek gedaan naar oudergedrag in relatie tot stemming in het dagelijks leven binnen gezinnen vanuit verschillende perspectieven (jongere, moeder en vader) op verschillende niveaus (objectief met Bluetooth beacons, op het moment, dagelijks) en in een klinische steekproef (gezinnen met een jongere met een depressie) in aanvulling op een steekproef uit de algemene bevolking waarbij de jongeren geen psychische problemen hebben. Samengevat laten deze studies zien dat het oudergedrag van moeders en vaders in het alledaagse leven belangrijk is voor de stemming van de jongeren. Hoe de gezinsleden het oudergedrag ervaren kan echter verschillen, wat vraagt om meer onderlinge afstemming. Bovendien zagen we dat niet alleen de mate en richting van samenhang tussen oudergedrag en stemming verschilden tussen personen, maar ook binnen personen en gezinnen. Dit vraagt om meer onderzoek naar individuele processen waarbij kwantitatieve en kwalitatieve maten gecombineerd worden die inzicht geven in hoe personen gebeurtenissen, interacties en zichzelf ervaren. Door gebruik te maken van een meer idiografische benadering in toekomstig onderzoek kunnen individuele verschillen beter in kaart gebracht worden. Dit kan bijdragen aan de ontwikkeling van interventies waarin algemene opvoedprincipes gecombineerd worden met adviezen hoe deze afgestemd kunnen worden op kenmerken van het individu of het gezin.

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Loes Huberdina Cornelia Janssen was born on the 15th of August 1992 in Venray. After completing her secondary education at the Dendron College in Horst in 2010, Loes moved to Utrecht to start the bachelor Interdisciplinary Social Sciences at Utrecht University and obtained her degree in 2013. She continued her education at Utrecht University and completed both the two-year research master Development and Socialisation in Childhood and Adolescence in 2015 and the master Youth, Education and Society in 2016. During her masters, Loes completed a research internship and worked as a student-assistant at the Youth and Family Department at Utrecht University and completed a research internship at the Mental Health Department of the Trimbos Institute. In 2016, Loes started working as junior researcher at the Institute of Linguistics OTS at Utrecht University in a Dynamics of Youth project to investigate the relation between language skills and problem behavior in preschoolers.

In February 2017, Loes started her five-year PhD project at the Department of Clinical Psychology at Leiden University as part of a large multi-method, multi-informant project (RE-PAIR) focusing on the association between parent-child interactions and adolescent depressive symptoms. Loes investigated the relations between parenting and well-being of adolescents in daily life. She received training from the Dutch-Flemish postgraduate school for Experimental Psychopathology (EPP) and the Graduate School of Social and Behavioural Sciences of Leiden University. She also followed external statistical courses. During her PhD, Loes performed various teaching tasks, such as training and supervising master students in data collection and clinical interviews, supervising students with their master theses, and tutoring a bachelor course. She was member of the organizing committee of the VNOP-CAS Research Days in 2018, 2019, and 2020. From 2019 to 2022, Loes was part of the daily board of the Clinical Psychology Department as PhD representative.

Currently, Loes works as a post-doctoral researcher as part of team AWeSome at the University of Amsterdam, focusing on the relationship between adolescents' social media use and their well-being.

List of publications

Manuscripts in this dissertation

Janssen, L. H. C., Verkuil, B., Van Houtum, L. A. E. M., Wever, M. C. M., Wentholt, W. G. M., & Elzinga, B. M. A closer look into the affect dynamics of adolescents with depression and the interactions with their parents: An ecological momentary assessment study. *Submitted for publication*.

Janssen, L. H. C., Sloan, C. J., Verkuil, B., Van Houtum, L. A. E. M., Wever, M. C. M., Fosco, G. M.*, & Elzinga, B. M.* In the eye of the beholder: Towards a better understanding of how parents' and adolescents' affect relates to discrepant perceptions of parental warmth in daily life. *Submitted for publication*.

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Other manuscripts

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