Family matters: a multi-perspective approach to the link between parenting and offspring mental health problems

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Cover: Florianne de Vries
Printed by: Gildeprint, Enschede, the Netherlands

This study was financially supported by Leiden University Profile Area “Health, prevention and the human life cycle” for the research project *‘Family aggregation of mood and anxiety disorders’* awarded to Prof. dr. B.M. Elzinga and Prof. dr. A.M. van Hemert.

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Proefschrift

ter verkrijging van
de graad van doctor aan de Universiteit Leiden,
op gezag van rector magnificus prof.dr.ir. H. Bijl,
volgens besluit van het college voor promoties
te verdedigen op woensdag 21 september 2022
klokke 16:15 uur

door

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Geboren te Nijmegen
in 1993

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All online supplementary materials can be found here: osf.io/d3nht/

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General Introduction

"We only know a tiny proportion about the complexity of the natural world. Wherever you look, there are still things we don't know about and don't understand. [...] There are always new things to find out if you go looking for them." - David Attenborough

Investigating parenting and mental health problems: Towards a family perspective

Ninety percent of Western population grows up with at least one brother or sister (Milevsky, 2013), just as Jessica and Julian (see textbox 1) and Mia and Lily (see textbox 2). Full-biological siblings share their childhood rearing environment (e.g. the neighborhood they grow up in), their family context (e.g. parents that struggle with mental health problems or parental divorce) and at least 50% of their genes. More specifically, brothers and sisters growing up together are also likely to have similar childhood parenting experiences (Hines, Kantor, & Holt, 2006; Neiderhiser et al., 2004). Widely acknowledged theories on human development stretch that one's direct environment, including home and family and particular parenting experiences, is an important context of mental development and wellbeing (Bronfenbrenner & Morris 1998; Sameroff, 2009). Shared environmental influences and shared genetic makeup among family members determine to a large extent the increased risk of mental health problems in families of a person with a psychological disorder (Smoller, 2016). Siblings of persons with an anxiety and/or depressive disorder, for instance, are at increased risk of depressive and anxiety symptomatology as compared to unrelated controls (van Sprang et al., 2021). Yet, despite siblings' shared home environment and shared genetics, brothers and sister can also (vastly) differ in terms of mental wellbeing and similar childhood parenting experiences, as illustrated by the vignettes (textbox 1 and 2). Names have been changed to ensure anonymity of the interviewees.

The case of Jessica and Julian and the case of Mia and Lily illustrate that siblings, raised in the same environment and by the same parents, have a unique relationship with their parents during childhood and can also differ greatly in the mental health problems they may develop. In the context of the family, persons interact and influence each other through their verbal and non-verbal communication and behaviour. The family systems theory (Bowen, 1966) states that a family is more than the sum of the individual persons within that family. It defines the family as a dynamic and interacting system. One could compare the family system to a mobile of the American sculptor Alexander Calder (see Figure 1). The sculpture consists of several rods, from which objects or other rods are hanging. The objects are all attached to each other with rods and strings, so if one object moves, it makes the other objects in the mobile move as well. When translating this to the family system one could say that parental behavior has an impact on all children (whether or not it is directed at a single child). So, when something happens to one person, for instance a child gets yelled at by their father, it can affect all other family members too. Moreover, the whole system might be influenced or even defined by the overall parenting 'climate' and the behavioral norms of the family.

Textbox 1. Vignette of Jessica and Julian

Julian (40 years) lives in a village near Amsterdam with his partner and children and works as a teacher in higher education. He grew up with his father and mother and his older sister in the same village as he is currently living. Julian's sister Jessica (45 years) lives with her family in a village in the eastern part of the Netherlands and works at a child and adolescent psychiatric practice. They describe their mother and father and their relationship with their parents separately from each other. Both Julian and Jessica describe their mother as caring, overprotective and anxious.

When we ask Julian to tell us more about the relationship with his mother during childhood, he answers: "My mom was much more worried about me than about Jessica. I guess that had to do with my asthma and bronchitis. My sister had no health issues, she was healthy and stable. So, my mother was always more on top of me and less concerned about Jessica. So, they [mum and Jessica] also had less clashes than we had. Jessica's down-to-earth and rational character may have also resulted in some (emotional) distance in their relationship, I think. But yes, my health issues also contributed to a closer bond between my mother and me." Somewhat later, during adolescence, Julian became rebellious, went out partying and drinking a lot, and had many fights with his mother. It made her desperate and she slapped him sometimes. Jessica: "These fights with Julian were bad and had a negative impact on the atmosphere at home. It affected me, I withdrew, and did my own thing."

Julian and Jessica describe their father as down-to-earth, rational, but also involved with them. Yet, they had a different relationship with their father. Julian: "[...] I would say that my father and sister had a different kind of relationship than dad and me had. I think they are more alike, down-to-earth, pragmatic. I am more, emotional and extroverted. They are both a bit more introverted and rational than I am." Jessica: "I had a good relationship with my father. [...] Not that he shared a lot of his feelings, but I did feel related to my father. I did feel that I was more like my father than my mother in my youth. I understood my father better, so to speak."

Julian has suffered from anxiety symptoms since he was 20 years old. It started with uneasy feeling when in crowds and an overwhelming feeling when he was in spacious areas. If he was in the mountains, for instance or in large grasslands. Over the years he started suffering from frequent panic attacks. When he became older, he also developed more and more obsessive thoughts related to insulting God or obsessive thoughts of killing his partner when being in the same room". Julian: "These thoughts were terrible and made me feel miserable". He increasingly developed a fear to depersonalize, to lose sense of reality and to become insane. Over the years he was engaged in several types of psychotherapy, such as cognitive-behavioral therapy, Eye Movement Desensitization and Reprocessing (EMDR) and mindfulness, and also medication (anti-depressives). He still gets cognitive-behavioral therapy. [Text continues on the next page.]

His sister Jessica never had any mental health issues. When asked if she has ever suffered from mental health problems, Jessica answers: "No. I wonder sometimes what it would be like if my current and stable circumstances, family and religion, were different. I am aware that I may have a genetic predisposition to psychological problems with both parents and brother suffering…." Julian: "She [Jessica] is more down to earth than I am, it has always been that way. […] My sister comes out swinging, which is a bit exaggerated of course. But she experiences little to no difficulties on this area, which is very different to my situation. […] Sometimes I think: Gosh, I would like to be a bit more as my sister than how my situation has turned out."

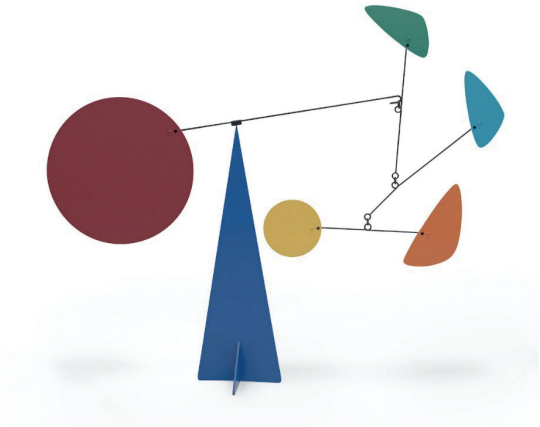

Figure 1. A mobile by Calder, here representative of the family system

This notion raises several core empirical questions: To what extent do adult siblings share similar recollections of childhood parenting experiences? And why do some siblings develop mental health problems whereas others, raised in the same family, do not? The differences in (maternal) parenting behaviour between Jessica and Julian (see textbox 1), i.e. the overprotectiveness and clashes with Julian, and between Mia and Lily, i.e. the meddling and judgements towards Lily (see textbox 2) also raises the question to what extent the parent responded to the child's characteristics or behaviours i.e., to what extent could certain child behaviour also *elicit* certain parenting behaviour?

While the increased risk of mental health problems in families is well-investigated and the importance of the family context is widely acknowledged, most empirical studies still focus on the experience of one individual per family,

often overlooking the (diverging and converging) perspectives among siblings. The questions as raised above cannot be answered from a single-person perspective. To contribute to prevention and treatment strategies of mental health disorders, we therefore aim to answer these questions (among others) in the context of the family in order to better understand the etiology, development and maintenance of common mental health problems.

Textbox 2. Vignette of Mia and Lily

Mia (age 55) lives by herself in the city center of Amsterdam. Her sister Lily (age 51) lives in a city near the coast of the Netherlands with her husband and two adolescent children. During childhood, their mother had multiple severe depressive episodes and (hypo)manic periods. She got hospitalized several times. Most of the time Mia and Lily lived with their mother. Only when their mother was hospitalized, when the girls were around the age of 7 and 12, they lived with their father for a while. After her death a couple of years ago, they delved into their turbulent childhood and discovered that they have experienced things differently.

Mia describes their mother as extravagant and charming, but also down-to-earth. To Mia's opinion, she desired approval for everything, and was a little over concerned. Lily, however, does not think of her mother as down-to-earth at all. She describes their mother as very complex and driven by fear. She thinks of her as compelling and judgmental. Mia: "Mom treated us differently. She let me free and do my own thing and with you [Lily], she was more controlling [...] she perceived you as more vulnerable." Lily: "[...] I think she saw her own vulnerabilities as a child in me and hence she wanted to protect me at all costs. That did not work out well... [...] She gave me the impression that I was not doing well, or not good enough. It made me insecure."

They both remember that their father was working most of the time. When he visited them at their mother's place, he was often napping the entire Sunday. They were happy when he came, he was fun to be around, even though they felt he didn't show much interest in them. However, Lily believes she took that more personal than Mia. Lily: "Mia was dad's pride and joy". Mia acknowledges that, she was daddy's girl and admired him. Lily defines the relationship with her father as complicated, she always felt that he was more fond of Mia. Lily: "I was always ill when I came home from dad's place. I was so stressed all the time, tiptoeing around there."

With regard to their mental wellbeing, Mia has never suffered from any mental health issues, while Lily searched professional help for anxiety and issues with her self-esteem. Lily: [...] "Actually, you [Mia] are going through life fearlessly, while I still have to deal with a feeling of unsafety. Perhaps she [mother] should have been more concerned about you than she was about me, as I was way more well-behaved and less reckless than you. [....] I had social phobia and a panic disorder as well. Ordering a drink at the bar, paying at the supermarket made me shake."

Mental health problems and the importance of the parent-offspring relationship

Mental health problems

Mental health problems are common worldwide, with anxiety and depressive disorders having the highest estimated prevalence of 3.8% and 3.4% of the global population per year respectively (Dattani et al., 2021). In the Netherlands, approximately four in ten adults have experienced a mental health disorder at some point during their life (de Graaf et al., 2012). Internalizing problems and externalizing problems are the two main categories of mental health problems (Achenbach & Edelbrock, 1978; Krueger, Caspi, Moffitt, & Silva, 1998; Polanczyk, Salum, Sugaya, Caye, & Rohde, 2015; Vollebergh et al., 2001). Internalizing problems generally include conditions such as depression, anxiety, withdrawal and (psycho)somatic complaints, whereas externalizing problems include behavorial problems, rule-breaking, aggressive and intrusive behaviors.

Most mental health conditions have their first onset in childhood or adolescence (Kessler et al., 2005; Solmi et al., 2021). Approximately 20% of children and adolescents experience mental health problems in any given year (World Health Organization, n.d.). Estimates of the lifetime prevalence of DSM-IV mental disorders in adolescents (aged 13-18 years) were highest for anxiety disorders (31.9%), followed by externalizing problems (19.1%) and depressive disorders (14.3%) and these typically co-occur (Merikangas et al., 2010). Internalizing problems during adolescence are highly associated with diagnoses of depression and anxiety later in life (e.g. Beesdo-Baum & Knappe, 2012). Adolescents who experience externalizing problems are also likely to experience poor adult wellbeing and psychopathology, such as disruptive, anxiety, mood and substance use disorders (Colman et al., 2009; Odgers et al., 2008; Reef, Diamantopoulou, Van Meurs, Verhulst, & Van Der Ende, 2010). Although internalzing and externalzing problems may resolve across development (Costello, Copeland, & Angold, 2011; Hofstra, Van Der Ende, & Verhulst, 2000), mental health problems may continue from childhood to adolescence to adulthood and even onto the next generation (Loeber et al., 2009).

The importance of the parent-offspring relationship

The home environment and family household, and parenting in particular, have been typically linked to the development and course of mental health problems (Repetti, Taylor, & Seeman, 2002). It is thus important to understand mental health problems within the family context. Previous research has shown that the quality of all family relationships (i.e. parent-offspring, marital and sibling) are associated with adolescents' well-being and problem behavior (Buist, Deković, & Gerris, 2011). It is well-established that of all family relationships the parent-offspring bond is one of the most important relationships for human mental development (e.g., Eisenberg et al., 2001; Tamis-LeMonda, Bornstein, & Baumwell, 2001). According to Bowlby's attachment theory, social interactions with childhood caregivers serve as a

blueprint for further social and cognitive development such as relationships and the perception of the self and others (Bowlby, 1969). Sensitive and caring parenting and providing a safe and stimulating rearing environment are key factors for healthy social emotional wellbeing and cognitive functioning (Ainsworth, 1979). Conversely, poor parent-offspring relationship and negative parenting practices during childhood are related to mental health issues, such as mood disorders across the lifespan (Berg-Nielsen, Vikan, & Dahl, 2002; Enns, Cox, & Clara, 2002). In this dissertation fathers, mothers and offspring siblings are investigated to shed new light on the associations between parenting and mental health problems in the family context.

Parenting dimensions

Parenting and the parent-offspring relationship is defined by multiple parenting aspects and behaviors which have been categorized into several dimensions and styles (Power, 2013). The two-dimensional approach, that characterizes parenting by parental warmth (also referred to as care and/or support) and negativity (also referred to as criticism and/or control; Rollins & Thomas, 1979) has been frequently used and proven informative in relation to mental wellbeing. Within this framework, parental warmth is typically defined by sensitive parenting behavior, including acceptance, support, protection and positive involvement towards the child. Parental negativity is defined as expressing criticism, disapproval, or dissatisfaction and restricting the child. Negativity might be expressed in *overt* parental behaviors such as physical or verbal punishment, negative control, rejective behavior towards the child and intrusiveness. In addition, parental negativity can also reflect more *covert* parenting, for instance, neglecting the child. While the two dimensions of warmth and negativity reflect and incorporate the most important parenting behaviors, they are not mutually exclusive nor exhaustive. For instance, parental (over)protection cannot be categorized as 'warm and positive', nor as 'negative' parenting. Parental protectiveness reflects the extent to which parents protect their child from potential dangers, which is benign in stressful or dangerous circumstances. Overprotection, i.e. too much caution and involvement of the parent, however, refers to unnecessary protection that may be disadvantaging children's healthy development (Barber, 1996; Ungar, 2009). In the past decade, overprotection has also been referred to 'helicopter' or 'curling' parenting (Segrin, Givertz, Swaitkowski, & Montgomery, 2015). For proper transition to adulthood, promoting the child's autonomy and independency is also needed (Padilla-Walker, Nelson, Madsen, & Barry, 2008). Appropriate autonomy-granting behavior requires parents to balance involvement and promoting autonomy. Examples of autonomy-granting parenting behaviors are to encourage the child to make own choices and decisions and to show respect for the child's opinions (Kendler, 1996; Padilla-Walker et al., 2008). In the studies presented in the current dissertation, we aimed to address

these key parenting dimensions; namely parental warmth/care, negativity/control, and overprotection and autonomy-granting behavior. The association between the parental bonding dimensions, care, overprotection and autonomy-granting behavior, and depressive and anxiety disorders in adulthood is examined in chapter 2.

Siblings' parenting experiences and the association with individuals' mental health problems

Raised in the same household and by the same parents, brothers and sister might have similar childhood parenting experiences. Studies on retrospective self-reports on the parenting dimensions, parental care, overprotection and autonomy-granting behavior in adult twins, showed agreement among siblings. Still, substantial differences among twins exist with regard to their parenting experiences as sibling correlations range from 0.11 for maternal autonomy-granting behavior (dizygotic twins) to 0.46 for paternal care (monozygotic twins; Otowa, Gardner, Kendler, & Hettema, 2013). The difference and similarity in recollections of childhood parenting experiences among non-twin siblings, as illustrated in Jessica and Julian's and Mia and Lily's cases (textbox 1 and 2), have not been investigated before. These findings are described in chapter 3.

The shared childhood rearing environment puts siblings at increased risk for similar (adverse) childhood experiences, and, resonating with Calder's mobile, individuals might also be influenced by their siblings' (parenting) experiences (Steinglass, 1987). Still, the association between siblings' childhood experiences and mental health problems in the long-term remained unclear until now. In this dissertation, we focused on two potential (and concurrent) ways in which siblings experiences might play a role in adult mental wellbeing. First, siblings' mental wellbeing is influenced by the overall or shared parenting style as reported by multiple siblings within a family (Jenkins et al., 2009), the so-called "family-wide parent-child relationship" or "parenting climate" (Oliver & Pike, 2018). Studies have demonstrated the effects of the parenting climate, next to the individual parental bond, on child and adolescent mental wellbeing (Feinberg & Hetherington, 2001; Jenkins, McGowan, & Knafo-Noam, 2016; Oliver & Pike, 2018). Second, in children, prior studies on negative parenting in siblings indicate that, next to poor parental bonding experienced by all or several children in the family, receiving more parental negativity or less parental support from their parents compared to their sibling (i.e. being the black sheep) is associated with child mental health problems (Dunn, Stocker, & Plomin, 1990; Jenkins et al., 2016; Meunier, Bisceglia, & Jenkins, 2012; Pillemer, Suitor, Pardo, & Henderson, 2010). Even though the impact of the parenting climate and 'the black sheep effect' on wellbeing have been investigated in children, less is known about adult mental health problems and specifically depression and anxiety symptomatology. The associations between siblings' childhood parental

bonding and depressive and anxiety symptom levels in adults are examined in chapter 3.

Understanding individual differences in mental health outcomes

While, on average, poor parent-child relationships are associated with increased levels of mental health problems (Marshall, Shannon, Meenagh, Mc Corry, & Mulholland, 2018), these associations might differ from person to person, even within a family (as illustrated in textbox 1 and 2). Siblings might respond differentially to negative within-family experiences in terms of mental health problems. Lily suffered from anxiety symptoms, whereas Mia never had any mental health problems despite the shared rearing environment, e.g. growing up with a mother with mental health problems (textbox 2). It can be expected that individual characteristics, e.g. temperament, or individual-specific negative life experiences, e.g. maltreatment, might explain why one person *within* the family is dealing with more severe mental health problems as compared to his/her relatives. To elucidate individual protective factors related to depressive and anxiety symptomatology, we investigated moderating effects of personality characteristics on the association between siblings' parenting experiences and these mental health problems (chapter 3).

In addition, the family as a whole may experience hardship through family-wide factors, equal for all family members, such as socioeconomic status or similar parental bonding patterns among siblings, which might contribute to differences *between* families in terms of mental wellbeing. In chapter 6 and 7, we aimed to explain these between-family differences. Specifically, in chapter 6 we aimed to test whether socioeconomic status and chaos at the home explain differences between families in the associations between parenting and child problems. In chapter 7, we aimed to explain differences in parenting and mental wellbeing during the global COVID-19 pandemic between families.

Siblings' childhood maltreatment experiences and the association with individual's mental health problems

Another closely-related, yet harsher, factor that has been associated with offspring's mental health problems is child maltreatment, which also often occurs in the family context. Active forms of childhood maltreatment entail physical, sexual and emotional child abuse. Experiences of emotional abuse are, for instance, name calling, being verbally attacked or given the feeling to be hated by a family member on a regular basis. The passive forms of childhood maltreatment are physical and emotional neglect. Emotional neglect relates for instance to the lack of basic social needs (because of parents' indifference), such as emotional support, comfort and care. Physical neglect refers to the failure to meet a child's basic physical needs, such as food, shelter and clothing. Reckless disregard of the child's safety and

health can also be referred to as physical neglect. Exposure to childhood maltreatment may set in motion changes in basic processes related to trust and safety, and threat processing, therewith having impact on mental health and social interactions across the lifespan (McLaughlin, Colich, Rodman, & Weissman, 2020). The association between childhood maltreatment and mental health problems has been well-established: Persons who report a history of maltreatment as compared to non-maltreated persons are at increased risk to develop mental health problems (Norman et al., 2012), especially depression and anxiety disorders (Infurna et al., 2016; Li, D'Arcy, & Meng, 2016; Norman et al., 2012; Spinhoven et al., 2010).

Childhood maltreatment experiences may be more or less similar among siblings, reared in the same environment, depending on the type of maltreatment. Emotional and physical maltreatment often occur in the family household (Hovens et al., 2009). Consequently, brothers and sisters are more likely to report similar maltreatment experiences as their sibling (Hines et al., 2006; Witte, Fegert, & Walper, 2018). Sexual abuse is relatively less often perpetrated by a parent compared to the other maltreatment types (Hovens et al. 2009), which makes it less likely that siblings have akin experiences. The relative scarcity of data on siblings in studies concerning childhood maltreatment (and childhood parenting experiences) and their associations with adult mental health problems may lead to an underestimation of the problem and to a lack of knowledge on factors related to within-family risk factors. Another reason to examine the link between childhood maltreatment (and childhood parenting experiences) and their associations with adult mental health problems in siblings is to better understand why some siblings develop problems and others do not.

In the current dissertation therefore both the direct association between individual experiences and (adult) depressive symptomatology and the indirect associations between one's sibling's experiences and individual's depressive symptom levels are examined in chapter 4. Knowledge on siblings' experiences of childhood maltreatment and the association with mental health problems is a novel effort and may provide relevant information for prevention and (family) interventions.

Bidirectional effects of parenting and mental health problems

While suboptimal parental bonding and negative parenting practices increase the risk of developing mental health problems (see e.g. Baumrind, 1991; Crosnoe & Cavanagh, 2010; Fletcher, Steinberg, & Williams-Wheeler, 2004), offspring's mental health problems might also *elicit* certain parenting behaviour (Cecil, Barker, Jaffee, & Viding, 2012; Oliver, 2015; Serbin, Kingdon, Ruttle, & Stack, 2015; Viding, Fontaine, Oliver, & Plomin, 2009; Wang & Kenny, 2014). Studies indicate that parenting and mental health problems are associated in a bidirectional

and transactional fashion, influencing and reinforcing one another over time (Pinquart, 2017b, 2017a; Sameroff, 2009), as also illustrated by Julian's problems and his mother's response of overprotection (see textbox 1). Less is known about associations between offspring's internalizing and externalizing psychological problems and the parent-offspring relationship. More specifically, this association has not been investigated yet from a family and lifespan perspective including siblings and both fathers and mothers. We therefore addressed cross-sectional associations between offspring (and parent) psychological problems (during the past six months) and parent-offspring interactions in a sample including offspring spanning a broad age range (7-65 years, chapter 5). Findings from this observational study can inform us on important behavioural aspects of the parent-offspring relationship in the light of mental health problems.

Yet, conclusions from these cross-sectional investigations are limited as they cannot inform us on potential causality. To elucidate the direction of effects, and potential causal relations, we also investigated longitudinal associations between harsh parental discipline and offspring emotional and behavioural problems at age 9, 12 and 16 years in chapter 6.

The unique role of fathers and mothers

Over the last decades, fathers' involvement in child care has increased substantially (Bakermans-Kranenburg, Lotz, Alyousefi-van Dijk, & IJzendoorn, 2019). Yet, most existing research has focused on the mother-child relationship and studies on fathers' parenting behavior is relatively scarce. The family systems theory (Bowen, 1966) argues that the mother-child and father-child relationship are distinct, yet related, subsystems of the family. Also, the importance of the (unique) parental role from both fathers and mothers in the child's development is widely acknowledged (Day & Padilla-Walker, 2009; Lamb & Lewis, 2013; Paquette, 2004; Restifo & Bögels, 2009). It has been found for instance, that a negative relationship with one's mother and a negative relationship with one's father are concurrently associated with adolescent depressive symptoms (e.g., Restifo & Bögels, 2009; Vazsonyi & Belliston, 2006). Since investigating maternal and paternal parenting behavior simultaneously is of importance to elucidate their potentially unique association with offspring's mental health problems, we investigated the parenting behaviors of mothers *and* fathers in chapter 2, 3, 5 and 7.

Considerations on investigating parenting and mental health problems in the family context

To better understand parenting and mental health problems in the family context and capture a comprehensive image of the associations between within-family adversities and psychopathologies, at least three strategies are important:

1. *The examination of multiple family members: siblings, fathers and mothers*

To elucidate associations between parenting and mental health problems in the family context, four family studies have been examined. Studies presented in chapter 2, 3 and 4 are based on the Netherlands Study on Depression and Anxiety (NESDA; Penninx et al., 2008). NESDA is an ongoing longitudinal cohort study designed to examine the onset, course and consequences of depressive and anxiety disorders. Reports on parental bonding with father and mother from participants of the nine-year follow-up assessment (2014-2017, N=2069) are included in our analyses for chapter 2. Second, in chapter 3 and 4 we examined data from the NESDA sibling study, including 256 probands with lifetime depressive and/or anxiety disorders and 380 of their siblings. Chapter 5 is based on the three Generation ('3G') Leiden Parenting Study on the intergenerational transmission of parenting styles, stress and emotion regulation (see also Buisman et al., 2019; Pittner et al., 2019). In a sample of 94 fathers and 125 mothers and their offspring, spanning a wide age range ($N_{offspring}$=224, 7.5-65.5 years), we examined dyadic parent-offspring interactions in an observational design. In chapter 6 harsh parental discipline and child problems are addressed in a sample of identical twins (N=5698) from the British Twin Study on Early Development (TEDS; Rimfeld et al., 2019). Lastly, parenting and mental wellbeing are studied during the COVID-19 pandemic in a sample of Dutch parents and adolescents of the 'RE-PAIR' study (Relations and Emotions in Parent-Adolescent Interaction Research; Janssen, Verkuil, van Houtum, Wever, & Elzinga, 2021).

2. *The use of multiple measures*

Most studies investigating (negative) parent-offspring interactions and mental health problems are based on parent or child self-reported quality of the parent-offspring relationship. Self-report assessments have their advantages as compared to observational techniques. For instance, self-report measures are a valid method to examine *experienced* parenting and maltreatment experiences and are relatively uncomplicated and effortless for both researcher and participant. More importantly, self-reports can provide valuable information on the (different or congruent) perspectives from multiple family members (see chapter 2, 3, 4 and 6).

In contrast to self-report, observational techniques aimed at assessing parent-offspring interactions have the advantage to rule out this self-report bias. Also, observations allow the rater to mark and rate subtle affective and behavioral aspects of parenting behavior that are presumably not captured by self-report. As such, observing parents and offspring interact with each other is a valuable addition to the self-reports (see chapter 5 for our observational study).

Moreover, parenting is a dynamical process between parents and their children and can fluctuate from time to time during the day. These fluctuations on a

micro-level cannot be observed in the lab, nor measured by a single questionnaire (Keijsers, Boele, & Bülow, 2022). To measure parenting on a daily level in the naturalistic context ecological momentary assessments (EMA) are used in our study on the impact of the COVID-19 pandemic on parenting and mental wellbeing of adolescents and their parents (chapter 7).

3. The application of adequate (complex) analytical methods

To deal with the complexity of the family-structured data and to select analytical models that best align with the research question(s) at hand, advanced statistical knowledge and skills and interdisciplinary collaborations are needed. Adequate statistical modeling of family data contributes to the specificity of the results and consequently improves the quality of the findings. Recent advances in the methodological domain have greatly facilitated statistical analyses for family studies, e.g. multilevel and random intercept models (Bouwmeester et al., 2013) as it allows to control for the nested structure of repeated measures data within persons or within families (Hox, Moerbeek, & Schoot, 2010). Multilevel modelling is used for the analyses in chapter 3, 4 and 7. Within multilevel modeling, individual-specific and family-wide associations can be disentangled. This allows to answer questions such as 'do family-wide (shared) experiences of childhood abuse and neglect contribute to elevated depressive symptom levels, in addition to the effects of individual-specific maltreatment experiences?', as discussed in chapter 4. Also, by extending the models with a random intercepts and random slopes, we can clarify whether associations differ from person to person to elucidate between person differences in terms of risk and resilience to mental health outcomes (chapter 6 and 7). To concurrently analyze the multiple associations while controlling for other effects within the family, we have used structural equation modeling (SEM) in chapter 5. In the study presented in chapter 2 we have also applied SEM as it also allows to explicitly assess measurement error and estimate latent (unobserved) variables by means of observed variables (Byrne, 2013).

In the current dissertation, the examination of multiple family members, the use of multiple measures and the application of adequate (complex) analytical models allows to investigate parenting experiences beyond the individual perspective. As such, this work aims to contribute to a better, and a more specific understanding of mental health problems in the family context.

Outline and objective

In this dissertation we aimed to answer the core questions as described at the beginning of this introduction: To what extent do adult siblings share recollections of childhood parenting experiences, and how do these experiences relate to mental wellbeing? Why do some persons develop mental health problems whereas others, raised in the same family, do not? And to what extent do child problems elicit

certain parenting behaviour? Figure 2 presents an overview of the concepts examined in this dissertation.

Section A "Recollecting Childhood" contains the examination of the psychometric properties of the Parental Bonding Instrument and two chapters on (siblings') recollections of childhood parental bonding and maltreatment experiences and the associations with anxiety and depression in adults of NESDA and their siblings. Findings are described and discussed in chapter 2, 3 and 4. Secondly, in **section B "Interacting Families"** it is examined how (con)current mental health problems of fathers, mothers and offspring relate to their levels of expressed warmth and negativity in parent-offspring communication during a dyadic behavioural interaction task. Findings from this observational study are described in chapter 5. Finally, **section C "Growing Up Together"** sheds light on the associations of parenting and adolescent mental wellbeing over time. In the study described in chapter 6 the longitudinal links have been examined between harsh parental discipline and adolescent problems at 9, 12 and 16 years. Moreover, in chapter 7 parent and adolescent positive and negative affect and parenting behavior in daily life have been investigated, comparing a two-week period before and during the COVID-19 pandemic.

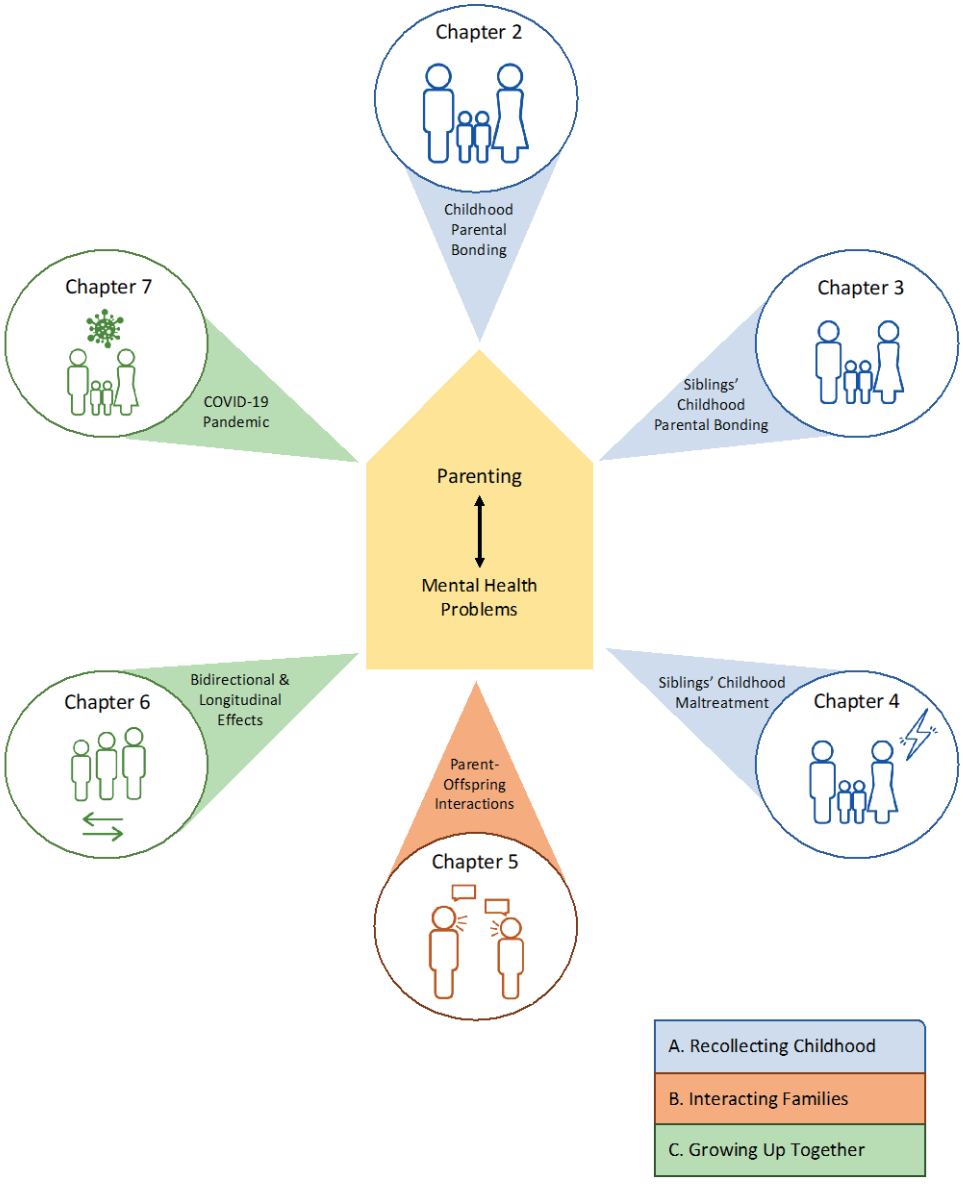

Figure 2. Graphical overview of the concepts examined in this dissertation

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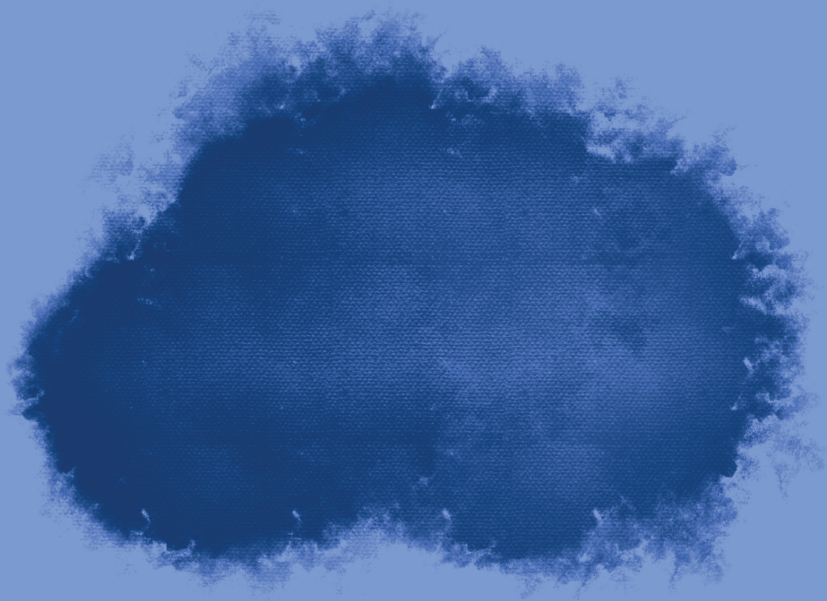


RECOLLECTING CHILDHOOD

2

Parental Bonding: Psychometric properties and association with lifetime depression and anxiety disorders

Published as: Kullberg, M. L., Maciejewski, D., van Schie, C. C., Penninx, B. W., & Elzinga, B. M. (2020). Parental bonding: Psychometric properties and association with lifetime depression and anxiety disorders. *Psychological Assessment, 32*(8), 780.

Abstract

In epidemiology and psychiatry research, the Parental Bonding Instrument (PBI) is commonly used to assess offspring's perception on maternal and paternal behavior during childhood. We tested the two- versus three-factor structure of the 16-item version and assessed measurement invariance across sex and across lifetime depressed, anxious, comorbid affected and healthy participants. Subsequently, we investigated PBI dimensions across sex and psychopathology groups using structural equation modeling. Participants were 2069 adults with a lifetime affective disorder and healthy controls, ages 26-75, from the Netherlands. Our findings support the three-factor solution of the distinct mother and father scales, distinguishing care, overprotection and autonomy (previously 'authoritarianism'). Moreover, measurement of the PBI appeared to be invariant across groups, indicating that means and relations can be reliably compared across sex and psychopathology groups. Males reported more maternal overprotection and paternal lack of care, whereas females reported higher paternal and maternal lack of autonomy and maternal lack of care levels compared to males. Lack of care and lack of autonomy levels were elevated in all affected groups, with the comorbid group showing highest levels of all three PBI dimensions. Adults with anxiety disorders reported heightened maternal lack of autonomy levels compared to the depression group and healthy controls. Adults with a depressive disorder reported heightened paternal lack of care levels as compared to the anxiety group and healthy controls. We advocate to use the three-factor structure and conclude that suboptimal parental bonding, mainly lack of care and lack of autonomy, is associated with lifetime anxiety and depression.

Keywords: Parental bonding, depression, anxiety, measurement invariance

Public Significance Statement: This study supports the three-factor solution of the Parental Bonding Instrument (PBI) and indicates that means and relations can be reliably compared across sex and psychopathology groups. Especially parental lack of care and lack of autonomy are associated with the presence of lifetime anxiety and depression. Findings highlight negative perceptions of childhood parental bonding play an important role in psychopathology across the entire lifespan.

Introduction

The parent-offspring relation during childhood is of crucial importance for the emotional, psychological and behavioral development (Bowlby, 1969) throughout the entire lifespan (Burns et al., 2018; Kendler, Myers, and Prescott, 2000). Warmth, care and protection by parents, i.e. key factors contributing to optimal parental bonding, may help establish a solid cognitive framework for constructive social interactions and mental wellbeing (Bretherton, Ridgeway, & Cassidy, 1990). In contrast, i.e. suboptimal bonding, for instance due to parental rejection, lack of care, warmth or overprotection, increases the risk of developing difficulties with interpersonal relations and adult psychopathology (Marshall et al., 2018).

Parental warmth and protection as perceived by offspring are often measured with the Parental Bonding Instrument (PBI, Parker, Tupling, & Brown, 1979). The PBI assesses a respondent's perception of the relation with their mother and their father figure (i.e., biological mother or father, stepmother/stepfather, or other mother/father figure, from here on referred to as 'mother' or 'father') before the age of 16, originally through two dimensions of parenting, namely Care and Control. The Care-scale assesses the perceived parental warmth, caring and lovingness, whereas the Control-scale reflects an overprotective and controlling parenting style, sometimes also referred to as 'helicopter parenting' (Segrin, Givertz, Swaitkowski, & Montgomery, 2013). The PBI is widely used in epidemiological studies on mental health (e.g. Enns et al., 2002; Xu et al., 2018) and recognized as an instrument for affiliation within the Research Domain Criteria (RDoC) framework (National Institute of Mental Health, 2019). However, there is no consensus yet regarding these dimensions of parenting (i.e. the factor structure of the PBI) and whether these are invariant across different groups (i.e., sex). Thus, the first aim of the study was to examine the factor structure and measurement invariance of the PBI. Moreover, it is unclear how the different types of suboptimal maternal and paternal bonding styles are specifically associated with anxiety disorders versus depression versus comorbid mood disorders. Therefore, the second aim of the study was to elucidate the difference in levels of reported suboptimal parental bonding between lifetime affected patients with depression, anxiety, comorbid mood disorders, and unaffected controls.

Factor Structure of the PBI

The factor structure of the original version of the PBI has frequently been examined in various samples, however there is still no consensus. While some studies support the original two factor structure (Kitamura et al., 2009; Parker, Tupling, & Brown, 1979), other studies point towards a three-factor solution in both a clinical sample from the UK (Xu et al., 2018) and a nonclinical Japanese sample (Sato et al., 1999). In the three-factor structure, the original Control-scale (Parker et al., 1979) is split up in Overprotection and Authoritarianism-scale (Kendler et al.,

1996), whereas items of the Authoritarianism-scale reflect a child's sense of autonomy and independence (e.g. 'your mother/father let you decide things for yourself'). In most studies using the three-factor solution, the subscale consisting of the items 'My father/mother liked me to make my own decisions', '...let me decide things for yourself', '...gave me as much freedom as I wanted' and '...let me dress in any way I pleased' is referred to as 'authoritarianism' (Enns et al., 2002; Heider et al., 2005; Kendler et al.,1996; Kendler et al., 2000; Khalid et al., 2018). Items of the authoritarianism subscale are generally reverse coded to ensure that high values reflect authoritarian parenting. Authoritarian parenting, however, is generally described as a highly directive, domineering and demanding parenting style, in which parents expect their children to be obedient (Buri, 1991; Yap et al., 2014), whereas the items of the subscale refer to the extent to which a parent acknowledges a child's opinion, input and choices and encourages to make own decisions (Kendler et al., 1996; Yap et al., 2014). Therefore, we recommend to use 'lack of autonomy-encouraging behavior' or in short 'lack of autonomy' instead of 'authoritarianism' when referring to this subscale. The Overprotection-scale reflects an overprotective and controlling parenting style including items as for instance 'My father/mother did not want me to grow up' and '...tried to control everything I did'.

Many studies used an abbreviated variant of the PBI, particularly the sixteen-item version. The shortened inventory also yielded a three-factor structure (Cox, Enns, & Clara, 2000; Enns et al., 2002; Heider et al., 2005). This version, which is also used in the current sample (NESDA; Penninx et al., 2008), was especially designed for epidemiological studies (Kendler et al, 1996). Research in a clinical sample of female twins (Kendler et al., 2000) and a clinical adolescent sample (Khalid et al., 2018) supports the three-factor structure of the 16-item version, however this has never been investigated in an adult clinical and non-clinical sample including both males and females.

Maternal and Paternal Bonding: Sex Differences

The perception of a suboptimal relation with father or mother may affect males and females differently. Males retrospectively reporting lack of paternal care during childhood retrospectively are in general at increased risk for mental health problems, whereas this relation was not significant for females (Burns, Loh, Byles, & Kendig, 2018; Xu et al., 2018). Also, the recollections of paternal overprotection seem to be a risk factor for depression in males, but not in females (Heider et al., 2006). Although it is well established that the relationship between perceived parental bonding and psychopathology varies across sex, no clear sex-specific patterns have been identified yet. Moreover, in order to evaluate the sex differences regarding the link between reported childhood parental bonding and adult psychopathology, we first have to evaluate whether there are sex differences in the reported experiences of the parental bonding. It is expected that the males and females differ in the

recollections of the parental bond with father and mother. Against that background, our goal was to test whether the levels of care, overprotection and lack of autonomy by father and mother differed across sex.

Suboptimal Parental Bonding and Adult Depression and/or Anxiety Disorders

Many studies have demonstrated that recollections of suboptimal parental bonding during childhood are associated with adult anxiety and depression (Avagianou & Zafiropoulou, 2008; Burbach et al., 1986; Oakley-Browne, Joyce, Wells, Bushnell, & Hornblow, 1995; Silove, Parker, Hadzi-Pavlovic, Manicavasagar, & Blaszczynski, 1991; Valiente, Romero, Hervas, & Espinosa, 2014). The three parental bonding styles, i.e. care, overprotection and lack of autonomy, assessed with the PBI, have different effects on mental health. Reported lack of parental care has been found to have the strongest link with adult depression and anxiety compared to overprotection and lack of autonomy, with stronger associations with lack of care by mothers compared to fathers (Enns et al., 2002; Kendler et al., 2000). Lack of parental sensitivity and adequate care can contribute to low self-esteem, negative beliefs about oneself, such as the idea of not being good enough or feelings of worthlessness, and maladaptive coping (Bartholomew & Horowitz, 1991; Meites, Ingram, & Siegle, 2012). These cognitive vulnerabilities can in turn increase the risk of mood disorders in the long-term (Finzi-Dottan & Karu, 2006; Wei, Heppner, & Russell, 2006).

Next to parental care, perceived overprotective parenting is also linked to both depression and anxiety in adulthood (Overbeek, ten Have, Vollebergh, & de Graaf, 2007). However, the different influences of fathers versus mothers remains equivocal. For instance, in a study in six European countries, high levels of reported overprotection by mother, but not by father, was linked to lifetime mood disorders (Heider, Matschinger, Bernert, Alonso, & Angermeyer, 2006). Furthermore, perceived maternal overprotection has been associated with lifetime social phobias, specific phobias and depression, whereas paternal overprotection was only associated to agoraphobia in males, and not to other affective disorders (Enns et al., 2002). Recollections of childhood maternal overprotection were associated with physical symptoms of anxiety and fear of dying, whereas paternal overprotection was linked to a decreased self-esteem and dysfunctional self-beliefs (Meites, Ingram, & Siegle, 2012). These findings highlight the distinct role of maternal and paternal overprotection in the association with anxiety and depression.

Contrary to findings linking perceived lack of childhood parental care or overprotection and adult anxiety and depression, literature on the adverse effects of parental lack of autonomy is less conclusive. Whereas perceived lack of autonomy is linked to both anxiety and depression in some studies (Yap, Pilkington, Ryan, & Jorm, 2014), in others it was not found to be associated with the occurrence of depression (Heider et al., 2006; Khalid et al., 2018) nor anxiety, such as social

phobia and agoraphobia (Enns et al., 2002; Lieb, Isensee, Höfler, Pfister, & Wittchen, 2002). Moreover, even when studies found indications that lack of autonomy is related to increased psychopathology risk, the effect sizes are usually smaller compared to care (Kendler et al., 2000; Valiente et al., 2014). Retrospectively reporting a lack of independency as a child as a result of overprotective or authoritarian parenting, however, has also been associated with more externalizing psychopathology, such as drug abuse (Kendler et al., 2000), antisocial personality (Enns et al., 2002) and narcissism (Van Schie et al., in prep).

Parental bonding styles in persons with comorbid depression and anxiety has to the best of our knowledge not been investigated, nor been compared to persons affected by solely lifetime depression or anxiety. Thus, we aimed to study the levels of perceived lack of care, overprotection and lack of autonomy across four psychopathology groups: lifetime depressed, anxious or comorbid affected (anxiety and depression) and unaffected participants. Patients with the comorbid diagnoses are known to be extra vulnerable. For instance, they report higher levels of childhood trauma, neuroticism, an earlier age of onset and a higher percentage of family history of anxiety and depression compared to patients with only depression or anxiety (Lamers et al., 2011). Therefore, it is expected that this patient group shows the highest levels of all three suboptimal bonding styles, followed by the groups with lifetime depression or anxiety. Considering abovementioned findings, it is hypothesized that a lack of parental care is elevated in the comorbid and depression groups and we expect higher levels of overprotection in the comorbid and anxiety groups compared to healthy controls. It is also expected that the levels of lack of autonomy are elevated in the affected groups compared to healthy controls, but do not differ between depression and anxiety.

Measurement Invariance

Several studies found differences in perceived parental bonding between males and females (Enns et al., 2002; Mackinnon, Henderson, Scott, & Duncan-Jones, 1989), and across psychopathology, particularly depression and anxiety disorders, but also such as personality disorders (Nordahl et al., 1997; Enns et al., 2002). However, one prerequisite to draw valid conclusions about mean differences in constructs, is that the measurement is equal across groups (e.g., sex, psychopathology). For instance, if males and females have different starting values, factor loadings, and residual variances on a certain questionnaire, then conclusions about sex differences can be biased, because the underlying construct is measured differently for males than for females. Testing whether the construct is measured similarly between groups can be established by testing measurement invariance (Chen, Sousa & West, 2005; Vandenberg & Lance, 2000). Measurement invariance involves testing of hierarchical models of different measurement invariance forms. The theoretical assumption comes from classical test theory, where the response to

an item is a linear function of an item intercept (i.e., starting value), regression slope (i.e., factor loading), and measurement error (i.e., residual variance). To determine whether the measurement is equal across groups, each of the components is hierarchically constrained to be equal across groups (Maciejewski, van Lier, Branje, Meeus, & Koot, 2017; Vandenberg & Lance, 2000). Importantly, if the measurement of a construct does not differ across groups (i.e., is invariant), this does not mean that the construct itself cannot differ across groups. In this case, the observed differences are not due to differences in measurement, but due to true differences. Whereas studies have shown that the *original* version of the PBI is invariant across age groups (Tsaousis et al., 2012) and across sex (Xu et al., 2018), it is unclear whether the *abbreviated* 16-item version is invariant across sex and across psychopathology groups (lifetime depression versus lifetime anxiety versus lifetime comorbid depression/anxiety versus healthy controls).

Current Study

Based on findings from earlier studies on the 16-item version of the PBI, our overall research objective is three-fold: The first aim of the current study is to evaluate the factor structure of the PBI by testing the model fit of the two versus three-factor structure. The second aim is to test the measurement (in)variance of the PBI across sex and the four psychopathology groups, to examine whether the measurement of the PBI is equivalent for males and females and individuals with anxiety, depressive or comorbid disorders, or no lifetime mood/anxiety disorder. Third, we aim to test differences in levels of suboptimal parental bonding styles across sex and across lifetime depressed, anxious, comorbid affected (anxiety and depression) and healthy participants.

Method

Procedure

The NESDA study is an ongoing longitudinal cohort study designed to examine the onset, course and consequences of depressive and anxiety disorders. At baseline a sample of 2981 individuals aged 18–65 years was included, consisting of persons with a history of depression and/or anxiety disorders, persons with a current depression and/or anxiety disorder and healthy controls. Respondents were recruited in the general population and in specialized health care services. General exclusion criteria were a primary diagnosis of severe psychiatric disorders such as psychotic, obsessive compulsive, bipolar or severe addiction disorder, and not being fluent in Dutch. A detailed description of the NESDA design and sampling procedures can be found elsewhere (Penninx et al., 2008). The research protocol was approved by the Ethical Committees of the participating universities and all respondents provided written informed consent.

Sample

In the current study we included participants (*N*=2069) from the nine-year follow-up assessment (data collection time point six (T6); 2014-2017), the wave during which the PBI was administered. PBI score was available of 1915 participants for reports about the mother and 1826 for reports about the father. In the final sample, 66.1% was female, the age at T6 ranged from 26-75 years (*M* = 50.84, *SD*= 13.11), and years of education ranged from 5-18 years (*M* 13.00, *SD*= 3.33). The presence of a disorder was thoroughly assessed across nine years and diagnosed using the Composite Interview Diagnostic Instrument (CIDI, Version 2.1; World Health Organization, 1997, see below). A lifetime diagnosis is defined as one or more episodes of a depressive or anxiety disorder in the past. Of the total sample at T6 (*N*=2069), 15.9% (*n*=329) had a lifetime depressive disorder (MDD or dysthymia), 9.6% (*n*=199) had an anxiety disorder (panic disorder with or without agoraphobia, social anxiety disorder, generalized anxiety disorder or agoraphobia without panic disorder), 55.4% (*n*=1146) had comorbid anxiety and depression and 19.1% (*n*=396) had no lifetime affective disorder (healthy). In the month before assessment, 15.7% (*n*=325) of the participants reported an episode of anxiety and 11.3% (*n*= 234) of depression.

Measures

Parental Bonding - Parental Bonding Instrument (PBI). Parent–child relationship was measured with the shortened 16-item Parental Bonding Instrument (PBI) based on Parker et al.'s (1979) original 25-item instrument. Respondents were asked to report on their experiences with their mother and father separately, when they were growing up (before the age of 16). The instrument is a self-report measure and responses are scored on a 4-point Likert scale (ranging from 1 'a lot' to 4 'not at all'). The 16 item PBI used in this study was especially developed for epidemiological research (Kendler, 1996, eliminating the original items 2, 3, 6, 10, 14, 20, 22 and 24). The two-factor solution consists of the Care (items 1, 2, 3, 7, 8, 11, 12) and Control (items 4, 5, 6, 9, 10, 13, 14, 15, 16) subscales, and in the three-factor solution the Control scale is further divided in Lack of autonomy (items 4, 10, 14, 16) and Overprotection (items 5, 6, 9, 13, 15). The items of the Care-subscale assess warmth, caring and lovingness of the parent–child relationship (e.g. My father/mother spoke to me with a warm and friendly voice). The items of the Overprotection-scale reflect an overprotective and controlling parenting style (e.g. My father/mother did not want me to grow up), and the items of the Autonomy -scale assess a parental style that reflects a child's sense of autonomy and independence (e.g. My father/mother let me decide things for myself). The items of the Control-scale and two items (2 and 12) of the Care-scale were reverse coded to make sure that high scores reflect suboptimal parental bonding, i.e. lack of care, lack of autonomy-encouraging

behavior or overprotective parenting. (see supplementary materials). In the current sample the internal consistency appeared to be good to excellent for the PBI total score on mother and father (total maternal bonding: α = .88; total paternal bonding: α = .88), for the subscales of the two-factor solution (maternal Lack of Care: α =.89, paternal Lack of Care: α=.90, maternal Control: α=.82, paternal Control: α=.80) and also for the subscales of the three-factor solution (paternal Lack of Autonomy: α =.85, maternal Lack of Autonomy: α =.84, paternal Overprotection: α =.70, maternal Overprotection: α =.73).

Composite Interview Diagnostic Instrument (CIDI). The presence (current and lifetime) of DSM-IV-TR (American Psychiatric Association, 2000) depressive (dysthymia and major depressive disorder) and anxiety (generalized anxiety disorder, social phobia, panic disorder with or without agoraphobia and agoraphobia) disorders was established using Composite Interview Diagnostic Instrument (CIDI, version 2.1, WHO). The CIDI is used worldwide in clinical and epidemiological studies (e.g. de Graaf et al., 2010; Kessler et al., 2010) and high validity for depressive and anxiety disorders (Wittchen, 1994) was found.

Inventory of depressive symptoms (IDS). Depressive symptoms, as assessed with the Inventory of Depressive Symptomatology, were included in the analysis on sex differences to control for current mood. The IDS is a self-report questionnaire designed to assess the severity of depressive symptoms (Rush, et al. 1986; Rush, Gullion, Basco, Jarrett & Trivedi, 1996). The IDS assesses all DSM-IV criterion symptom domains for major depressive disorder, commonly associated symptoms (e.g. anxiety, irritability) and symptoms relevant to melancholic and atypical features. The questionnaire consists of 30 items, each with four answering options from 0 through 3. Sum scores on the items range from 0 to 84, with higher values indicating more severe symptoms of depression. The psychometric properties of the IDS-SR have shown to be acceptable; for instance, high correlations were found between the IDS and scores on the Hamilton Depression Rating Scale and Beck depression Inventory (Rush et al., 1996). The IDS showed excellent internal consistency (α = .98) in the current sample. Information on the IDS was available for 1950 participants.

Beck's anxiety inventory (BAI). The Beck Anxiety Inventory (BAI) is a 21-item self-report instrument that assesses the overall severity of anxiety (Beck et al., 1988). The BAI scores were used to control for current levels of anxiety in the analyses comparing males and females. The respondents are asked to rate how much he or she has been bothered by each symptom over the past week on a 4-point scale, ranging from 0 (*not at all*) to 3 (*severely, I could barely stand it*). The BAI is scored by summing the ratings for all of the 21 symptoms to obtain a sum score that can

range from 0 to 63, which are used in this study. The total BAI scale obtained high internal consistency in the current sample (α =.98). Moreover, a good validity and reliability were found (Beck 1988). Sum scores of the BAI were available for 1945 participants.

Missing Data

Of all participants, 154 did not complete the PBI about mother and 243 did not complete the PBI about father. For some of the participants the reason was that they did not have a father-figure (*n*=73), or mother-figure (*n*=6) or neither of them (*n*=4). Participants who did not complete the PBI-mother were slightly younger (*t*(2067)=-2.68, *p*=.007) and less educated than completers (*t*(2067)=-2.38, *p*=.018). Age and education were thus taken into account in the analyses. Participants who did not complete the PBI-father did not differ on sex, age, and years of education compared to completers (all *p*-values >.05). The pattern of missing data for PBI resembled a missing-at-random (MAR) pattern ($\chi 2$= 1569.42, *df* = 1208, $\chi 2/df$ ratio = 1.29). Therefore, in the analyses, full Maximum Likelihood Estimation (FIML) was used to control for missing data (Arbuckle, 1996).

Statistical Analyses

Data preparation was performed with SPSS Statistics 25.0 (IBM Corp, 2019). All other analyses were done in R version 3.5.1 (R Core Team, 2018) with the *lavaan*-package version 0.6-3 (Rosseel, 2012). Models were estimated using the maximum likelihood (ML) estimator. In all analyses, we fitted models using Confirmatory Factor Analysis (CFA). For model identification purposes, the first item's factor loading was fixed to 1 to set the scale of each factor and the first item's intercept was fixed to 0 to set the mean of each factor (Vandenberg & Lance, 2000). Moreover, we allowed for correlations between higher order factors. The R code and all model output are available online (https://osf.io/kz2s7/) to reproduce all analyses.

Research Question 1: Two versus Three Factor Structure of the PBI. To answer our first research question, we fitted two models using CFA: A two-factor structure model (Care, Control) and a three-factor structure model (Care, Overprotection, Autonomy) for maternal and paternal bonding separately. To test whether the two or three factors fit the data best we compared these two solutions using model fit indices. Model fit was evaluated using the Tucker–Lewis Index (TLI), the Comparative Fit Index (CFI), the Root-Mean-Square Error of Approximation (RMSEA) and Standardized Root Mean Square Residual (SRMR). For the TLI and CFI, values between .90 and .95 are considered acceptable, and values of .95 and greater as good. For the RMSEA and SRMR, acceptable models have values of .10 or less (Chen, 2007; Cheung & Rensvold, 2002).

Research Question 2: Measurement Invariance Across Sex and Psychopathology Groups. Measurement invariance of the PBI (i.e., configural, metric, scalar and strict) across sex and across psychopathology groups (lifetime depression, lifetime anxiety, lifetime comorbid anxiety and depression and healthy participants) was examined to test whether the measurement was the same across groups. In the configural model, the factor structure is the same across groups but no parameters are set to be equal to one another across groups. If configural variance is established, this indicates that the factor structure is similar between groups (i.e., that the same items load on the same overall factor). In the metric model, all factor loadings are constrained to be the same across groups. If metric invariance is established, this indicates that the items contribute in the same way to the overall factor between groups, making it possible to compare relations between groups. Scalar invariance is important to be able to compare groups in mean levels; to this end, the intercepts are constrained to be equal across groups, indicating that individuals have common starting points in rating items. Last, the residual variances were constrained to be the same across groups to test strict invariance which would implicate that the amount of error is similar between groups (Chen, Sousa, & West, 2005; Gregorich, 2006). In practice, strict invariance is often not established, but is not necessary to conduct tests of differences in relations and means. Differences in fitting between the nested models was evaluated using ΔCFI. A change in CFI smaller than .01 is an indication of measurement invariance (Cheung & Rensvold, 2002), which is known as a reliable criterion for measurement invariance model comparisons (Chen, 2007; Cheung & Rensvold, 2002). The chi-square difference test was not used, because it is overly sensitive to trivial deviations in large samples (Marsh, Hau, & Grayson, 2005; Putnick & Bornstein, 2016). Additional analyses to test whether father and mother items can be combined into aggregated scales were conducted (Table S2). Results showed that a scalar invariance model constraining factor loadings and intercepts to be equal across father and mother items resulted in a worse fitting model compared to the metric model, allowing intercepts to be freely estimated across father and mother items (Table S3). These findings indicate that starting values differed across items for father and mother and therefore, it is not recommended to combine these items into one aggregated scale.

Research Question 3: Suboptimal Parental Bonding Styles Across Sex and Across Lifetime (Comorbid) Anxiety and Depression.To evaluate differences between maternal and paternal bonding (i.e. of Care, Overprotection and Autonomy) between males and females (research question 3a) and between lifetime depressed, anxious, comorbid affected and healthy participants (research question 3b) we fitted the CFA models for all groups. We compared two nested models, one in which latent means were estimated freely between groups and one in which latent means were constrained to be equal across groups. If model fit significantly worsens, this is an

indication that means differ between groups. In case of significant overall differences (omnibus test), post-hoc tests were performed to identify which groups differed on which subscales. We ran these nested multiple group models for males and females (3a) and for the four psychopathology groups (3b) separately. To control for confounding variables, participant's age and years of education were included in the models testing sex and psychopathology differences. Current levels of depression (as measured with the IDS) and anxiety (as measured with the BAI) were added in the models testing sex differences. In the models testing differences between psychopathology, sex was additionally added as a covariate. The influence of covariates was constrained to be equal across groups, because otherwise the interpretation of the parameters is not equal across different values of the covariates (comparable to the homogeneity of slope assumption in an ANCOVA). Chi-square difference tests were used to compare the models. In view of the large number of comparisons, significance levels were corrected using the Benjamini-Hochberg procedure for multiple testing with a false discovery rate of 5% (1995). In tables, raw p-values are represented.

Results

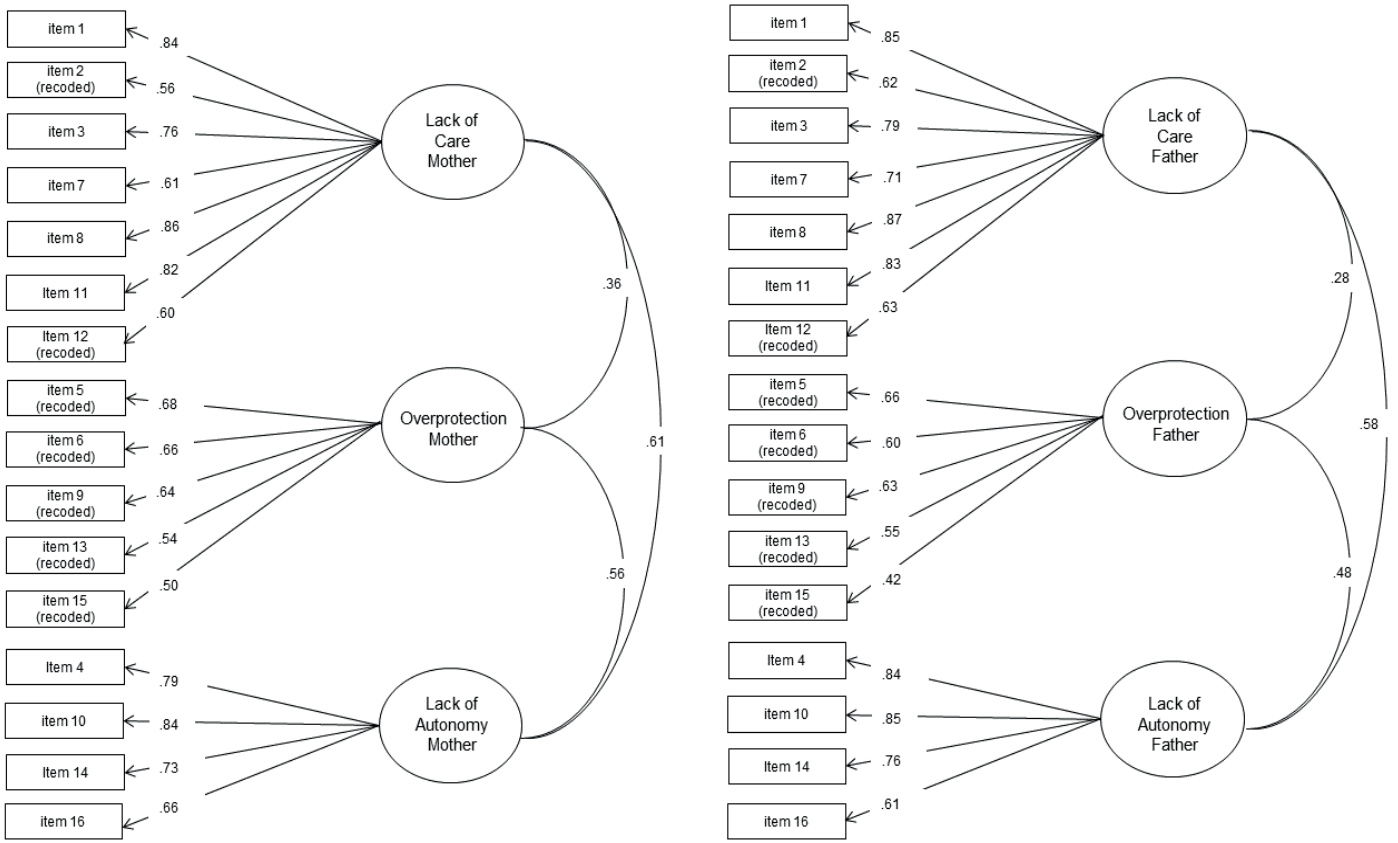
Two versus Three Factor Structure

The two and three factor models were tested for maternal and paternal bonding separately. The two-factor structure ("Care" and "Control") showed a relatively poor fit to the data for both maternal and paternal bonding, see Table 1. In contrast, the three-factor structure ("Care", "Overprotection" and "Autonomy") showed an acceptable model fit. Factor loadings for the three-factor solution ranged from .60 to .89 for Care and .68 to .88 for Autonomy. Factor loadings for Overprotection were somewhat lower, ranging from .50 to .72 (all significant at $p <$ .001; Figure 1).

Descriptive Statistics

Sample means, standard deviations and correlations of all study variables can be found in Table 2. In the current sample levels of depressive symptoms, measured with the Inventory of Depressive Symptomatology (IDS), ranged from 0-69 (M = 14.85, SD = 11.67) and levels of anxiety symptoms, measured with the Beck Anxiety Inventory (BAI), ranged from 0-63 (M= 7.67, SD =8.36). As shown in Table 2, maternal and paternal bonding were highly correlated (r=.560, p<.01). Moreover, all PBI subscales and total scores for paternal and maternal bonding were positively correlated with anxiety and depressive symptoms (all $r's >$.146). In Table 3, the comparison between comorbid (anxiety and depression), depressed, anxious and healthy persons is represented. The comorbid affected group had less years of

Figure 1. *Three factor models of the PBI (left: maternal bonding, right: paternal bonding) with item loadings on the latent factors*



Note: Reported factor loadings are standardized and all statistically significant (p<001).

education and higher levels of depressive and anxiety symptoms. Moreover, proportionally, this group contained more persons with a current anxiety or depression diagnosis compared to the other groups.

Measurement Invariance Across Sex and Psychopathology Groups

Next, we estimated the configural invariance of the three-factor model of the PBI simultaneously in both males and females by fitting a multiple group model. Statistics on model fit and comparisons can be found in Table 4. This configural model, allowing parameters to be freely estimated across groups, had an acceptable fit. A metric invariance model constraining factor loading to be equal across groups did not result in a worse fitting model, indicating metric invariance. Similarly, a subsequent scalar invariance model constraining factor loadings and intercepts to be equal across groups did not result in a worse fitting model, indicating scalar invariance. Lastly, the strict invariance model constraining residual variances to be equal across males and females also yielded a good-fitting model did also not result in a worse fitting model, indicating that strict invariance across sex was established for both maternal and paternal bonding. We further analysed the measurement invariance of the three-factor model across the four psychopathology groups; healthy (n=396), lifetime depressed (n=329), lifetime anxious (n=119) and the lifetime comorbid group (n=1146), see Table 4. The three-factor model of the PBI (maternal and paternal bonding) was invariant across psychopathology groups (up to scalar, but not strict invariance). Together, these results indicate that the PBI is measurement invariant across sex and psychopathology groups, indicating that the measurement is equal across these groups and relations as well as means can be reliably compared.

Latent Mean Differences Between Males and Females and Psychopathology Groups

To answer our third research question whether males and females differ in their levels of parental bonding, we compared the base model, which contained freely estimated latent means, with a model where the latent means of the PBI subscales constrained to be equal across sexes. The chi-square difference test showed that the levels of Care, Overprotection and Autonomy differed between males and females for both the mother ($\Delta\chi^2$ (Δdf)= 25.01(3), p<.001) and the father figure ($\Delta\chi^2(\Delta df)$= 36.41(3), p<.001). Chi-square tests showed that females reported more lack of care from mother and more lack of autonomy from both parents compared to males (Table 5). Males reported more paternal lack of care and maternal overprotection compared to females. Groups did not differ in their reported levels of paternal overprotection.

Table 1. *Two versus three factor structure*

	χ^2	df	CFI	TLI	RMSEA	SRMR
Model 1 - maternal bonding	1990.2	103	0.860	0.837	0.097	0.073
two factor model: Care and Control						
Model 2 - maternal bonding	1011.6	101	0.932	0.920	0.068	0.051
three factor model: Care, Overprotection, Autonomy						
Model 1 - paternal bonding	1883.3	103	0.871	0.850	0.096	0.073
two factor model: Care and Control						
Model 2 - paternal bonding	940.8	101	0.939	0.928	0.067	0.048
three factor model: Care, Overprotection, Autonomy						

Note: CFI =comparative fit index; RMSEA = root mean-square error of approximation; TLI = Tucker–Lewis Index; SRMR = standardized root mean-square residual; Given our large sample, and as χ^2 is sensitive to sample size, we only used χ^2 for descriptive purposes (Kline et al., 2010).

Table 2. *Descriptives and correlations of all study variables*

		N	Sex	Age	Education	IDS	BAI	PB mother	PB father	Care M	Care F	Over M	Over F	Auto M
Sex N (%)	1367 (66.1)	2069												
Age M years (SD)	50.84 (13.11)	2069	-.060**											
Years of Education M years (SD)	13 (3.33)	2069	.019	-.222**										
Depressive symptoms M (SD)	14.85 (11.67)	1950	.056*	.103**	-.190**									
Anxiety symptoms M (SD)	7.67 (8.36)	1945	.072**	.035	-.182**	.775**								
PBI mother M (SD)	31.35(9.49)	1915	.037	.176**	-.082**	.339**	.258**							
PBI father M (SD)	31.96 (9.27)	1826	.012	.165**	-.073**	.332**	.237**	.560**						
Lack of care mother M (SD)	14.48 (5.52)	1932	.051*	.172**	-.063**	.323**	.231**	.864**	.501**					
Lack of care father (PBI) M (SD)	16.21(5.85)	1850	-.033	.098**	-.005	.298**	.207**	.473**	.873**	.508**				
Overprotection mother M (SD)	7.99 (3.15)	1924	-.069**	.083**	-.087**	.203**	.175**	.650**	.285**	.286**	.164**			
Overprotection father M (SD)	7.19 (2.7)	1850	.013	.137**	-.134**	.203**	.172**	.313**	.564**	.176**	.212**	.410**		
Lack of autonomy mother M (SD)	8.92 (3.34)	1929	.086**	.137**	-.052*	.241**	.189**	.804**	.497**	.534**	.349**	.433**	.213**	
Lack of autonomy father M (SD)	8.61(3.36)	1855	.079**	.175**	-.093**	.212**	.146**	.469**	.787**	.346**	.496**	.174**	.377**	.595**

Note: Two-tailed significance-levels * $p<.05$, ** $p<.01$, **$p<.001$.

Table 3. *Comparison of psychopathology groups on clinical and demographic characteristics*

					Group comparison		
	Comorbid	Depression	Anxiety	Healthy	df	F/χ^2	sig
Female sex N (%)	795 (69.4)a	211 (64.3)a, b	134 (67.3)a, b	227 (57.3)b	3	19.7	<.001
Age M years (SD)	51.0 (12.4)a	51.1 (13.3)a	50.4 (13.7)a	50.4 (14.6)a	3	0.359	0.782
Years of Education M years (SD)	12.6 (3.3)a	13.5 (3.2)b	13.3 (3.4)b	13.7 (3.3)b	3	15.37	<.001
Depressive symptoms M (SD)	19.9 (12.3)a	11.2 (8.1)b	10.3 (6.9)b	6.0 (5.1)c	3	212.1	<.001
Anxiety symptoms M (SD)	10.9 (9.3)a	4.5 (4.9)b	5.7 (6.0)b	2.4 (3.4)c	3	149.5	<.001
Current depressive disorder N (%)	216 (18.9)a	18 (5.5)b	0 (0)c	0 (0)c	3	151.9	<.001
Current anxiety disorder N (%)	293 (25.6)a	0 (0)b	32 (16.1)c	0 (0)b	3	219.1	<.001

Note. Groups with the same letter (a,b or c) did not differ significantly, groups with a different letter, differed from each other using Bonferroni post-hoc testing, $p<.05$.

Table 4. *Measurement Invariance across sex and across psychopathology groups for maternal and paternal bonding*

Maternal bonding	χ^2	*df*	CFI	TLI	RMSEA	SRMR	ΔCFI	Invariant?
Across sex								
Step 1: Configural Invariance - same factor structure	1140.6	202	0.931	0.918	0.069	0.052		yes
Step 2: Metric Invariance - equal factor loadings	1195.6	215	0.928	0.92	0.069	0.056	0.003	yes
Step 3: Scalar Invariance - equal intercepts	1281.0	228	0.923	0.919	0.069	0.058	0.005	yes
Step 4: Strict Invariance - equal residual variance	1323.3	244	0.921	0.922	0.067	0.058	0.002	yes
Across psychopathology groups								
Step 1: Configural Invariance - same factor structure	1468.6	404	0.915	0.900	0.074	0.061		yes
Step 2: Metric Invariance - equal factor loadings	1508.5	443	0.915	0.908	0.070	0.064	0.000	yes
Step 3: Scalar Invariance - equal intercepts	1573.9	482	0.913	0.914	0.068	0.066	0.002	yes
Step 4: Strict Invariance - equal residual variance	1948.3	530	0.887	0.898	0.074	0.073	0.026	no
Paternal bonding	χ^2	*df*	CFI	TLI	RMSEA	SRMR	ΔCFI	Invariant?
Across sex								
Step 1: Configural Invariance - same factor structure	1030.7	202	0.940	0.929	0.066	0.050		yes
Step 2: Metric Invariance - equal factor loadings	1055.8	215	0.939	0.932	0.065	0.053	0.001	yes
Step 3: Scalar Invariance - equal intercepts	1175.1	228	0.932	0.928	0.067	0.055	0.007	yes
Step 4: Strict Invariance - equal residual variance	1216.4	244	0.930	0.931	0.065	0.055	0.002	yes
Across psychopathology groups								
Step 1: Configural Invariance - same factor structure	1370.9	404	0.926	0.912	0.072	0.058		yes

Step 2: Metric Invariance - equal factor loadings	1469.3	443	0.922	0.915	0.070	0.064	0.004	yes
Step 3: Scalar Invariance - equal intercepts	1547.7	482	0.919	0.919	0.069	0.065	0.003	yes
Step 4: Strict Invariance - equal residual variance	1913.4	530	0.895	0.905	0.075	0.073	0.024	no

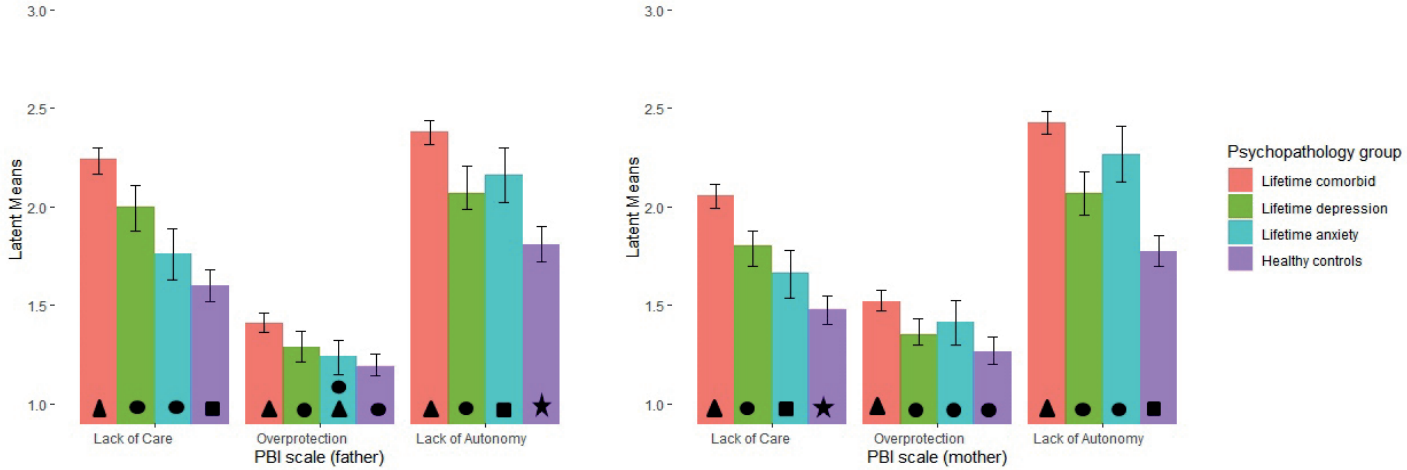
Note: CFI =comparative fit index; ΔCFI = change in CFI; TLI = Tucker–Lewis Index; RMSEA = root mean-square error of approximation; SRMR = standardized root mean-square residual; Given our large sample and as χ^2 is sensitive to sample size, we only used χ^2 for descriptive purposes (Kline et al., 2010)

Table 5. *Latent means group differences between males and females*

		Females	Males	Group comparison		
	Grand mean (95% CI)	mean (95% CI)	mean (95% CI)	$\Delta\chi^2$	Δdf	*p*
Lack of Care mother	1.87 [1.83-1.91]	1.57 [1.50-1.64]	1.44 [1.36-1.52]	8.78	1	.003**
Lack of Care father	2.03 [1.98-2.07]	1.63 [1.56-1.71]	1.79 [1.71-1.88]	11.76	1	<.001***
Overprotection mother	1.44 [1.40-1.47]	1.24 [1.18-1.30]	1.35 [1.27-1.42]	7.46	1	.006**
Overprotection father	1.33 [1.30-1.37]	1.22 [1.17-1.27]	1.18 [1.12-1.24]	1.19	1	.275
Lack of Autonomy mother	2.23 [2.19-2.28]	2.01 [1.94-2.09]	1.88 [1.79-197]	7.36	1	.007**
Lack of Autonomy father	2.20 [2.16-2.25]	2.02 [1.94-2.10]	1.86 [1.77-1.95]	10.72	1	.002**

Note. Reported test statistics are based on the overall comparison of the freely estimated vs fully constrained models. Models comparing sexes are controlled for age, years of education and current levels of anxiety and depression, c=comorbid group, d=depression group, a=anxiety group and h=healthy control group, *p<.05, ** p<.01, ***p<.001.

Figure 2. *Latent mean differences in parental bonding between psychopathology groups (N=2069)*



Note. Groups with the same symbol did not differ significantly on the PBI, groups with a different symbol, differed from each other. Significance level was corrected for multiple testing with Benjamini-Hochberg procedure.

Table 6. *Latent means group differences between lifetime psychopathology groups (N=2069)*

	Lifetime Comorbid (C)	Lifetime Depression (D)	Lifetime Anxiety (A)	Healthy (H)	Group comparison			
	M (95% CI)	*M* (95% CI)	*M* (95% CI)	*M* (95% CI)	$\Delta\chi^2$	Δdf	*p*	post-hoc tests
Maternal lack of care	2.06 [2.00-2.12]	1.80 [1.70-1.90]	1.66 [1.54-1.78]	1.48 [1.41-1.55]	146.77	3	<.001***	C>D=A>H
Paternal lack of care	2.24 [2.17-2.30]	2.00 [1.88-2.11]	1.76 [1.63-1.89]	1.60 [1.52-1.68]	152.07	3	<.001***	C>D>A>H
Maternal overprotection	1.52 [1.47-1.58]	1.35 [1.27-1.44]	1.41 [1.30-1.52]	1.27 [1.20-1.34]	33.29	3	<.001***	C=A=D=H C>D,H
Paternal overprotection	1.41 [1.36-1.46]	1.29 [1.21-1.37]	1.24 [1.15-1.32]	1.19 [1.14-1.25]	32.78	3	<.001***	C>D=A=H
Maternal lack of autonomy	2.43 [2.37-2.49]	2.07 [1.96-2.18]	2.27 [2.12-2.41]	1.78 [1.70-1.86]	142.27	3	<.001***	C>A>D>H
Paternal lack of autonomy	2.38 [2.32-2.44]	2.10 [1.99-2.21]	2.16 [2.02-2.30]	1.81 [1.72-1.90]	104.23	3	<.001***	C>A=D>H

Note. Reported test statistics are based on the overall comparison of the freely estimated vs fully constrained models. All models are controlled for sex, age and years of education. M=maternal figure and p=paternal figure, , *p<.05, ** p<.01, ***p<.001.

Next, we tested whether levels of paternal and maternal bonding differed across participants with lifetime depression, anxiety, comorbid depression and anxiety and healthy controls. For this, we constrained the latent means of the PBI subscales to be equal between the four participant groups. The chi-square difference tests were significant for maternal bonding ($\Delta\chi^2(\Delta df)$= 219.75(9), p<.001) and paternal bonding ($\Delta\chi^2(\Delta df)$= 194.37(9), p<.001), indicating differences between the groups in levels of Care, Overprotection and Autonomy (Table 6). Posthoc tests showed that of all lifetime affected groups, the comorbid group reported overall the highest levels of lack of care, overprotection and lack of autonomy compared to the groups with depression or anxiety only. Compared to healthy controls, the depression group showed higher levels of maternal and paternal lack of care, paternal overprotection,

maternal and paternal lack of autonomy, but not maternal overprotection. Also, the depression group showed higher levels of paternal lack of care when comparing to the anxiety group. The anxiety group, however, showed higher levels of maternal lack of autonomy when comparing to the depression group. Moreover, the anxiety group reported higher levels of maternal lack of care, maternal and paternal lack of autonomy, but not maternal or paternal overprotection nor paternal lack of care, when comparing to unaffected healthy persons. Figure 2 illustrates the differences between groups on all PBI subscales separately for father and mother (all χ^2 difference tests and p-values of the post-hoc tests can be found in the supplementary materials).

Discussion

The present study examined the factor structure and measurement invariance of the PBI between males and females and among different psychopathology groups (anxiety, depression, comorbid, no lifetime diagnosis) in a large sample of people with anxiety and depression disorders and healthy controls. Moreover, we tested differences between males and females and psychopathology groups of the PBI subscales. A three-order factor structure fitted the data best and scalar measurement invariance across sex and psychopathology groups was found. Moreover, levels of care, overprotection and autonomy differed across sex and psychopathology group. Results and their implications are discussed below.

Factor Structure and Measurement Invariance

The first study aim was to evaluate the two versus three factor structure of the PBI in a clinical sample of lifetime depressed, anxious, comorbid affected and healthy adults. Our results confirmed the three-factor structure representing “Care,” “Overprotection,” and “Autonomy” subscales, which is in line with the structure of the PBI proposed by Kendler et al. (1996) and with more recent studies in Western populations (Heider et al., 2005; Cox et al., 2000; Xu et al, 2018). It should be noted that the items reflecting negative parental behavior (e.g. ‘Tended to baby you’ and ‘Seemed emotionally cold to me’) show lower factor loadings on the care and overprotection dimensions compared to the items reflecting positive behavior (e.g. ‘Frequently smiled at you’) as shown in Figure 1. Moreover, the low to moderate correlations between overprotection and lack of autonomy (Cohen, 1988) suggest that while the subscales are related, they reflect unique parental bonding styles. It should be noted however, that, the Overprotection-scale mainly consists of negatively worded items whereas the Autonomy-scale contains positively worded items. It could therefore be thought that these two factors differ on methodological grounds, since items framed in the same direction tend to cluster. Nonetheless, the items of the Autonomy-scale refer to the extent in which parents encourage the

child making own decisions, whereas the items of Overprotection-scale refer to the extent in which parents tend to baby and make the child dependent, therefore it is assumed that also based on content subscales reflect distinct parental bonding dimensions. Further research into the convergent and discriminant validity of these subscales can help to understand the basis of these two subscales. Altogether, in western populations, we recommend using the three subscales as opposed to two subscales, particularly for the 16-item version.

Using multiple group analysis, we evaluated measurement invariance of the three-factor model across sex and the four psychopathology groups as a configural model (equal factor structure), metric model (equal factor loadings), scalar model (equal factor loadings and equal intercepts) and strict model (plus equal residual variances). In line with the measurement invariance of a 24-item version of the PBI (Xu et al., 2018), we found evidence up to strict invariance across sex. Furthermore, our results show (scalar) invariance across depressed and anxious psychopathology groups for both paternal and maternal bonding examined with the abbreviated PBI version. Given the large sample size it can be concluded that the measurement of the PBI items is equal across sex or lifetime psychopathology diagnosis. Importantly, the PBI can be reliably used to compare relations and latent means across sex and psychopathology groups.

Males and Females and Parental Care, Overprotection and Autonomy

In our study, males reported higher levels of maternal overprotection and lack of care by their father compared to female participants. Females, on the other hand, reported the lack of care by their mothers more compared to males. Moreover, lack of autonomy levels were elevated in females compared to males, meaning that they perceive their parents as more restrictive than males do. In line with our findings, a large cohort study in a sample of American adolescents and adults has found that males report less 'affectionless-authoritarian' maternal bonding, i.e. lack of autonomy, and more likely to report 'neglectful/indifferent' paternal bonding, i.e. lack of care, than females (de Cock & Shevlin, 2014). Moreover, adolescent males reported to receive more permissive, i.e. non-restrictive, parenting and autonomy than females (McKinney & Renk, 2008), which aligns our findings.

In view of a cohort growing up in the mid twentieth century, the sex role theory (Bem, 1974) may account for the differences in reported lack of autonomy in our sample: Parents treated their sons and daughters differently, assuming that sons are more wired to take care of themselves and are more encouraged to be independent (Holmbeck, Paikoff, & Brooks-Gunn, 1995). Also, in the context of particular masculine or feminine characteristics, males and females may perceive the role of their caregivers differently (Spence, 1993). However, we do not know to what extent this perception, as measured by the PBI, is reflecting a differential treatment of sons and daughters or rather reflect a mismatch in the needs of sons

versus daughters in what they receive from their parents, regardless of whether parents treat their sons and daughters differently. Prospective and observational research are needed to elucidate whether these sex differences are mainly due to distinct parenting or rather explained by discrepancies in perception on the upbringing.

Lack of Care, Overprotection and Autonomy: Differences Across Psychopathology Groups

In line with our hypothesis, lack of care, overprotection and lack of autonomy were highest in comorbid affected (lifetime anxiety and depression) participants compared to lifetime depressed, lifetime anxious and healthy participants. These results corroborate findings of elevated levels of other risk factors (e.g. childhood trauma and neuroticism) in participants with comorbid depression and anxiety and reflect their additional susceptibility compared to individuals with a single diagnosis (Lamers et al., 2011). Personality characteristics, such as low self-esteem, introversion, emotional instability (Avagianou & Zafiropoulou, 2008) and neuroticism (Enns et al., 2000) are known to play a mediating role in the link between negative parental rearing and adult depression and anxiety. Therefore, elevated levels of neuroticism in the comorbid affected persons as described by Lamers and colleagues (2011) could partially explain the high levels of all suboptimal bonding types in this psychopathology group.

All three affected groups reported more lack of care by father and mother figures than the unaffected persons, which aligns with earlier findings (Burns et al., 2018; Kendler, Myers, & Prescott, 2000) and indicates the detrimental effect of relatively cold parenting in childhood on adult mental health. As with emotional neglect (Spinhoven et al., 2010), in particular, depression as compared to anxiety was related to higher paternal lack of care. Interestingly, compared to the healthy controls, only comorbid affected patients reported heightened levels of overprotective parenting, whereas individuals who only developed either depression or anxiety did not report higher levels of overprotection. Those observations contrast with earlier studies showing that overprotected offspring is at an increased risk for both an anxiety and depressive disorder (Overbeek et al., 2007). Levels of lack of autonomy were elevated in all three affected groups compared to the unaffected persons. Generally, our findings contradict most of earlier findings that perceived authoritarian parenting is not related to adult depression and anxiety (e.g. Khalid et al., 2018, Enns et al., 2002). While some studies found that reported lack of autonomy have been shown to relate to increased adult psychopathology risk (Kendler et al., 2000; Seganfredo et al., 2009), others showed that, when controlling for the effects of care, associations between lack of autonomy and affective disorders were reduced (Gerlsma, Emmelkamp, & Arrindell, 1990) or no longer significant (Kendler et al., 2000; Khalid et al., 2018).

However, in addition, our findings show some specific contrasts between depressive and anxiety-related psychopathology. When comparing depression and anxiety groups, adults with anxiety disorders reported higher levels of maternal lack of autonomy and adults with a depressive disorder reported higher levels of paternal lack of care. This indicates that individuals who perceive their mother as discouraging autonomy are specifically at risk to develop lifetime anxiety, whereas cold, affectionless parenting by father is specifically linked to adult depression. Maternal lack of care and paternal lack of autonomy had no specific link with anxiety or depression, but were elevated in both groups compared to healthy controls, meaning that persons reporting affectionless mothering or lack of encouragement and autonomy by father are at increased risk for both anxiety and depression. In addition to our analyses on the complete sample (N=2069), we ran analyses on lifetime psychopathology groups without participants with a current depression or anxiety diagnosis (N=1629) to isolate the effect of lifetime psychopathology (see Table S4 and S5 of supplementary materials). Results show that latent means were overall somewhat higher in the complete sample compared to the sample without current cases. However, out of the 24 tested group comparisons, 3 comparisons differed between the complete sample and the sample without current cases. More specifically, when removing cases with current depression or anxiety diagnoses, levels of paternal lack of care were equal across healthy and anxiety groups, levels of maternal lack of autonomy was equal across depression and anxiety groups and levels of paternal overprotection were now equal across the comorbid and depression groups. However, results from the sample without current cases may underestimate the levels of parental bonding in lifetime groups as the more chronically affected persons were removed from the analyses. Nevertheless, given the similar pattern of findings, it should be recognized that the presence and/or severity of current psychopathology may somewhat influence the magnitude of the association between parental bonding and lifetime psychopathology, although the influence seems to be small.

Suboptimal parental bonding reflects the retrospective perceptions of negative parent-offspring communication and unfavorable regulation of a child's behavior and is therefore, conceptually closely linked to childhood emotional maltreatment by parents (Rikhye et al., 2008). Emotionally maltreating parental behavior consists of the active forms of abuse, such as insulting or given the feeling to be hated, and the passive neglecting forms, for instance lack of care when concern is needed or being indifferent to a child. The reported experiences of abusive or neglectful parenting is therefore intertwined with the recollections of the parental bond. Parental bonding problems and childhood emotional maltreatment, are the blueprint for negative internal working models and therefore contribute to maladaptive interpersonal schemas, deteriorated processing of social information and might result in dysfunctional relationships and insecure attachment as an adult

(Bretherton, Ridgeway, & Cassidy, 1990; Riggs, 2010; Shapero et al., 2013) and consequently increase the risk for adult psychopathology (Blatt & Homann, 1992; van Dam, Korver-Nieberg, Velthorst, Meijer, & de Haan, 2014; Widom, Czaja, Kozakowski, & Chauhan, 2018). In addition, dysfunctional emotion regulation is known to mediate suboptimal parenting and adult mood disorders. Parental emotional neglect and abuse increase negative cognitive processing (Ingram & Ritter, 2000), rumination and behavioral avoidance, which are associated with depression (O'Mahen, Karl, Moberly, & Fedock, 2015) and anxiety (Huh, Kim, Lee, & Chae, 2017). Moreover, we found that emotionally maltreating parenting is also strongly linked with enhanced negative automatic (and explicit) self-associations, and increased depressive or anxious symptomatology (van Harmelen et al., 2010). Moreover, the association between inadequate care and psychopathology could be mediated by the increased exposure to adversities such as sexual abuse (McLaughlin et al., 2000), negative interaction with others (Meites et al., 2012) or increased likelihood of dysfunctional relationships (McCarthy & Taylor, 1999) and could therefore make a person more vulnerable to anxiety or depression. Lastly, psychopathology in fathers or mothers could play a role in suboptimal parenting as well as adult psychopathology in offspring. In adult twins, it was found that genes accounted for 40% in the risk to depression (Kendler, Neale, Kessler, Heath, & Eaves, 1992), whereas parenting explained only a small fraction in the liability to depression (Enns et al., 2002; Kendler et al., 2000). Parental anxiety was positively related to overinvolved parenting style, which was associated with stress and more anxiety adult offspring (Segrin, Woszidlo, Givertz, & Montgomery, 2013). Therefore, an additional explanation of the association between suboptimal parental bonding and mood disorders could be the mediating role of parental psychopathology.

Strengths, Limitations and Future Directions

Strengths of the current study are: the large sample including both lifetime affected and healthy persons. Psychopathology was carefully diagnosed and assessed across 9 years using the widely used CIDI interview (de Graaf et al., 2010; Kessler et al., 2010). Additionally, our study is (one of the) first comparing the suboptimal maternal and paternal bonding types between adult males and females and between people who are lifetime comorbid affected, depressed, anxious and unaffected. Father and mother items differed in starting values indicating that measurement of the PBI was not invariant across father and mother scales. Also, based on the comparison across sexes and psychopathology groups, the patterns of associations were different for maternal versus paternal bonding. Therefore, we recommend to avoid aggregation of maternal and paternal scales in future research. Next to these strengths, some limitations need to be acknowledged. First, our sample may not represent an average community sample, as participants reported on average elevated levels of depression and anxiety symptoms, and moreover,

consisted mainly of Dutch adults with moderate to high levels of education. Therefore, it is uncertain how findings generalize to more diverse populations and how parental bonding relates to externalizing psychopathology in adulthood (e.g. Lansford, Laird, Pettit, Bates, & Dodge, 2014). Second, an alternative explanation for the elevated levels of suboptimal bonding in the comorbid affected participants is that a proportionally larger group also had current psychopathology, which could have influenced their reports on parental bonding. Earlier findings indicate that the perception of parenting is partially influenced by current mood and personality (Duggan, Sham, Minne, Lee, & Murray, 1998; Reuben et al., 2016; Wilhelm, Niven, Parker, & Hadzi-Pavlovic, 2005). However, previously it was found that the association of poor parental bonding during childhood remained a significant risk for developing a lifetime affective disorder after controlling for personality and current mood, even in late adulthood (Burns et al., 2018; Reuben et al., 2016). Moreover, studies show stability of reported parenting in childhood as measured by the PBI over a 20-years follow up into adulthood (Murphy, Wickramaratne, & Weissman, 2010; Wilhelm, Niven, Parker & Hadzi-Pavlovic, 2005). Lastly, our measurement invariance analyses have shown that the construct is measured in a same way when comparing affected versus unaffected participants. Third, directionality of the association could not be assessed due to the cross-sectional design. One prospective study on the effects of early mother-child interaction showed that less maternal stimulation was associated with elevated depression risk in offspring in young adulthood (Schmid et al., 2011), whereas findings of a birth-to-maturity study in a Swedish cohort suggested that a suboptimal parent–child bond quality of partner relationship and life dissatisfaction, but not of depression or anxiety in midlife (Overbeek, Stattin, Vermulst, Ha, & Engels, 2007). Also, the developmental stage in which the detrimental parental behaviour occurs, i.e. timing, could be of crucial importance, which could not be investigated in our study, given the retrospective design and the fact that we did not inquire about parental binding during specific phases throughout childhood. Even though robust prospective and observational studies on overprotective and low supportive parenting of mothers and fathers in relation to child's internalizing psychopathology such as anxiety symptoms exists (e.g. Edwards, Rapee, & Kennedy, 2010; Hastings et al., 2008; McShane & Hastings, 2009; Pinquart, 2017), future studies with a longer prospective and/or multiple-informant design could corroborate the direction of the association between childhood parental bonding and (late) adult mood disorders and the impact of timing. Given the self-report nature of the PBI, it should be acknowledged that the construct reflects offspring's perceptions on childhood experiences. Concurrent (informant) reports on childhood experiences used in prospective studies and retrospective information show moderate agreement (Baldwin, Reuben, Newbury, & Danese, 2019). Nevertheless, next to concurrent reports of childhood maltreatment, the adult perception of the past is linked to elevated psychopathology risk in

adulthood (Newbury et al., 2018; Reuben et al., 2016). In the context of prospective research (e.g. Edwards, Rapee, & Kennedy, 2010; Hastings et al., 2008; McShane & Hastings, 2009; Pinquart, 2017), findings on retrospective self-reports of parental bonding contribute to the literature in a way that negative perceptions of childhood parental bonding play an important role in psychopathology across the entire lifespan. Also, in clinical practice, current perceptions on childhood experiences rather than the occurrence of poor parenting in the past are used for diagnostic and intervention practices."

Implications and Conclusion

The present study confirmed the three-factor structure of the 16 item-version of the PBI, e.g. lack of care, overprotection and lack of autonomy (in previous studies often referred to as authoritarianism), and demonstrated that the PBI is measurement invariant across sex and psychopathology groups (depressed, anxious, comorbid and healthy). This enabled us to compare reported parental bonding between males and females and between groups differing in terms of history of depression and/or anxiety patient. The measurement of the PBI was however not invariant across mother and father scales and the patterns of associations were differed across maternal and paternal bonding. Therefore, we dissuade aggregating mother and father scales in forthcoming studies. Altogether, our results suggest that the PBI is a reliable instrument to measure the perceived relationship with father and/or mother figures during childhood. Note that these conclusions are based on the 16-item version of the PBI and it is unclear whether results are applicable to other PBI versions such as the 25-item variant. Moreover, adults with a lifetime anxiety and/or depressive disorder perceive their childhood parental bonding less optimal as compared to healthy persons. Especially parental lack of care and lack of autonomy are associated with the presence of psychopathology later in life. These findings underline the importance of fostering positive and balanced parenting especially in children with signs of depression and/or anxiety in order to prevent (adult) psychopathology in offspring. Parents should be instructed about importance of parental warmth and autonomy and the negative long-term consequences of overprotectiveness for their offspring.

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3

Why some siblings thrive whereas others struggle: A within-family study on recollections of childhood parental bonding and current adult depressive and anxiety symptoms

Published as: Kullberg, M. L. J., van Schie, C. C., van Sprang, E. D., Hartman, C. A., van Hemert, A. M., Penninx, B. W., & Elzinga, B. M. (2021). Why some siblings thrive whereas others struggle: A within-family study on recollections of childhood parental bonding and current adult depressive and anxiety symptoms. *Journal of Affective Disorders, 281, 413-421.*

Abstract

Background: Brothers and sisters growing up together share a large proportion of their genes and rearing environment. However, some siblings thrive whereas others struggle. This study investigated family-wide childhood bonding experiences with mother and father, in addition to individual-specific recollections, in relation to current depressive and anxiety symptom levels in adulthood. We examined whether extraversion and internal locus of control (iLoC) had a protective effect in this.

Methods: The sample consisted of 256 families with at least one lifetime depressed or anxious person (N=596; ages 20-78). Multilevel modeling with cross-level interactions was used.

Results: Adult siblings showed moderate to high agreement in their childhood parental bonding (PB) recollections. Over-and-above the association between individual-specific recollections of PB and adult internalizing symptoms, family-wide poor PB was additionally linked to elevated symptom levels. Within families characterized by poor maternal bonding persons with an iLoC were relatively less anxious (but not less depressed), whereas extraversion was not protective in this context.

Limitation: Although evidence exists that poor childhood PB has an impact on (adult) psychopathology, causality cannot be determined and possible recall bias of PB should be noted. Moreover, next to their moderating effects, extraversion and LoC may also act as mediators.

Conclusions: Our findings extend prior work by demonstrating the importance of siblings' childhood PB experiences next to a person's own recollections when investigating adult internalizing symptoms, while also elucidating individual differences within families.

Introduction

'Why are siblings from the same family so different from one another in terms of mental wellbeing and psychological functioning?' This is a key question in the field of developmental psychology (see Plomin et al., 2001; Plomin and Daniels, 1987; Turkheimer and Waldron, 2000). Brothers and sisters from the same biological parents growing up together share their rearing environment and ~50% of their genes.

However, some siblings thrive whereas others struggle. Considering the shared family background, to what extent are the family-wide and individual-specific perceptions of childhood parenting behavior linked to adult psychopathology? And, which individual characteristics are protective in these associations? Although many studies on parent-child relations among siblings exist in children (see e.g. Otowa et al., 2013), little information is available on the recollections of childhood parental bonding (PB) experiences and the link with mental wellbeing of siblings in mid- to late adulthood. A within-family design enabled us to investigate family-wide and individual-specific PB and elucidate individual differences in terms of depression and anxiety levels that cannot be detected with a classical between-subjects approach, without the reports of multiple siblings per household.

Sibling resemblance of parental bonding (PB)

PB is often represented by three parent-offspring relationship dimensions, namely care, (over)protection and autonomy-granting. Poor PB is characterized by the absence of parental warmth and support, an overprotective parenting style, and a lack of encouragement in making own decisions (i.e. lack of autonomy; Kullberg et al., 2020). Brothers and sisters growing up with the same parents are likely to relate in similar ways to their parents, in terms of having an akin attachment style (Klahr & Burt, 2014). For instance, a study on infant attachment at 12-14 months after birth showed that there is moderate correspondence among siblings (intraclass correlations: .23-.37; van IJzendoorn et al., 2000). In adults however, twin sibling correlations of retrospective self-reports on PB during childhood are rather lower, ranging from .11 for dizygotic to .49 for monozygotic twins (Kendler, 1996; Otowa et al., 2013). This suggests substantial within-family differences in PB. Indeed, children are often treated differently by parents based on children's needs and character, and may also perceive their bond with their parents differently (Plomin, 2011; Turkheimer & Waldron, 2000). The resemblance of PB experiences among non-twin adult siblings remains to be further investigated.

Childhood poor PB and adult anxiety and depression

The relationship with parents is generally assumed to play a key role in the development of psychopathology throughout the lifespan (Berg-Nielsen, Vikan, & Dahl, 2002; Enns, Cox, & Clara, 2002; Kashani, Orvaschel, Rosenberg, & Reid, 1989;

Kullberg et al., 2020). More specifically, recollections of childhood lack of parental care as well as perceived parental overprotection have been found to be associated with affective disorders, such as anxiety and depression (Enns et al., 2002; Parker, Tupling, & Brown, 1979). Within the context of siblings, the difference between a person's own experience of PB as compared to their sibling's may have an additional detrimental effect on individual's mental health (Boyle et al., 2004; Feinberg & Hetherington, 2001; Mcguire, Dunn, & Plomin, 1995). Differential bonding, e.g. reporting less maternal warmth compared to the other siblings, is linked to youth internalizing problems (Tamrouti-Makkink, Dubas, Gerris, & van Aken, 2004), such as depression (Shanahan, McHale, Crouter, & Osgood, 2008). In line, in adult twins, experiencing relatively poorer PB as compared to their co-twin has been associated with the presence of major depression and generalized anxiety disorder (Long, Aggen, Gardner, & Kendler, 2015).

In addition to siblings' individual experiences with their parents, children are also influenced by the overall or shared parenting style as reported by multiple siblings within a family (Jenkins et al., 2009), also referred to as the family-wide parent-child relationship (Oliver & Pike, 2018). The family-wide parent-child relationship or "parenting climate" can be established by averaging the reports of multiple children from a family (Jenkins et al., 2009). Studies have demonstrated the concurrent effects of family-wide and individual-specific harsh parenting on child and adolescent mental wellbeing (Feinberg & Hetherington, 2001; Jenkins, McGowan, & Knafo-Noam, 2016; Oliver & Pike, 2018). Whether the associations of siblings' experiences of poor PB, above and beyond the associations of individual-specific recollections of PB, with anxiety and depression hold for adults, remains to be investigated. In this sample of adult siblings, we therefore investigated the relation between individual-specific recollections and family-wide levels of PB during childhood and adolescence and current depressive and anxiety symptom levels. Investigating reports on maternal and paternal bonding simultaneously might elucidate their potentially unique association with adult depressive and anxiety symptom levels. This will be pursued in the present study.

Differences within the family: why some siblings may thrive and others struggle

One person may not experience any adverse consequences of suboptimal bonding with father or mother, whereas his or her sibling may be clearly affected by it. Individual characteristics may account for these within-family differences in depressive and anxiety symptoms. As such, siblings within the same family can grow up to be very different from each other (Dick, Johnson, Viken, & Rose, 2000; Plomin, Asbury, & Dunn, 2001). Until now, most studies on recollections of PB in relation to anxiety and depression included one person per family (Enns, Cox, & Clara, 2002; Overbeek, ren Have, Vollebergh, & de Graaf, 2007), therefore only conclusions on differences on the between-family could be drawn. Including multiple persons per

family, as was done in the present study, enabled us to investigate individual differences in depression and anxiety levels in a more fine-grained manner.

Two important personality characteristics that may facilitate resilience and mental wellbeing after negative childhood experiences (Fritz, de Graaff, Caisley, van Harmelen, & Wilkinson, 2018), are extraversion and internal locus of control (iLoC). Extraversion is associated with outgoing behavior and experiencing reward in social situations, in networking experiences and when receiving attention (Magnus, Diener, Fujita, & Pavot, 1993). In general, persons with a relatively extraverted personality tend to seek social support more easily compared to persons who are less extraverted (as described in Swickert, Rosentreter, Hittner, & Mushrush, 2002). This in turn is known to make one less vulnerable to mental health problems (Gariépy, Honkaniemi, & Quesnel-Vallée, 2016), specifically to depression and anxiety (Jylhä & Isometsä, 2006; Spinhoven, Roelofs, et al., 2011). In addition, one's perceived level of mastery (Pearlin & Schooler, 1978; Rotter, 1966), or internal Locus of Control (iLoC), has also been shown to be a protective factor for one's mental health (Scott Heller, Larrieu, D'Imperio, & Boris, 1999). An individual with a strong iLoC believes that an event and its outcome are under his/her own influence, whereas someone with an external LoC tends to attribute outside forces for these events and their consequences. Those personality characteristics may greatly differ between siblings from the same family (Plomin, Asbury, & Dunn, 2001). Although personality characteristics have shown to be rather stable, they may also change over time and are malleable to a certain extent (Costa, McCrae, & Löckenhoff, 2019). Hence, within clinical practice, encouraging a person's extraverted behaviors, such as seeking social support, and fostering a sense of mastery might facilitate resilience. Relative to the number of studies concerning childhood abuse (especially physical and sexual abuse; Meng, Fleury, Xiang, Li, & D'Arcy, 2018), there are only a few studies on resilience following poor PB. The third aim of this paper, therefore, was to investigate whether extraversion and iLoC influence the association between poor PB and depressive and anxiety symptoms to further elucidate why some siblings thrive and others struggle in terms of adult internalizing symptomatology. More specifically, it is expected that in families characterized by poor PB, being relatively extraverted or having an iLoC makes a person within a family thrive in terms of less depression and anxiety symptoms as compared to their siblings. To investigate this, we examined extraversion and iLoC as moderators in the association of family-wide PB with mother and father with current psychopathology levels. With this approach we strived to explain individual differences within families in depressive and anxiety symptom levels in order to shed light on the question why some siblings thrive whereas others struggle.

Present study

The present study aimed to assess siblings' recollections of their parental bond during childhood and adolescence and investigate the association with adult depressive and anxiety symptoms. First, we examined the degree of concordance among siblings in the recollections of PB with their father and mother during childhood. Based on earlier findings in adult twins (Kendler, 1996; Otowa et al., 2013), it is hypothesized that adult siblings' reports will be moderate to highly concordant. Secondly, we investigated the individual-specific recollections and family-wide levels (operationalized by the family-mean) of childhood PB, and how these relate to adult depressive and anxiety symptomatology. Next to the associations of individual poor PB experiences, it is expected that the family-wide levels are additionally associated to more depressive and anxiety symptoms. Based on previous findings in adults (Kullberg et al., 2020; Long, Aggen, Gardner, & Kendler, 2015), we hypothesized that poor PB with mother and father are uniquely linked to elevated symptoms levels when examined simultaneously. Thirdly, in the context of siblings' shared family background, we examined what makes one a person within a family thrive and others struggle in terms of adult depressive and anxiety symptoms. It is hypothesized that in the context of family-wide poor bonding experiences, high levels of extraversion and an iLoC are associated with fewer depressive and anxiety symptoms.

Method

The present study is part of the Netherlands Study of Depression and Anxiety (NESDA), an ongoing longitudinal cohort study (2004-present), investigating the long-term course and consequences of depression, i.e. major depressive disorder and dysthymia, and anxiety, i.e. generalized anxiety disorder, panic disorder with and without agoraphobia, social phobia, and agoraphobia. A detailed description of the NESDA sampling and procedure can be found elsewhere (Penninx et al., 2008). The study protocol was approved by the Ethical Review Board of Amsterdam Medical Centre, location VUmc, and by the review boards of all participating centers. All participants received full verbal and written information about the study and informed consent was obtained. During the 9-year follow-up (W6; 2014-2017), siblings of NESDA probands with a lifetime anxiety and/or depressive disorder were additionally recruited for the sibling study of NESDA to examine the family context of depression and anxiety. In addition to the siblings recruited during W6, some first-degree family relatives (n=23) were identified in the original NESDA cohort and added to the sample of the sibling study. Identification of first-degree family relatives within the original NESDA cohort was based on the proportion of alleles identical by descent, ~ 0.5, and proxy data, i.e., years of birth and last names we ascertained whether siblings were 100% first-degree family members, i.e. full siblings. Inclusion and exclusion criteria for affected probands and their siblings are described in *Table 1.*

Table 1. Inclusion and exclusion criteria of the study sample

Affected probands	Inclusion criteria	1. A lifetime anxiety and/or depressive disorder diagnosis as assessed with the CIDI at least at two time points during NESDA measurements 2. 100% the same biological parents as their participating siblings 3. Participated in at least three out of four NESDA face-to-face interviews 4. Availability of genetic information to ensure family relatedness 5. Approval of contacting siblings for research purposes 6. Participated in the face-to-face interview at the 9-year follow-up wave
	Exclusion criterium	A diagnosis of psychotic disorder, obsessive–compulsive disorder, bipolar disorder or severe addiction disorder
Siblings	Inclusion criteria	1. Currently living in the Netherlands and being fluent in Dutch 2. Aged between 18 and 78 years 3. Willing to participate in the face-to-face interview at the 9-year follow-up.
	Exclusion criterium	A diagnosis of psychotic disorder, obsessive–compulsive disorder, bipolar disorder or severe addiction disorder

Sample

The sample of the NESDA sibling study consisted of 636 participants from 256 unique families. Of each family at least one person with a lifetime anxiety and/or depressive disorder diagnosis, i.e., the affected probands (N=256), participated with at least one sibling, with and without depressive and anxiety disorders (N=340). Of the total sibling sample, 2.5% (*n*=15) had more than 3 missing items on the PBI-mother and 5.5% (*n*=35) on PBI-father. Of the persons with missing data, four persons (0.6%) had missing data because they reported not having a mother figure during childhood, 24 persons (3.8%) had no father figure. Individuals with more than 3 missing items on the PBI were deleted listwise from the analyses, which brings the study sample to N=596 of 252 families. Mean age of respondents was 49.7 years, 62% was female. In *Table* 2 an overview of individual and family characteristics can be found. An overview of the study variables, including sample means, standard deviations and Pearson's correlations can be found in *Table 3*.

Measures

Although, probands were included based on the presence of a lifetime depressive or anxiety diagnosis, in the current study we are interested in the current level of symptoms. PB, extraversion, iLoC and depressive and anxiety symptoms were measured using self-report questionnaires. A description of the instruments and psychometric properties of the questionnaires can be found in *Table 4.*

Statistical analysis

Data preparation was done with SPSS Statistics 25.0 (IBM Corp, 2019). All other analyses were performed in R version 3.5.1 (R Core Team, 2018) with the *lme4*-package version 1.1-21 (Bates, 2014).

Missing data on the outcomes (IDS and BAI) were completely at random (MCAR), X^2 (27) = 25.37, p=.553, indicating that non-completers did not differ from completers on lifetime psychopathology, PB, gender, age and years of education (all p-values >.05).

First, the sibling concordance regarding the parental bond with father and mother was assessed by calculating covariate-adjusted intraclass correlation coefficients (ICC; between family variance / total variance; Higgins & Keller, 1975; Shoukri & Ward, 1989; Shoukri, Donner, & El-Dali, 2013). ICC values ≥0.3 were considered 'large', indicating a strong concordance between the data collected from individuals within the same family (Scherbaum & Ferreter, 2009). Moderate concordance is defined by a coefficient <0.3 and low concordance by a coefficient <0.15 (Bliese, 2000; James, 1982).

Secondly, to test associations of individual-specific and family-mean levels of PB (mother and father) to current depression and anxiety symptoms, mixed effects random intercept models were built considering the nested-structure (siblings within families) of the data (Raudenbush & Bryk, 2002). Separate analyses for depression (IDS) and anxiety (BAI) were carried out (a detailed description of the models can be found in *Table S1 and Table S2* of the supplementary materials).

Lastly, we investigated whether individual characteristics (i.e., extraversion and iLoC) make a person within a family thrive in the face of family-wide poor bonding experiences. To this end, we tested the moderating effect of extraversion and iLoC on the association of the family-mean level of poor bonding with mother and father (cross-level interactions) with current depressive or anxiety symptoms. Using the mean PB score per family enabled us to test whether the individual characteristics of extraversion and iLoC contribute to within-family differences in symptom levels against a backdrop of poor family-wide PB.

We computed four interaction terms of the continuous predictor variables: extraversion*family-mean level of poor bonding with mother; extraversion*family-mean level of poor bonding with father and LoC*family-mean level of poor bonding with mother and LoC*family-mean level of poor bonding with father. We acknowledge the potential individual differences in PB within families, which might

contribute to differences in current psychopathology levels. To control for the influence of individual perception of bonding, individual-specific PB levels were added as covariate to the moderation models.

All analyses were controlled for the influence of gender, age and education level, by adding these as covariates to the models. Significance levels were adjusted for multiple testing using the Benjamini-Hochberg procedure (1995). The variance inflation factor (VIF) for all predictors was <2.5, indicating that multicollinearity was not a problem. The R code is available online (https://osf.io/6xz5p/) to reproduce all analyses.

Table 2. Individual (N=596) and family (N=252) characteristics

Individual characteristics (N=596)	*N (%)*
Lifetime anxiety diagnosis	313 (52.5)
Lifetime depression diagnosis	347 (58.2)
Lifetime comorbid depression and anxiety	246 (41.3)
Current anxiety diagnosis past month	94 (15.8)
Current depression diagnosis past month	57 (9.6)
Family characteristics (N=252)	*N (%)*
Number of participating individuals per family (range 2-6)	
2	164 (65.1)
3	61 (24.2)
≥ 4	27 (10.7)
Total family size (range 2-13)	
2	80 (31.7)
3	71 (28.2)
4	42 (16.7)
5	23 (9.1)
6	21 (8.3)
≥7	14 (5.6)
Sibling constellation	
Same sex- male	27 (10.7)
Same sex- female	91 (36.1)
Mixed sex	134 (53.2)
Maximum age difference	
0-5 years	143 (56.7)
6-9 years	75 (29.8)
10-19 years	34 (13.5)

Table 3. Sample (N=596) descriptives and correlations between study variables

	M (SD)	1	2	3	4	5	6	7	8	9
1. Age (years)	49.80 (13.3)	1	-.006	-.091*	.279**	.186**	-.164**	-.059	.041	-.009
2. Female *N* (%)	372 (62.4)	-.006	1	-.032	.004	.120**	.062	-.080	.102*	.146**
3. Years of education	13.28 (3.1)	-.091*	-.032	1	-.004	-.057	.034	.087*	-.112**	-.112**
4. Poor parental bonding father	31.43 (8.4)	.279**	.004	-.004	1	.478**	-.286**	-.200**	.303**	.223**
5. Poor parental bonding mother	31.06 (8.6)	.186**	.120**	-.057	.478**	1	-.261**	-.250**	.285**	.257**
6. Extraversion	38.27 (7.19)	-.164**	.062	.034	-.286**	-.261**	1	.399**	-.411**	-.287**
7. Internal locus of control (iLoc)	14.22 (4.27)	-.059	-.080	.087*	-.200**	-.250**	.399**	1	-.677**	-.555**
8. Depressive symptoms	14.40 (10.37)	.041	.102*	-.112**	.303**	.285**	-.411**	-.677**	1	.740**
9. Anxiety symptoms	7.26 (7.66)	-.009	.146**	-.112**	.223**	.257**	-.287**	-.555**	.740**	1

* p<.05, ** p<.01.

Table 4. Measures of parental bonding, extraversion, locus of control, current depressive and anxiety symptom levels

Instrument	Description and psychometric properties
Parental Bonding Instrument (PBI)	The perception on the parent–child relationship was established with the shortened 16-item Parental Bonding Instrument (PBI) based on Parker et al.'s (1979) original 25-item instrument. In this self-report measure (4-point Likert scale, ranging from 1 'a lot' to 4 'not at all'), respondents reported their experiences with their mother and father separately, when they were growing up (before the age of 16). Positive items were reverse-coded to ensure that high scores reflect suboptimal parental bonding. In the current sample the internal consistency was good for the PBI total score for mother (α = .88) and father (α = .88). Under the condition that no more than 3 out of 16 PBI items were missing, missing items were replaced by the mean of the available items. The values for individual-specific parental bonding perceptions were calculated by subtracting the family mean from the individual's original PBI score. High positive scores indicate poor bonding as compared to the other siblings, whereas negative scores for the individual-specific variables indicated optimal bonding. The family mean includes all sibling reports on the PBI and represents the overall family-wide level of bonding with mother and father.
Inventory of Depressive Symptomatology-SR (IDS-SR)	The Inventory of Depressive Symptomatology (IDS) is a self-report questionnaire designed to measure the number of depressive symptoms (Rush, Gullion, Basco, Jarrett, & Trivedi, 1996; Rush, Giles, & Schlesser, 1986). The questionnaire consists of 30 items, each with four answering options from ('never') 0 through 3 ('almost always'). Sum scores on the items range from 0 to 84, with higher values indicating more symptoms of depression. The IDS showed excellent internal consistency (α = 0.95) in the current sample. Depressive symptomatology for the sibling study was measured at W6 and was available for 626 participants.
Beck Anxiety Inventory (BAI)	The Beck Anxiety Inventory (BAI) is a 21-item self-report instrument that assesses the overall severity of anxiety (Beck et al., 1988). The respondents are asked to rate how much he or she has been bothered by each symptom over the past week on a 4-point scale, ranging from 0 (not at all) to 3 (severely, I could barely stand it). The BAI is scored by summing the ratings for all of the 21 symptoms to obtain a sum score that can range from 0 to 63, which are used in this study. The total BAI scale obtained high internal consistency in the current sample (α =.98). Moreover, a good validity and reliability were found (Beck 1988). BAI sum scores are available for 625 participants.

NEO Five-Factor Inventory: Extraversion	The NEO Five-Factor Inventory (NEO-FFI; Hoekstra & Ormel, 1996) was used to measure personality domain of extraversion (summed positive affect, sociability, activity; 12 items). Cronbach's alpha for extraversion in the current sibling sample was .79, reflecting a good internal consistency. Data were obtained at baseline for the targets and at W6 for the siblings. Because of the moderate to high 9-year temporal stability of extraversion as found in a previous NESDA study (ICC: 0.77; Struijs et al., 2020), no alterations in personality characteristics across time points are expected and it can be assumed that difference in timing of measurement between targets and siblings will not affect the results.
Mastery scale: Locus of Control	Locus of control (LoC) is assessed through the self-report measure Pearlin & Schooler Mastery Scale. The Mastery Scale measures a person's level of mastery, namely the extent to which one regards that one's chances and events are under one's own control (iLoC) as opposed to being fatalistically ruled (external LoC; Pearlin & Schooler, 1978). The Mastery Scale used in NESDA consists of five items (e.g. 'I have little control over the things that happen to me' or 'Sometimes I feel that I'm being pushed around in life') rated on a 5-point scale ranging from 'strongly disagree' (1) to 'strongly agree' (5). All items were reverse coded to make sure high scores indicate an internal LoC as opposed to external. Cronbach's alpha was .88. Data was obtained at W6 for NESDA targets and their siblings.

Results

Sibling concordance of PB with mother and father

Estimates of covariate-adjusted intraclass correlation coefficients (ICC) indicated higher sibling concordance for bonding with mother (ICC = .43) as compared to father (ICC =.28, z=2.97, p=.002). Family membership explained 43% of the variance in maternal bonding and 28% of the variance in paternal bonding, which indicates a 'moderate' to 'large' degree of similarity among siblings.

Poor PB in the family context and levels of current psychopathology

Depression. First, a covariate adjusted unconditional means model of depressive symptoms was built (ICC =.20), indicating moderate concordance of current depressive symptoms within families (see *Table S1* of the supplementary materials for all test statistics). We tested whether the individual-specific PB and family-wide PB with mother and father were linked to depressive symptom levels. When maternal bonding and paternal bonding were simultaneously tested in one model (*Table 5*), both individual-specific poor bonding (mother: *coeff*= .23, *SE*=.09, p=.009, father: *coeff*= .35, *SE*=.08, p<.001) and family-wide poor bonding (mother: *coeff*=.18, *SE*=.07, p=.012, father: *coeff*= .28, *SE*=.08, p<.001) contributed simultaneously to current elevated depressive symptom levels.

Anxiety. The covariate adjusted unconditional means model of anxiety symptoms yielded an ICC of .15, indicating moderate concordance of current anxiety symptoms within families (see *Table S2* of the supplementary materials for all test statistics). It was found that individual-specific poor bonding (mother: *coeff*=.16, *SE*=.07, *p*=.021, father: *coeff*=.17, *SE*=.07, *p*=.009) and family-wide poor bonding (mother: *coeff*=.15, *SE*=.05, *p*=.003, father: *coeff*=.14, *SE*=.06, *p*=.013) were simultaneously associated to current elevated anxiety symptoms (see *Table 5*).

Table 5. Multilevel regression analyses on depressive and anxiety symptoms: individual score and family mean of poor parental bonding with mother and father (PB; N=596)

	DEPRESSION				ANXIETY			
	coeff.	*SE*	*t*	*p*	*coeff.*	*SE*	*t*	*p*
Intercept	14.50	0.46	31.63	<.001	7.29	0.33	22.31	<.001
Individual poor PB - mother	0.23	0.09	2.64	0.009	0.16	0.07	2.33	0.021
Family-mean poor PB - mother	0.18	0.07	2.51	0.012	0.15	0.05	2.95	0.003
Individual poor PB - father	0.35	0.08	4.19	<.001	0.17	0.07	2.62	0.009
Family-mean poor PB - father	0.28	0.08	3.55	<.001	0.14	0.06	2.50	0.013
Age	-0.05	0.04	-1.31	0.192	-0.05	0.03	-1.99	0.047
Years of education	-0.37	0.13	-2.78	0.006	-0.23	0.10	-2.33	0.020
Female gender	1.65	0.80	2.06	0.040	1.86	0.62	3.02	0.003
Between family variance	21.61 (4.65)				7.33 (2.71)			
Within family variance	70.25 (8.38)				44.59 (6.68)			

PB= parental bonding

Moderation analyses: Depression

In order to investigate what makes a person within a family thrive in the face of poor PB in terms of fewer depressive symptoms, we tested extraversion and iLoC as moderators in the link of family-wide poor maternal bonding and poor paternal bonding to current depression levels (cross-level interaction). As main effects, higher levels of extraversion (*coeff* =-.42, *SE* =.07, *p <.001*) and iLoC (*coeff*=-1.39, *SE*=.09, *p*<.001) were linked to lower depressive symptom levels. For the moderator analysis, a significant interaction between extraversion and family-wide maternal bonding (*coeff*=.02, *SE*=.01, *p*=.034) was found. In families characterized by poor maternal bonding, having an extraverted personality had no effect on current depression symptom levels, whereas when family levels of maternal bonding are relatively optimal, extraversion is associated with low depression levels (see left panel of *Figure 1*). For family-wide paternal bonding no interaction between extraversion or iLoC was found (all *p*-values >.05). All model statistics can be found in *Table S3* of the supplementary materials.

Moderation analyses: Anxiety

Similar moderation models for anxiety were built to investigate what makes a person within a family thrive in terms of fewer anxiety symptoms. Cross-level interactions of extraversion and iLoC with family-wide PB with mother and father were tested in association to anxiety symptom levels. High levels of extraversion (*coeff*= -0.27, *SE*= 0.05, *p*=<.001) and iLoC (*coeff*= -0.80, *SE*= 0.08, *p*=<.001were linked to lower anxiety symptom levels (main effects). Moreover, iLoC moderated the association of family-wide maternal bonding and current anxiety levels (*coeff*=-0.02, *SE*=0.01, *p*=.047), see right panel of *Figure 1*. At high levels of poor maternal bonding, persons with an iLoC reported less anxiety symptoms relative to persons with an external LoC. No interaction effect of family-wide paternal bonding was found with extraversion, nor with iLoC (all *p*-values >.05). All model statistics can be found in *Table S4* of the supplementary materials.

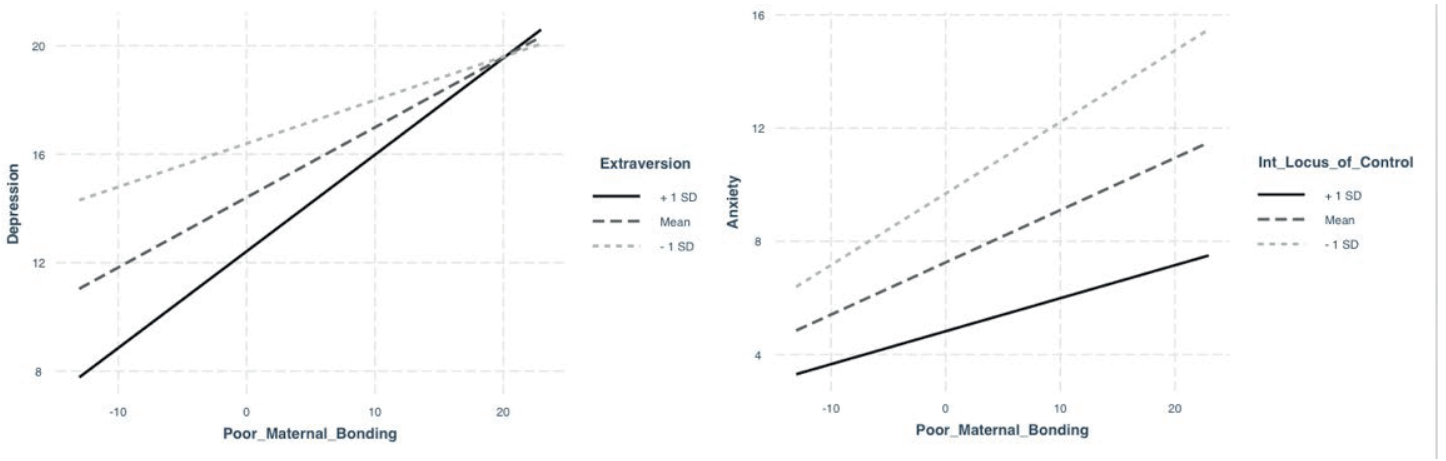

Figure 1. Family-wide Poor Maternal Bonding and Current Depression Levels: Moderation effect of Extraversion (left) and Family-wide Poor Maternal Bonding and Current Anxiety Levels: Moderation effect of Locus of Control (right)

Discussion

In the current within-family study, we investigated the association of adult siblings' recollections of childhood parental bonding (PB) with current adult depressive and anxiety symptoms. Specifically, we focused on the individual-specific recollections, contrasting with PB of their siblings (e.g. 'being the black sheep'), and family-wide ("parenting climate") PB levels. Also, we examined why some siblings may thrive whereas others struggle in terms of adult internalizing psychopathology, by investigating the moderating effects of extraversion and internal locus of control (iLoC).

In line with previous findings in adult twin samples (Kendler, 1996; Otowa et al., 2013) we found moderate to high within-family concordance of reports on childhood PB experiences with mother and father in adult siblings. However, substantial within-family variation in the PB levels was also apparent. Despite the differences among siblings in the bonding with their parents, our results showed that, in addition to the individual-specific PB recollections, the family means of poor maternal and paternal bonding are also associated with current elevated depression and anxiety symptom levels. That is, in addition to one's own childhood PB recollections, an individual's sibling experiences play a significant role in the degree to which that individual reports elevated depression and anxiety symptoms as an adult. Given the cross-sectional nature, the present study was, however, unable to test the direction of these associations.

Moreover, we found that the personality characteristics of extraversion and iLoC had a protective effect. In the context of family-wide poor bonding with mother, an internal locus of control (iLoC) was associated with lower levels of current anxiety symptoms. Being relatively extraverted, on the other hand, was associated with fewer depressive symptoms, but only when maternal bonding was relatively optimal. In the context of family-wide poor bonding with fathers, iLoC and extraversion did not affect current internalizing symptoms.

Individual reports of PB and sibling experiences

In line with previous studies in children (Feinberg & Hetherington, 2001; Shanahan et al., 2008) and adults (Long et al., 2015), we found that individual recollections of poor PB, relative to siblings' PB, were linked to elevated depression and anxiety levels. This also accords with earlier findings that even in adulthood, the experience of being treated worse by father or mother compared to siblings has a large impact on wellbeing (Jensen, Whiteman, Fingerman, & Birditt, 2013; Peng, Suitor, & Gilligan, 2016). The individual deviation from the mean, i.e. individual-specific PB, may either arise from differential parental treatment across their offspring, or from dissimilarities in (retrospective) perceptions of the parental bond among siblings. Parents might treat their children differentially in response to discrepancies in siblings' needs and behavior (Avinun & Knafo, 2014), which could

negatively affect offspring's mental wellbeing (Shanahan et al., 2008; Solmeyer & McHale, 2017). Regardless of 'actual' differential parental treatment, the adult (retrospective) perception of the relation with their parents might also vary across siblings. Family members may use each other as a reference point and these comparisons among siblings may lead to experiences of unfairness and inequity (Festinger, 1954). The sense of being worse off compared to siblings can, for instance, have a negative effect on a person's self-esteem and adjustment and consequently increases the risk for psychopathology, even into adulthood (Grotmol et al., 2010). It should be noted, however, that the causal interpretation could also be the other way around, where internalizing symptoms of a child elicit unequal parenting behaviors among sibling offspring or that current psychopathology affect the recall of the nature of parental bonding. Moreover, adult recollections of the childhood parental bond are likely to be influenced by their own experiences as a parent, by more global and societal views on parenting (Avinun & Knafo, 2014) and by the current relationship with parents as an adult. These factors might all contribute to the differences among adult siblings in their recollections of childhood parenting. Despite the substantial variation in PB recollections within a family, our findings indicate that – in addition to one's own recollections - siblings' mean level of poor PB was also associated with an individual's internalizing symptomatology. Further work could elucidate the underlying processes.

While individual-specific childhood PB recollections are important for wellbeing, the family-wide levels of poor maternal and paternal bonding were additionally associated to elevated depression and anxiety levels in adulthood. Previous research has shown that in children the family-mean levels and child-specific negative maternal bonding have been linked to internalizing problems (Boyle et al., 2004). Family-wide PB, i.e. the "parenting climate", as assessed in our study, was based on the reports of multiple siblings from the same family. The associations of the parenting climate, next to the individual parental bond, with adult wellbeing suggest that functioning of a family is more than the sum of parts. This accords with family system theories and supports the system approach of the family as a whole (Minuchin, Fishman, & Minuchin, 1981; Nichols & Schwartz, 2001). That is, individual experiences within the household, such as a person's parental bond and social interactions among other family members, are likely to color functioning and mental wellbeing of all family members. In the light of our findings, this means that above and beyond the individual PB recollections, their siblings' poor PB experiences are associated with elevated symptom levels of that individual.

Why some siblings thrive and others struggle in the face of poor PB

Moderate family resemblance of current depressive (ICC=.20) and anxiety (ICC=.15) symptoms was found in our study. The majority of variance, however, resided within-families, indicating that siblings considerably differ in symptom

levels despite their shared family background. Our findings indicate that in the light of family-wide poor maternal bonding, being relatively extraverted is not associated to fewer depression and anxiety symptoms as compared to siblings with a less extraverted personality. However, when family-wide maternal bonding is relatively optimal, our findings suggest that being more extraverted is a protective factor for depression. This seems to suggest that in a positive context, i.e. optimal maternal bonding, extraversion is a characteristic associated with fewer depressive symptoms. High levels of extraversion have been found to diminish the course of depression in previous studies (Noteboom, Beekman, Vogelzangs, & Penninx, 2016; Spinhoven, Elzinga, et al., 2011), suggesting that extraversion has been associated to adaptive adult mental wellbeing. Our findings are in line with the vantage sensitivity model, which states that individuals vary in their response to positive experiences or a favorable environment as a function of individual-specific characteristics (Pluess & Belsky, 2013). Within this framework, extraversion can be referred to as a vantage-sensitivity factor, as it increases a person's sensitivity to the beneficial effects of a warm and solid bond with one's mother. Yet, in a context of negative maternal bonding, everyone within the family suffers equally regardless of individual levels of extraversion.

A person's sense of mastery, however, *is* protective to anxiety symptoms in the present study and therefore partially explains why some siblings thrive whereas others struggle. At similar levels of poor maternal bonding as siblings (i.e. family-wide PB), persons with a relatively high iLoC (i.e. individuals who feel in charge of events), report less anxiety symptoms. Thus, it could be the case that having a sense of mastery has a protective role in anxiety, but not depressive, symptomatology in persons of families characterized by poor MB. Hence, iLoC is considered a resilience factor. In treatment, perceived control may function as a mechanism of change for anxiety disorders (Gallagher, Naragon-Gainey, & Brown, 2014). As such, in persons with a negative perception of maternal bonding strengthening the sense of mastery, for instance by Socratic questioning (Braun, Strunk, Sasso, & Cooper, 2015) might mitigate anxiety symptoms. This highlights the relevance and modifiability of perceived control in the treatment of anxiety symptoms. Next to iLoC found in this study, other research has shown that unique environmental factors, such as the presence of a stable romantic relationship, social support and having a job, may also influence the within-family differences among siblings in depression and anxiety in adulthood (Kendler et al., 2011). In the face of poor maternal bonding, these factors might also enhance resilient functioning (Fritz et al., 2018).

Strengths and limitations

Although the parent-child relationship in siblings is frequently described, sibling concordance of PB has only been studied in relatively small samples of young

children and sibling dyads or twins only, not in adult siblings with multiple individuals per family, as was addressed here. Siblings in the current sample have been raised by the same parents and are ~50% genetically similar. Investigating the perceived childhood parental relationship in relation to depressive and anxiety symptoms against their shared family background, provides more fine-grained insights in family-wide effects and individual-specific differences among siblings. That is, an individual's characteristics of iLoC and extraversion contribute to individual differences in, respectively, anxiety and depressive symptom levels. Our study has shown the additional value of including information about sibling experiences of childhood parenting when investigating depression and anxiety levels in families, which is novel in the field. This contributed to our understanding of the complexities of PB recollections in association to adult mental wellbeing.

Next to these strengths, some limitations need to be acknowledged. First, given the cross-sectional design of our study, the directionality of the effects cannot be determined. Nevertheless, PB recollections as antecedent of increased psychological distress (i.e., depression and phobic anxiety) provided a better fit to the data than a model in which psychological distress was modelled as the cause of PB (Gillespie, Zhu, Neale, Heath, & Martin, 2003). Second, the PBI is a self-report measure to assess bonding with parents retrospectively and hence recall biases cannot be ruled out. Retrospective reports on childhood experiences and concurrent information show only moderate agreement (Baldwin, Reuben, Newbury, & Danese, 2019). Findings of prospective research on the association of the parent-child relationship and adult internalizing psychopathology are mixed (Overbeek, Stattin, Vermulst, Ha, & Engels, 2007; Schmid et al., 2011). That is, one study found an increased risk to depression in adulthood after poor mother-child interactions (Schmid et al., 2011), whereas another study failed to find an association between parent-child relationships and adult depression or anxiety (Overbeek et al., 2007). However, retrospective reports have shown to be valuable in understanding psychopathology in adulthood, next to concurrent reports (Newbury et al., 2018; Reuben et al., 2016). Moreover, PB recollections as measured by the PBI showed stability over a 20-year period, up into adulthood (Murphy, Wickramaratne, & Weissman, 2010; Wilhelm, Niven, Parker, & Hadzi-Pavlovic, 2005), suggesting that recall biases are modest. Thirdly, the potential predictor-criterion overlap between personality characteristics and psychopathology measures should be acknowledged. In fact, in our sample, extraversion and symptom levels were negatively correlated (depression: r=-.41, anxiety: r=-.29), as was iLoC (depression: r=-.68, anxiety r=-.56). Hence, these factors may also mediate the association between poor PB and internalizing symptoms (Garber & Flynn, 2001). In line, external LoC, for example, has been found to partially mediate the link between overprotective parenting and social anxiety (Spokas & Heimberg, 2009), indicating that overprotective parenting may lead to a more external LoC, which may be

associated with more social anxiety. Also, in the link between childhood maltreatment and adult depression and anxiety, extraversion and iLoC acted as mediators (Spinhoven, Elzinga, Van Hemert, De Rooij, & Penninx, 2016). Lastly, it should be considered that in small families, high levels of poor PB have a relatively large effect on the family mean as compared to large families (Feaster, Brincks, Robbins, & Szapocznik, 2011).

Implications, future research and conclusion

Findings showed that while adult siblings report rather similar bonding styles, substantial differences among brothers and sisters in the recollections of the bond with their parents during childhood remain. In general, our results suggest that over-and-above the poor individual bond with a mother and father, "the parenting climate" is negatively associated with adult mental health. Findings emphasized the importance of the childhood bond with a father in addition to that with mother. Considering the context of sibling recollections of bonding with mother and father, alongside the individual perception of childhood PB, contributes to a more comprehensive picture of childhood PB and adult internalizing symptomatology within families. Hence, our findings support using a system approach that accounts for the perspectives of multiple siblings from the same family when addressing poor PB in association to internalizing symptomatology in clinical practice and future research.

Yet, some siblings thrive whereas others struggle: extraverted siblings reported fewer depressive symptoms at optimal levels of maternal bonding. Siblings with an iLoC were less anxious at high levels of poor MB and was thus considered as a resilience factor. In clinical practice, fostering a sense of mastery, might mitigate anxiety levels. In the future, observational sibling studies may disentangle the effects of observed differential parenting behavior and retrospective perception of the parental bond. Incorporating sibling reports of the specific parenting styles as measured by the PBI (i.e. lack of care, overprotection and lack of autonomy; Kullberg et al., 2020) might, in future work, contribute to an even more comprehensive image of poor childhood PB within families and adult mental wellbeing. Moreover, prospective longitudinal research is needed to understand the likely direction of effects. The present findings underscore the importance of the family context, in terms of siblings' experiences, next to the recollection of the individual for understanding the link between childhood parenting experiences and internalizing symptoms in adulthood.

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4

It is a family affair: Individual experiences and sibling exposure to emotional, physical and sexual abuse and the impact on adult depressive symptoms

Published as: Kullberg, M. L., Van Schie, C., Van Sprang, E., Maciejewski, D., Hartman, C. A., Van Hemert, B., ... & Elzinga, B. M. (2021). It is a family affair: individual experiences and sibling exposure to emotional, physical and sexual abuse and the impact on adult depressive symptoms. *Psychological medicine, 51(12), 2063-2073.*

Abstract

Background; Childhood abuse and neglect often occurs within families and can have a large influence on mental wellbeing across the lifespan. However, the sibling concordance of emotional abuse and neglect (i.e., together referred to as emotional maltreatment; EM), physical abuse (PA) and sexual abuse (SA) and the long-term impact in the context of siblings' maltreatment experiences is unclear. To examine the influence of EM, PA and SA on adult depressive symptoms within the family framework we differentiate between (a) the family-wide (mean level of all siblings) effects and (b) the individual deviation from the mean family level of maltreatment.
Methods; The sample (*N*=636) consists of 256 families, including at least one lifetime depressed or anxious individual and their siblings. Multilevel modeling was used to examine the family-wide and relative individual effects of childhood maltreatment.
Results; (a) Siblings showed most similarity in their reports of EM followed by PA. SA was mostly reported by one person within a family. In line with these observations, the mean family levels of EM and PA, but not SA, were associated with more depressive symptoms. In addition, (b) depression levels were more elevated in individuals reporting more EM than the family mean.
Conclusions; Particularly in the case of the more visible forms of childhood maltreatment, siblings' experiences of EM and PA are associated with elevated levels of adult depressive symptoms. Findings implicate that in addition to individual maltreatment experiences, the context of siblings' experiences are another crucial risk factor for an individuals' adult depressive symptomatology.

Introduction

Depression is one of the most prevalent mental health problems worldwide (De Graaf, Ten Have, Van Gool, & Van Dorsselaer, 2012; World Health Organization, 2017) and accounted for 40.5% of disability-adjusted life years (Whiteford et al., 2013). As most psychiatric disorders, depression finds its roots in adverse childhood circumstances like parental abusive behavior (Kessler et al., 2010; Norman et al., 2012). Exposure to childhood maltreatment (CM) is associated with an increased risk of mood disorders (Norman et al., 2012) and in particular depression (Spinhoven et al., 2010), as opposed to other psychopathology. Epidemiological studies have shown that emotional abuse and neglect (emotional maltreatment; EM) strongly predict depression (Cecil, Viding, Fearon, Glaser, & McCrory, 2017; Gerke et al., 2018), followed by sexual abuse (SA) and physical abuse (PA; (Infurna et al., 2016; Spinhoven et al., 2010). The high prevalence of abuse and neglect across the population (Stoltenborgh, Bakermans-Kranenburg, Alink, & van Ijzendoorn, 2015) and its effect on emotional disorders across the entire lifespan (Ege, Messias, Thapa, & Krain, 2015; Nanni, Uher, & Danese, 2012) contributes to the fact that CM has been identified as one of the greatest psychopathology risk factors (Sara & Lappin, 2017). .

Similarities in sibling experience of CM

Studies on the impact of abuse and neglect and the association with psychopathology have typically focused on a variety of consequences of CM for individuals being at risk. However, CM typically involves families, and siblings of maltreated children are likely exposed to similar parental behaviors (Baldwin & Oliver, 1975; Hamilton-Giachritsis & Browne, 2005; Hines, Kantor, & Holt, 2006; Jean-Gilles & Crittenden, 1990). Studies have shown greatest overlap between siblings in reported emotional abuse and neglect, followed by physical abuse and neglect, whereas sexual abuse seems to show the least overlap (MacMillan, Tanaka, Duku, Vaillancourt, & Boyle, 2013; Witte, Fegert, & Walper, 2018). The degree of concordance may be related to whether the perpetrator is a family member, since in the case of EM and PA the perpetrator is a parent in 80% of the cases, whereas in sexual abuse this is most often someone else (86%; Bifulco, Brown, Lillie, & Jarvis, 1997; Hovens et al., 2009). Although ~90% of the Western individuals grow up with at least one sibling (Milevsky, 2013) and siblings are at increased risk for similar maltreating behavior, up to now the influence of any CM type on adult functioning is mostly studied in unrelated individuals, not considering the experiences of siblings growing up in the same household.

Whether and how siblings' childhood experiences of abuse and neglect are related to depressive symptomatology of an individual on the long-term remains unclear. To unravel the psychological consequences of CM in the family context, a

differentiation needs to be made between the impact of family-wide (e.g., an adverse family atmosphere) and the individual experiences contrasting with those of other siblings (e.g., 'being the black sheep'), within the family (Feaster, Brincks, Robbins, & Szapocznik, 2011; Steinglass, 1987).

Family-wide effects of CM

Within a family context, when one sibling is exposed to abuse or neglect by a parent or other family members may also be at risk by being exposed to the same harmful behavior. In addition to direct exposure, emotional abuse such as criticism (e.g., "*you are stupid or lazy*, *you are the most worthless child ever born*") or physical violence (e.g., getting hit or kicked by a parent), could also affect siblings indirect by being the spectator, i.e., the vicarious effect of abuse (Spano, 2018). Thus, a key question we aim to investigate is whether CM reported by siblings growing up together (i.e., the family level) relates to an individual's adult depression.

The impact of being the black sheep

Research on negative parenting in children indicates that, next to CM experienced by all or several children in the family, receiving more parental negativity compared to other siblings (i.e., being the black sheep) is also associated with unfavorable mental health outcomes (Dunn, Stocker, & Plomin, 1990; Jenkins, McGowan, & Knafo-Noam, 2016; Meunier, Bisceglia, & Jenkins, 2012; Pike & Plomin, 1996). For example, children reporting less support from their parents relative to their sibling (less favored) reported more depressive symptoms in young adulthood (Jensen, Whiteman, Fingerman, & Birditt, 2013). Hence, the second question we aim to address is whether being more emotionally maltreated or physically or sexually abused than other siblings from the same family (i.e., being the black sheep) is related to adult depressive symptomatology.

The present study

High concordance, and moreover an impactful family level of CM would imply that CM is engrained in the family structure and could point out the potential harm of siblings' childhood experiences of abuse and neglect on the long-term. Studying the family-wide and relative effects of harsh parenting has shown to be insightful in children and adolescents (Jenkins et al., 2016). However, in adult siblings, the family context of CM and the long-term impact of emotional maltreatment (EM), physical (PA) and sexual abuse (SA) on depressive symptomatology has, to the best of our knowledge, never been investigated. A within-family approach provides new insights into the family-wide impact of CM and the individual relative harm compared to other siblings that cannot be detected or understood with a between-subjects design, without the reports of siblings from the same household.

To elucidate the sibling concordance of abuse and neglect and evaluate the potential harm of CM within a family framework, we aim to: (1) examine the extent to which the reports on the three types of CM are similar among siblings (i.e., sibling concordance), where we expect to find most similarity for EM, followed by PA and SA; (2a) elucidate whether the family level of EM, PA and SA is associated with adult depressive symptoms; (2b) and elucidate whether the experience of being maltreated more (EM, PA and SA) relative to the other siblings in the family is associated with more depressive symptoms, while accounting for the family level of CM. Based on abovementioned literature, it is hypothesized that family levels of CM are associated with individual depressive symptomatology and that the experience of being maltreated more than the other siblings is associated with more depressive symptoms with strongest effects for EM.

Method

The present study is part of the Netherlands Study of Depression and Anxiety (NESDA), an ongoing longitudinal cohort study started in 2004, aiming to determine the long-term course and consequences of depression and anxiety. A detailed description of the NESDA study design can be found elsewhere (Penninx et al., 2008). The study protocol was approved by the Ethical Review Board of Amsterdam Medical Centre, location VUmc and by local review boards of each participating center. After full verbal and written information about the study, written informed consent was obtained from all participants. At the 9-year follow-up (wave 6, 2014-2017), 380 siblings from 256 participants with a lifetime anxiety and/or depressive disorder were interviewed to collect data on anxiety and depression, psychosocial functioning and health (behavior) to examine the family context of the development of depression and anxiety disorders in this cohort. For the current study, information on CM and depressive symptoms was collected using self-report measures between 2010 and 2013, six years after baseline at wave 4 (W4) and at wave 6 (W6), nine years after baseline. Siblings participated at W6 only. In the analyses, data of the affected targets collected at W4 and at W6 and sibling data from W6 was used.

Sample

The study sample consisted of 636 participants, within 256 unique families. In total, 380 siblings participated, aged 20-78 years, with and without depression and anxiety disorders, who were related to 256 original NESDA participants with a lifetime anxiety and/or depressive disorder diagnosis, i.e. the affected targets. Inclusion criteria for affected targets were: 1) a lifetime anxiety and/or depressive disorder diagnosis assessed based on the CIDI psychiatric interview (see below) at least two time points during NESDA measurements; 2) 100% the same biological parents as their

siblings; 3) participated in at least three out of four NESDA face-to-face interviews; 4) availability of genetic information; 5) approval of contacting siblings for research purposes; and 6) participated at 9-year follow-up face-to-face interview. Inclusion criteria for the siblings were 1) currently living in the Netherlands; 2) aged between 18 and 78 years; and 3) willing to participate at the 9-year follow-up (W6) face-to-face interview. Targets and siblings with a diagnosis of psychotic disorder, obsessive–compulsive disorder, bipolar disorder or severe addiction disorder were excluded. A second exclusion criterion was not being fluent in Dutch. Individual and family characteristics are described in *Table 1*. Mean age of respondents was 49.7 years, 62% was female. Of all respondents, 74% reported EM and 9% reported any form of PA. For SA, 18% from the respondents reported any experience of SA before the age of 16 based on the CTQ. For more detailed information on the prevalence of CM in this sample see *table A1* and *figure A1* from appendix 1 in the supplementary materials. From the 380 siblings, 191 (50.3%) were lifetime affected with an anxiety and/or depressive disorder and 189 siblings (49.7%) did not have a lifetime anxiety and/or depression.

Table 1. Sample characteristics of 636 respondents from 256 families

Individual characteristics (n=636)	
Gender, *N* Female (%)	397 (62.4)
Level of education	
Basic (lower vocational education) *N (%)*	14 (2.2)
Intermediate (higher vocational education) *N (%)*	318 (50.0)
High (college/university education) *N (%)*	304 (47.8)
Age (*years) M* (*SD*)	49.68 (13.2)
Lifetime anxiety disorder *N* (%)	338 (53.1)
Lifetime depression *N* (%)	376 (59.1)
Lifetime comorbid depression and anxiety *N (%)*	267 (42.0)
Current depression *N* (%)	65 (10.2)
Current anxiety disorder *N* (%)	100 (15.7)
Depressive symptoms *M (SD*)	14.53(10.4)
Childhood maltreatment total *M (SD*)	37.88 (10.6)
Emotional maltreatment *M (SD*)	9.82 (3.6)
Physical abuse *M (SD*)	5.63 (1.8)

Sexual abuse *M (SD)*	5.78 (2.4)

Family characteristics (n=256)	*N (%)*
Number of participating individuals per family	
2	168 (65.6)
3	61 (23.8)
≥ 4	27 (10.5)
Total family size	
2	82 (32.0)
3	73 (28.5)
4	42 (16.4)
5	23 (9.0)
6	21 (8.2)
≥7	15 (5.9)
Sibling constellation	
Same sex- male	28 (10.9)
Same sex- female	92 (35.9)
Mixed sex	136 (53.1)
Maximum age difference	
0-5 years	147 (57.4)
6-9 years	75 (29.3)
10-19 years	34 (13.3)

Measures

Inventory of Depressive Symptomatology-SR (IDS-SR). The Inventory of Depressive Symptomatology (IDS) is a self-report questionnaire designed to measure the number of depressive symptoms (Rush, Giles, & Schlesser, 1986). The questionnaire consists of 30 items, each with four answering options from 0 through 3. Sum scores on the items range from 0 to 84, with higher values indicating more symptoms of depression. The psychometric properties are acceptable; for instance, high correlations were found between the IDS and scores on the Hamilton Depression Rating Scale and Beck depression Inventory (Rush et al., 1996). The IDS showed excellent internal consistency (α = 0.95) in the current sample. Depressive symptomatology was measured at W6 for all participants.

Composite Interview Diagnostic Instrument (CIDI). The presence (current and lifetime) of DSM-IV-TR (American Psychiatric Association, 2000) based depressive disorders (dysthymia and major depressive disorder) and anxiety disorders (generalized anxiety disorder, social phobia, panic disorder with or without agoraphobia and agoraphobia) was established using Composite Interview Diagnostic Instrument (CIDI, version 2.1, WHO) at W6. The CIDI is used worldwide in clinical and epidemiological studies (e.g., de Graaf et al., 2010; Kessler et al., 2010) and high validity for depressive and anxiety disorders were found (Wittchen, 1994).

Childhood Trauma Questionnaire-Short Form (CTQ-SF). The CTQ-SF is a 25-item retrospective questionnaire assessing five types of CM before the age of 16: Emotional (EA), Physical (PA) and Sexual Abuse (SA), as well as Emotional (EN) and Physical Neglect (PN). Each scale consists of five items scored on a 5-point Likert scale ranging from *never true* to *very often true*. A sum score on the CTQ, ranging from 25 to 125, is calculated by adding the five subscales. Data was collected during W4 for the targets and during W6 for the siblings. Psychometric properties are good (Bernstein et al., 2003; Spinhoven et al., 2014; Thombs, Bernstein, Lobbestael, & Arntz, 2009). The internal consistency of the CTQ (α = 0.88) and most subscales is excellent in the current sample (PA: α = 0.92; SA: α = 0.94: EA: α = 0.90; EN: α = 0.89). Because of the moderate internal consistency for PN (α = 0.45), this subscale is excluded from the analyses. Given the large overlap between EA and EN (r=.63, p <.001) we combined the EA and EN subscale into an emotional maltreatment subscale, in line with previous studies in the NESDA cohort by taking the average of the two subscales (see Van Der Werff et al., 2013; van Harmelen et al., 2010), for similar definition see the American Professional Society on the Abuse of Children (APSAC) and Glaser (2002). The Cronbach's alpha for the combined emotional abuse and neglect scale was .89 in our sample. Subscales used in the analyses are EM, PA and SA. Scores on the CTQ subscales can be assorted into four categories; No maltreatment (i.e., EM score 5-7, PA score 5-7, SA score 5) low maltreatment (i.e., EM 8-10; PA 8-9; SA 6-7), moderate maltreatment (i.e., EM 11-14; PA 10-12; SA 8-12) and severe maltreatment (i.e., EM >14; PA > 13, SA >13, Bernstein & Fink, 1998

Statistical analyses

Handling missing data. Data cleaning, preparation and descriptive statistics were performed with IBM SPSS Statistics 23.0 (SPSS Inc, Chicago, Illinois). For the IDS, 1.6% and for the CTQ 2.8% was missing and Little's Missing Completely at Random (MCAR) test indicated that data was not missing completely at random (χ2

= 16.23, df = 8, p = .039). As compared to those with complete data, those with missing data tend to be younger, t (634) =-3.2, p=<.001. There were no differences regarding gender, educational level, CTQ and IDS scores between those with complete and those with missing data (all p's > .05). To retain the sample size, missing data was handled using multiple imputations (*mice*-package version 3.3.0, van Buuren & Groothuis-Oudshoorn, 2011), carried out with R version 3.5.0 (R Core Team, 2018). A detailed description of the procedure of imputation can be found in the supplementary materials, appendix 2. The newly generated datasets reflected the original means. The parameter estimates of all models were combined according to Rubin's (1987) rules.

Analyses. We first tested whether the previously found association between individual levels of EM, PA and SA and depressive symptoms (Hovens et al., 2012; Spinhoven et al., 2010) could be replicated in the current sample using a multilevel regression model with a grouping variable unique for each family as a random effect to control for the family structured data. Sum scores per CTQ subscale (EM, PA and SA) were taken as predictors, and IDS sum scores as outcome. Subsequently, to investigate the main research questions, first the sibling concordance of CM, i.e., the degree of similarity within the family for CM, was assessed using intraclass correlations (ICC) for EM, PA and SA (1). The ICC was calculated by dividing the total family variance by the between-family variance on the CTQ subscale, which gives an indication of the degree of sibling resemblance (Higgins & Keller, 1975; Shoukri & Ward, 1989). A high correlation within families is defined as a coefficient of 0.3 or higher (Donner, Eliasziw, & Shoukri, 1998). For the calculation of the ICCs the *lme4*-package version 1.1-17 (Bates 2014) was used with R version 3.5.0. (R Core Team, 2018).

To identify the family-wide (common across all siblings) and relative (individual deviation from the siblings mean) effects of EM, PA and SA on depressive symptoms, regression analyses using multilevel modeling with 2-levels were performed with a family grouping variable as random effect. First an unconditional means model, without predictors, was built to calculate the ICC. In the baseline model age, gender and educational level were added as covariates. Model 1 includes the family means of the CTQ subscales as predictor variables to assess the contribution of the family level EM, PA and SA, common across all siblings, to individual depressive symptoms and examine between-family differences (2a). Next, in model 2, the individual deviations from the family mean were added to model 1 to identify the effect of the relative level of EM, PA and SA on depressive symptoms and examine within family differences (2b). A description of the exact calculation of the predictors can be found in the supplementary materials, appendix 3. Model fit was compared according to the methods for multilevel models with multiple imputed data described by Li, Meng, Raghunathan, & Rubin (1991) using the F-test. Multilevel

regression analyses (*lme4*-package 1.1.-17; Bates 2014) were carried out with R version 3.5.0 (R Core Team, 2018). To examine the level of multicollinearity the Variance Inflation Factor (VIF) score for the final models were inspected. The rule of thumb cut-off criterion of 2.5 for deciding if a given independent variable displays too much multicollinearity was used (O'Brien, 2007). The VIF of the predictors in model 1 and 2 were all <2.0, indicating that multicollinearity was not a problem. The R code is online available (https://osf.io/g39yk/) to reproduce all analyses.

Results

Individual CM and adult depressive symptoms

Individual scores of EM (t=6.92, p<.001) and SA (t=2.09, p=.037), but not PA (t=1.25, p=.212) were significantly associated with the severity of depressive symptoms, see *Table 2* for all model statistics. Of the covariates, being female (t=2.99, p =.003) and having low education (t=-2.55, p =.011), but not age (t=.51, p=.610) were associated to depressive symptoms.

Sibling concordance of CM types

To understand what types of CM are more family-wide and what types are more individual-specific, intraclass correlations (ICC) were calculated. For EM the highest ICC (*r=.37)* was found, followed by PA (r =.21), indicating large and medium concordance among siblings, respectively (Donner et al., 1998). The ICC of SA was .04, which indicates almost no concordance of reports of SA within the family, meaning that siblings from the same family are not more alike in their reports of SA than random other individuals in the sample.

Family levels and relative scores of CM with adult depressive symptoms

Figure 1 illustrates the variation between and within families in CM and depressive symptom levels in six families, randomly drawn from the study sample, emphasizing the value of this sibling design to provide more accurate estimates regarding the impact of CM on depressive symptoms. Whereas for example in family 1 no one reports PA or SA, in family 5 both individuals report moderate to severe EM, PA and SA, illustrating the differences between families. Within the families, some individuals report high levels of CM, whereas their sibling(s) do not, as is shown in family 2, 3 and 5.

To test whether family level of CM related to depressive symptoms, model 1 contained the family means of EM, PA and SA and showed significant improvement in model fit compared to the baseline model including covariates only (F(3, 36367)=14.25, p<.001), see *Table 3* for all model statistics. Compared to the baseline model, about 40% of the between-family variation in IDS score was explained by the family levels of CM. The family mean of EM (t=3.36, p<.001) and PA (t = 2.10, p

=.036), predicted depressive symptoms, whereas for SA only a trend was found (t=1.94, p=.052).

In order to test the hypothesis whether being relatively more maltreated in comparison to the other siblings related to depressive symptoms, model 2 included the individual deviations from the family mean, i.e., relative scores, which was a significant improvement to model 1, i.e., family means only, F (3, 42892) =16.18, p<.001 (model 2). The relative EM score (t=6.40, p<.001) was associated with depressive symptoms, whereas no association was found for relative PA score (t=-.03, p= .977) and relative SA score (t=.90, p=.370). Compared to the baseline model, about 13% of the within-family variation in IDS score was explained by the relative levels of CM.

Post hoc specificity analyses

Anxiety disorders were highly prevalent in the current sample (53.1%), therefore we tested for specificity of our findings to depressive symptoms by rerunning the analyses with anxiety symptoms as assessed by the Beck Anxiety Inventory (BAI, Beck et al., 1988). Individual scores of EM (t=0.38, p<.001), PA (t=.41, p=.035) and SA (t=0.30, p=.022) were significantly associated with the severity of anxiety symptoms, see *Table A2* from appendix 4 in the supplementary materials for all model statistics.

The family mean of PA (t=2.14, p=.032) was associated with anxiety symptoms, whereas the family mean of EM (t=1.83, p=.067) and SA (t =1.83, p =.067) did not, see *Table A3* of the supplementary materials for all model statistics (appendix 4). In line with our findings for depression, the relative EM score (t=3.76, p<.001) was associated with anxiety symptoms, whereas no association was found for relative PA score (t=0.93, p= .352) and relative SA score (t=1.29, p=.196).

Table 2. Multilevel regression analyses on depressive symptoms: unconditional means model, baseline and individual model (*N*=636)

	UNCONDITIONAL MEANS MODEL						BASELINE MODEL						INDIVIDUAL MODEL					
	Estimate	*SE*	*T*	*p*	95% CI		*Estimate*	*SE*	*T*	*p*	95% CI		*Estimate*	*SE*	*T*	*p*	95% CI	
Intercept	14.64	0.48	30.70	<.001	13.70	15.57	14.56	3.05	4.79	<.001	8.60	20.51	4.07	3.17	1.28	0.20	-2.15	10.29
EM													0.86	0.12	6.92	<.001	0.62	1.10
PA													0.33	0.26	1.25	0.212	-0.19	0.84
SA													0.37	0.18	2.09	0.037	0.02	0.71
Covariates																		
Age							0.02	0.04	0.51	0.610	-0.05	0.09	-0.02	0.03	-0.57	0.567	-0.08	0.05
Educational level							-1.98	0.78	-2.55	0.011	-3.50	-0.46	-1.48	0.73	-2.02	0.043	-2.91	-0.05
Gender							2.49	0.83	2.99	0.003	0.80	4.07	1.64	0.79	2.06	0.039	0.08	3.19
Between family variance IDS			21.28						20.97						17.06			
Within family variance IDS			86.42						84.09						73.69			
ICC			0.20						0.20						0.19			
F									5.29						27.70			
p									0.001						<.001			

Note. Sex: 0 = Male 1 = Female, EM = Emotional Maltreatment, PA=Physical Abuse, SA=Sexual Abuse

Figure 1. Childhood maltreatment (bars) and adult depressive symptoms (lines): An example of six random families from the sample

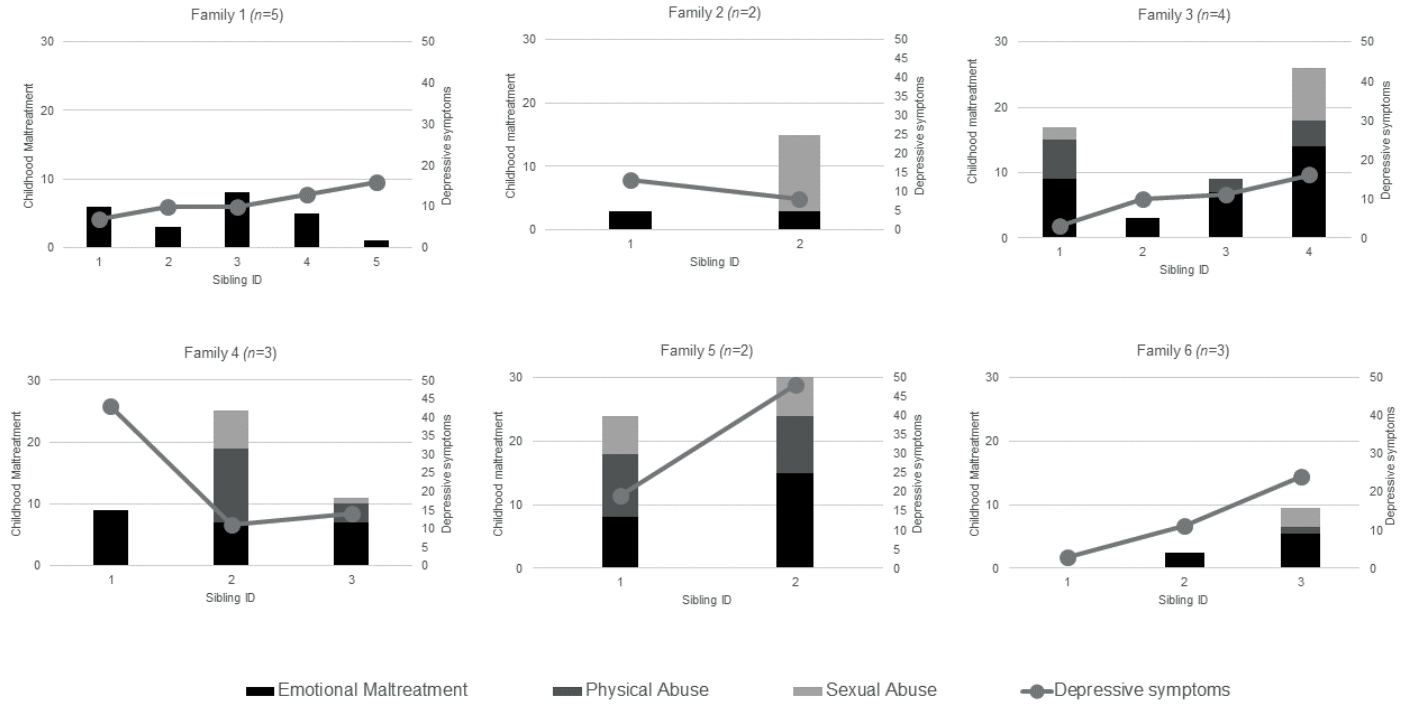

Table 3. Multilevel regression analyses on depressive symptoms: model 1 (family means of EM, PA and SA) and model 2 (relative EM, PA and SA) (*N* = 636)

	FAMILY MODEL 1						FAMILY MODEL 2					
	Estimate	*SE*	*T*	*p*	*95% CI*		*Estimate*	*SE*	*T*	*p*	*95% CI*	
Intercept	15.79	2.93	5.39	<.001	10.05	21.53	15.79	2.86	5.52	<.001	10.18	21.94
EM												
family level	0.60	0.18	3.36	0.001	0.25	0.95	0.59	0.18	3.34	0.001	0.25	0.94
relative level							1.12	0.18	6.40	<.001	0.78	1.46
PA												
family level	0.89	0.42	2.10	0.036	0.06	1.71	0.91	0.42	2.17	0.030	0.09	1.73
relative level							-0.01	0.33	-0.03	0.977	-0.65	0.63
SA												
family level	0.60	0.31	1.94	0.052	-0.01	1.20	0.60	0.31	1.95	0.051	0.00	1.20
relative level							0.19	0.22	0.90	0.370	-0.23	0.61
Covariates												
Age	-0.02	0.03	-0.46	0.643	-0.08	0.05	-0.01	0.03	-0.29	0.775	-0.07	0.06
Educational level	-1.55	0.75	-2.07	0.038	-3.02	-0.09	-1.35	0.73	-1.86	0.063	-2.78	0.07
Gender	2.08	0.81	2.55	0.011	0.48	3.67	1.74	0.79	2.21	0.027	0.20	3.28
Between family variance IDS		12.58						16.40				
Within family variance IDS		83.14						73.18				
ICC		0.13						0.18				
F		14.25						16.18				
p		<.001						<.001				

Note. Sex: 0 = Male 1 = Female, EM = Emotional Maltreatment, PA=Physical Abuse, SA=Sexual Abuse.

Discussion

This sibling study on the impact of childhood maltreatment (CM) on adult depression examined (1) the extent to which reports on emotional maltreatment (EM; abuse and neglect), physical (PA) and sexual abuse (SA) were similar among siblings (i.e., sibling concordance), and the association of (2a) the family level and (2b) the differential experience of EM, PA and SA of siblings (e.g., "being the black sheep") with siblings' individual depressive symptoms in adulthood. In addition, associations with anxiety symptoms were tested to examine the specificity of our findings for depression.

Sibling concordance of CM types

EM was most shared between siblings followed by PA, whereas SA was most individual-specific, which was in line with our hypothesis and supporting previous studies (Bifulco et al., 1997; Hamilton-Giachritsis & Browne, 2005; Hines et al., 2006; Jean-Gilles & Crittenden, 1990; Witte et al., 2018). The levels of sibling concordance (i.e., highest for EM and lowest for SA) are in line with the findings that the majority of individuals reporting EM or PA indicated that a parent was the perpetrator, whereas the perpetrator of SA is often someone else rather than a first-degree relative (Hovens et al., 2009). The risk factors for EM described in the literature are mostly parental or environmental factors shared within a family (e.g., parental psychopathology, family structure), resulting in an increased risk of CM for all siblings. In contrast, risk factors for PA and SA appear to be predominantly individual characteristics (e.g., sex, child's behavioral problems, Hamilton-Giachritsis & Browne, 2005; Witte et al., 2018). To summarize, when an individual reports EM, there is an increased probability that a sibling experiences similar adversity. However, the other maltreatment types showed small to medium overlap within families (Donner et al., 1998), indicating that physical and sexual abuse experiences in childhood are quite unique to each individual of the family.

CM in the family context and adult depressive symptoms

In line with earlier findings, our analyses showed that individual reports of EM and SA, but not PA, were simultaneously related to more depressive symptoms (Cecil et al., 2017; Infurna et al., 2016; Spinhoven et al., 2010). Results of our post hoc specificity analyses indicate that individual experiences of EM and SA are linked to elevated symptom levels of both depression and anxiety, whereas PA is only associated with anxiety, but not depression severity. However, when considering the family mean and relative level of CM a slightly different picture emerges. The family-wide effects of CM on an individual may be either direct, by being exposed to the same adverse parental behavior, or indirect, the so-called vicarious effect of

CM (Spano, 2018). For EM, both the family means and relative levels (i.e., reporting more abuse or neglect than siblings) were jointly related to more depressive symptoms in adulthood. In addition to the family-wide impact, individuals who report more childhood EM than the family average also report more depressive symptoms. This may reflect the "Black Sheep Effect". Previous studies in both children and adults indicate that differential parenting, e.g., the perception or actually receiving less affect and engagement from a parent than another child in the family (Boyle et al., 2004; Jenkins et al., 2016), are associated with negative outcomes such as depressive symptoms (Jensen et al., 2013; Meunier et al., 2012). Compared to EM, levels of reported PA varied more among siblings from the same family. Surprisingly, despite the variation of PA levels within the family, the family level of PA related to individual depression severity, whereas individual PA reports did not. It should be noted that, when CM types are examined in isolation, individual reports of PA do contribute to elevated depression levels. However, PA often occurs in the context of EM (Higgins & McCabe, 2001) and when modeled simultaneously, the effect of individual PA reports often diminishes or even disappears (Cecil et al., 2017; Spinhoven et al., 2010). In line with these observations, internalizing psychopathology is often mostly explained by emotional forms of abuse and neglect over and above PA (Cecil et al., 2017). In the case of EM, negative schemas and negative self-perceptions are explicitly handed to the child by parental criticism and belittlement, hence inducing a cognitive vulnerability for depressive symptomatology (van Harmelen et al., 2010; Wright, Crawford, & Del Castillo, 2009).

The family level's impact of physical violence on adult depression and anxiety, raises the question whether this is due to a vicarious effect by witnessing that a sibling has been abused or maltreated (Gerke et al., 2018), or whether reported physical violence is an indication of an adverse family environment in general, which in turn influences the development of later depressive and anxiety symptoms. The negative impact of the family level of EM and PA could thus also be an expression of a negative family atmosphere in which siblings grew up. Parental psychopathology, substance abuse or divorce, to which all family members are exposed, increase the risk of CM for all offspring (Witte et al., 2018) and also relate to adult depression (Lieb, Isensee, Höfler, Pfister, & Wittchen, 2002; Weissman et al., 2006). This interplay between family risk factors within the household should be further investigated. However, the simultaneous association between the family level of EM and PA with depression suggests that both types of CM are unique risk factors for depressive symptoms, rather than a same underlying construct like an overall negative family atmosphere. The association of the family level of PA with anxiety and depressive symptom levels suggests that physical violence has a common effect on adult anxiety and depression, whereas the family level of EM has a specific effect on depression as compared to anxiety. Although the individual report of SA was associated with depressive and anxiety symptoms, the family and

relative level of SA were not. This may be related to the fact that the perpetrator is usually someone outside the core family and the fact that if it occurs within the family it happens mostly in secret, which both may greatly reduce the chance of a vicarious effect. A methodological explanation of these findings is that the family mean of SA can be inflated due to one extreme value within the family while the other siblings report no SA. Therefore, association of the SA family mean with depression may reflect the association between an individual report of SA and depression rather than the overall family context. Associations of maltreatment types and depressive and anxiety symptoms remain when controlling for the main effects of gender and educational level.

Strengths and limitations

This is one of the few studies investigating multiple siblings per family, which contributes to the understanding of the family framework in which CM mostly occurs. Moreover, decomposing individual variables into a family level variable and relative scores helps to differentiate between family-wide and individual-specific effects (Feaster et al., 2011; Jenkins et al., 2016). Another strength is the large clinically relevant sample, consisting persons with a lifetime depressive or anxiety disorder and their affected and unaffected siblings. Considering the genetic background of depression (Smoller, 2016), it should be acknowledged that the study sample includes families with at least one affected family member, symptom levels in the sample may therefore be higher than in the general population. It should be noted however, that PA and SA were less prevalent than EM which could have contributed to lower ICCs for PA and SA. Nevertheless, despite the lower prevalence, PA and SA did contribute to depression in their unique way. Moreover, these numbers do seem to adequately reflect the sibling concordance for the three types of CM. Second, CM was measured using a retrospective instrument (the CTQ), which may be sensitive to recall bias. However, most studies indicate fairly good reliability of the CTQ (Hardt & Rutter, 2004) and are not critically affected by current mood disorders (Spinhoven et al., 2010). Previous studies have reported good test-retest reliability for the CTQ (Bernstein & Fink, 1998). Moreover, CTQ reports (W4) were highly correlated with reports on the Childhood Trauma Interview 4 years earlier (W1) in NESDA (Spinhoven et al., 2014), which indicates that the CTQ shows adequate consistency across time, suggesting stability of retrospective CM reports. Hence it can be assumed that the difference of 5-8 years between data collection points of targets (W4) and siblings (W6) in retrospective recall does not significantly affect the reliability of the reports on childhood experiences. Third, the decomposed variables depend on the number of siblings participating within the family. That is, in large families an extreme score of an individual, as may be the case for SA, has a smaller effect on mean family level than in small families (Feaster et al., 2011). However, for EM and PA, i.e., abuse occurring within the household,

differentiation between family and individual relative effects as risk factors for depression revealed new valuable information.

Implications and future research

The overall family-wide experience (common across siblings) of EM and PA and the relative experience (individual difference from the family mean; the Black Sheep Effect) of EM contribute to adult depression levels. Our findings underline that the context of siblings' CM experiences play a vital role in an individuals' adult depression and anxiety. Even though the environmental influence of CM on depression is substantial, it is important to bear in mind that shared genetic factors partly determine and explain the presence of depressive symptoms within families (Smoller, 2016). Moreover, our results provide a clear image of sibling concordance with respect to the three CM types, which helps to understand to what extent adult siblings share their (perception on) childhood experiences (see Plomin, 2011; Robert Plomin & Daniels, 1987; Turkheimer & Waldron, 2000). Although siblings report similar levels of CM experiences, also substantial differences within families remain. Further research should focus on the underlying determinants of CM within the family to better understand the processes of parental maltreatment and how one individual from the same family may feel more or less depressed than a sibling after similar adverse childhood experiences. Future studies addressing the impact of childhood family adversities, should address the sibling context to disentangle the effect of the family system. Agreement between concurrent and retrospective reports of CM is low (Baldwin, Reuben, Newbury, & Danese, 2019). We therefore like to underline that our retrospective approach targets a specific group of adults reporting childhood maltreatment. Nevertheless, it should be acknowledged that both concurrent and retrospective reports of CM are linked to psychopathology (Newbury et al., 2018; Scott, McLaughlin, Smith, & Ellis, 2012). Observational and qualitative studies would be valuable to elucidate the within-family differences in more detail to identify individuals within the family at risk, and to advance the understanding of the influence of family context on adult depression. In clinical practice, health professionals should be aware of the effect of CM not only on the targeted individual, but also on other siblings. Informing parents, community health services, general practitioners and schools could lead to better identification and understanding of the impact of (parental) abuse and neglect and vulnerability to adult depression and anxiety. Moreover, focusing on the improvement of the family environment could potentially contribute to adequate prevention of both CM and psychopathology in the long-term.

Conclusion

Altogether the findings of this study illustrate that the childhood experiences of adult siblings are in part interdependent and, furthermore, suggest that in addition to individual experiences, maltreatment experiences of a brother or sister may also have a long-term burden on an individual. Considering the experiences of multiple siblings from the same family and, moreover, differentiating between family and relative (within-family) level allows new insights into the individual and family-wide effects of childhood maltreatment on adult depression and anxiety.

Acknowledgement. The infrastructure for the NESDA study (www.nesda.nl) is funded through the Geestkracht program of the Netherlands Organisation for Health Research and Development (ZonMw, grant number 10-000-1002) and financial contributions by participating universities and mental health care organizations (VU University Medical Center, GGZ inGeest, Leiden University Medical Center, Leiden University, GGZ Rivierduinen, University Medical Center Groningen, University of Groningen, Lentis, GGZ Friesland, GGZ Drenthe, Rob Giel Onderzoekscentrum).

Financial support. This work was supported by the Leiden University Research Profile '*Health, prevention and the human life cycle'* as part of the research project *'Family aggregation of mood and anxiety disorders'* (B.M.E., A.v.H.) and by The Netherlands Organisation for Scientific Research (NWO) with a VICI-grant (B.M.E., 45314001).

*Conflicts of interest***.** None.

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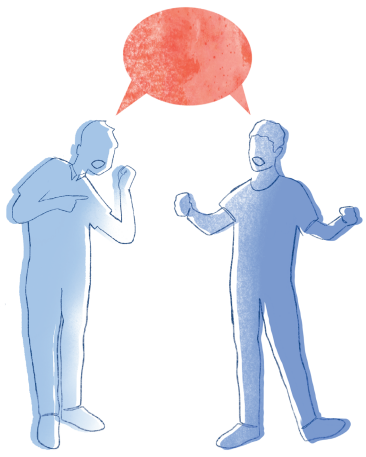


INTERACTING FAMILIES

5

Linking internalizing and externalizing problems to warmth and negativity in dyadic parent-offspring communication - An observational study on fathers, mothers and offspring across the lifespan

Under review: Kullberg, M.-L., Buisman, R., van Schie, C., Pittner, K., Tollenaar, M., van den Berg, L., Alink, L., Bakermans-Kranenburg, Elzinga, B. Linking internalizing and externalizing problems to warmth and negativity in dyadic parent-offspring communication - An observational study on fathers, mothers and offspring across the lifespan.

Abstract

Psychological conditions of one family member may be related to intrafamilial social interactions. Particularly, internalizing and externalizing problems may affect the quality of parent-offspring communication. In this study, fathers (*N* = 94), mothers (*N* = 125) and their offspring (*N* = 224, age range $_{offspring}$ =7.5-65.5 years) from 137 nuclear families participated as parent-offspring dyads in a behavioral conflict interaction task during which expressed warmth and negativity were observed. Associations between parents' and offspring's psychological problems (of the past six months) and parent-to-offspring and offspring-to-parent communication were tested simultaneously using structural equation models separated for fathers and mothers. Based on prior findings in the study sample, our analyses were controlled for history of childhood abuse. Offspring's internalizing problems were related to *less negativity* towards their father, whereas offspring's externalizing problems were related to *more negativity* towards their father and to receiving *less warmth* from their mother. Father's externalizing problems were linked to *more negativity* towards offspring. No associations were found between maternal and paternal internalizing problems and dyadic parent-offspring interactions, nor for maternal externalizing problems. Supporting families with interventions to improve parent-offspring interactions and (early) treatment of externalizing problems is recommended.

Keywords: internalizing problems, externalizing problems, parent-offspring interactions, dyadic conflict interaction task, family communication

Introduction

The quality of parent-offspring interactions has been identified as an important factor contributing to offspring's emotional, psychological and behavioral development (e.g., Bowlby, 1969; Steinberg, 2001). Warm and sensitive interactions between parents and their offspring foster a secure internal working model for a person's interaction with others (Bretherton, Ridgeway, & Cassidy, 1990), while poor parent-offspring relationship quality, characterized by negativity and lack of warmth, increases difficulties with interpersonal relations in general and can have negative consequences for offspring's mental health (Berg-Nielsen, Vikan, & Dahl, 2002; Pinquart, 2017; Seiffge-Krenke, Overbeek, & Vermulst, 2010). The parent-offspring relationship is one of the most long-lasting emotional connections, in a lifetime, up to (late) adulthood, and remains important for mental wellbeing across the lifespan (van Wel et al., 2000).

Families can be seen as a complex social system in which parents and their offspring are continuously interacting and influencing one another (Minuchin, 1985). According to the family systems theory of human behavior (Bowen, 1966) this means that mental states and conditions of one family member do not only reside in the individual, but may also have an impact on their social interactions within the family (Brown & Prinstein, 2011). As such, internalizing and externalizing problems of fathers, mothers and their offspring may influence the quality of parent-offspring interactions. To more fully understand the intergenerational associations and transmission of psychological problems, we examined associations of fathers', mothers' and offspring's psychological problems and the association with observed dyadic parent-offspring communication. Thus, the four research directions are 1) parental problems and parent-to-offspring behavior, 2) parental problems and offspring-to-parent behavior, 3) offspring problems and parent-to-offspring behavior, and 4) offspring problems and offspring-to-parent behavior, including mothers and fathers and examining internalizing and externalizing problems.

Parents' psychological problems and parent-to-offspring communication

The impact of parental internalizing problems (i.e., withdrawal, depression, anxiety and somatic complaints) on parent-offspring interactions has been frequently described (e.g., Lovejoy, Graczyk, O'Hare, & Neuman, 2000; Wilson & Durbin, 2010): depression of fathers and mothers has been associated with lower quality of parent-offspring interactions. For instance, it was shown that maternal depression was related to more negativity in interactions towards one's own children (Browne, Leckie, Prime, Perlman, & Jenkins, 2016; Dietz et al., 2008; Olino et al., 2016). Less is known about the associations between parental externalizing problems (i.e., rule-breaking, aggressive and intrusive behaviors) and parent-offspring interactions. Only one study has shown that maternal inattention and impulsivity were associated with negative parenting practices, namely inconsistent

discipline and lower involvement after controlling for maternal depression and child behavioral problems (Chen & Johnston, 2007). Also, parental anger and hyperreactivity were identified as risk factors of child maltreatment (Stith et al., 2009). However, to the best of our knowledge, the links between fathers' and mother's externalizing problems and expressed warmth and negativity have not been investigated yet.

Parents' psychological problems and offspring-to-parent communication

Parenting and parent-offspring communication are often defined by parental behavior and communication from parents towards their offspring. However, according to the transactional model of human development, the parent-offspring relationship is viewed as a continuous process of reciprocal influences between the parent and their child (Sameroff, 2009): besides *parent-to-offspring communication*, parent-offspring interactions also consist of *offspring-to-parent* communication (Kuczynski & Mol, 2015). To our knowledge only one study has examined the association between parental psychological problems and offspring-to-parent communication, it was found that dyads in which mothers were high in PTSD symptoms (when daughters were low in PTSD symptoms) resulted in daughters showing especially warm, positive relational behaviors (Milan & Carlone, 2018). To date, studies on father's symptomatology and offspring-to-parent problems are lacking. Thus, we aimed to explore the associations between internalizing and externalizing problems of fathers and mothers and offspring-to-parent communication.

Offspring's psychological problems and parent-to-offspring communication

As mentioned above, ample research has shown that the quality of parent-offspring interactions is an important factor in child psychological development (e.g., Baumrind, 1991; Pinquart, 2017). Associations of child and adolescent psychological problems and parental rearing behaviors are known to have reciprocal effects (e.g. Oliver, 2015; Serbin, Kingdon, Ruttle, & Stack, 2015; Viding, Fontaine, Oliver, & Plomin, 2009; Wang & Kenny, 2014). That is, above the influence of parental behaviors on offspring's mental well-being, offspring's psychological problems might also elicit certain parenting behavior.

So, in addition to *parent* psychological problems, in this study we also focused on the associations of *offspring's* psychological problems with the quality of parent-offspring interactions. Previous research has shown that offspring's internalizing and externalizing problems are associated with observed increased negativity and decreased positivity during family communication. It was previously found that parents expressed more negativity (e.g. criticism) towards their offspring with ADHD as compared to their non-ADHD siblings (Cartwright et al., 2011). Adolescents' depressive symptoms were related to more negative parental

affective behaviors (Sheeber et al., 2009; Yap, Schwartz, Byrne, Simmons, & Allen, 2010) and less positive communication (Milan & Carlone, 2018). That is, in families with a depressed adolescent, anger was expressed more often by parents and adolescents as compared to families of an adolescent without depression (Bodner, Kuppens, Allen, Sheeber, & Ceulemans, 2018). Similarly, mothers of anxious children were more negative towards their children during the interactions than mothers from children without anxiety (Gar & Hudson, 2008; Hudson & Rapee, 2001). Although ample research has shown that parents' and offspring psychopathology are both associated with the quality of parent-offspring communication in children and adolescents (e.g. Wilson & Durbin, 2010; Yap et al., 2010), older or even adult offspring is relatively less investigated in this context. Therefore, we have investigated the concurrent associations between parent and offspring psychological problems and dyadic parent-offspring interactions in a sample of offspring aged 7.5-65.5 years and their fathers and mothers.

Offspring's psychological problems and offspring-to-parent communication

So far, psychological problems in relation to offspring's communication towards their parents (as opposed to parents' communication towards their offspring) have mainly been studied in adolescents (Dietz et al., 2008; Milan & Carlone, 2018; Nelson, Byrne, Sheeber, & Allen, 2017). It was found in girls that depressive symptoms and PTSD symptoms were concurrently associated with negative communication from adolescent towards their mother (Milan & Carlone, 2018). Also, depressed adolescents expressed fewer positive behaviors towards their parent during observed interactions as compared to their non-depressed peers (Dietz et al., 2008; Nelson et al., 2017). Yet, in adult offspring, the associations of psychological problems and offspring to parent communication remained rather unaddressed, even though the parent-offspring relationship continues to be important across the lifespan (van Wel, et al. 2000). As psychological problems of one family member may have an impact on their social interactions within the whole family (Brown & Prinstein, 2011), we aim to contribute to the existing literature by elucidating whether internalizing and externalizing problems from child, adolescent and adult offspring are associated with expressed warmth and negativity to their fathers and mothers.

Fathers and mothers

The importance of the parental role from both fathers and mothers in the child's development is widely acknowledged in the literature nowadays (Bakermans-Kranenburg, Lotz, Alyousefi-van Dijk, & IJzendoorn, 2019; Day & Padilla-Walker, 2009; Lamb & Lewis, 2013; Paquette, 2004). Yet, the majority of studies on the associations of psychological problems and parent-offspring communication focuses on mothers with their child and/or adolescent offspring (Gar & Hudson,

2008; Milan & Carlone, 2018), whereas research on associations between psychological problems and fathers' interactions with their offspring is relatively scarce. Results from our sample showed that within a family, the correlation between fathers' and mothers' communication style was 0.10, suggesting that mothers and fathers communicate differently with the same child (Buisman et al., 2021). Thus, investigating offspring interacting with both parents is of importance to elucidate the associations of psychological problems with parent-offspring communication in fathers and mothers. This will be pursued in the present study.

Current study

As part of the 3G Parenting Study, -a family study on the intergenerational transmission of parenting styles, stress and emotion regulation-, 94 fathers and 125 mothers and their offspring spanning a wide age range ($N_{offspring}$=224, 7.5-65.5 years) participated in the current study. We aimed to examine the relative associations of mothers'/fathers' and offspring's internalizing and externalizing problems (in the past 6 months) with parent-to-offspring and offspring-to-parent warmth and negativity. Measures of family communication were based on social interactions of fathers and mothers with (multiple) offspring as observed in the conflict Family Interaction Task ('Revealed Differences Task'; Strodtbeck, 1951). Only one study has been found that covers both psychological problems of parent and offspring simultaneously in the association with parent-to-offspring *and* offspring-to-parent communication (Milan & Carlone, 2018). Yet, no research covers internalizing *and* externalizing problems and the two directions of communication, parent-to-offspring and offspring-to-parent, in fathers *and* mothers in one study, which were all addressed in the current investigation. This research is further unique in that it tries to cover a wide age range. Thus, core research questions were:

(1) Are father's and offspring's internalizing and externalizing problems linked to father-to-offspring warmth and negativity and to offspring-to-father warmth and negativity?
(2) Are mother's and offspring's internalizing and externalizing problems linked to mother-to-offspring warmth and negativity and to offspring-to-mother warmth and negativity?

Given the scarcity of studies including fathers, we will explore the associations of father's and offspring internalizing and externalizing problems with father-to-offspring (FtO) and offspring-to-father (OtF) warmth and negativity during interactions. Thus, we do not formulate a hypothesis for any of the father-offspring interactions. Likewise, we do not have a hypothesis for the combination of mother's problems and OtM, given the exploratory nature of the topic. Based on the abovementioned literature (e.g., Cartwright et al., 2011; Chen & Johnston, 2007; Lovejoy et al., 2000; Milan & Carlone, 2018; Wilson & Durbin, 2010), it is expected that mothers' internalizing and externalizing problems are associated with less

warmth and more negativity in mother-to-offspring (MtO) communication. Similarly, we hypothesize that offspring internalizing and externalizing problems are related to less warmth and more negativity in offspring-to-mother (OtM) and in MtO communication.

Previous findings from the same sample as the current study showed that parents' history of abuse was associated with less expressed warmth and more expressed negativity in the interaction with their child (Buisman et al., 2019). Also, it is well-investigated that experienced childhood abuse is related to the development of psychological problems (Horwitz, Widom, McLaughlin, & White, 2001). To elucidate associations of psychological problems and parent-offspring interactions, over and above the effects of experienced childhood abuse, we included experienced abuse in our analyses as a covariate.

Method

Recruitment and procedure

The current study sample was part of the 3G Parenting Study on the intergenerational transmission of parenting styles, stress and emotion regulation (see also e.g. Buisman et al., 2019, 2020). Participants were recruited via the NESDA study (Penninx et al., 2008) and two other studies that included the assessment of caregiving experiences (Joosen, Mesman, Bakermans-Kranenburg, & van IJzendoorn, 2013; Scherpenzeel, 2011). From these studies, individuals who agreed to be contacted for participation in future studies, and who had at least one child of 7.5 years or older were invited. We included only participants who reported any maltreatment during childhood to increase the ability to detect intergenerational transmission of child maltreatment. Thus, participants with a history of childhood maltreatment were oversampled. A total of 395 individuals from 63 families gave consent and participated in the study. Data collection was conducted between March 2013 and May 2016. Nuclear families visited the laboratory at the Leiden University Medical Centre. Participants with offspring were invited to visit the laboratory twice—once with their family of origin (parents and siblings) and once with their partner and offspring. A laboratory visit took approximately seven hours and involved questionnaires, computer tasks, family interaction tasks, and collection of saliva and hair samples (e.g. Pittner et al., 2020). Informed consent was obtained from all participants. For underage children, both parents signed for consent. Ethical approval was obtained from the Medical Ethics Committee of the Leiden University Medical Centre (reference number: P11.134).

Sample

The current study therefore consisted of 224 offspring aged between 7.5–65.5 years (average age was 25.7; 58% was female), and their parents ($N_{mothers}$= 125, $N_{fathers}$ = 94) from 137 nuclear families. On average, mothers were 53.3 years (range:

29.4-88.4) and fathers were 52.2 years (range 26.6-82.3). Participants were families living the Netherlands and were mainly Caucasian (97%). In total, 25% held a college or university degree, 66% held an advanced secondary school or vocational school diploma, 7% had completed, or were still in elementary school or a short track of secondary school, and 2% of the participants did not report their education. Of all families, 135 offspring participated with two parents, 64 offspring participated with their mother only, and 25 offspring participated with their father only. Approximately half of the mothers (n = 74) and more than half of the fathers (n=54) completed the interaction task with two or more (up to seven) of their offspring, with one child at a time. Out of all participants (N=395), 57 persons (16%) participated both as parent and as offspring in the conflict family interaction task. Most families participated with two children (63.4%), 28.1% of the families participated with one child (5.4%), four families participated with three children and one family participated with seven children (3.1%). In total, 185 mother-offspring dyads and 140 father-offspring dyads completed the Family Interaction Task.

Measures

Dyadic Parent–Offspring interactions. The Family Interaction Task (FIT) in this study concerned a Revealed Difference Task in which dyads of one parent and one of their children were asked to discuss and try to reach consensus on a topic they disagreed on (Strodtbeck, 1951). Participants selected topics they had been arguing about most often during the past month from a list. They could also add a topic that was not listed. A research assistant selected the two topics that participants felt most strongly about, preferably topics that were reported by both parent and offspring. Mothers predominantly discussed family issues (e.g. amount of time spent together, 14%), child's behavior/behavioral rules (e.g. table manners and bed time, 14%), housekeeping (e.g. cleaning, 14%) and lifestyle (e.g. alcohol/drugs use, 13%) with their offspring. Fathers predominantly discussed child's behavior/behavioral rules (20.3%), followed by lifestyle (12%), housekeeping (10%), money-related issues (10%) and family issues (9%). A full overview of frequencies of the discussed topics during the FIT of mothers and fathers can be found in the online supplementary materials. The interactions were videotaped, and there were no other people in the room during the task. The videotaped dyadic parent-offspring interactions were coded by one or two of four coders with The Supportive Behavior Task Coding Manual, Version 1.1 (Allen et al., 2001; see also Buisman et al., 2019 for a more detailed description). Warmth and Negativity of fathers, mothers and offspring during the task were rated on a 9-point Likert-scale.

Warmth and negativity in communication. Warmth reflects the extent to which a person demonstrates warmth towards the other, that they care about the other, value, and genuinely like the other. This includes verbal expressions (e.g., verbally

empathizing) and non-verbal expressions (e.g. facial expressions, touching and body postures). The scale ranged from (1) no signs of warmth (i.e., 'You can't tell if the person likes or cares about the other') to (9) clear signs of warmth (i.e., 'The participants' overall behavior gives a warm feeling to the interaction'). Negativity captures the level and persistence of tension, hostility, dissension, or antagonism directed at the conversational partner. Examples of negativity are stonewalling, negative statements of the other, eye rolling, loud sighing, interrupting the other and negative teasing (sarcasm). Negativity was rated on a 9-point rating scale ranging from (1) demonstrations of negativity are absent to (9) the person is very negative (i.e. 'The negativity endures throughout the discussion and is disruptive to the interaction'). Interrater reliability between all pairs of observers was adequate to good, (intraclass correlations coefficients were between .71-.82 for Warmth and .66–.78 for Negativity, see also Buisman et al., 2021). Negativity scores from the FIT were highly skewed to the left, therefore we log-transformed scores and then multiplied by 10 to scale up the variance.

Internalizing and externalizing problems. Internalizing and externalizing problems were assessed with age group-specific questionnaires, assessing similar problems for all ages. The *Child Behavioral Checklist (CBCL), Youth Self Report (YSR)* and *Adult Self Report (ASR)* are part of the Achenbach System of Empirically Based Assessment (ASEBA) taxonomy and consist of items to assess adaptive functioning and problems (Achenbach, Dumenci, & Rescorla, 2001; Achenbach & Rescorla, 2005). The scales Withdrawn, Somatic Complaints, and Anxious/Depressed are combined into the internalizing dimension of psychopathology and the scales Aggressive and Rule-Breaking Behaviors constitute the externalizing dimension (Achenbach, 1991). Sum scores on internalizing and externalizing dimensions of each questionnaire were calculated.

Child Behavioral Checklist (CBCL). Fathers and mothers of children aged 7-11 years (N=46) rated their child's behavioral and emotional problems on 112 items using a three-point scale (0 = not true, 1 = somewhat true, 2 = very true). If both parents participated, means of mother and father report were calculated. Internal consistencies for internalizing (mother report α = .88, father report α = .87) and externalizing problems (mother report α = .86, father report α =.90) were excellent.

Youth Self Report (YSR). In the YSR, adolescents aged 12-17 years (N=43) rate 112 items on a three-point scale (0 = not true, 1 = somewhat true, 2 = very true). Cronbach's alpha in the current sample was .90, for internalizing and .82 for externalizing problems, indicating excellent internal consistency.

Adult Self Report (ASR). In the ASR, adults (≥ 18 years) rate 120 items on a three-point scale (0 = not true, 1 = somewhat true, 2 = very true). Cronbach's alpha of the ASR internalizing problems was .91 and was .84 for externalizing problems, indicating excellent internal consistency.

Z-values of the continuous sum scores per instrument were used in the analyses. Outliers in mother and offspring internalizing problems and offspring externalizing problems were winsorized, i.e., the difference between the two next highest values was added to the next highest value with standardized value < 3.29 to approach a normal distribution (Tabachnick, Fidell, & Ullman, 2007).

Covariates

Demographic information. Offspring's age and sex were included as covariates as well as household socioeconomic status (SES). To assess household SES, participants of 18 years and older were asked about household income and highest completed education. Yearly household income was measured on a 7-point scale ranging from (1) less than €15,000 to (7) more than €65,000. Most participants rated their level of education on a 7-point scale. Due to changes in the Dutch educational system, some offspring rated education on a 10-point scale. Both education scales were rescaled to a 4-point scale.

A composite household SES score was calculated by averaging the standardized household income and standardized completed educational level. If data of two partners living in the same household were available, their scores were averaged for the household SES score. Children living with their parents shared their parents' household SES score.

History of experienced childhood abuse (CA). To examine the effects of psychological problems over and above the effects of experienced childhood abuse (CA; Buisman et al., 2021, 2019), self-reported CA was included in our final model. Childhood maltreatment was measured using adapted versions of the self-reported Parent-Child Conflict Tactics Scales (CTS-PC; Straus, Hamby, Finkelhor, Moore, & Runyan, 1998) supplemented with items from the Childhood Trauma Questionnaire (CTQ; Bernstein & Fink, 1998). Fathers, mothers and offspring reported the extent to which they had a history of experienced emotional and physical abuse, and physical and emotional neglect before the age of 18 years. Offspring aged 12-18 years and living with their parents at the time of the study indicated whether they had experienced maltreatment within the last year and/or in the years before. Here, we used the overall abuse score, averaging the emotional and physical abuse scales. Participants reported separately on experienced abuse by their father and mother. Scale scores comprised the highest score for father or mother. The emotional abuse scale consisted of 5 items (e.g., "Shouted, yelled, or screamed at me"). The internal consistency of the emotional abuse scale was good (α_{mother} = .81, α_{father} = .74). The physical abuse scale consisted of 13 items, including corporal punishment (5 items, e.g., "Being spanked on the hand, arm or leg with a bare hand"), severe assault (4 items, e.g., "Being hit with a fist or kicked hard"), and very severe assault (4 items, e.g., "Being burned or scalded"). Internal consistency of the physical abuse scale was excellent (α_{mother} = .91, α_{father} = .91). All items were answered on a 5-point Likert scale

(1 ='never' to 5= 'almost always'). The emotional and physical abuse scales correlated r = .57; p < .001.

Analyses

Missing data. From the total number of fathers (N=94) and mothers (N=124) that were eligible for the FIT, data from 82 fathers and 115 mothers with in total 224 of their offspring was available. Some information from the FIT was missing due to technical problems (22 dyads) or because parents and offspring could not attend at the same day (10 dyads). Little's MCAR test showed that data were not missing completely at random (χ^2 = 239.01, df = 198, p=.025). Participating mothers were younger (t=2.07, df=122, p=.041) as compared to non-participating mothers and came from households with a lower SES (t=2.39, df=122, p=.018), but they did not differ on experienced CA, internalizing and externalizing problems. Participating fathers did not differ from non-participating fathers. Full information maximum likelihood (FIML) was used to estimate missing information on the outcome variables.

Descriptive analyses. As a first step, we described means and standard deviations of all study variables and compared group differences between fathers and mothers with an independent sample t-test. Correlations between study variables were assessed using robust Spearman correlations, since negativity scores from the FIT were highly skewed to the left, even after log-transformation. Next, we assessed resemblance of psychological problems and FIT measures among sibling offspring and among parent couples by calculating intraclass correlation coefficients (ICC; between-family variance/total family variance; Higgins & Keller, 1975; Shoukri & Ward, 1989). ICCs were computed within *LME4*-package version 1.1-21 (Bates, Mächler, Bolker, & Walker, 2014). ICC coefficients ≥0.3 indicate high family resemblance (Scherbaum & Ferreter, 2009), ICC coefficients <0.3 were considered 'moderate' and values <0.15 were considered 'low' (Bliese, 2000; James, 1982). In a previous study on the same sample, we found that, when warmth and negativity from fathers and mothers were aggregated to parent-to-offspring and offspring-to-parent communication, the resemblance of communication from one parent to offspring siblings was high (*ICC* =.41) and the resemblance of communication from offspring siblings to one parent was low (*ICC* =.08; Buisman et al., 2021).

Main analyses. Structural equation modeling (SEM) with the *Lavaan*-package version 0.6-3 (Rosseel, 2012) in R version 3.5.1 (R Core Team, 2018) was used to test the associations between psychological problems of father, mother and offspring and the observed warmth and negativity in FtO, OtF, MtO and OtM communication. Demographic variables of offspring's age, gender and household SES were included in the first model to control for confounding effects. Mother-offspring dyads and father-offspring dyads offspring did the task separately. So, despite interrelatedness of fathers and mothers from the same family, separate analyses

for fathers and mothers were carried out, due to already complex models. Moreover, analyzing fathers and mothers separately allows for insights into father-offspring interactions, where there is a dearth of knowledge as compared to mother-offspring interactions.

Experienced CA of parents and offspring were associated with negative communication from parents to offspring and offspring to parents in the current sample (Buisman et al., 2021, 2019) and given that experienced CA and psychological problems are known to correlate (Danese & Widom, 2020), we controlled in our main analyses for potential confounding effects of CA experiences of parents and offspring. All non-significant demographic control variables were removed from the analysis to keep the main models parsimonious.

For all models, estimates and standard errors of the individual paths in the model are described. A robust estimator (MLR) was used to estimate the model parameters as the negativity scores from the FIT were highly skewed (Rosseel, 2012). Given the nested family structure of the data, multilevel modeling (ML-SEM) would be the appropriate method to control for interrelatedness among family members. However, listwise deletion for cases with missing data is currently used for ML-SEM in the *lavaan*-package. To retain as much data as possible in order to contribute to the statistical power of our models we did not use ML-SEM. To control for dependency of FIT-observations within nuclear families, robust standard errors were calculated with the *lavaan.survey.fiml*-package and reported, see Buisman et al. (2019) for a similar approach. Assessment of fit will be based on the Comparative Fit Index (CFI) and the Root Mean Square Error of Approximation (RMSEA). Acceptable and excellent model fit is indicated by CFI values greater than .90 and .95, respectively, and by RMSEA values smaller than .10 and .06, respectively (Chen, 2007; Cheung & Rensvold, 2002). χ^2-statistics and Standardized Root Mean Square Residual (SRMR) are reported for descriptive purpose (Kline, 2010). *P*-values <.05 were considered statistically significant.

Table 1. Descriptive Characteristics

	Offspring	Mothers	Fathers	Mothers vs Fathers	
	M (SD)/ % (N)	*M (SD)*	*M (SD)*	*t*	*p*
Age *M(SD)*	25.65 (14.15)	52.87 (13.01)	53.18 (12.86)	-0.17	0.866
Female, % (N)	58 (130)				
Household SES *M (SD)*	.19 (.66)				
Experienced Childhood Abuse *M (SD)*	1.53 (0.46)	1.69 (.66)	1.66 (.49)	0.46	0.647
ASR internalizing *M (SD)*	53.31 (9.64)	54.39 (9.15)	51.45 (9.86)	2.17	0.031*
ASR externalizing *M(SD)*	45.12 (7.32)	42.96 (5.38)	44.45 (6.02)	-1.84	0.068
YSR internalizing *M (SD)*	40.26 (7.94)				
YSR externalizing *M (SD)*	38.49 (5.53)				
CBCL internalizing *M (SD)*	36.21 (4.73)				
CBCL externalizing *M (SD)*	39.78 (5.10				
Warmth to Child *M (SD)*		5.61 (1.81)	5.14 (1.76)	2.22	0.027*
Negativity to Child *M (SD)*		2.18 (1.57)	2.19 (1.48)	-0.02	0.987
Warmth from Child *M (SD)*		4.74 (1.88)	4.71 (1.71)	-0.11	0.916
Negativity from Child *M (SD)*		2.59 (1.98)	2.14 (1.73)	-2.21	0.028*

Note. * = Correlation is significant at the .05 level (2-tailed). ASR = Adult Self Report (ASR), YSR =Youth Self Report, CBCL = Child Behavioral Checklist

Results

Descriptive analyses

Sample characteristics. Descriptive characteristics of offspring, mothers and fathers can be found in Table 1. The mean levels of internalizing and externalizing problems were above the clinical cut off (t-score > 63; Achenbach et al., 2001) in all three groups (i.e., mothers, fathers and children). Mothers expressed higher levels of warmth as compared to fathers ($t(329)=2.22$, $p=0.027$) and offspring displayed higher levels of negativity to their mothers as compared to fathers ($t(329)=-2.21$, $p=0.028$).

Mothers reported more internalizing problems than fathers ($t(197)=2.17$, $p=0.031$). Parental age, externalizing symptom levels, experienced childhood abuse, levels of negativity to child and positivity to parent did not differ across fathers and mothers. Table 2 displays correlations between all study variables.

Family resemblance of psychological problems and FIT outcomes. ICCs revealed that there was moderate resemblance of internalizing problems (ICC=0.15) and high resemblance of externalizing problems (ICC=0.33) among sibling offspring. Furthermore, there was no sibling resemblance of OtM and OtF negativity (ICCs=0.00), indicating that brothers and sisters were not similar in levels of negativity in the communication towards the same parent. OtF and OtM warmth yielded ICCs of 0.14 and 0.40 respectively, meaning that siblings were moderately concordant in warmth towards their father and highly concordant in warmth towards their mother. Previous findings showed that resemblance of parent-to-offspring communications among offspring siblings was moderate (Buisman et al., 2021). Here, when looking separately at mothers' and fathers' warmth and negativity we found that mothers were highly concordant towards multiple offspring in their warmth and negativity (ICC MtO warmth=0.55; ICC MtO negativity=0.47). Similarly, fathers were also highly concordant in warmth (ICC FtO=0.33) and negativity (ICC FtO=0.46) towards their children. Resemblance of warmth and negativity towards offspring in parent couples was low (ICC warmth=0.13 and ICC negativity=0.08). Offspring, however, was highly concordant in warmth (ICC=0.38) and moderately concordant in negativity (ICC=0.27) towards their parents.

Table 2. Spearman correlations between study variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. Int Offspring (z-score)	1																			
2. Ext Offspring (z-score)	.508**	1																		
3. Int Father (z-score)	.207*	.106	1																	
4. Ext Father (z-score)	.153	.181*	.579**	1																
5. Int Mother (z-score)	.073	.061	.291**	.233**	1															
6. Ext Mother (z-score)	.097	.170*	.055	-.015	.522**	1														
7. FtO Warmth	-.147	-.190*	-.144	-.092	-.143	-.140	1													
8. OtF Warmth	-.007	-.177*	-.144	-.122	-.118	-.026	.748**	1												
9. MtO Warmth	-.080	-.121	-.014	.070	-.098	-.059	.132	.169	1											
10. OtM Warmth	-.145	-.216**	-.130	-.003	-.162*	-.105	.132	.260**	.716**	1										
11. OtF Negativity	-.004	.232**	.106	.152	0.026	-.098	-.236**	-.352**	-.245**	-.287**	1									
12. FtO Negativity	.014	.197*	.214*	.241**	.050	.008	-.465**	-.393**	-.206*	-.216*	.649**	1								
13. MtO Negativity	-.076	.080	-.082	-.114	.089	.141	-.001	-.007	-.505**	-.425**	.124	.142	1							
14. OtM Negtivity	.174*	.191*	.000	.012	.110	.094	.023	-.115	-.359**	-.572**	.298**	.220*	.573**	1						
15. Offspring *N* Female (%)	.107	-.130	-.096	-.140	-.046	-.030	.084	.143	.198**	.252**	.056	-.089	-.161*	-.077	1					
16. HHSES	-.125	-.146*	.007	-.052	-.088	-.064	.047	.097	.037	.139	.075	-.119	-.053	-.090	.068	1				
17. Child Age (years)	-.013	-.082	.113	-.005	.136	.040	-.094	-.060	-.131	.072	-.097	-.299**	-.164*	-.138	.110	.091	1			
18. Exp CA child	.280**	.327**	.180*	.164*	.263**	.208**	-.280**	-.239**	-.138	-.182*	.142	.142	.116	.209**	-.013	-.057	.124	1		
19. Exp CA Father	.126	.190*	.348**	.160*	.161	.080	-.174*	-.138	-.025	-.160	.210*	.275**	-.117	-.047	-.009	-.020	.136	.134	1	
20. Exp CA Mother	.040	.078	.092	-.017	.324**	.415**	-.242**	-.232**	.018	-.017	-.048	-.110	.060	.051	.055	-.098	.178*	.336**	-.010	1

Note. **=Correlation is significant at the .01 level (2-tailed), * = Correlation is significant at the .05 level (2-tailed). Int = Internalizing problems, Ext = Externalizing problems, FtO=Father-to-Offspring, OtF = Offspring-to-Father, MtO=Mother-to-Offspring, OtM =Offspring-to-Mother, HHSES= household SES, Exp CA= Experienced Childhood Abuse. [a] 0=Male, 1=Female

Main analyses

Internalizing and externalizing problems and father-offspring interactions. First, we tested the hypothesized structural model of father and offspring internalizing and externalizing problems and father-offspring communication during the FIT (both FtO and OtF) controlled for household SES, offspring's age and offspring's sex. This model exhibited an acceptable fit, indicating it described the data sufficiently (χ^2=18.02, df=12 p=.115, CFI=.984, RMSEA=0.047, SRMR=0.029). Of all associationsbetween the covariates and FIT outcomes, household SES and age were significantly associated with FtO negativity: Fathers from families characterized by higher SES displayed more negativity toward their offspring (β=0.12, *adj SE*=0.07, p=0.001) and fathers from older offspring displayed less negativity (β= -0.14, *adj SE*=0.01, p=0.001). Older offspring displayed less negativity towards their father (β= -0.23, *adj SE*=0.02, p<0.001). Other covariates were not associated to any of the FIT-outcomes in the model (all p-value*s* >.06). All model and parameter estimates can be found in the supplementary materials.

In our main father-offspring model, experienced CA of father and offspring were included in the model. In the father-offspring model including experienced CA, household SES and offspring's age were non-significant and were therefore removed due to the already complex model (χ^2=6.94, df=8, p=.543, CFI=1.00, RMSEA=0.000, SRMR=0.030). The model showed that offspring's internalizing problems (β =-0.20, *adj SE* = 0.10, p= 0.027) were related to less OtF negativity, whereas offspring's externalizing problems were related to more OtF negativity (β =0.25, *adj SE*= 0.13, p=0.012). Father's externalizing problems (β =0.17, *adj SE*= 0.06, p=0.049) and father's experienced CA *(*β=0.17, *adj SE*=0.07, p=0.004) were associated with elevated FtO negativity. Father's experienced CA *(*β =-0.15, *adj SE*=0.04, p=0.005) was also associated with less FtO warmth. Results from this model are displayed in Table 3 and Figure 1.

Table 3. Internalizing and externalizing problems and fathers-offspring interactions

	Father to Offspring Warmth			Father to Offspring Negativity			Offspring to Father Warmth			Offspring to Father Negativity		
	Beta	*adj SE*	*p*	*Beta*	*adj SE*	*p*	*Beta*	*adj SE*	*p*	*Beta*	*adj SE*	*p*
Intercept	2.93	0.03	<.001***	1.51	0.04	<.001***	2.75	0.03	<.001***	1.25	0.05	<.001***
Internalzing problems father	-0.09	0.03	0.347	-0.03	0.05	0.773	-0.07	0.04	0.489	0.01	0.05	0.845
Externalizing problems father	0.04	0.04	0.677	0.17	0.06	0.049*	0.01	0.04	0.939	0.09	0.06	0.264
Internalizing problems offspring	0.01	0.04	0.886	-0.13	0.07	0.384	0.11	0.07	0.972	-0.20	0.10	0.027*
Externalizing problems offspring	-0.09	0.06	0.310	0.16	0.10	0.066	-0.16	0.07	0.115	0.25	0.130	0.012*
Experienced CA father	-0.15	0.04	0.005**	0.17	0.07	0.005**						
Experienced CA offspring							0.05	0.08	0.384	0.08	0.15	0.154

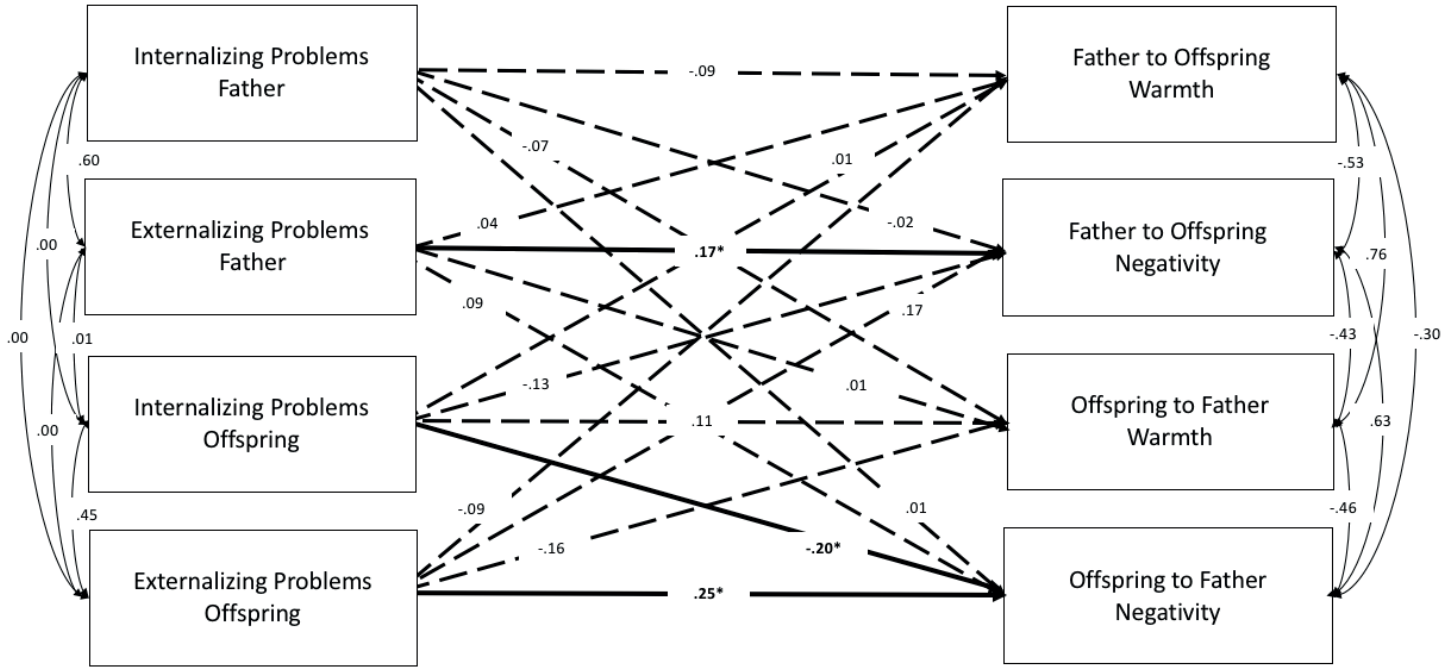
Note. ***=Correlation is significant at the .001 level (2-tailed), **=Correlation is significant at the .01 level (2-tailed), * = Correlation is significant at the .05 level (2-tailed). SE = Standard Error, Experienced CA= Experienced Childhood Abuse.

Table 4. Internalizing and externalizing problems and mothers-offspring interactions

	Mother to Offspring Warmth			Mother to Offspring Negativity			Offspring to Mother Warmth			Offspring to Mother Negativity		
	Beta	*adj SE*	*p*	*Beta*	*adj SE*	*p*	*Beta*	*adj SE*	*p*	*Beta*	*adj SE*	*p*
Intercept	3.11	0.02	<.001***	1.4	0.04	<.001***	2.53	0.03	<.001***	1.30	0.04	<.001***
Internalzing problems mother	-0.11	0.04	0.294	-0.02	0.08	0.883	-0.15	0.05	0.162	0.15	0.07	0.111
Externalizing problems mother	0.04	0.04	0.665	0.10	0.07	0.306	-0.02	0.05	0.866	-0.01	0.07	0.955
Internalizing problems offspring	-0.02	0.03	0.620	0.03	0.06	0.643	-0.10	0.05	0.154	0.05	0.10	0.523
Externalizing problems offspring	-0.10	0.03	0.042*	0.09	0.08	0.203	-0.06	0.05	0.337	0.07	0.09	0.294
Age offspring							0.09	0.06	0.001**	-0.17	0.26	0.019*
Experienced CA mother	-0.09	0.03	0.120	0.10	0.070	0.174						
Experienced CA offspring							0.04	0.08	0.469	-0.01	0.22	0.958

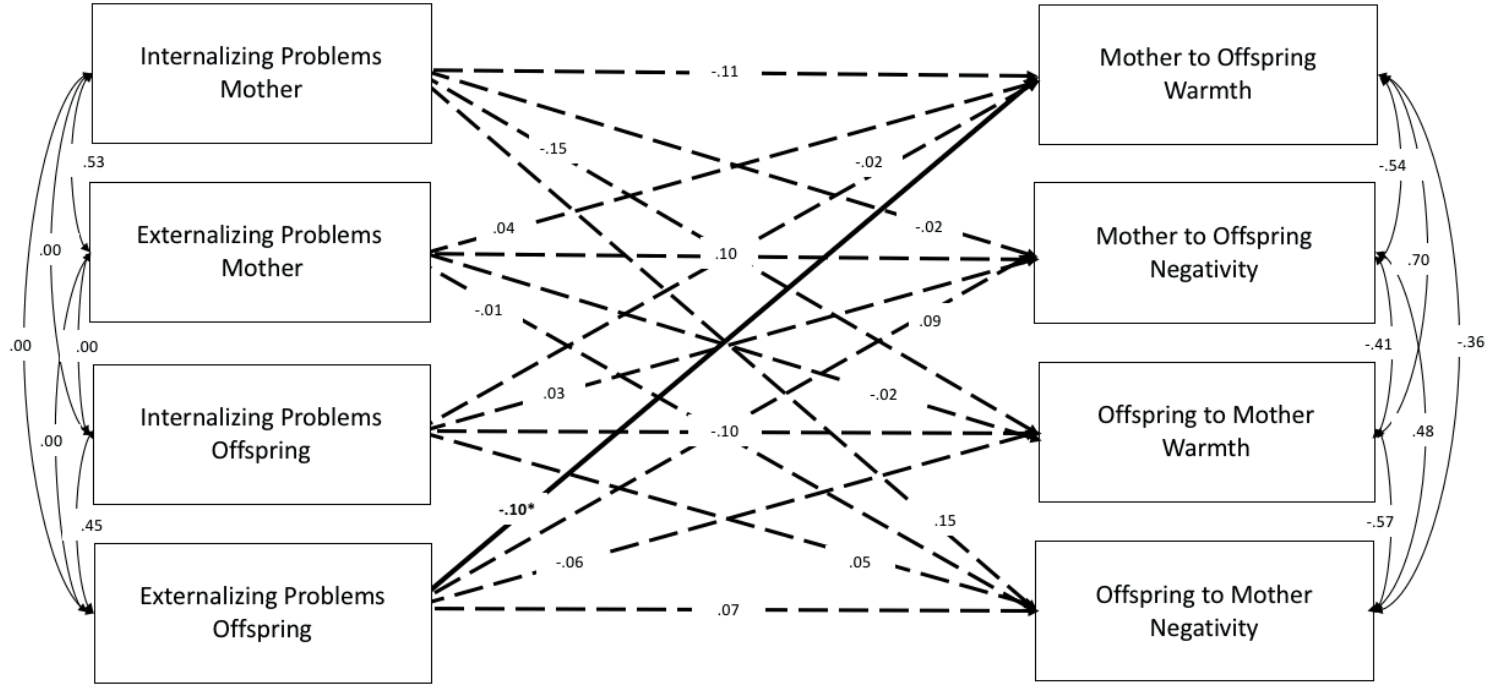
Note. ***=Correlation is significant at the .001 level (2-tailed), **=Correlation is significant at the .01 level (2-tailed), * = Correlation is significant at the .05 level (2-tailed). SE = Standard Error, Experienced CA= Experienced Childhood Abuse.

Figure 1. Associations father-model: Father-to-offspring (FtO) and Offspring-to-Father (OtF) warmth and negativity



Note. This model was controlled for father and offspring experienced childhood abuse. Double-ended arrows = estimated covariance, solid single-ended arrows = significant associations (p<.05), dotted single-ended arrows = nonsignificant associations.

Figure 2. Associations mother model: Mother-to-offspring (MtO) and Offspring-to-Mother (OtM) warmth and negativity



Note. This model was controlled for mother and offspring experienced childhood abuse and offspring's age. Double-ended arrows = estimated covariance, solid single-ended arrows = significant associations (p<.05), dotted single-ended arrows = nonsignificant associations.

Internalizing and externalizing problems and mother-offspring interactions. Similar to father-offspring models, we first tested sted the hypothesized structural model of mother and offspring internalizing and externalizing problems and mother-offspring communication (both MtO and OtM) controlled for household SES, offspring's age and offspring's sex. The model exhibited an adequate fit (χ^2=17.32, df=12, p=.138, CFI=0.99, RMSEA=0.044, SRMR=0.026). Of all relations between the covariates and FIT outcomes, offspring's age was positively associated with expressed warmth (β=0.12, *adj SE*=0.11, p=0.022) and inversely related with negativity (β=-0.17, *adj SE*=0.29, p=0.029). That is, older offspring displayed more warmth and less negativity towards their mother. None of the other covariates included in the model were significant (all p-values >.09). All model and parameter statistics can be found in the supplementary materials.

In the main mother-offspring model, in which experienced CA scores were taken into account (all non-significant demographic covariates were removed; χ^2=11.70, df=14, p=.631, CFI=1.00, RMSEA=0.000, SRMR=0.026) offspring's externalizing problems were associated with less MtO warmth (β=-0.10, *adj SE*=0.03, p=0.042), see Figure 2. All other links of psychological problems and experienced CA with mother-offspring communication were non-significant (all p-values >0.15), see Table 4.

In post-hoc sensitivity analyses (see supplementary materials), we tested whether the associations differed across age groups for fathers and mothers (offspring's age <= 18 years versus > 18 years), which was not the case.

Discussion

In the current study we have examined the associations between fathers', mothers' and offspring internalizing and externalizing problems (in the last six months) and their expressed warmth and negativity during dyadic parent-offspring interactions. We found that offspring's internalizing problems related to *less negativity* towards their father, whereas offspring's externalizing problems were related to *more negativity* towards their father and receiving *less warmth* from their mother. Externalizing problems from father were associated with *more negativity* expressed towards their offspring. In contrast to our expectations, mother's externalizing and internalizing problems were not associated with expressed warmth and negativity towards her offspring.

Externalizing problems and increased negativity during father-offspring interactions

Our main finding was that paternal externalizing problems relate to increased expressed negativity to his child and offspring's externalizing problems relate to increased negativity to their father, above and beyond the significant effect of

father's experienced abuse. Fathers' expressed negativity during communication, such as hostility and (verbal) aggression, might set an example for their child and reinforces and normalizes aversive and externalizing behaviors of the child and, in turn, increases offspring's negativity during communications towards their father. This transactional process could be indicative of the intergenerational transmission of psychological problems (Harold et al., 2011; Lewis, Rice, Harold, Collishaw, & Thapar, 2011). Within the framework of the Social Development Model (SDM; Catalano & Hawkins, 1996; Hawkins & Weis, 1985) externalizing problems can be understood as socially learned behaviors. Behavioral researchers have postulated that offspring learn and mirror their externalizing behaviors from their parents, but also that genetic factors contribute to the development of externalizing problems (Catalano & Hawkins, 1996; Hawkins & Weis, 1985; Plomin, DeFries, Knopik, & Neiderhiser, 2016). Our study adds to the literature (e.g. Bailey, Hill, Oesterle, & Hawkins, 2009; Thornberry, Freeman-Gallant, Lizotte, Krohn, & Smith, 2003) by elucidating the link between offspring's externalizing problems and increased expressed negativity towards their father, in addition to the association of fathers' externalizing problems and negative parenting behaviors. Parental communication towards the child plays a role in intergenerational transmission of externalizing problems from parents to offspring (Bailey, Hill, Oesterle, & Hawkins, 2009; Verona & Sachs-Ericsson (2005). Longitudinal studies with a prospective design including twins and their parents could verify the mechanism underlying the transactional processes and potential intergenerational transmission of externalizing problems.

The association of externalizing problems and increased expressed negativity has been found here for fathers, but not for mothers. This aligns with earlier findings on the transmission of antisocial/externalizing behavior specifically from fathers to offspring with parenting as an explaining factor (Thornberry et al., 2003). Discrepancy between fathers' and mothers' intergenerational continuity of externalizing behaviors was attributed to differences in prevalence and severity of externalizing problems between males and females, with males showing more externalizing problems than females (Moffitt & Caspi, 2001; Rutter, Caspi, & Moffitt, 2003). In our study, however, mothers and fathers did not differ in their mean levels of externalizing problems. An alternative explanation for the differences in findings between fathers and mothers could be that fathers' externalizing problems result in more overt behaviors, such as expressing their hostility and (verbal) aggression, i.e., more negativity, compared to mothers' externalizing behaviors. Consequently, these negative expressions can be observed in the interaction with their child. Mothers' externalizing problems might be more covert and for example entail 'not following the rules', 'lack of feeling guilty after doing something wrong' or 'sudden change in mood/feelings' (Achenbach & Dumenci, 2003), which can be less easily observed in terms of negativity in the interaction with their child.

Externalizing problems and reduced maternal warmth during parent-offspring interactions

Offspring's externalizing problems were related to less warmth from mothers. No associations of externalizing problems and negativity during the mother-offspring interactions were found. This is in line with findings from a (longitudinal) study on mother-adolescent dyads: Problem behavior of the child was related to reduced levels of positive parenting practices of mothers, but not to an increase of negative parenting practices (Serbin et al., 2015). Offspring's externalizing behaviors might provoke annoyance and dissatisfaction in one's interaction partner, which in turn could result in receiving less warmth and patience during communication (Rothenberg et al., 2020; Williams & Steinberg, 2011). Externalizing behaviors of a child and reduced positive parenting are known to have a reciprocal relationship and amplifying each other over time (Serbin et al., 2015). This self-perpetuating process is also referred to as the 'coercive' or 'vicious cycle' (Sameroff & Mackenzie, 2003). However, it could also be argued that offspring with externalizing problems might need more restrictive parenting, including setting clear boundaries and rules, which might come with a more directive communication style during the mother-offspring interactions and could have been rated as less warm. It should be noted though that it is not clear yet whether reduced maternal warmth (and increased boundary setting) is beneficial in terms of reducing offspring's externalizing problems in the long term or whether these problems aggravate over time.

To break the vicious cycle, (early) treatment of offspring's externalizing problems is recommended. Moreover, it was previously shown that children from mothers who demonstrated significantly more positive parenting behaviors have fewer externalizing problems (Boeldt et al., 2012; Eisenberg et al., 2005). Therefore, families might benefit from interventions to improve the parent-offspring dynamics (Bailey & Grenyer, 2014). One example of an evidence-based intervention to promote positive parenting is the VIPP-SD training, which has shown to be effective in promoting positive parenting and reducing externalizing problems of the child (Juffer, Bakermans-Kranenburg, & van IJzendoorn, 2017).

Lack of associations between parental psychological problems and parent-offspring interactions

In the present study, parents' psychological problems were unrelated to offspring's expressed warmth and negativity during the interactions when offspring's psychological problems were taken into account. Our results contrast the previous finding that maternal PTSD resulted in an increase of expressed warmth of daughters (Milan & Carlone, 2018). Remarkably, also no associations of maternal and paternal internalizing problems nor maternal externalizing problems and their own expressions of warmth and negativity were found. This was somewhat in

contrast with previous literature (Browne et al., 2016; Dietz et al., 2008; 2011; Chen & Johnston et al., 2007; Milan & Carlone, 2018), which shows that mothers' depressive symptoms and maternal inattention and impulsivity were linked to increased negativity and less positivity in communication. Our study differed from earlier research on some methodological aspects: First, we investigated the full-spectrum of internalizing (i.e. depressive, anxious and somatic complaints) and externalizing problems (i.e. intrusive, aggressive and rule-breaking behaviors) in association to expressed warmth and negativity, while earlier studies focused on specific parental mental conditions or behaviors, e.g. depression (Lovejoy et al., 2000; Wilson & Durbin, 2010). Secondly, prior work on the effects of parental psychological problems on parenting practices, focused on self-reports of their parenting behaviors in contrast to our observational design (e.g. Chen. & Johnson, 2007). This might contribute to stronger associations between these variables as a person's problems might color their view on the family communication (negativity bias; Platt, Waters, Schulte-Koerne, Engelmann, & Salemink, 2017). Thirdly, even though our results did not give any indication of multicollinearity, internalizing *and* externalizing problems were significantly correlated (r=.52-.58). These three aspects might partly explain the lack of associations between parental problems and their expressed warmth and negativity in our study. Moreover, the low to moderate factor loadings and low percentage of explained variance in our analytical models could indicate that other factors, such as the content of the conversation, parental personality traits or temperament, may contribute additionally to the levels of expressed warmth and negativity within families.

Psychological problems and the role of CA and parent-offspring interactions

In the present 3G Parenting Study sample, parents' experienced childhood abuse (CA) is related to poorer parent-to-offspring communication (Buisman et al., 2019). In the current study, we therefore controlled our analyses for self-reported CA experiences. The findings from our main model indicate that mothers' and offspring's self-reported CA were not significantly associated with mother-offspring communication, nor was offspring's self-reported CA associated with offspring-to-father communication. However, the significant bivariate correlations between predictors (i.e., self-reported experienced CA and increased psychological problems) (r=.18-.31), as found in the present study, might indicate that CA has a *reciprocal suppressing effect* (Lancaster, 1999). Because of the correlations between self-reported CA and internalizing and externalizing problems, adding self-reported CA to the model increased the strength of the association between psychological problems and parent-offspring communication. Another way of understanding this phenomenon is in terms of mediation. A history of abuse is related to an increased risk of internalizing and externalizing psychological problems (Danese & Widom, 2020; Horwitz et al., 2001). As such, psychological problems,

specifically externalizing problems, could mediate the association between experienced abuse on the one hand and less expressed warmth and more expressed negativity in parent-offspring interactions on the other hand. Future studies with prospective designs could shed light on the potential mediating effects of psychological problems in the relation between parents' and offspring's CA and parent-offspring interactions and whether effects differ across father-offspring and mother-offspring interactions.

Strengths, limitations and future studies

One strength of this study is the observational design including mothers and fathers with - when available - multiple of their offspring. Observational techniques to assess parent-offspring interactions have the advantage to rule out self-report bias, e.g. influences of participants' mood, expectancies and social desirability tendencies (Feinberg, Neiderhiser, Howe, & Hetherington, 2001; Smith, 2011). Also, observations allow the rater to mark and rate subtle affective and behavioral aspects of parenting behavior that are presumably not captured by self-reports based on questionnaire measures, such as mother's emotional flexibility or responsiveness (Kluczniok et al., 2016; van Dijk et al., 2017). Secondly, investigating parents' and offspring psychological problems concurrently – instead of testing parent problems and offspring problems in isolation – enabled us to draw conclusions on the effects of offspring problems in the context of parental problems, and vice versa. Thirdly, including offspring-to-parent communication in addition to parent-to-offspring communication in our analyses provides a more representative image of the complex and interdependent family interactions. Lastly, the sample including child, adolescent *and* adult offspring of all ages allowed us to draw conclusions on the associations of psychological problems and family communication across the lifespan: Associations of psychological problems and family communication were independent of offspring's age.

The findings of this study should also be interpreted in the context of some limitations. First, because of the cross-sectional study design no firm statement on the direction of effects can be made. Here, participants reported retrospectively on their internalizing and externalizing problems during the past six months, prior to the interaction task. Therefore, negativity in family communication was 'predicted' by father and offspring externalizing problems in our models. It should be noted that associations of psychological problems and parent-offspring interactions might be bidirectional (e.g. Serbin et al., 2015). Future studies with a prospective (intervention) design could elucidate this. Moreover, in longitudinal studies we can test whether negative family communication acts as a mediating or moderating factor in the relation between parent and offspring psychopathologies (Elgar, Mills, McGrath, Waschbusch, & Brownridge, 2007; Steele & McKinney, 2019). Second, expressed negativity was highly skewed to the left in our study, which means that parents did

not display much negativity towards their children, although participants with a history of childhood maltreatment were oversampled. The skewness could be due to the observational setting, in which participants might behave in a more socially desirable way and express less negativity. Although observations of parent-offspring interactions reflect natural behavior relatively well (Gardner, 2000), we acknowledge that family communication might be different in a natural setting, such as in the home environment when family members are not being observed. Third, the quality of communication (warmth and negativity) were coded separately and independently for each person in the interaction. Each person received two scores based on the level of warmth and negativity he/she showed towards their interaction partner. In addition, a more dynamic and transactional approach, such as the Space Grids method, may capture systemic interactions at a microlevel. For example, elucidate the extent to which a person is flexible (vs. rigid) in their behavior in reaction to actions of their partner. (Hollenstein, 2007; Meinecke, Hemshorn de Sanchez, Lehmann-Willenbrock, & Buengeler, 2019). Fourth, 56 persons (15%) participated as both a parent and a child which causes some dependency in the data. We aimed to obviate this by using the robust estimator. Lastly, it should be noted that that study sample mainly consists of families who identify racially as 'white' and reported elevated mental health symptoms, which might limit the generalizability of our findings across populations (e.g., across different cultural backgrounds).

Conclusion and implications

In this study, we have shown that offspring externalizing problems were related to receiving *less* warmth from their mother and expressing *more* negativity towards their father, while offspring's internalizing problems were related to *less* expressed negativity towards their father. Father's (but not mother's) externalizing problems were associated with negativity expressed to their child. These findings contribute to the existing literature by demonstrating these associations, separately for mother-offspring and father-offspring dyads, across a wide age range (offspring's age 7.5-65.5 years). It should be noted that fathers', mothers' and offspring's mean levels of internalizing and externalizing problems in our sample were above the clinical cut off (T-scores between 79-83; Achenbach and Rescorla 2003), suggesting that our sample includes (clinically) vulnerable families. We highlight the importance of focusing on both mothers and fathers in understanding the associations between psychological problems and parent-offspring interactions in future research. Until now, most research on parent-offspring interactions is related children being under 18. The results from the present study show continued effects into adulthood.

Our findings support that psychological conditions of one family member have an impact on their social interactions within the family (Brown & Prinstein, 2011). As such we promote early treatment of psychological problems of one family member, which might have a positive effect on the dyadic parent-offspring interactions. As a consequence, and in line with the family systems theory (Bowen, 1966), the family might benefit as a whole. Also, supporting families to improve their interpersonal relationships and family communication by offering them educational programs, such as Curious Minds, VIPP-SD or Triple P - Positive Parenting Program, has been shown effective, especially in families where child's externalizing problems are at play (Juffer & Bakermans-Kranenburg, 2008; Juffer, Bakermans-Kranenburg, & van IJzendoorn, 2017; Sanders, Markie-Dadds, psychology, & 2000; Spruijt, Dekker, Ziermans, & Swaab, 2020). To that end, we promote early intervention and a systemic approach – including mothers, fathers and offspring – in clinical and future research when targeting within-family communication and mental health.

Funding. This study was supported by the Leiden University Research Profile '*Health, prevention and the human life cycle'* and by The Netherlands Organisation for Scientific Research (NWO) with two VICI-grants (B.M.E., no. 45314001; M.J.B.-K. no. 45309003) and a VIDI-grant (L.A. no. 016.145.360).

Authorship. L.A., M.B.-K., B.E. and M.T. initiated and developed the study concept and contributed to the study design. Testing, data collection and data cleaning were performed by R.B., K.P. and L.v.d.B. R.B. coded the observed behavioral data. Data analysis and interpretation were performed by M.K. under the supervision of C.v.S, B.E. and R.B. The manuscript was drafted by M.K. All authors provided critical revisions and approved the final version of the paper for submission.

Conflict of interest. All authors declare that they have no conflicts of interest.

Acknowledgments. We are grateful to all the families that have invested their time by participating in this study and to everyone who contributed to the data collection. We thank Marinus van IJzendoorn for his substantial contribution to the study and his financial support. We also would like to thank Marjolein Fokkema for her advice with regard to the method of handling missing data and controlling for family structure in the structural equation models.

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GROWING UP TOGETHER

6

Harsh parental discipline and offspring emotional and behavioural problems: Comparing findings from the random-intercept cross-lagged panel model with the monozygotic twin difference cross-lagged panel model

Under review: Kullberg, M. L., van Schie, C., Allegrini, A., Ahmadzadeh, Y. I., Wechsler, D., Elzinga, B., & McAdams, T. (2021). Harsh parental discipline and offspring emotional and behavioural problems: Comparing findings from the random- intercept cross-lagged panel model with the monozygotic twin difference cross- intercept cross-lagged panel model with the monozygotic twin difference cross- lagged panel model.

Abstract

Objective. This study examines associations between parental harsh discipline and child emotional and behavioural problems in identical twins aged 9, 12 and 16. We compare results obtained when applying the monozygotic twin difference version of the cross-lagged panel model (MZD-CLPM) and a random intercept cross-lagged panel model (RI-CLPM) to the same data with the goal to illustrate similarities and differences in findings and the conclusions that can be drawn using each method.

Method. Child reports of 5,698 identical twins from the Twins Early Development Study (TEDS) were analysed. We ran a regular CLPM to anchor are finding in the current literature. Next, we applied the MZD-CLPM and the RI-CLPM to the data.

Results. Given the study aim to infer causation, interpretation of models focussed primarily on the magnitude and significance of cross-lagged associations. In both the MZD-CLPM and the RI-CLPM behavioural problems at age 9 resulted in harsher parental discipline at age 12. Other effects were not consistently significant across the 2 models, although the majority of estimates pointed in the same direction.

Conclusion. Findings can be interpreted as corroborating (but not definite) evidence in favour of a causal effect of child behavioural problems at age 9 on experienced harsh parental discipline at age 12. Yet, in light of the triangulated methods, differences in the results between causal inference methods underline the importance of careful consideration of what sources of unmeasured confounding different models control for and that nuance is required when interpreting findings using such models. We provide an overview of what the CLPM, RI-CLPM and MZD-CLPM can and cannot control for in this respect and which conclusions can be drawn from each model.

Keywords: child, parental discipline, causal inference, emotional problems, behavioural problems

Background

Extensive research has shown that harsh parental discipline, including physical and verbal punishment and parenting strategies involving unclear and inconsistent communication with the child, is associated with the development of emotional and behavioural problems in children (see e.g. Baumrind, 1991; Crosnoe & Cavanagh, 2010; Fletcher, Steinberg, & Williams-Wheeler, 2004). Equally, some studies have also demonstrated reversed effects. That is, child emotional and behavioural problems might elicit certain parenting practices (Pinquart, 2017b, 2017a). Understanding the nature and direction of associations between parenting behaviour and child problems is likely to prove important for prevention and intervention strategiesto support families in fostering child mental well-being. In order to understand the direction of associations between harsh parental discipline and emotional and behavioural problems, researchers have used longitudinal data. The direction of effects between parenting and child emotional and behavioural problems have been mainly tested using the cross-lagged panel model (CLPM; Hipwell et al., 2008; Lansford et al., 2011; Serbin, Kingdon, Ruttle, & Stack, 2015; Wang & Kenny, 2014). The CLPM estimates the effect of a predictor on an outcome while controlling for prior differences in the outcome. As such the CLPM can help to determine whether one variable predicts the other and/or vice versa. In these models, longitudinal influences of a variable on the other over time are referred to as cross-lagged effects. Nevertheless, CLPMs have several shortcomings when it comes to determining the direction of effects between associated variables (Hamaker, Kuiper, & Grasman, 2015). For example, CLPMs do not distinguish within-person changes from between-person differences across repeated measures in the trait-like, time-invariant stability of many psychological constructs. As such, it is not possible to draw any conclusions on within-person changes using CLPMs. This is a limitation given that developmental researchers are often most interested in processes within a person. Also, CLPMs cannot account for unmeasured sources of confounding, and this may distort estimates of cross-lagged effects.

Two commonly used alternatives to the CLPM that are designed to strengthen the capacity for causal inference are the monozygotic twin difference CLPM (MZD-CLPM; Moscati, Verhulst, McKee, Silberg, & Eaves, 2018; Ritchie, Bates, & Plomin, 2015) and the random intercept CLPM (RI-CLPM; Hamaker et al., 2015). The MZD-CLPM and RI-CLPM account for stable between-subject differences across development and have each been designed with the intention of controlling for potential sources of unobserved confounding. However, these models differ conceptually and in their underlying assumptions, and thus, conclusions that can be drawn from these methods differ as well. An overview of features from each model can be found in Table 1.

MZ twin difference method

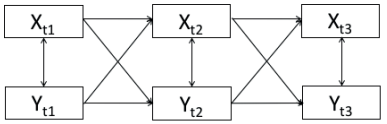
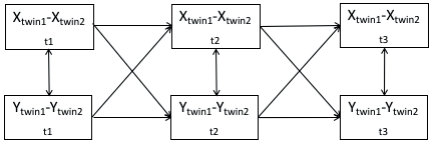
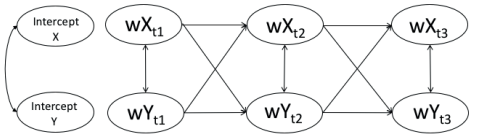
MZ twins who grow up together share 100% of their genes and many aspects of their rearing environment. As such, when twins differ on an exposure of interest, they can each act as an almost-perfect matched control for the other (McAdams, Rijsdijk, Zavos, & Pingault, 2021; Pingault et al., 2018). In the MZ twin difference method, difference scores between twins in a pair are calculated for each variable of interest (e.g. differences between twins' perceived parental discipline; and emotional and behavioural problems). These difference scores can then be used as predictors of one another (e.g. we can test whether twin differences in exposure to harsh parental discipline predict twin differences in behavioural problems). Longitudinal studies of MZ twins have demonstrated that negative parenting experiences are associated with increased child behavioural problems over time, even after accounting for potential genetic and shared environmental confounds (Burt, McGue, Iacono, & Krueger, 2006; Cecil, Barker, Jaffee, & Viding, 2012; Larsson, Viding, Rijsdijk, & Plomin, 2008; Lynch et al., 2006; Oliver, 2015; Viding, Fontaine, Oliver, & Plomin, 2009).

Twin differences in one variable prospectively predicting differences in another (e.g. as in an MZD-CLPM), indicates that any population-level prediction is not attributable to genetic confounding or environmental confounding shared by MZ twins. A limitation of the MZ twin difference method is that environmental influences not-shared between twins (ie. 'unique' or 'child-specific' environmental effects) are not accounted for and can still serve to confound associations.

The random intercept CLPM (RI-CLPM)

The MZ twin difference method can only be used on MZ twin data and so questions remain about the generalisability of results to non-twin populations. Another approach to strengthening researchers' ability to draw causal inferences that can be applied to non-twin data is the random intercept CLPM (RI-CLPM; see Table 1 for details). The random intercepts in this model accounts for stable between-person differences in each variable, thus capturing the effects of any unobserved confounding that is stable across time (Rohrer & Murayama, 2021; Usami, Murayama, & Hamaker, 2019). The residual within-person variance on each variable (which indicates variation around a person's mean) is used to evaluate whether an increase or reduction of one variable predicts an increase or reduction in another variable within-person. Cross-lagged relationships between the residual within-person variances of each variable therefore indexes within-person effects after controlling for sources of between-person variance (Hamaker et al., 2015). Controlling for stable (time-invariant) between-person differences, therefore strengthens the ability to draw causal inference from significant cross-lags in the RI-CLPM.

Table 1. Overview of model features of three CLPM models to test direction of effects in longitudinal data

	CLPM	MZD-CLPM	RI-CLPM
Model type	Cross-lagged panel model	MZ twin difference cross-lagged panel model	Random intercept cross-lagged panel model
Illustration of the model			
Model features	Cross-lagged paths are intended to inform on direction of effects between variables over time. Cross-lagged effects indicate to what extent e.g. trait X_t prospectively predicts trait Y_{t+1} controlling for autoregressive prediction from Y_t, and vice versa.	Cross-lagged paths are intended to inform on direction of effects between variables over time. Accounts for genetic and environmental effects shared by monozygotic twins by modeling relationships between twin differences in traits X and Y. Cross-lagged effects indicate to what extent within-twin pair differences in X_t prospectively predict the same in Y_{t+1}, controlling for prior differences in Y_t, and vice versa. Differences between twins can be attributed to environmental influences unique to each twin.	Cross-lagged paths are intended to inform on direction of effects between variables over time. Accounts for stable between-subject differences across development by inclusion of random intercepts. Separation of between- subject (time-invariant) and within-subject (time-variant) variation. Cross-lagged effects indicate to what extent within-person deviation from the trait level of X_t prospectively predicts change in the within-person deviation from the trait level of Y_{t+1}, controlling for prior deviation at Y_{t1}, and vice versa.
Controls for	Autoregressive effects and within-time covariance.	Autoregressive effects and within-time covariance. Any unmeasured confounders indexed by the genetic and environmental influences shared by MZ twins.	Autoregressive effects and within-time covariance. Stability within a trait (i.e. trait-like, *time-invariant* stability) and associated unobserved time-invariant confounding.

Example RQ	Are children who report higher levels of harsh parental discipline (compared to others in the sample) at age 9 also likely to show more behavioural problems (compared to others in the sample) at age 12?	Are children who report higher levels of harsh parental discipline (compared to their co-twin) at age 9 also likely to show more behavioural problems (compared to their co-twin) at age 12?	Are children who report higher deviations from their own average of harsh parental discipline at age 9 also likely to show higher deviations from their own average of behavioural problems at age 12?
Limitations	Does not control for unmeasured confounders. Does not distinguish between-person effects from within-person processes. Cannot be used to investigate whether the change in one variable between two measurement occasions is associated with change in another.	Cannot be used to investigate whether the change in one variable between two measurement occasions is associated with change in another.	Does not control for time-varying sources of confounding within individuals.
Example of conclusion that can be drawn on behavioural problems and parental discipline	"When an individual reports more behavioural problems at Tx (relative to others), (s)he will be more likely to experience a subsequent rank-order increase in harsh parental discipline at Tx+1."	"When an individual reports more behavioural problems than his/her MZ cotwin at Tx, (s)he will be more likely to experience a subsequent increase in parental discipline as compared to their cotwin at Tx +1. Moreover, any association will be explained by environmental factors unique to that child" *	"When an individual reports more behavioural problems than expected based on that individual's average (intercept), (s)he will be more likely to experience a subsequent increase in parental discipline."

Note. X=observed phenotype 'X', Y=observed phenotype 'Y', t1=first measurement occasion, t2 = second measurement occasion, t3 = third measurement occasion, Xtwin1-Xtwin2 = difference scores of X between twins in a pair, Ytwin1-Ytwin2= difference scores of Y between twins in a pair, wX= within-person deviation from the trait level of X, wY= within-person deviation from the trait level of Y, *irrespective of their rank position in the total distribution

A growing number of studies has investigated within-person associations between parenting and various developmental outcomes controlling for the between-person variance (Aunola, Tolvanen, Viljaranta, & Nurmi, 2013; Janssen, Elzinga, Verkuil, Hillegers, & Keijsers, 2021; Nelemans et al., 2020). Altough findings of between-person studies indicated longitudinal links between harsh parental discipline and emotional and behavioural problems of the child (e.g. Serbin et al., 2015), there was hardly any evidence of time-lagged within-person effects of parenting and child problems (Boele, Denissen, Moopen, & Keijsers, 2020). Studying within-person time-lagged effects, while controlling for between-person associations, may lead to a more nuanced understanding of the within-family processes of harsh parental discipline and child emotional and behavioural problems. Consequently, it could strenghten our ability to make causal inferences and prove useful for families and mental healthcare professionals (Dietvorst, Hiemstra, Hillegers, & Keijsers, 2018).

Comparing the MZD-CLPM and the RI-CLPM

The MZD-CLPM and the RI-CLPM have been proposed as ways of improving the capacity of the CLPM for drawing causal inference. Each model allows researchers to control for unobserved sources of confounding. It is well-known that identifying, measuring, and controlling for potential confounders helps to delineate cause and effect in data analysis, but that it is challenging to capture all confounding effects in this manner. As such, any method that allows researchers to control for unobserved confounding strengthens our ability to draw causal inferences. Besides being designed for different types of data (MZ twins vs singleton offspring), the MZD-CLPM and RI-CLPM also differ in the types of unobserved confounding they control for (see Table 1). Since both models control for overlapping but non-identical sources of unmeasured confounding, comparing results from these two approaches will be informative and may aid researchers in understanding how and why findings converge/diverge when using distinct methods to control for unobserved confounding. Moreover, this study will help identify which results are robust and could inform clinical practice.

Present study

The goal of the present study is to gain a better understanding of any potentially causal links between harsh parental discipline and child emotional and behavioural problems at age 9, 12 and 16 in a sample of MZ twins. To do so, we tested cross-lagged associations using the MZD-CLPM and RI-CLPM and compared findings across models. To the best of our knowledge, this is the first study to compare the RI-CLPM to MZD-CLPM within the same sample. Converging evidence from these models would serve to reinforce confidence in any putative causal relationships between harsh parental discipline and child emotional and behavioural problems.

Methods

Sample

We examined data from 5,698 monozygotic (MZ) twin pairs from the Twins Early Development Study (TEDS), an ongoing longitudinal study of twin pairs born between 1994 and 1996 in England and Wales. Participants were identified through birth records and approached for recruitment to the study (involving 16,810 families). The first TEDS data collection was conducted when twins were around 18 months of age. The sample is reasonably representative of the England and Wales population in terms of ethnic and socio-economic diversity, as well as sex and zygosity of twins (Rimfeld et al., 2019). Overall, 55% of the MZ twin sample is female, and 93% of parents identified their twins as 'white' (using a single item with response options 'Asian', 'Black', 'Mixed', 'White' and 'Other'). Participant retention in the complete TEDS sample is significantly associated with female sex, monozygosity and identifying racially as 'white'. More detailed information on TEDS can be found elsewhere (Rimfeld et al., 2019). Here we focus on child rated measures, administered when the twins were aged 9, 12 and 16.

Measures

Child problems

Emotional and behavioural problems were measured via child self-report using the strengths and difficulties questionaire (SDQ, Goodman, 1997). The SDQ is designed to assess psychological adjustment in youth aged 3–16 years. The emotional problems subscale included five statements such as 'I have many fears, I am easily scared' and 'I am nervous in new situations, I easily lose confidence'. The behavioural problems scale included five items such as 'I am often accused of lying and cheating', and 'I fight a lot, I can make other people do what I want' over the past 3 months. Ratings were on a three-point scale (with response options 'not true'=0, 'somewhat true'=1 and 'certainly true'=2). Sum scores on child self-reported emotional problems and behavioural problems of the twins at age 9, 12, and 16 years were used seperately in the analyses. Cronbach alpha's were as follows: EP9=.686, BP9 = .592, EP12 =.682, BP12 =.597, EP16=.694, BP16=.536.

Harsh parental discipline

Harsh parental discipline was assessed by four items derived from the parenting domain of a semi-structured interview (see Deater-Deckard et al., 1998). Children reported how often parents used various disciplinary strategies to deal with instances of child misbehaviour (i.e 'When I misbehave I am smacked or slapped'; 'When I misbehave Mum/Dad makes a joke out of it'). All items were answered on a 3-point scale, with the options: 'Not true'=0; 'Quite true'=1; and 'Very true'=2. The two positive items, 'When I misbehave Mum/Dad is firm and calm with me' and 'When I misbehave Mum/Dad explains why what I have done is wrong' were reverse-

coded, to ensure that higher scores reflect harsher parenting. Sum scores on child-reported harsh parental discipline at age 9, 12 and 16 were used for the analyses. Although Cronbach's alphas were low (9=.420, 12=.455, 16=.575), this is likely because the scale was made of only 4 items (alpha strongly depends on the number of items in a scale). Spearman's Rho correlations across years suggest that test-retest reliability is sufficient for this measure (9 -12 years: r_s=.32, 9-16 years: r_s=.15, and 12-16 years: r_s=.28; see Table 2). Also, face validity of the measure is adequate and appropriate for the aim of the study to compare findings across two statistical models.

Statistical analyses

A Cross-Lagged Panel Model (CLPM) was specified to model the relationship between harsh parental discipline and child emotional and behavioural problems at 9, 12 and 16 years. Results from this model were intended to anchor our findings within the literature, which has predominantly used a CLPM to model bi/multivariate relationships over time. We then fitted a CLPM with MZ twin differences scores (MZD-CLPM) and a RI-CLPM (Hamaker et al. 2015). Twin age and sex were regressed out of all variables and unstandardized residual scores were used in all models.

To inform the degree of correspondence between the RI-CLPM and the MZD-CLPM Spearman's Rho and R-squared between beta coefficients were calculated. The full sample of MZ twins was used for all analyses. To deal with non-independence of twins' data we added 'family ID' to control for family clustering in the CLPM and RI-CLPM. Model fitting was carried out in R using the Lavaan-package (Rosseel, 2012). We estimated all models using maximum likelihood estimation with robust standard errors for nonnormality of the data (MLR estimator) and full information maximum likelihood to deal with missing data. To evaluate model fit, we inspected Chi squared test statistics, comparative fit index (CFI), standardized root mean square residuals (SRMR) and root mean square error of approximation (RMSEA). A CFI >.90 and a RMSEA <.08 are considered good (Hu & Bentler, 1999). The analytic plan for this study was uploaded to Open Science Framework prior to analyses (https://osf.io/29s53/).

Moderation analyses

Part of our pre-registered analytic plan was to explore whether associations between harsh parental discipline and child emotional and behavioural problems differed between twins from families with high versus low levels of home chaos and socioeconomic status (SES). We ran two multiple group models, one to test home chaos and one to test SES as moderators. A more detailed description of the home chaos and SES constructs and the analytical models can be found in online supplementary materials (appendix 1).

Results

Descriptive statistics

Means, standard deviations and bivariate correlations among study variables are reported in Table 2. Spearman's Rho correlations indicated that harsh parental discipline, behavioural problems and emotional problems were significantly correlated with one another at all ages (range r_s=.12 - .33).

Main analysis

Next, we tested assocations between harsh parental discipline, behavioural problems and emotional problems using the CLPM, MZD-CLPM and RI-CLPM. Based on a comparison of model fit between constrained and unconstrained models, we specified that correlations and cross-lagged effects were allowed to vary across time in all models. Model fit indices are presented in Table 3 and show all models fitted the data adequatly. Estimated cross-lagged paths and autoregressive effects of the MZD-CLPM and RI-CLPM can be found in Table 4. Results from the CLPM are presented in appendix 1 of the online supplementary materials as baseline information. Harsh parental discipline at age 9 prospectively predicted behavioural problems at age 12 and vice versa (β=0.10, *SE*=0.02, p<.001); behavioural problems at age 9 prospectively predicted harsh parental discipline at age 12 (β=0.14, *SE*=0.02, p<.001). Also at the next occasions, age 12 and 16, harsh parental discipline (β=0.06, *SE*=0.02, p=.045) and behavioural problems (β=0.07, *SE*=0.04, p=.045) predicted each other prospectively. No cross-lagged associations between emotional problems and harsh parental discipline were found (β range -0.02 - 0.04, p>.095).

Table 2. Means, SDs and phenotypic Spearman's Rho correlations at age 9, 12 and 16

		M	*SD*	1	2	3	4	5	6	7	8	9
1	Parental discipline at 9	3.20	1.63	1								
2	Emotional problems at 9	3.22	2.40	.157**	1							
3	Behavioural problems at 9	2.21	1.85	.327**	.330**	1						
4	Parental discipline at 12	3.13	1.49	.317**	.077**	.201**	1					
5	Emotional problems at 12	2.18	2.07	.108**	.381**	.148**	.124**	1				
6	Behavioural problems at 12	1.87	1.65	.248**	.206**	.395**	.293**	.319**	1			
7	Parental discipline at 16	2.72	1.70	.153**	.055*	.130**	.276**	.035	.113**	1		
8	Emotional problems at 16	2.74	2.27	.063*	.237**	.037	.029	.378**	.083**	.120**	1	
9	Behavioural problems at 16	1.56	1.40	.125*	.069**	.210**	.143**	.124**	.329**	.180**	.200**	1

Note. ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

Table 3. Fit indices

Model	Chi-square	df	AIC	BIC	RMSEA	CFI	TLI
CLPM	36.7	9	93221	93511	0.026	0.988	0.956
RI-CLPM	1.72	3	93193	93521	0.000	1.000	1.006
MZD-CLPM	14.13	9	96606	96896	0.011	0.983	0.932

MZD-CLPM

The MZD-CLPM is displayed in Figure 1 (estimates and 95% CI can be found in Table 4). Twin differences in behavioural problems at age 9 predicted twin differences in harsh parental discipline at age 12 (β=0.08, SE=0.03, p=0.015) but not vice versa. We also found that twin differences in harsh parental discipline at age 9 predicted twin difference in emotional problems at age 12 (β=0.08, SE=0.05, p=0.024), but not vice versa (β=-0.02, SE=0.02, p=0.526). All other cross-lagged associations were non-significant (β range [-0.03,0.04]). Autoregressions and contemporaneous associations can be found in Table 4.

RI-CLPM

The RI-CLPM is displayed in Figure 2 (estimates and 95% CI can be found in Table 4). At the between-person level, significant positive associations were found among harsh parental discipline, behavioural problems and emotional problems (PD-EP; β=0.72, SE=0.12, p=.001, PD-BP; β=0.79, SE=0.08, p<.001, EP-BP; β=0.42, SE=0.11, p=.005). This indicates that children reporting higher levels of harsh parental discipline across all ages reported more behavioural problems and emotional problems as well. At the within-person level, behavioural problems at age 9 were associated with harsh parental discipline at age 12 (β=0.11, SE=0.03, p=0.004) but not vice versa (β=0.07, SE=0.03, p=0.062). This means that, when children report more behavioural problems at age 9 than their average, they prospectively report more harsh parental discipline at age 12. We did not find significant within-person cross-lagged paths between harsh parental discipline at age 9 and emotional problems at age 12 (β= -0.04, SE=0.05, p=0.410) nor vice versa (β= -0.06, SE=0.03, p=0.123). From age 12 to 16, we found that emotional problems were predictive of decreased harsh parental discipline at age 16 (β= -0.10, SE=0.04, p=0.021). In other words, when children report more emotional problems at age 12 than expected (based on that individual's average), they report less harsh parental discipline at age 16 than expected. All the other cross-lagged associations between harsh parental discipline and child problems were non-significant (β range [-0.10, 0.07]. Autoregressions and contemporaneous correlations can be found in Table 4.

Comparing the MZD-CLPM and RI-CLPM

We calculated correlations between the beta coefficients estimated in the MZD-CLPM and RI-CLPM. Spearman's Rho and R-squared (r_s=.594, p=.009, R2 =0.298) indicated that the coefficients from each model were significantly correlated (see Figure 4). However, focusing only on the cross-lagged estimates this was not the case, r_s=.273, p=.391, R2 = 0.031.

Table 4. Parameter Estimates

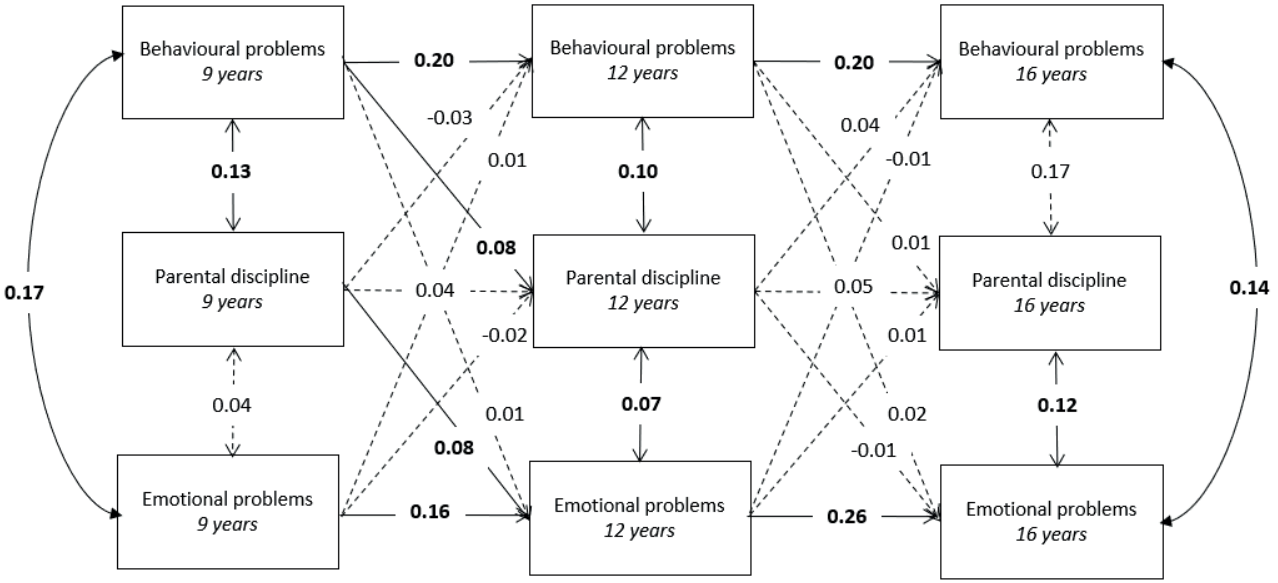
	MZD-CLPM				RI-CLPM			
Parameter	Estimate	SE	p-value	Std beta (95% C)	Estimate	SE	p-value	Std beta (95% CI)
Between-person effects								
PD <-> EM					0.40	0.12	**0.001**	0.72 (0.15, 1.30)
PD <-> BE					0.30	0.08	**<.001**	0.80 (0.39, 1.20)
EM <-> BE					0.32	0.11	**0.005**	0.42 (0.18, 066)
Cross-lagged effects								
PD9 -> EM12	0.11	0.05	**0.024**	0.08 (0.01, 0.14)	-0.04	0.05	0.410	-0.04 (-0.12, 0.05)
PD9 -> BE12	-0.03	0.04	0.435	-0.03 (-0.09, 0.04)	0.06	0.03	0.062	0.07 (0.14, -0.03)
EM9 -> PD12	-0.01	0.02	0.526	-0.02 (-0.09, 0.04)	-0.04	0.03	0.123	-0.06 (-0.14, 0.02)
EM9 -> BE12	0.01	0.02	0.690	0.01 (-0.05, 0.08)	0.09	0.03	**0.001**	0.12 (0.05, 0.20)
BE9 -> PD12	0.07	0.03	**0.015**	0.08 (0.02, 0.14)	0.09	0.03	**0.004**	0.11 (0.03, 0.19)
BE9 -> EM12	0.01	0.04	0.715	0.01 (-0.05, 0.08)	0.12	0.05	**0.009**	0.11 (0.03, 0.20)
PD12 -> EM16	-0.02	0.06	0.797	-0.01 (0.09, 0.07)	-0.13	0.07	0.052	-0.10 (-0.19, 0.00)
PD12 -> BE16	0.04	0.04	0.257	0.04 (-0.03, 0.11)	-0.03	0.05	0.484	-0.04 (-0.15, 0.07)
EM12 -> PD16	0.01	0.03	0.735	0.01 (-0.07, 0.10)	-0.09	0.04	**0.021**	-0.10 (-0.19, -0.02)
EM12 -> BE16	-0.01	0.03	0.850	-0.01 (-0.09, 0.07)	-0.04	0.04	0.287	-0.07 (-0.19, 0.05)
BE12 -> PD16	0.01	0.05	0.808	0.01 (-0.08, 0.10)	0.03	0.06	0.515	0.03 (-0.06, 012)
BE12 -> EM16	0.02	0.06	0.697	0.02 (-0.07, 0.10)	0.06	0.06	0.953	0.05 (-0.05, 0.14)

Table continues on the next page

Contemporaneous associations								
EM9 <-> BE9	0.80	0.16	**<.001**	0.17 (0.10, 0.24)	1.15	0.13	**<.001**	0.32 (0.26, 0.38)
EM9 <-> PD9	0.16	0.13	0.207	0.04 (-0.02, 0.10)	0.26	0.13	0.065	0.08 (-0.01, 0.16)
BE9 <-> PD9	0.40	0.10	**<.001**	0.13 (0.07, 0.20)	0.66	0.10	**<.001**	0.26 (0.19, 0.32)
EM12 <-> BE12	0.83	0.10	**<.001**	0.27 (0.17, 0.28)	0.70	0.09	**<.001**	0.29 (0.22, 0.36)
EM12 <-> PD12	0.22	0.09	**0.010**	0.07 (0.02, 0.12)	0.03	0.09	0.774	0.01 (-0.07, 0.09)
BE12 <-> PD12	0.25	0.06	**<.001**	0.10 (0.05, 0.15)	0.31	0.06	**<.001**	0.17 (0.11, 0.23)
EM 16 <-> PD16	0.48	0.18	**0.007**	0.12 (0.03, 0.20)	0.17	0.11	0.142	0.06 (-0.02, 0.13)
EM16 <-> BE16	0.46	0.14	**0.001**	0.14 (0.06, 0.21)	0.28	0.10	**0.004**	0.14 (0.05, 0.24)
BE16 <-> PD16	0.15	0.16	0.122	0.17 (-0.02, 0.13)	0.15	0.08	**0.049**	0.09 (0.01, 0.17)
Autoregressions								
PD9 -> PD12	0.04	0.03	0.271	0.04 (-0.03, 0.11)	0.21	0.05	**<.001**	0.23 (0.13, 0.34)
PD12-->PD16	0.06	0.05	0.254	0.05 (-0.04, 0.13)	0.24	0.07	**<.001**	0.20 (0.09, 0.32)
EM9 ->EM12	0.14	0.03	**<.001**	0.16 (0.09, 0.23)	0.16	0.05	**<.001**	0.19 (0.09, 0.30)
EM12-> EM16	0.27	0.05	**<.001**	0.26 (0.17, 0.34)	0.18	0.07	**0.010**	0.17 (0.04, 0.30)
BE9 -> BE12	0.18	0.03	**<.001**	0.20 (0.12, 0.27)	0.20	0.04	**<.001**	0.23 (0.15, 0.32)
BE12 -> BE16	0.18	0.04	**<.001**	0.20 (0.12, 0.28)	0.11	0.05	**0.020**	0.16 (0.03, 0.28)

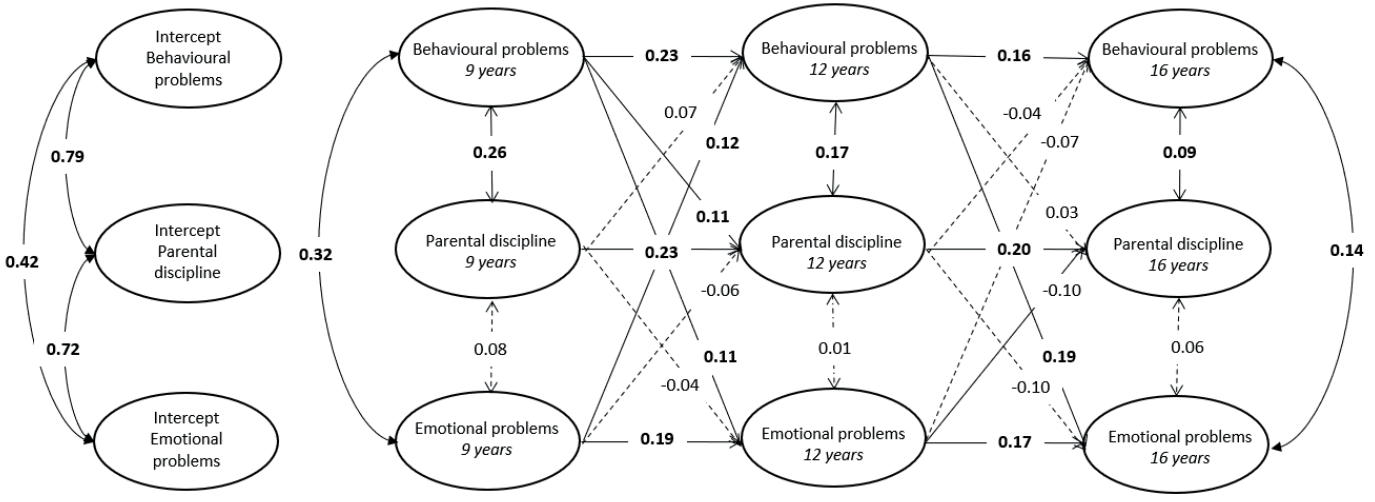
PD = harsh parental discipline, EP = emotional problems, BP = behavioural problems p-values in bold are significant (p<.05). Confidence intervals of the standardized estimates were simple symmetric 95% CIs.

Figure 1. Representation of MZD-CLPM with standardized effects (β).



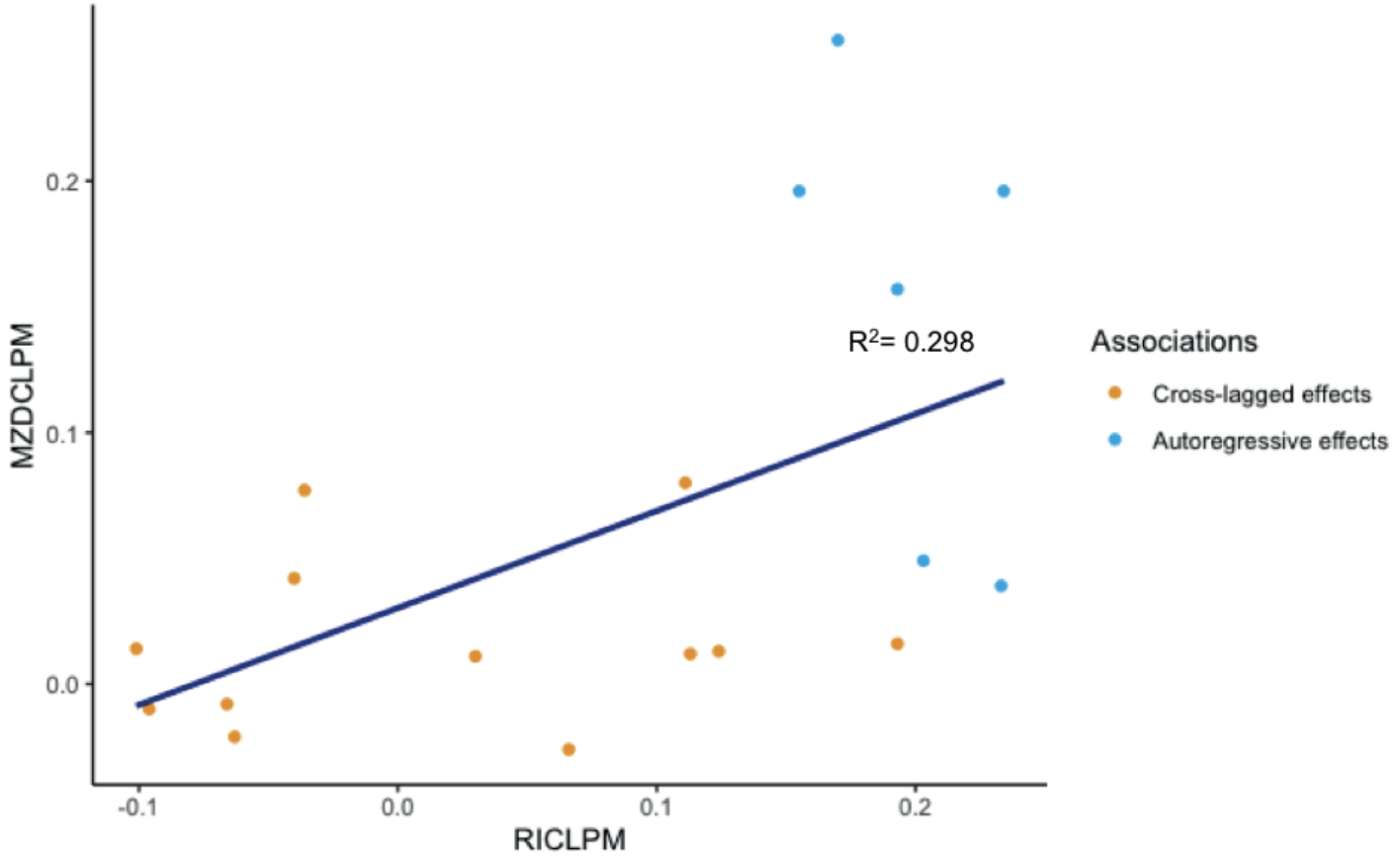
Note. Covariance between behavioural problems and emotional problems at age 12 is missing in the depiction = 0.27. Estimates in bold /solid lines are significant (p<.05).

Figure 2. Simplified representation of the unconstrained RI-CLPM with standardized effects (β).



Note. Covariance between behavioural problems and emotional problems at age 12 is missing in the depiction = 0.29. Estimates in bold /solid lines are significant (p<.05).

Figure 3. Beta coefficients of the regression effects from the MZD-CLPM and RI-CLPM.



Exploratory post-hoc analyses

We explored whether the associations between harsh parental discipline and child emotional problems and behavioural problems differed between twins from families with high versus low levels of home chaos and high versus low levels of SES. This was not the case in our study. Results from these analyses can be found in online supplementary materials (appendix 2).

Discussion

In this study we investigated longitudinal relationships between harsh parental discipline, and child emotional and behavioral problems, triangulating evidence across two extensions of the cross-lagged panel model (CLPM): the monozygotic twin difference cross-lagged panel model (MZD-CLPM) and the random intercept CLPM (RI-CLPM). One longitudinal cross-lagged association was significant in all three models: children's behavioural problems at age 9 predicted increased harsh parental discipline at age 12. The converging evidence from the MZD-CLPM and RI-CLPM strengthens our confidence in a potentially causal relationship between child behavioural problems at age 9 and consequent experienced harsh parental discipline at age 12. For all other associations there was a lack of convergence across models, as also illustrated by the small correlations between cross-lagged parameters.

Why do findings from the MZD-CLPM and RI-CLPM not converge?

A comparison of beta coefficients from the RI-CLPM and MZD-CLPM (Figure 4) indicated a similar pattern of results from both models: beta coefficients were positively correlated, suggesting that, on average, associations were in the same direction. Nonetheless, substantial differences in the magnitude of associations estimated in each model were also evident. One noteworthy difference between models was that the link from harsh parental discipline at age 9 to emotional problems at age 12 was non-significant in the RI-CLPM, whilst results from the MZD-CLPM indicated that perceiving more harsh parental discipline at age 9 than one's sibling was related to having more emotional problems at age 12. Differences between RI-CLPM and MZD-CLPM likely exist because the two approaches control for overlapping, but not identical, confounding influences. The MZD-CLPM controls for all genetic factors and all environmental influences shared between MZ twins, these can be both time-invariant (stable) and time-varying (unstable). The random intercept of the RI-CLPM, however, controls only for time-invariant (stable) effects, which could entail genetic and environmental influences, but does not account for time-variant (unstable) within-person confounding effects, see also Table 1 for an overview. Although genetic influences on traits are generally considered stable, evidence shows some change over time, certainly across childhood and adolescence (Hannigan et al., 2017). Broadly speaking, the MZD-CLPM design can therefore be seen as a more stringent approach compared to the RI-CLPM, given that the MZD-

CLPM controls for both time-varying and time-invariant shared effects, while the RI-CLPM accounts for time-invariant stability only. Although it should be noted that the RI-CLPM does account for all stable environmental influences, whereas the MZD-CLPM only accounts for environmental influences shared between twins. Our results underline the important nuances in conclusions that can be drawn from each of these these distinct and complementary approaches (Lüdtke & Robitzsch, 2021, and see also Table 1).

Associations between traits that change over time, or traits that are only in part genetically linked (e.g. parental discipline, child emotional and behavioural problems) may substantially vary across the MZD-CLPM and RI-CLPM. In the RI-CLPM, we are unable to capture developmental changes of the child and their environment, as the model controls for time-invariant confounding only. It could also be expected that the models might converge more when modelling associations among traits in adulthood, when we might expect genetic and environmental effects to be more stable. As a result, findings from the MZD-CLPM and RI-CLPM may be more similar when modelling traits that are stable over time and under stable genetic influence (e.g. impulsivity; Niv, Tuvblad, Raine, Wang, & Baker, 2012).

Strengths, limitations and future studies

Some limitations to our study should be noted. First, we like to underline that we did find evidence for contemporaneous associations between harsh parental discipline and child emotional and behavioural problems. So, we do not know whether non-significant findings regarding the time-lagged effects indicate absence of longitudinal associations or that, for instance, the effects of harsh parental discipline and child problems unfold on a shorter time scale (Bolger & Laurenceau, 2013). The long intervals, i.e. three and four years between measurement occasions, may have limited our ability to capture processes between parents and children that might unfold on monthly, daily, weekly or even hourly basis (Granic & Patterson, 2006). Future studies are needed to address the dynamic processes between harsh parental discipline and child emotional and behavioural problems on different timescales. Moreover, it should be noted that within-person effects in the RI-CLPM are based on scores that capture temporary fluctuations around a person's mean. As such, the RI-CLPM may be a more appropriate method to answering questions about short-term within-person effects using time series data and/or intensive longitudinal designs than for understanding long-term changes in longitudinal data with less measurements and long intervals (Lüdtke & Robitzch; 2021; Orth, Clark, Donnellan, & Robins, 2021). Second, it should be noted that in comparing the MZD-CLPM cross-lagged path estimates with those of the RI-CLPM we assessed the correlation among 12 beta estimates. Low statistical power due to the low number of data points may have contributed to the non-significance of the correlation. As

such, the comparison of the models by assessing correlations among estimates, as depicted in Figure 3, has an illustrative purpose. Lastly, our measure of parental discipline scored low on Cronbach's alpha, indicating low reliabilities. The low number of items might be a reason for the low alpha. However, test-retest reliability seemed sufficient and the measure correlated with emotional and behavioural prbolems as predicted, so it can be assumed that the harsh parental discipline scale measured a stable trait-like phenotype. The analytical models could be replicated with higher number of parental discipline items or with a latent factor model. It is expected that our findings are still robust and reliable, as face validity is reasonable and the low number of heterogeneous parenting items are appropriate for the aim of the current study.

Conclusions and recommendations

Taken together, our study described the types of unmeasured confounding different longitudinal designs can account for, and underlined how slight differences in the sort of confounding being controlled for can lead to quite different conclusions, even when using the exact same data (see Table 1). Findings from all models, i.e. the CLPM, RI-CLPM and MZD-CLPM, indicated that child behavioural problems at age 9 predicted increased harsh parental discipline at age 12. These results can be interpreted as corroborating (albeit not conclusive) evidence in favour of a causal relationship.

Importantly however, results also illustrate divergence in the MZD-CLPM and RI-CLPM outcomes. While both methods are intended to improve the ability of researchers to draw causal inference, they do not lead to the same conclusions. The substantial differences in results underline that nuance in conclusions is required when interpreting findings using such models and that triangulating results across multiple (longitudinal) methods strengthens the ability to draw conclusions on causality.

Conflict of interest. All authors declare that they have no conflicts of interest.

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7

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

Published as: Janssen, L. H. C.*, Kullberg, M. L. J.*, Verkuil, B., van Zwieten, N., Wever, M. C., van Houtum, L. A., ... & Elzinga, B. M. (2020). Does the COVID-19 pandemic impact parents' and adolescents' well-being? An EMA-study on daily affect and parenting. *PloS one, 15*(10), e0240962.
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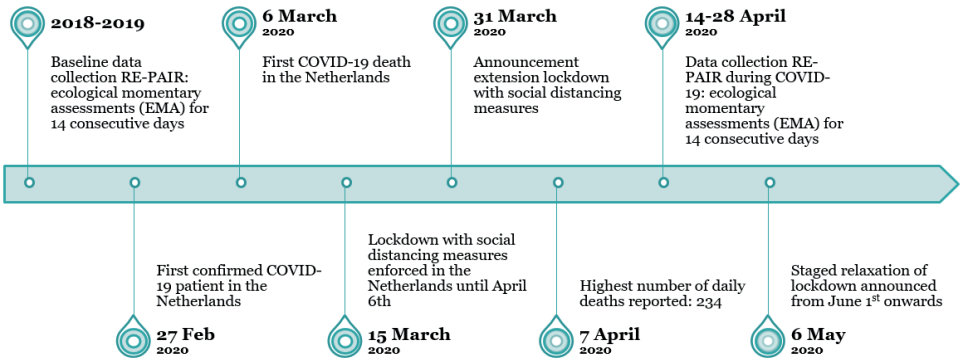
Abstract

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 (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 (L Steinberg & Silk, 2002; Laurence Steinberg, 2005). 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.

Figure 1. Timeline of study period



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, Fay, Beanlands, McCay, & Wignall, 2005; Hawryluck et al., 2004; Jeong et al.,

2016; Liu et al., 2012; G. 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 (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.

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, Oravecz, & Tuerlinckx, 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, Dishion, & Hollenstein, 2008; Houben, Van Den Noortgate, & Kuppens, 2015; Maciejewski et al., 2014; C. 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, Reynolds, Robles, & Repetti, 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, Hartley, & Papp, 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; R. Repetti, Wang, & Saxbe, 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., 2008), 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, Dash, Scarlet, & Davey, 2012; Zlomke & 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, Gagnon, Ladouceur, & Freeston, 1998; Freeston, Rhéaume, Letarte, Dugas, & Ladouceur, 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, Blais, Freeston, & Dugas, 1998; Ladouceur, Gosselin, & Dugas, 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, Wals, & Hillegers, 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.

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 (Data, 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, 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, Clark, & Tellegen, 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, Norton, & Asmundson, 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, Spitzer, & Williams, 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, Gilbody, & McMillan, 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 (Team, 2019), using the multilevel version 2.6 (Bliese & Bliese, 2016) package to test our hypotheses with maximum likelihood (ML) estimation. Level 2 predictors were grand-mean centered, following guidelines proposed by Hoffman (Hoffman, 2015) and Bolger and Laurenceau (Bolger & Laurenceau, 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 (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 2020, osf.io/34ycu).

Table 1. Sample Characteristics and Study Variables

Variables	*n*	Before COVID-19	During COVID-19
Parents			
Gender, % Female, (*n*)	67	56.7 (38)	56.7 (38)
Age (years), *M (SD)*	67	48.23 (5.79)	49.12 (5.73)
Highest education [a] , *% (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)		71.6 (48)	71.6 (48)
Depressive symptoms (PHQ-9), *M (SD)*	67	2.45(2.78)	2.87 (2.76)
Intolerance of Uncertainty (IUS), *M (SD)*	64	27.81 (6.51)	-
Positive affect [a], *M (SD)*	67	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 educational Level, *% (n)*	34		
Lower vocational education		5.9 (2)	5.9 (2)
Higher/ advanced secondary vocational 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

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 ($\chi 2(1) = 1.581$, $p = .209$) 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 ($\chi 2(2) = 56.613$, $p < .001$). 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 ($\chi 2(1) = 0.738$, $p = .390$). 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 ($\chi 2(2) = 122.186$, $p < .001$). 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.

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

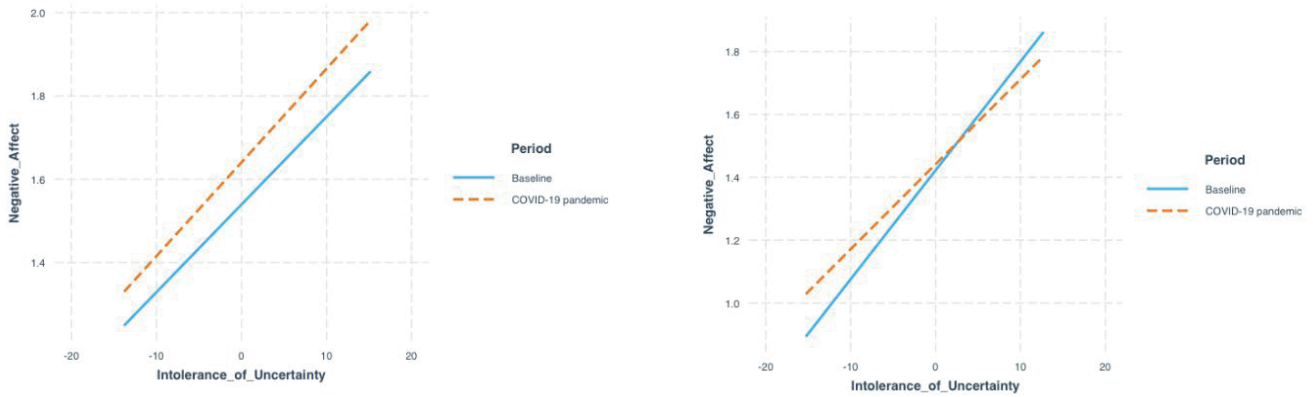


Table 2. Results of Final Model 5 on the Relation Between Period and Affect and the Moderating Role of Intolerance of Uncertainty in Parents.

	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.

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.

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.

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.

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 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.

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. (Loades et al., 2020)). 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, Morris, Burr, Picard, & Ochsner, 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 (L Steinberg & Silk, 2002; Laurence Steinberg, 2005) 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, Katz, Risser, & Lovejoy, 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 (M. E. Lamb, Lewis, 2013; Van Lissa, Keizer, Van Lier, Meeus, & Branje, 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, 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, Crum, Goyer, Marotta, & Akinola, 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, Akinola, Martin, & Fath, 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.

Acknowledgments

We are grateful to all the families that have invested their time by participating in this study. We furthermore thank Ethica data for offering their services (i.e., use of the Ethica app and platform) free of charge during the COVID-19 pandemic. Funding: The study was supported by a personal research grant from the Netherlands Organization for Scientific Research awarded to Bernet Elzinga (VICI; Unravelling the Impact of Emotional Maltreatment on the Developing Brain 453-15-006).

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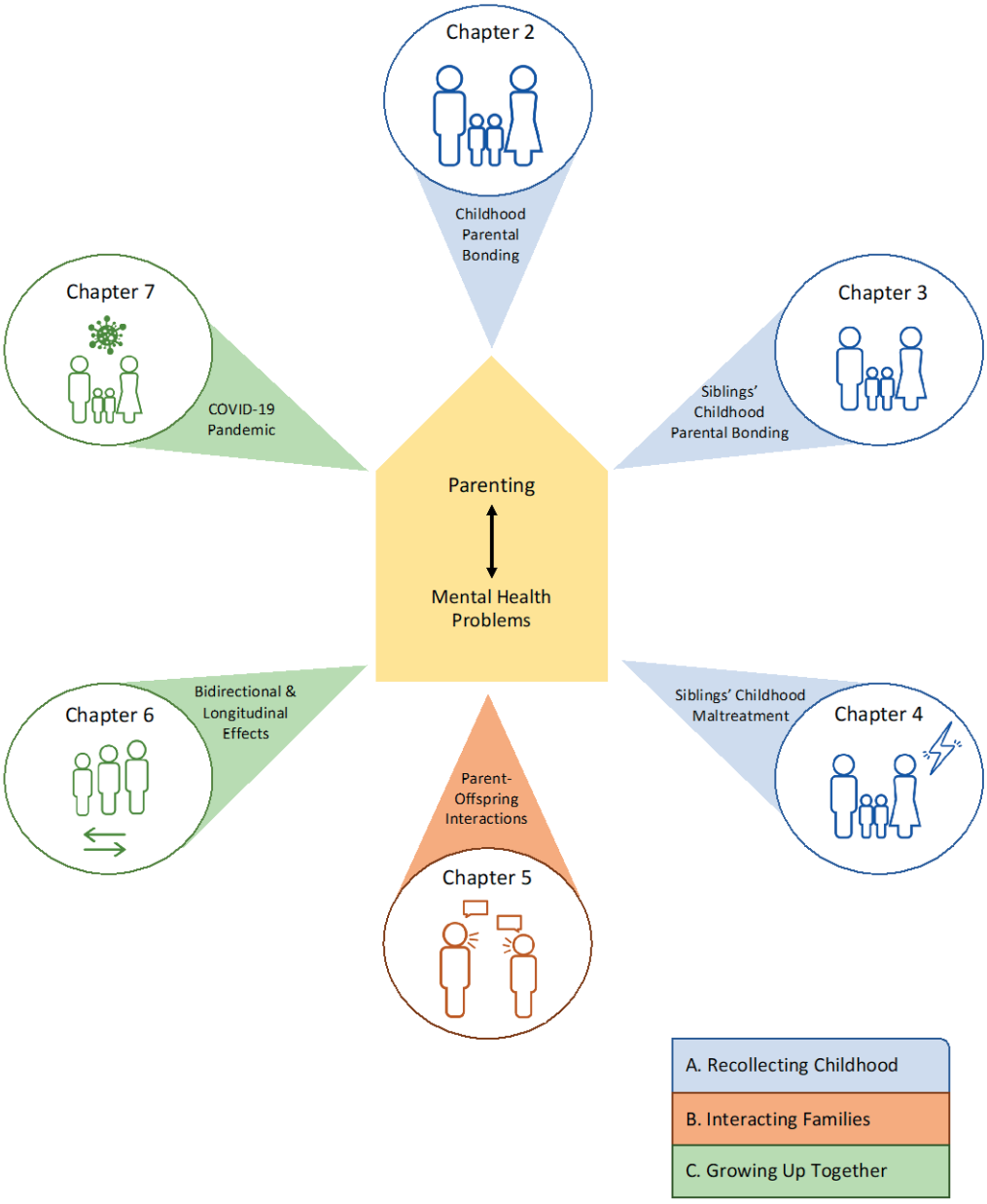
8

General Discussion

"Science is not a body of knowledge – it's a dynamic, ongoing reconfiguration of knowledge and must be free to change."
- David Barash

Traditionally, mental health professionals, both researchers and clinicians, tend to focus on the individual when addressing mental health problems in adults. For instance, treatment guidelines for most common disorders, e.g. anxiety and depression, are predominantly aimed to target the symptomatology of the individual (GGZ Standaarden, 2021a, 2021b) and do not consider childhood parenting experiences nor the current family context. Most people live with their family, however, and parents' and offspring's mental states and behaviors greatly influence each other. Families are dynamic interacting systems, like Calder's sculptures (see figure 1 of chapter 1). And as illustrated by the vignettes of Jessica and Julian (see textbox 1, chapter 1) and Mia and Lily (textbox 2, chapter 1) siblings raised by the same parents may experience the relationship with the parent differently and may themselves differ in terms of mental wellbeing. The central aim of this dissertation was to investigate mental health problems in the family context, specifically focusing on (A) recollections of parenting behavior and childhood maltreatment, (B) parent-offspring interactions and (C) adolescents' mental wellbeing and parenting experiences including bidirectional influences between parents and offspring. Figure 1 provides a graphical overview of the concepts examined in this dissertation. In this final chapter, the main findings are discussed in the light of three identified strategies (chapter 1). That is, (1) The examination of multiple family members: siblings, fathers and mothers, (2) The use of multiple measures and (3) The application of adequate (complex) analytical models. At the end, implications for clinical practice and research questions for future studies will be discussed.

Figure 1. Graphical overview of the concepts examined in this dissertation



1. The examination of multiple family members: siblings, fathers and mothers

Do siblings share experiences of parenting and maltreatment?

With respect to similarities in retrospective reports on childhood parental bonding experiences among adult siblings, we found moderate to high resemblance for parental bonding with mother and father in chapter 3. It should be noted that substantial within-family variation in the levels of recollected parental bonding was also apparent. This is in accordance with findings from adult twin samples (Kendler, 1996; Otowa et al., 2013) and is also illustrated by the vignettes of Jessica and Julian (textbox 1) and Mia and Lily (textbox 2) in chapter 1. For example, Jessica and Julian both perceived their mother as overprotective, but the bond with their mother also substantially differed between them: their mother was more on top of everything Julian did and was less concerned about Jessica. In Mia and Lily's case, they both thought of their father as hard-working and fun to be around. However, Lily always felt he was fonder of Mia and she was often stressed when being around him. Differences in recall among siblings may arise from actual differential treatment by parents (Plomin & Daniels, 1987), which may partly be in response to differences in siblings' needs and behavior (Avinun & Knafo, 2014). In addition to 'actual' differential parental treatment, siblings may also differ in their (retrospective) *perception* of parental treatment and the relation with their parents (Plomin, 2011; Tamrouti-Makkink et al., 2004; Turkheimer & Waldron, 2000): one child might perceive a parent's protective behavior as warm, interested and caring, while a sibling might perceive that same behavior as overprotecting or even suffocating.

With respect to childhood maltreatment, we found that emotional maltreatment was most consistently recalled between siblings, followed by physical abuse, whereas sexual abuse was most often experienced by only one sibling (chapter 4). This supports our hypothesis and corroborate previous studies on sibling resemblance of childhood maltreatment (Bifulco, Brown, Lillie, & Jarvis, 1997; Hamilton-Giachritsis & Browne, 2005; Hines et al., 2006; Jean-Gilles & Crittenden, 1990; Witte et al., 2018). The relatively high similarity in the recall of emotional (and physical) maltreatment (as opposed to sexual abuse) is in line with the fact that in most cases of emotional maltreatment a parent was the perpetrator, whereas in the cases of sexual abuse, the perpetrator was most often someone else (Hovens et al., 2009).

Although siblings share countless rearing experiences, the substantial within-family variation suggests that childhood experiences of parental bonding and maltreatment are unique for each child and cannot be generalized to their siblings. As such, considering multiple siblings rather than focusing on one child per family in research and clinical practice, contributes to a more comprehensive picture of the childhood family context. A family perspective potentially reveals family-wide and person-specific patterns of parental bonding and maltreatment

which can inform clinicians to target (preventive) interventions. The family perspective on childhood experiences might be also informative for clients to better understand the background of their mental health problems.

Why siblings' experience of poor parental bonding and maltreatment matter

In adults and their sibling(s) we have demonstrated that siblings' experiences during childhood were associated with increased depressive and anxiety symptoms of the individual, above-and-beyond one's own recollections of poor parental bonding (chapter 3). A similar pattern has been shown in children: In addition to the child's individual bond with mother, the family-wide bond was also linked with child adjustment (Oliver & Pike, 2018). In addition to our findings on parental bonding, family-wide levels of emotional and physical maltreatment, but not sexual abuse, were also associated with increased adult depressive symptoms (chapter 4). The levels of physical abuse varied largely among siblings from the same family. Still, the family-wide level of physical abuse was associated with increased depressive symptom levels, whereas individual physical abuse reports did not. The negative impact of the family level of physical violence could indicate a vicarious effect by witnessing that a sibling has been abused (Gerke et al., 2018). These findings support the notion that the family is a dynamic and interacting system (Bowen, 1966), like Calder's sculpture. Moreover, Aristotle postulated that a system is something besides, and not the same, as its elements. He emphasized the importance of interactions, synergy and connection among elements of the system, which can also be applied to family systems. Adverse (parenting) experiences of one sibling do not only reside in the individual, but may also have an impact on their brothers and sisters (Brown & Prinstein, 2011). This also means that this pattern cannot be uncovered by studying individuals only. In the case of Jessica and Julian, the fights Julian had with his mother also affected Jessica, as a consequence she somewhat withdrew from family contact which made her more on her own (textbox 1). Mental health care professionals should be aware of the effect of poor parental bonding and maltreatment, not only in relation to the targeted individual, but also when considering their siblings. Focusing on the improvement of the family environment could contribute to adequate prevention for all siblings.

Is it a two-way road?

Often parenting is considered as a one-way road: parents' rearing behavior towards their offspring. Multiple types of negative parent-offspring interactions are associated with increased mental health problems in offspring during both child- and adulthood (chapter 2, 3 and 6). Specifically, perceived lack of parental care and lack of parental autonomy-granting behavior were associated with the presence of lifetime anxiety and depression (chapter 2). Yet, since relations between parental behavior and offspring mental wellbeing are bidirectional, it was studied how mental

health problems of both parents and offspring impact on how parents and offspring interact with one another in chapter 5 and 6. It can be concluded that the child's externalizing problems are also associated with their behavior towards the parent (chapter 5) and the child's behavioral problems also elicited harsher disciplinary parenting behavior (chapter 6). These findings underline the dynamical interplay between parents' and offspring's behavior in families and are also illustrated by Julian and Jessica's vignette, where Julian's rebellious behavior during adolescence made his mother desperate and made her slap him now and then (textbox 1).
This two-way road could be addressed more in clinical practice by augmenting individual-focused treatment aiming to reduce symptoms, e.g. cognitive behavioral therapy, with family-focused interventions to support the interpersonal (family) relationships. Systemic interventions and parental support to improve family communication is recommended to foster offspring's wellbeing, so that the descending two-way road may take a turn uphill.

Do fathers and mothers have a unique role?

Most studies on parent-offspring relationship and mental health problems are mainly based on mothers and one of their children, and hence findings may not be generalizable to fathers, since fathers play a unique role in child rearing. Our findings indicate that fathers do indeed play a unique role. In this thesis, recollections of a poor parental bond with mother and father were both linked to elevated symptom levels of depression and anxiety (chapter 2 & 3). The association between father-offspring bond and mental health problems, in addition to the mother-offspring bond, suggests that it is not only the amount of time spent with the child but also the quality of the interactions and relationship that is of importance for psychological wellbeing of the offspring. These findings emphasize the importance of the relationship with a father and a mother figure when it comes to mental health problems. In chapter 5 both differences and similarities emerged between fathers and mothers. On average, mothers expressed more warmth towards their child than fathers and children expressed more negativity (but not less warmth) towards their mother. Offspring's internalizing problems were related to *less negativity* towards their father, whereas offspring's externalizing problems were related to *more negativity* towards their father and to receiving *less warmth* from their mother. Father's externalizing problems were linked to *more negativity* towards offspring. Even though we found distinct associations between mental health problems and expressed warmth and negativity in mother- versus father-offspring dyads, it should be noted that father and mother models were not directly statistically compared in chapter 5 due to unbalanced groups and difference in patterns of missing data. The vignettes from textbox 1 and 2 also illustrate that the relationship with mother and father differ substantially: Jessica and Julian describe their mother as caring and overprotective and their father as pragmatic and down-

to-earth. In the case of Lily and Mia, their mother did most of the caretaking as they mainly lived with her. Nevertheless, their father played an important role in their lives for example when their mother could temporarily not look after them. On the other hand, it was also postulated in prior work that even though, in general, Dutch children still spent less time with their fathers than with their mothers (Janssen et al, in prep; Portegijs & van den Brakel, 2018) father and mother roles have become more similar over the years and fathering and mothering are not conceptually distinct constructs (Fagan, Day, Lamb, & Cabrera, 2014). Altogether, above findings indicate that the child's bond with mother *and* father should be acknowledged when addressing parenting and mental wellbeing in research and clinical practice.

Who thrives and who may struggle?

All Calder's sculptures were based on the same concept, yet each sculpture has a different form, size, colors and constellation (Figure 2). Besides the analogy of the sculptures and families as dynamical and interacting systems, the diversity within and between sculptures applies also to families.

Figure 2. Variety of sculptures representing diversity within and between families

In the two families described in the vignettes (in the introduction) one sibling struggled with anxiety symptoms, while the other had not developed any mental health problems. This variation was also illustrated in Figure 1 of chapter 2, depicting six randomly selected families from the study sample. *Within* the families, siblings differed in the level of abuse they experienced: some reported severe emotional abuse, others reported mild or no abuse (families 2, 3 and 5). Likewise, although family resemblance of anxiety and depressive symptoms exist, severity of symptoms also varied among siblings from the same family (chapter 3 and as illustrated with the vignettes). This pattern of results is in line with the theoretical notion of differential susceptibility (Pluess & Belsky, 2010) and raises the question what determines 'who thrives and who may struggle?'

Despite their shared genetics, rearing background and familial disposition, half of the siblings of participants with a history of at least two episodes of depression and/or anxiety in the Netherlands Study of Depression and Anxiety (NESDA) has not (yet) developed a depression and/or anxiety disorder (see chapter 3). Our findings indicate that a person's sense of mastery (internal locus of control) is protective to anxiety symptoms in a context of poor maternal bonding. While having a sense of mastery has a protective role for anxiety, it was not protective for depression (chapter 3). Rather than a single factor, a recent comprehensive review highlighted the complex nature of resilience and suggests that resilient functioning after adverse childhood adversities is facilitated by numerous mechanisms (Ioannidis, Askelund, Kievit, & van Harmelen, 2020). Social support, the presence of a stable romantic relationship and having a job, have previously also been found to advance resilient functioning (Fritz, de Graaff, Caisley, van Harmelen, & Wilkinson, 2018). Still, the complex interplay among all these protective factors needs to be further elucidated, as knowledge on the mechanisms of resilience is essential to improve preventive strategies of mental health problems after childhood family adversities.

In sum, the studies in this dissertation have demonstrated that studying multiple family members simultaneously, e.g. siblings and fathers and mothers, can reveal a picture of associations between adverse childhood (parenting) experiences with father and mother and mental health problems that adds on findings when studying one individual per household (see chapter 3 and 4). Studies with a sibling design may elucidate within family differences in response to adverse childhood events and may hence be instructive to learn more about resilient functioning.

2. The use of multiple measures

Parent-offspring relationship and interactions are immensely complex and dynamic processes and therefore hard to capture with a single method/measure. In this dissertation different measures were used to assess multiple distinct, but also overlapping facets of the parent-child bond: self-reports to inform us on the

perception/recall of the bond over longer time periods that cannot be observed by others (chapter 2, 3, 4 and 6), behavioral observations to assess independent and subtle behaviors and verbal and non-verbal expressions of parents and offspring (chapter 5), ecological measurement assessments (EMA) to capture daily parent-offspring dynamics on a micro time scale (chapter 7), and lastly, in-depth interviews to gain detailed insights in a person's experiences that cannot be assessed with questionnaires or observations (chapter 1 and 8). Retrospective recall, observational measures, EMA and in-depth interviews as have been used in the current studies, inform us on distinct types and different patterns of the parent-offspring relationship. Strengths and limitations of each measure are discussed below.

Self-reports of childhood parenting and maltreatment experiences

In chapter 2, 3 and 4 the associations between adult retrospective reports of childhood parental bonding and maltreatment have been investigated and in chapter 6 child reports of harsh parental discipline have been examined. Besides the relatively easy and low-impact application as compared to observations, interviews and EMA, retrospective and concurrent self-reports have some other important advantages. Child-rated, subjective experiences of the parent-child relationship can be viewed as a reflection of the (mis)match between the experienced parental behavior and the child's (emotional) needs (Lerner et al., 1986), which might also explain the strong association with mental health problems. Moreover, integrating and comparing multiple self-reported perspectives from siblings growing up together in relation with mental health outcomes can yield a more fine-grained image of what happened during childhood in the context of the family to better adapt and adjust (family-focused) interventions.

Even though it is well-established that one's perception of the adverse (parenting) experience, rather than the actual event does matter most when addressing mental health problems (Danese & Widom, 2020; Newbury et al., 2018; Reuben et al., 2016), retrospective self-reports are fallible for several reasons. First, psychopathology-associated (mood-congruent) memory biases might contribute to stronger associations between these variables as a person's emotional state might color their view on the family interactions (negativity bias; Dalgleish & Werner-Seidler, 2014; Platt, Waters, Schulte-Koerne, Engelmann, & Salemink, 2017). It should be noted that, when removing cases with current depression or anxiety diagnoses from the analyses, a similar pattern of results was found between parental bonding and lifetime anxiety and depression (chapter 2). Secondly, subjective reports (not only on parenting and childhood maltreatment questionnaires, but in general) are limited to certain aspects and behaviors. For instance, the parental bonding instrument has been frequently used to assess childhood parenting experiences and captures various important aspects of the parent-offspring relationship, yet it does not reflect the dynamical and transactional processes of parenting, e.g. parental

flexibility or responsiveness (Kluczniok et al., 2016; van Dijk et al., 2017). Moreover, (parenting) experiences might be difficult to quantify with the answering categories, "never", "rarely", "sometimes", "often" and "always". In sum, parenting is a dynamical process consisting of multiple interactions between parents and offspring that cannot solely be studied with (retrospective) questionnaires.

Observations of the parent-offspring interactions

Observational measures are well-suited to capture parent-offspring dynamics. Observational techniques allow us to assess subtle affective and behavioral aspects of the parent-offspring dynamics and have been often used as a valid manner to examine parents' and offspring's micro (e.g. frowning or sighing) and macro (e.g. banging one's fist on the table and yelling) verbal and non-verbal expressions towards each other (Feinberg, Neiderhiser, Howe, & Hetherington, 2001; Smith, 2011). Observations, as opposed to (self) reported parenting, are not influenced by mental health problems of the parent or child. Next to these advantages, some limitations should be noted. In our observational study (chapter 5), expressed negativity was highly skewed to the left, which means that parents did not display much negativity towards their children and vice versa. The skewness could be due to the observational setting, in which participants might behave in a more socially desirable way. Although observations of parent-offspring interactions reflect natural behavior relatively well (Gardner, 2000), we acknowledge that the lab setting and video cameras could influence parents' and offspring's behavior. Family communication might be different in a natural setting, such as in the home environment when family members are not being observed. Also, the observational measurement contains a single task/conversation and is only a snap shot of the long-lasting dynamic parent-offspring interplay. These aspects might violate the ecological validity of the observational measures. To assess parenting behavior in the natural day-to-day setting EMA can be used (Keijsers, Boele, & Bülow, 2022).

Parenting in daily life (during the COVID-19 pandemic)

Mood and parenting are both considered to be dynamical processes that can fluctuate from time to time on a daily level, in response to other individuals and external circumstances (e.g., Kuppens, Oravecz, & Tuerlinckx, 2010). Therefore, it was especially relevant during the pandemic to measure mood and parenting on a daily level in the naturalistic context with EMA, rather than by observations in the lab or by a single questionnaire (Keijsers, Boele, & Bülow, 2022). Importantly, the intensive time series data allows us to indicate the presence of heterogeneity in our data. The heterogeneity suggests that whether or not parents and adolescents experience (emotional) problems can vary from family to family, which could not have been assessed using measurements on a single timepoint (chapter 6 and 7). Even though it was beyond the scope of this paper, EMA also enables the

visualization and examination of intraindividual variation across time, e.g. in mood and parenting, by testing whether these fluctuations (standard deviations) differ across measuring period or across (psychopathology) groups. It has been suggested that destabilization of daily parent-offspring interactions can contribute to or can transform into suboptimal long-term relationship (Branje, 2018). Insights into intraindividual variation of parenting and child's mood from future EMA-studies may be used to optimize and individualize supportive interventions aimed at adequate, adaptive and sensitive parenting (Molenaar & Campbell, 2009).

Qualitative in-depth interviews

As was illustrated with the vignettes of Jessica and Julian (textbox 1) and Mia and Lily (textbox 2) in chapter 1, in-dept qualitative interviews are a fruitful addition to quantitative analyses. The vignettes illustrate the differences in perception on childhood parenting and their differential pathways in terms of mental wellbeing, and may give a deeper understanding of person's view points on the causes/origin of their (different) childhood experiences and mental health problems, e.g. by answers on 'why' – questions. Here, for instance, from Mia and Lily's vignette we gain fine-grained insights into intergenerational patterns and resilience factors, e.g. their mother's emotional involvement and encouragement, despite her own anxieties. As illustrated in the current chapter, in-depth interviews can complement and refine quantitative data. Qualitative methods make it possible to ask follow-up questions to specify and to get more detailed information to explain complex issues and it allows to delve into the context of certain events, relationships, thoughts and behavior. These insights might generate follow up research questions, can inform future research and are suited for policy development (Braun & Clarke, 2006). It should be noted that there is an effect of the interviewer on the conversation and on the interpretation of qualitative data. Moreover, information from qualitative methods is not representative for the whole population and results can be difficult to replicate. However, with thematic analyses and derived key themes it is possible to replicate qualitative studies in other individuals (Braun & Clarke, 2006). Mixing quantitative and qualitative methods could provide meaningful and important knowledge about mental wellbeing in families on top of single method research.

Altogether, this dissertation illustrates that all measures capture distinct facets of the parent-offspring relationship and no single method can capture the entire complexity and dynamics of the parent-offspring relationship. The choice of measurement should be driven by the research question and theoretical assumptions underlying each method. Outcomes of the questionnaires, observations, EMA and interviews do not have to converge. Thus, even though combining methods might be challenging, a multi-step mixing-method approach in clinic and research is recommended.

3. The application of adequate (complex) analytical methods

Like Calder's sculptures, families are dynamical and interacting systems in which various processes at multiple levels take place, i.e. family-, dyadic and individual level. To combine the perspectives of participating family members and analyze data on the different levels requires complex analytical approaches. Research on families also comes with challenges such as dependence in data from family members and unbalanced designs due to unequal family sizes. Even though we strived to model family data as best as possible, the methodology that was used in the current studies also had its shortcomings. Considerations on the statistical methods are discussed below.

Family-wide and individual-specific effects

Multilevel models, i.e. random intercept models, allow to estimate family-wide (common across all siblings/family members) and individual-specific effects of childhood maltreatment and parental bonding, (Bates et al., 2015). With lme4-package, individual variables were decomposed into a family mean variable and individual relative scores (chapter 3 and 4). A similar procedure has been used in previous studies to elucidate whether siblings' experiences above-and-beyond the individual difference as compared to one's siblings have an impact on individual functioning/wellbeing (Feaster, Brincks, Robbins, & Szapocznik, 2011; Jenkins et al., 2016). A disadvantage of averaging and collapsing individuals with different parenting experiences into one undifferentiated value is that it assumes that measurement error is absent, which is an unrealistic assumption in psychology (Griliches & Hausman, 1986). Secondly, the family mean score is based on the assumptions that individual parenting scores are good indicators of the family climate (Cox & Paley, 2003). However, the latter may not always be the case: how one child is treated might substantially differ from their sibling(s), as is illustrated by Mia and Lily's case (textbox 2). Therefore 'family climate' does not perfectly represent the family-wide value as was measured here and we opt to use the term 'sibling- or family-mean or family-wide' levels. Finally, the mean does not inform us on the dispersion of parenting/maltreatment in the family and does not provide the complete image. Hence, it is relevant to examine individual differences (from the mean), i.e. relative scores as was done in chapter 3 and 4. To the best of our knowledge, there are no other methods available yet to take into account the multiple perspectives to study family-wide and individual-specific effects.

Modeling multiple (bidirectional) relationships

To combine multiple within-family relationships, e.g. the relationships between a father and his son and his daughter, and take into account bidirectional effects of these relationships as has been done in chapter 5, multilevel structural equation model (MSEM) is recommended(?). It allows to investigate the associations

between the levels of parent and offspring mental health problems and expressed warmth and negativity simultaneously in a sample of families with varying sizes. Yet, a limitation of MSEM is that often convergence issues arise due to a lack of statistical power as a result of missing data, as was also a problem in the analyses for chapter 5. Even though, we aimed to combine multiple imputations to account for missing data, it was not yet possible to integrate multiple imputations in MSEM within the 'Lavaan' R-package (Rosseel, 2012). A trade-off had to be made between retaining as much data, and thereby power, as possible or appropriately accounting for multiple levels in the data. We have applied regular SEM with adjusted standard errors to control for family relatedness in the data (chapter 5). Recently, a modeling approach to integrate multiple imputation in multilevel models and a corresponding R-package ('mdmb') have been published which might be a solution for future multilevel (family) studies (Grund, Lüdtke, & Robitzsch, 2021).

In studies on family dyads consisting of two members (e.g. parent and offspring, father and mother, sibling pair) other methods such as siblings' difference scores (see for instance Feinberg, McHale, Crouter, & Cumsille, 2003; Tamrouti-Makkink et al., 2004) and response-surface analysis can be used to integrate individual perspectives and discrepancies between perspectives (see for instance, Janssen, Verkuil, van Houtum, Wever, & Elzinga, 2021). For studies including more than two family members the family-version of the Social Relations Model (Cook, 1984) might be an appropriate method (fSRM; Stas, Schönbrodt, & Loeys, 2015). The fSRM-package allows to examine bidirectional relations in families while accounting for the fact that family relations are mutually interdependent. This model enables the researcher to answer questions on bidirectional relationships within the family, i.e. actor and partner effects, and for instance comparing groups, e.g. 'do individuals from affected families show larger variation in the amount of warmth they experience with their family members compared to individuals in unaffected families?' Due to unequal family sizes and continuous predictor variables it was not a suitable technique to answer our specific questions from chapter 5.

The importance of careful statistical model selection

To elucidate the reciprocal relationships and directional influences between negative parenting and child problems over time, we have applied the monozygotic twin difference version of the cross-lagged panel model (MZD-CLPM) and the random intercept CLPM (RI-CLPM) with the intention to strengthen our confidence in a possible causal relation (chapter 6). Although a similar pattern of results from the models was found, results also illustrate divergence in the MZD-CLPM and RI-CLPM outcomes. Substantial differences in findings from these models underline the importance of a well-defined research question, careful model selection and caution and precision when drawing causal conclusions on within-person processes.

To conclude, advanced statistical knowledge and skills and interdisciplinary collaborations are needed to deal with the complexity of family processes, family-structured data and the corresponding analytical models. Researchers need to compromise between the 'ideal' and the practically feasible statistical models (Preacher, Zhang, & Zyphur, 2016).

Implications and recommendations

Future research: Implications and interesting avenues

To contribute to a deeper understanding of the onset and maintenance of mental health problems in families and the prevention of psychopathology due to within-family adversities such as child maltreatment, we discuss several topics for future studies on mental health problems and (negative) parenting.

1. *Including family members: the family perspective*

Including multiple family members in research contributes to a more fine-grained and complete picture of the etiology and impact of childhood family matters and mental health problems. A systemic perspective in future studies may contribute to a better understanding of within-family processes and differences with regard to parenting and mental wellbeing. First, an examination of the potential buffering effect of optimal and sensitive parenting after childhood maltreatment within a sibling design might elucidate processes related to resilience. Second, investigating fathers and mothers shed new light on difference between mother- and father-offspring relationship (chapter 2 and 5). These findings also raise questions for future research: 'how do fathers and mothers contribute (uniquely) to child development?' and 'can warm and sensitive care-taking of one parent compensate for/buffer the effects negative parenting (e.g. neglect or abuse) of the other parent?' Another research question that arises and can solely be answered from a systemic perspective is whether family network strengths, i.e. relationship quality and strength among multiple family members, is predictive of one's functioning after childhood trauma. Studies on mother-offspring and father-offspring dyads also allow to compare interactions between parents and offspring across same-sex parent–offspring dyads and mixed-sex parent–offspring dyads. The focus on traditional families, including mothers, fathers and full biological (twin) siblings, in this dissertation limits the generalizability of the findings. It has for example been shown that families with other structures and constellations than traditional father-mother families generally reported more depressive symptoms (Barrett & Turner, 2005). As such, it is important to consider specific family structures as a potential risk or resilience factor in future studies.

2. Considering heterogeneity

Relations that were found on average in a sample may not apply to each family (Molenaar & Campbell, 2009). As shown in chapter 7, the substantial heterogeneity in the data suggests that whether or not parents and adolescents experience (emotional) problems during the COVID-19 pandemic, varies from household to household. As can be seen in Figure 3, some parents reported an increase of negative affect, whereas others reported a decrease or the same level before compared to during the COVID-19 pandemic. However, like most research in the field, many studies in the current dissertation (chapter 2, 3, 4 and 5) mainly provided information on the average effects in the studied populations. To explain within-family differences in depression and anxiety symptom levels, interaction effects were tested In chapter 3: It was found that in the context of poor maternal bonding, extraverted persons reported fewer depressive symptoms than siblings with lower levels of extraversion. Although the cross-level interaction analysis has contributed to the specificity of our findings, the results might still not apply to every individual. This limits the clinical implication of the findings in daily practice. To identify persons at risk and to elucidate who (and why a person) is resilient after adverse childhood family circumstances and to optimize treatment for each individual, consideration of heterogeneity (e.g. between and within family variation) in future studies is indispensable. Studies on longitudinal or time series data and applying random intercept and random slopes models allow us to take into account the heterogeneity in the data and to learn from individual differences in future research. It should be noted, however, that increased complexity of the analytical model, estimating separate slopes for all individuals, might impede the application of the results in practice. As such, balancing complexity of the model and applicability of the findings is an essential challenge for psychology researchers.

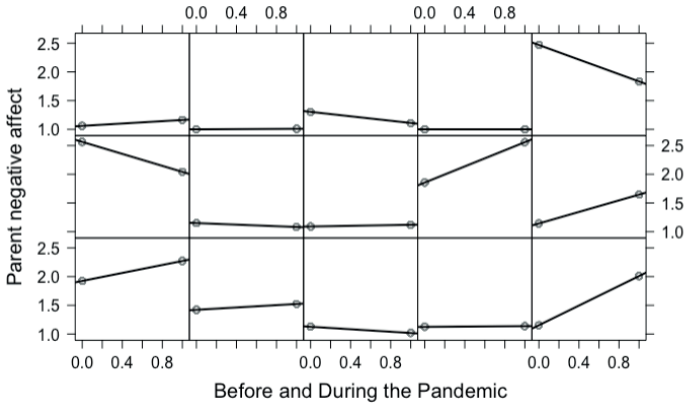


Figure 3. Depiction of change in negative affect between before and during the COVID-pandemic in 15 random parents from the sample.

3. Gaining in-depth insights with intensified (N=1) and qualitative studies

Related to our previous consideration, studies on time-series data with an intensive longitudinal design as well as qualitative studies could provide us with detailed and practical knowledge on the individual (family), on top of the information on a group level. Internal processes such as emotions, feelings, thoughts, predominantly occur within ourselves. Even (the sense of) connection with others cannot always be observed from the outside. As such studies based on observations may miss important internal processes and experiences. Even though we are able to capture these internal processes with (retrospective) self-reports (at least to a certain extent), the complex dynamic interplay between family members and the intrinsic non-stationarity of mental wellbeing are hard to capture with traditional quantitative approaches. In addition, these methods estimate predominantly average effects in the sample, which may not apply to the individual (van Os, Guloksuz, Vijn, Hafkenscheid, & Delespaul, 2019). Intensified and qualitative approaches enable us to compensate for limitations of cross-sectional designs and quantitative studies on observations and self-report data in several ways. N=1 (or single subject) designs consider the individual or family as the core unit of observation (Lillie et al., 2011). N=1 studies with an intensive longitudinal design are useful to examine within-family and within-person processes and change over time. N=1 studies can be easier to conduct in clinical practice, cheaper and less time-consuming than studies on larger samples. It is also an interesting avenue within the scientist-practitioner model (Shapiro, 2002), as N=1 studies can make research relevant for practice and practice also relevant for research (Kravitz et al., 2014). Findings from N=1 designs can guide the clinician in treatment decision and inform on the process during treatment. At the same time these findings can also contribute to answer empirical questions, and can be used as hypothesis generating process or as proof of concept.

In-depth interviews with multiple family members may also give insights in each other's' perspectives. Qualitative studies have been shown useful for illustrating, and identifying client needs and generating follow-up questions (Nooteboom et al., 2020). Also, the clinician/interviewer could take a helicopter view and provide some reflections and ask follow-up questions regarding the (differential) mental development. As illustrated in the vignette of Mia and Lily (textbox 2), in interaction with one another new insights may arise: Sharing perspectives on (childhood) events or parenting among family members could contribute to a deeper understanding of parent-offspring interactions and the association with mental health problems. Another interesting avenue for qualitative research in the future is to elucidate the needs and wishes in parenting support of parents with mental health problems such as depressive and anxiety disorders. These insights may contribute to development (or improve existing interventions) and implementation of interventions aimed to foster adaptive and sensitive

parenting and to provide parents practical help to maintain a warm and healthy parent-offspring relationship. Subsequently these interventions could prevent mental health problems in the next generation.

Clinical implications and recommendations
With respect to the clinical field, four implications are specified based on the findings from our studies.

1. *In adult mental health care, we should pay more attention to the (childhood) family context*

In child mental health care systemic interventions are common practice (Carr, 2009). In adult mental health care however, most treatments of common mental health problems, e.g. anxiety and depression, are individually focused, e.g. cognitive behavioral therapy (Cuijpers et al., 2014; Cuijpers, Smit, Bohlmeijer, Hollon, & Andersson, 2010; GGZ Standaarden, 2021a, 2021b). In this dissertation, it was demonstrated that childhood maltreatment and poor parental bonding, both individual and siblings' experiences, are associated with increased anxiety and depression levels (chapter 2, 3 and 4). Our findings suggest that the family context – parents and siblings - is relevant for *adults'* mental well-being. Besides, individuals with mental health disorders experience problems in family interactions. This was demonstrated in chapter 5: externalizing problems of fathers and offspring were related to increased negativity towards each other. It has been demonstrated in prior work as well: mothers with a depression were less emotionally available for their child (Kluczniok et al., 2016).
Based on the findings described in this dissertation, we opt to shift from a focus on the individual in treatment to a systemic perspective to improve care for adult mental health problems. To do so, we recommend to involve one or more family members in the diagnostic phase to integrate multiple perspectives in order to better understand the impact on the family system and to address (psychopathology-related) problems experienced by family members. Also, during treatment, involvement of relatives can be beneficial (Price et al., 2018). Clients should be encouraged to invite their parent, child or partner to a therapy session. Addressing and strengthening the family system might also contribute to completing treatment and translate insights and skills from the therapy setting to daily life. Taken together, shifting from a primarily individualistic focus to a systemic approach in diagnosing and treating common mental health problems, also in adults, might contribute to improvements of treatment and might also lead to prevention of problems in the next generation.

2. *A focus on (differential) subjective experience*

Our findings highlight the importance of subjective experiences of childhood parenting or maltreatment (chapter 2, 3 and 4). Although siblings shared the family context with each other as children, one's recollections of childhood parenting or maltreatment might differ from their siblings' experiences (chapter 3 and 4), as was also illustrated by the vignette of Julian and Jessica and the vignette of Mia and Lily. To translate these findings to clinical practice, two practical applications have been defined. First, clinicians could facilitate conversations between the client and their parent(s) and/or sibling(s) in order to gain insights into their differing and overlapping perspectives. In-depth interviews with parents of a mental health care-seeking children in prior research, revealed that discussing the various perspectives within the family and with other families led to new insights into needs and strengths, which in turn resulted in a feeling of empowerment and positively influenced the care process (Nooteboom et al., 2020). EMA assessments could also help to increase a client's awareness and insights into behavior and mood patterns, such as mood fluctuations and conflicts with a family member, in daily life (Bos, Snippe, Bruggeman, Wichers, & van der Krieke, 2019). These insights could be a rich source of information for the parent-child conversation. For instance, parents could explain the origin of their behaviour (e.g. (over)protectiveness) and discuss the impact on the child ("I don't want you to walk home alone because it makes me worry about your safety. I felt it annoyed you [child], could you tell me why this was affecting you?") or of their frustration ("I have been angry with you because I haven't slept well recently. How was my irritation affecting you?"). Parents and adolescents discussing their (varying) perspectives on (parenting) experiences and encouraging perspective-taking and mentalizing might lead to a deeper understanding of each other's experience. Accordingly, it could enable families to search solutions for future unpleasant encounters and increase empathy and support (Farrant, Devine, Maybery, & Fletcher, 2012). It should be noted that the child's ability of perspective-taking and mentalizing depends on the child's developmental phase (Fonagy et al., 2018). As such, these parenting strategies might be especially relevant for parents of adolescent children.

Secondly, adapting memories and appraisals of adverse childhood experiences can alleviate one's mental health problems (Danese & Widom, 2020). It was demonstrated that childhood maltreatment is associated with lack of response to treatment for depression (Nanni et al., 212). Thus, a valuable addition to symptom-focused treatments for anxiety and depression after childhood maltreatment, is to address recollections of adverse childhood experiences (with parents) in therapy. A study to investigate the treatment effects of therapies aimed at processing childhood trauma in adults with depression is ongoing, but no results are available yet (https://jeugdtrauma-depressie.nl/reset-studies/). Furthermore, it was found that parental history of childhood abuse was associated with increased negativity during parent-offspring interactions, which association might be

mediated by parental mental health problems (Buisman et al., 2021; chapter 5). As such, addressing childhood trauma might result in alleviation of depressive and/or anxiety symptoms and, concurrently, improve the family climate.

3. *The need for parental support and family interventions*

Evidence-based interventions to strengthen parents' and adolescents' communication skills might be profitable to improve the overall family climate. The association between offspring's externalizing problems and receiving *less warmth* from their mother (chapter 5) and the association between offspring's behavioral problems and increased harsh parental discipline during adolescence (chapter 6) underline the importance to support parents of children with externalizing/behavioral problems with interventions fostering warm and responsive parenting. Similarly, father's externalizing problems were linked to *more negativity* towards offspring. As such, we encourage clinicians to offer parenting support when treating fathers with externalizing psychopathology to help them express themselves in less negative ways and facilitate warmer and more supportive expressions towards their child. Associations between parent and offspring internalizing/emotional problems and parenting, when modeled simultaneously with externalizing problems, were less evident from our studies in chapter 5 and 6. However, our post-hoc analyses (appendix 2, chapter 6) did show a significant link between harsh parenting and child's increased internalizing/emotional problems when modeled without child's behavioral problems (see also Pinquart, 2017). Also, the negative impact of parents' internalizing symptomatology on parenting behaviors has been frequently described in prior research (e.g., Lovejoy, Graczyk, O'Hare, & Neuman, 2000; Wilson & Durbin, 2010). Hence, in families of parents or offspring with internalizing/emotional problems might also benefit from parenting support fostering adequate and sensitive parenting.

An essential aspect of parenting is setting the right example: because of who you are and what you do, you may pass on your behavior and ideas about the world and the self to the next generation (Mesman, 2021). As such therapy may be the best prevention for intergenerational transmission of mental health problems, even young adults with (subclinical) mental health problems who do not have children yet. Decades of research on the factors mediating the association between childhood adversities and mental health problems in adulthood have shed light on the potential underlying mechanisms (Kuzminskaite et al., 2021). Increased negative self-associations and self-criticism (Campos, Besser, & Blatt, 2013; Irons, Gilbert, Baldwin, Baccus, & Palmer, 2006; van Harmelen et al., 2010), behavioral avoidance and rumination (O'Mahen, Karl, Moberly, & Fedock, 2015), emotion dysregulation and negative internalized beliefs (Coates & Messman-Moore, 2014) are identified as mediating factors in the link between experienced adversities during childhood, including maltreatment and suboptimal parental bonding and adult mental health

problems. Psycho-education is an essential aspect of adequate treatment. Scientific knowledge can be brought to practice by explaining parents that their own behavior and beliefs (e.g. negative self-beliefs and self-criticism) may be a (understandable but maladaptive) response to childhood adversities (e.g. emotional abuse), which in turn may also affect their children. Accordingly, clinicians could provide support, tools and counseling to improve these negative self-beliefs in order to enhance their (social) functioning and wellbeing.

Final Conclusion

This dissertation has described findings on mental health problems in the family context, specifically focusing on the links with parent-offspring relationship, parenting behavior and childhood maltreatment (see also Figure 1). Results support the notion that the impact of negative parent-offspring interactions and maltreatment during childhood is long-lasting and omni-various: it not only affects one child but may also increase mental health problems in siblings. Additionally, mental health problems of parents and offspring, specifically externalizing behaviors, have an impact on how parents and offspring interact. Hence, applying a systemic approach and offering parental support is recommended in treatment of mental health problems in adolescence and adulthood. To better understand mental health problems and improve prevention and treatment in the future, we should look beyond the individual. That is, the importance of the family context, interactions with and perspectives from siblings, mothers *and* fathers should be acknowledged in research and clinical practice*:* Family matters.

While our research on an epidemiological level yields relevant insight into global patterns and processes with regard to parenting and mental health problems, this may not apply to all families and individuals. Translated to clinical practice this means that clinical treatment guidelines might suit many but not all clients. As such, individual-specific and sensitive tailoring of (systemic) therapy to the client is essential. Integration of findings from multiple measures and advanced statistical analytical methods, as has been pursued in this dissertation, is an informative effort to unravel some of the complexity of human (interacting) behavior and the human mind. In spite of that, modesty is at place, as there will always be parts of human psychology that cannot be captured in general laws or theories despite the vantages of scientific research:

"Scientific knowledge, experiential knowledge and relational knowledge have to come together and not-knowing needs to be accepted. […] Knowledge arises due to interaction and conversation with one other. Not understanding is a fundamental part of human functioning rather than a problem."

– Freely adapted from Floortje Scheepers (translated)

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9

Appendices

Nederlandstalige samenvatting

Family Matters
De relatie tussen ouderschap en psychische problemen vanuit meerdere perspectieven

In dit proefschrift staan de bevindingen beschreven van onderzoek naar ouderschap en psychische problemen, met name bij kinderen. Het doel is om de oorzaken, ontwikkeling en overdracht van veelvoorkomende psychische problemen beter te begrijpen om zo bij te kunnen dragen aan preventie- en behandelstrategieën van psychische stoornissen. Om een beter beeld te krijgen van de relaties tussen negatieve opvoedervaringen en psychopathologie van gezinsleden zijn drie onderzoeksstrategieën gebruikt: (1) Het onderzoeken van meerdere gezinsleden: broers en zussen, vaders en moeders, (2) het toepassen van meerdere onderzoeksmethoden om zicht te krijgen op de ouder-kind relatie en (3) het toepassen van adequate (complexe) analysemethoden om inzichten op te doen.

Dit proefschrift bestaat uit drie delen: **Deel A 'Herinneringen aan de kindertijd'** van dit proefschrift gaat over de vraag of negatieve ervaringen in de relatie met ouders tijdens de kindertijd verband houden met internaliserende psychische problemen op volwassen leeftijd. Voordat we deze relatie onderzochten, hebben we de psychometrische eigenschappen van de vragenlijst, 'Parental Bonding Instrument' getest (hoofdstuk 2). Bovendien is onderzocht of volwassen broers en zussen vergelijkbare of juist verschillende perspectieven hebben op de jeugdervaringen met hun ouders en of zij ervaringen van mishandeling delen (hoofdstuk 3 en 4).

Deel B 'Interactieve gezinnen' gaat over de invloed van psychische problemen van ouders en kinderen op de ouder-kind interactie. We onderzochten of internaliserende problemen, zoals angst- en somberheidsklachten en externaliserende klachten, zoals gedragsproblemen, samenhangen met hoe positief (warm) en negatief (kil of kritisch) ouders en kinderen naar elkaar zijn tijdens een zogeheten ouder-kind conflicttaak (hoofdstuk 5).

Het derde en laatste deel van dit proefschrift, **deel C 'Samen opgroeien'**, bevat twee studies in kinderen. Om de relaties tussen ouderschap en mentaal welzijn van adolescenten beter te begrijpen, beschrijft dit proefschrift ook de verbanden over de tijd heen. In hoofdstuk 6 maten we op verschillende momenten tussen negatief oudergedrag en emotionele en gedragsproblemen van het kind op 9, 12 en 16 jaar (hoofdstuk 6). Begin 2020 brak de COVID-19 pandemie uit. Welk effect heeft dat op opvoedervaringen en de stemming van ouders en adolescenten? Deze vraag beantwoorden we in hoofdstuk 7.

A. Herinneringen aan de kindertijd

Hoofdstuk 2 beschrijft de psychometrische eigenschappen van een vragenlijst over de band die kinderen met hun ouders hebben (Parental Bonding Instrument; PBI). De deelnemers aan deze studie waren 2069 Nederlandse volwassenen tussen de 26-75 jaar met een affectieve stoornis en een gezonde controlegroep uit de *Nederlandse Studie naar Depressie en Angst* (NESDA). De PBI onderscheidt drie dimensies van ouderschap, namelijk warmte, overbescherming en het gebrek aan autonomie ondersteuning (voorheen 'autoritarisme') van vader of moeder. De PBI laat meetinvariantie en statistische overeenkomsten tussen groepen op basis van sekse of psychopathologie zien, wat aangeeft dat gemiddelden en relaties betrouwbaar kunnen worden vergeleken tussen sekse- en deelnemers met een angst- of stemmingsstoornis versus deelnemers zonder psychische klachten.

Mannen rapporteren gemiddeld meer overbescherming van hun moeder en minder warmte van hun vader in vergelijking tot vrouwen. Bij vrouwen is dat anders. Zij rapporteren gemiddeld minder autonomie-bevordering van vader en moeder en minder warmte van moeder in vergelijking tot mannen. De deelnemers met een angst- of stemmingsstoornis rapporteren minder warmte en minder autonomie-bevordering. Met name de deelnemers die zowel een angst- *als* stemmingsstoornis hebben rapporteren meer overbescherming en minder warmte en autonomie-bevordering vergeleken met de deelnemers die alleen een angst- *of* depressieve stoornis hadden en vergeleken met de gezonde controlegroep. Wanneer we inzoomen op de rol van de vader en moeder, dan zien we dat volwassenen met een angststoornis minder autonomie-bevordering van moeder rapporteren in vergelijking met de depressiegroep en gezonde controlegroep. Volwassenen met een depressieve stoornis rapporteren minder warmte van hun vader in vergelijking tot de groep met angstklachten en gezonde controlegroep.

Al met al laat deze studie zien dat de PBI een adequaat instrument is om de band met vader en moeder in de kindertijd te meten en dat daarbij drie dimensies te onderscheiden zijn: warmte, overbescherming en autonomiebevordering. Het gemis van warmte en autonomiebevordering houden met name verband met angst en depressie in de volwassenheid. Hoe de band met ouders in de kindertijd is ervaren, kan een belangrijke rol spelen in angst en depressie in de volwassenheid.

De broers en zussen van een kind met negatieve opvoedervaringen hebben vanzelfsprekend een verhoogde kans om ook negatieve opvoedervaringen te hebben. Ze groeien immers veelal op in dezelfde omgeving en met dezelfde ouders. Het is nog onbekend in hoeverre *volwassen* broers en zussen soortgelijke herinneringen aan (negatieve) opvoedingservaringen delen. Bovendien is het, met

het oog op preventie, belangrijk om te weten of niet alleen de unieke opvoedervaringen, maar ook de gedeelde opvoedervaringen met broers en zussen iemands mentale welzijn kunnen beïnvloeden (Steinglass, 1987).

In **hoofdstuk 3** is de mate van overeenstemming in opvoedervaringen van volwassen broers en zussen onderzocht. Tevens hebben we een eerste poging gedaan om een antwoord te geven op de vraag: Wie worstelt er met problemen in het gezin ondanks de gedeelde negatieve opvoedervaringen en wie niet? We onderzochten daarom of de persoonlijkheidskenmerken extraversie en internal locus of control (de mate waarin iemand gelooft zijn/haar eigen leven te kunnen bepalen en verantwoordelijk is voor eigen succes) een bufferend effect hebben in de relatie tussen negatieve opvoedervaringen en angst- en depressieklachten. Dit onderzochten we in 256 Nederlandse gezinnen met ten minste één persoon met een depressie of angststoornis in de volwassenheid uit NESDA (N=596; leeftijden 20-78). Uit de resultaten bleek dat broers en zussen uit hetzelfde gezin bleken in grote mate gelijk in hun ervaring van de band met hun moeder en in mindere mate gelijkend in de band met hun vader. Zoals verwacht hangen naast eigen negatieve opvoedervaringen, ook de negatieve opvoedervaringen van broers en zussen gerelateerd aan verhoogde depressie- en angstklachten van het individu in de volwassenheid. Binnen gezinnen met negatieve opvoedervaringen met moeder (maar niet met vader) zijn personen met een internal locus of control relatief minder angstig (maar niet minder depressief), terwijl extraversie in deze context niet beschermend is tegen depressie of angstklachten.

Hoofdstuk 4 beschrijft de studie, eveneens in de broers en zussen van mensen met angst en/of depressieve klachten (NESDA; N=636), naar emotionele mishandeling, fysieke mishandeling en seksueel misbruik en de relatie met depressieve klachten in de volwassenheid. Broers en zussen uit hetzelfde gezin tonen de meeste overeenkomst in hun ervaren emotionele mishandeling en - in mindere mate – fysieke mishandeling. Dit betekent dat er een aanzienlijke kans is dat broers en zussen van de persoon die emotionele of fysieke mishandeling heeft meegemaakt, ook mishandeld is. Seksueel misbruik wordt daarentegen meestal door één persoon in het gezin ervaren. Om de mate van mishandeling en misbruik in het gezin te bepalen zijn de rapportages van broers en zussen samengenomen in een gemiddelde score per gezin. Resultaten lieten zien dat het gezinsgemiddelde van emotionele en fysieke mishandeling samenhangen met een toename in depressieve klachten van een persoon. Deze samenhang was er niet voor het gezinsniveau van seksueel misbruik. Daarnaast waren de depressieve klachten ernstiger bij personen die *meer* emotionele mishandeling rapporteren dan het gezinsgemiddelde. Het ervaren van meer emotionele mishandeling dan broer(s) en/of zus(sen) en de samenhang met verhoogde depressiviteit kan het ‘zwarte schaapeffect’ genoemd worden.

Deze bevindingen duiden erop dat *naast* individuele ervaringen met mishandeling in de kindertijd, de (zichtbare) ervaring van broers en zussen met mishandeling, zoals fysieke mishandeling, een andere cruciale risicofactor is voor depressieve klachten. De vorm van mishandeling die vaak achter gesloten deuren plaats vindt, namelijk het meemaken van seksueel misbruik, is gerelateerd aan depressieve klachten bij het slachtoffer zelf en niet zozeer bij diens broers en zussen.

B. Interactieve gezinnen

De bevindingen uit de onderzoeken beschreven in deel A, hebben nieuwe inzichten opgeleverd in de overeenkomsten en verschillen in opvoed- en mishandelingservaringen in de jeugd van volwassen broers en zussen en hoe deze ervaringen samenhangen met depressieve en angstklachten. Deze onderzoeken waren gebaseerd op zelfrapportages. Alhoewel dit een belangrijke bron van informatie is, kan de beleving van opvoeding en mishandeling in de jeugd gekleurd zijn door de huidige (emotionele) toestand of door recente ervaringen met ouders. Observaties van interacties tussen ouders en kinderen, zoals beschreven in **hoofdstuk 5**, hebben het voordeel dat er geen sprake is van een zelfrapportage bias, waardoor de onderzoeker subtiele affectieve en gedragsaspecten van ouder-kind interacties kan observeren en beoordelen die mogelijk niet worden vastgelegd in zelfrapportages.

In hoofdstuk 5 werden de interacties van vaders (N = 94), en moeders (N = 125) met hun kinderen (N = 224, leeftijd: 7,5-65,5 jaar) uit 137 gezinnen geobserveerd. We bekeken voor vaders en moeders of internaliserende en externaliserende problemen van de ouder en het kind invloed hadden op de hoeveelheid warmte en negativiteit in hun interactie met elkaar. Het is uit voorgaande studies bekend dat psychische problemen van een gezinslid invloed kunnen hebben op de sociale interacties binnen een gezin (add refs). Op basis van eerdere bevindingen in de gezinnen die deelnamen aan deze studie, werden de analyses gecontroleerd op een voorgeschiedenis van kindermishandeling van vaders, moeders en hun kinderen.

Internaliserende problemen (gedurende de afgelopen zes maanden) maken kinderen *minder* negatief naar hun vader, terwijl externaliserende problemen van het kind verband houden met *meer* negativiteit richting hun vader en het ontvangen van *minder* warmte van hun moeder. Externaliserende problemen van vaders zijn gelinkt aan *meer* negativiteit naar hun kind. Er werden geen verbanden gevonden tussen internaliserende klachten van vaders en moeders en de ouder-kind interacties, evenmin voor externaliserende klachten van moeders. De resultaten suggereren dat met name externaliserende klachten in kinderen en vaders een negatieve invloed kunnen hebben op de interacties binnen het gezin. Op basis van deze bevindingen

strekt het tot aanbeveling om gezinnen te ondersteunen met interventies om de interacties tussen ouders en kinderen te verbeteren en om externaliserende problemen (vroegtijdig) te behandelen om in de impact op het gezin te beperken.

C. Samen opgroeien

De studies naar de relaties tussen ouderschap en psychologische problemen beschreven in deel A en B hadden een cross-sectioneel design, de gegevens van de onderzochte personen werden op één moment verzameld. Met een dergelijk design kan de richting van de effecten niet precies worden vastgesteld ('leidt bepaald ouderschap tot bepaalde problemen bij het kind of kunnen bepaalde problemen bij het kind ook voor bepaald ouderschap zorgen?'). Bovendien blijft de vraag hoe ouderschap en mentaal welzijn van het kind elkaar over en weer beïnvloeden en zich over tijd ontwikkelen nog onbeantwoord. In Deel C worden daarom twee longitudinale studies beschreven naar opvoedervaringen en mentaal welzijn in de adolescentie.

In **hoofdstuk 6** zijn drie longitudinale modellen getest om de verbanden tussen negatief oudergedrag en emotionele en gedragsproblemen van het kind over de tijd te analyseren. In data van 5698 identieke adolescente tweelingen uit de *Twins Early Development Study* (TEDS) vergelijken we de uitkomsten van twee varianten van het 'traditionele' *cross-lagged panelmodel* (CLPM), namelijk een *random intercept CLPM* (RI-CLPM) en een *monozygote twin-difference* versie van het CLPM (MZD-CLPM). De manier waarop alternatieve verklaringen worden uitgesloten in beide varianten is grotendeels overlappend, maar ook deels verschillend. Het belangrijkste verschil is dat de RI-CLPM controleert voor stabiele verschillen tussen personen waardoor effecten binnen een persoon over tijd bekeken kunnen worden. In het MZD-CLPM worden verschilscores tussen tweelinghelften gebruikt om zo te controleren voor de invloed van genen en gedeelde omgeving. De belangrijkste bevinding is dat in alle drie de longitudinale modellen terugkwam dat kinderen van 9 jaar met gedragsproblemen later op 12-jarige leeftijd meer negatief oudergedrag ervaren. Deze bevinding is als enige consistent in de drie modellen, alle andere bevindingen verschillen tussen de modellen. De bevindingen van deze studie zijn een duidelijke aanwijzing (maar nog geen bewijs) voor een causaal verband tussen gedragsproblemen van het kind als het 9 jaar is en het ervaren van negatief oudergedrag als het 12 jaar is. Hoewel de twee varianten van het CLPM bedoeld zijn om causale gevolgtrekking te versterken, leiden ze niet tot dezelfde conclusies. Het is daarom belangrijk om voorzichtig te zijn met het trekken van causale conclusies over processen binnen gezinnen op basis van één statistisch model. De substantiële verschillen tussen modellen illustreren dus ook dat triangulatie van resultaten tussen meerdere (longitudinale) methoden essentieel is om uitspraken te kunnen doen over causaliteit.

In maart 2020 heeft de Wereldgezondheidsorganisatie (WHO) het nieuwe coronavirus (COVID-19) uitgeroepen tot een wereldwijde pandemie. Daarom werden wereldwijd maatregelen getroffen om de verspreiding van het virus tegen te gaan. Het noodgedwongen thuisblijven en afstand van elkaar houden hadden onvermijdelijk een enorme impact op het dagelijks leven. In de tweede studie in sectie C (**hoofdstuk 7**) staan de bevindingen beschreven van een studie die de dagelijkse stemming en opvoedervaringen van adolescenten en hun ouders vergelijkt tussen een periode voor en tijdens de COVID-19 pandemie. Aan deze studie namen 34 adolescenten en 67 ouders uit de RE-PAIR-studie ('*Relations and Emotions in Parent-Adolescent Interaction Research*') deel. Ouders en kinderen rapporteerden meerdere keren per dag via hun telefoon over hun stemming gedurende een periode van twee weken. Deze methode van dataverzameling wordt ook wel ecological momentary assessments (EMA) genoemd.

Dit onderzoek laat zien dat de negatieve stemming van ouders was toegenomen in vergelijking tot de periode voorafgaand aan de pandemie. Dit was niet het geval voor de stemming van de adolescent, noch voor de mate van warmte en kritiek van de ouder. Het kunnen verdragen van onzekerheid hangt samen met een sterkere negatieve en minder positieve stemming van adolescenten en ouders. Intolerantie van onzekerheid, maar geen andere pandemie-gerelateerde kenmerken (d.w.z. woonoppervlakte, inkomen, familieleden met COVID-19, thuiswerken, kinderen helpen met school en contact met COVID-19-patiënten op het werk) hielden verband met de toename van negatieve stemming van ouders tijdens de pandemie. De relatief gezonde gezinnen van deze studie gingen behoorlijk goed om met de omstandigheden aan het begin van de pandemie. De verschillende uitkomsten suggereren echter wel dat het sterk kan variëren tussen gezinnen of ze last hebben van problemen door de pandemie, dus '*one size does not fit all'.* Beleidsmakers en professionals in de geestelijke gezondheidszorg dienen zich ervan bewust zijn dat elke ouder en adolescent baat kan hebben bij een andere coping strategie. Online contact, het zoeken van afleiding zoals naar muziek luisteren, sporten of televisiekijken, en zijn hier voorbeelden van. Op deze manier kan iedereen manieren vinden die passen bij hun eigen persoonlijke behoeften ten tijde van een lockdown en social distancing-maatregelen.

Algemene discussie

In **hoofdstuk 8** worden de resultaten van dit proefschrift besproken aan de hand van de drie elementen, zoals beschreven in hoofdstuk 1.

1. Door meerdere gezinsleden samen te onderzoeken, broers en zussen, vaders en moeders, in plaats van ons te richten op het individu en/of één ouder,

laten we nieuwe patronen zien tussen negatieve opvoedervaringen in de jeugd en psychische problemen en de bi-directionele verbanden daartussen. De resultaten ondersteunen het idee dat de impact van mishandeling en negatieve interacties tussen ouders en kinderen tijdens de kindertijd langdurig en omvangrijk is: het treft niet alleen één kind, maar kan ook de psychische problemen bij broers en zussen vergroten. Bovendien hebben psychische problemen van ouders en kinderen, met name externaliserende problematiek, invloed op de manier waarop ouders en kinderen met elkaar omgaan. Het gezin moet daarom beschouwd worden als een dynamisch interactief systeem in onderzoek en in de klinische praktijk. Daarom is het belangrijk om gezinsleden (bijvoorbeeld ouders of broers en zussen) te betrekken bij het aanpakken van psychische problemen.

2. In dit proefschrift gebruikten we verschillende meetmethoden om de ouder-kindrelatie in kaart te brengen. Namelijk, zelfrapportages, gedragsobservaties, ecological momentary assessments (EMA) en interviews. Alle methoden onderzoeken verschillende facetten van de ouder-kindrelatie en geen enkele methode kan de volledige complexiteit en dynamiek van de ouder-kindrelatie vastleggen. De keuze van de meting moet worden bepaald door de onderzoeksvraag en de theoretische aannames die aan elke methode ten grondslag liggen. Uitkomsten van de vragenlijsten, observaties, EMA en interviews hoeven niet overeen te komen of identiek te zijn. Dus, hoewel het samenbrengen van bevindingen uit verschillende methoden een uitdaging kan zijn, strekt het combineren van methoden in kliniek en onderzoek tot de aanbeveling om zo een geïntegreerd beeld te krijgen van de ouder-kind interacties en -relatie.

3. Families zijn dynamische en interacterende systemen waarin verschillende processen op meerdere niveaus plaatsvinden, d.w.z. het familie-, dyadisch en individueel niveau. Om de perspectieven van deelnemende familieleden te combineren en data van de verschillende niveaus te analyseren, zijn complexe statistische methoden nodig. Onderzoek naar families brengt daarnaast een aantal uitdagingen met zich mee, zoals de samenhang in de data van verschillende leden binnen het gezin en variërende gezinsgroottes. Geavanceerde statistische kennis en vaardigheden en interdisciplinaire samenwerkingen zijn nodig om om te gaan met de complexiteit van de processen binnen het gezin, de familiedata en de bijbehorende analytische modellen. Daarom moeten familie-onderzoekers compromissen sluiten tussen de 'ideale' en de praktisch haalbare statistische modellen.

Al met al ondersteunen de bevindingen van dit proefschrift het belang van de gezinscontext – de ouder-kindrelatie en opvoedervaringen van broers en zussen – in de ontwikkeling en mate van psychische problemen. In de behandelrichtlijnen van veelvoorkomende psychische stoornissen, zoals angst en depressie, zijn de meeste therapieën gericht op het verbeteren van de symptomatologie van het individu. We weten echter dat interacties in het gezin (tijdens de jeugd) verband houden met mentaal welzijn, en andersom, dat psychologische problemen van een familielid impact kunnen hebben op de interacties en relaties in het gezin. Met een systemische aanpak en oog voor vroegere én huidige familierelaties worden patiënten mogelijk nog beter geholpen. Daarom is een systemische aanpak, waarin ouders en broers en zussen betrokken worden, in zowel onderzoek als praktijk aan te bevelen. Het ondersteunen van families door middel van interventies om de ouder-kindrelatie te verbeteren kan zeer waardevol zijn en (vroegtijdige) behandeling van psychische en gedragsproblemen (van ouder of kind) kan het gehele gezin ten goede komen.

Heterogeniteit in onderzoeksbevindingen is eerder regel dan uitzondering. Hoewel onderzoek op epidemiologisch niveau relevante inzichten geeft in patronen tussen personen en processen binnen de persoon met betrekking tot opvoeding en psychische problemen, is dit niet op ieder gezin of individu van toepassing. Deze observatie kan worden vertaald naar de praktijk in die zin dat klinische behandelrichtlijnen voor veel, maar niet voor alle cliënten geschikt zijn. Het sensitief afstemmen van (systeem)therapie op de individuele cliënt of gezin is essentieel.

De conclusie van dit proefschrift kan kort en bondig worden omschreven: ‘Family Matters’. Om psychische problemen beter te begrijpen en preventie en behandeling te verbeteren, dienen behandelaren en onderzoekers verder te kijken dan het individu. Dat wil zeggen, de gezinscontext, interacties met en perspectieven van broers en zussen, vader en moeder is belangrijk in onderzoek en klinische praktijk. Toch moet enige bescheidenheid in acht worden genomen bij. Gezien de verscheidenheid tussen mensen en de complexiteit van menselijke interacties verwacht ik dat er altijd een deel van menselijk gedrag en gevoelens zal zijn dat niet in algemene wetten of theorieën kan worden gevat. Ondanks de kracht en de voordelen van wetenschappelijk onderzoek, zullen we de gehele menselijke psychologie nooit volledig kennen, en dat is precies waarom we ons altijd moeten blijven verdiepen in anderen en onszelf.

About the author (Curriculum Vitae)

Marie-Louise Julie Kullberg was born on the 5th of July 1993 in Nijmegen. She graduated from secondary school, Stedelijk Gymnasium Nijmegen, in 2010 and moved to Leiden to start with the bachelor Psychology at Leiden University. After she obtained her Bachelor's degree (2010-2014) she was a fulltime board member of her student association. In 2014, she started her Master's in Clinical Psychology at Leiden University. She completed her clinical and research internship at PsyQ The Hague 'Angststoornissen' and obtained her Master's degree with distinction (Cum Laude) in 2016.

In November 2017, Marie-Louise started as a junior researcher with prof. dr. Elzinga to investigate childhood experiences and depression and anxiety in the sibling study of The Netherlands Study of Depression and Anxiety (NESDA). Her research was part of the profiling area of the University '*Health, Prevention and the Human Life Cycle*'. Next to her work as a junior researcher, she worked as a research assistant with prof. dr. Maartje School and dr. Joanne Mouthaan on multiple projects: (1) childhood trauma and posttraumatic stress disorder in physical injured patients, (2) suicide prevention skills among students and (3) cost-effectiveness of a trauma-focused treatments in patients with childhood abuse-related Posttraumatic Stress Disorder (CA-PTSD).

In November 2018 she started as a PhD candidate, continuing her work on NESDA and investigating (adverse) parenting experiences and mental health problems in the family context. Marie-Louise received training from the Dutch-Flemish postgraduate school for Experimental Psychopathology (EPP) and the Graduate School of Social and Behavioural Sciences of Leiden University. During her PhD, Marie-Louise supervised multiple master thesis students and taught several bachelor and master's courses (e.g. clinical psychology and clinical interviewing and assessment). Marie-Louise was member of the organizing committee of the European Society for Traumatic Stress Studies Conference (ESTSS2019) and the communication committee of the Dutch Association of Psychotrauma (NTvP). In the second year of her PhD she received two travel grants from (LUF) and Prins Bernhard Cultuurfonds to collaborate with dr. Tom McAdams at King's College London. The visit was cancelled due to the pandemic and the collaboration continued virtually, which resulted in the study described in chapter 6 of this dissertation. During her third (last) year of her PhD Marie-Louise worked part-time as a psychologist at PEP-groep Noordwijk.

Currently, she works as a postdoctoral researcher focusing on trauma-related psychopathology and parenting and started her postmaster training (GZ-opleiding) at Leids Universitair Behandel- en Expertise Centrum (LUBEC).

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Dankwoord (acknowledgements)

Er zijn een heleboel mensen die ik een warm hart toedraag en wil bedanken voor hun substantiële bijdrage aan de totstandkoming van dit proefschrift, woorden schieten tekort...

In de eerste plaats **Bernet**. Vanaf het begin gaf je me vertrouwen, bleef je me uitdagen, stimuleren en inspireren. Bedankt voor je warmte en autonomiebevordering, het delen van je kennis en kunde en de organische samenwerking tijdens de afgelopen jaren. Ik kijk uit naar de komende jaren.

Charlotte, tijdens het brainstormen over methoden en bij het interpreteren van (verrassende) resultaten heb ik veel van je geleerd. Hoewel de fysieke afstand bijna niet groter kon, was je een belangrijke gids in de wonderlijke wereld van de wetenschap, dankjewel voor al je steun en advies.

De leden van de leescommissie, **Lenneke, Catrin, Geert-Jan en Christiaan**, dank voor de tijd die jullie genomen hebben om mijn proefschrift te lezen en van een oordeel te voorzien.

Tom, thank you for your supervision and all I have learned during our online collaboration. Perhaps we will meet one day in real life, that would be my pleasure.

Alle andere coauteurs wil ik ook bedanken voor hun waardevolle bijdragen aan dit proefschrift. Speciale dank aan **Renate** en **Dominique,** aan jullie heb ik zo veel kunnen vragen. **Eleonore,** dank voor al je praktische en mentale steun, het was ontzettend fijn om samen met je op te trekken.

Grote dank aan alle **NESDA-, 3G-, RE-PAIR- en TEDS-deelnemers**, door jullie persoonlijke bijdragen aan deze studies leren we de menselijke ontwikkeling en psyche steeds beter kennen.

Dank aan mijn (voormalig) **KP-collega's** voor de fijne jaren op het FSW als student en als onderzoeker, met speciale dank aan **Willem** en **Joanne** voor de kansen die jullie me afgelopen jaren geboden hebben. **Bart,** bedankt voor het sparren en ik ben blij dat we dat nog even voortzetten. **Maartje**, jouw veelzijdigheid en bevlogenheid zijn inspirerend. Mijn grote dank voor je steun en alle kansen.

Alle (voormalige) KP-AiO's, bedankt voor alle offline en online momenten en de veilige en gezonde werkomgeving. **Mona**, thanks for sharing your endless enthusiasm and energy. **Cosima**, zonder jou had ik minder koffiegedronken en minder

zwemavonturen beleefd, thanks. **Mirjam** en **Lisanne**, jullie maakten mijn landing in 2B36 zacht en lieten mij erg welkom voelen, mede dankzij ABBA.

Florianne, dankjewel voor het prachtige design van dit proefschrift, heel bijzonder na ruim 20 jaar.

Lieve **Cecile, Isabella en Iris,** ik denk niet dat mijn bevlogenheid voor de wetenschap begon bij het profielwerkstuk op de middelbare school, maar gelukkig heb ik wél onze fijne vriendschap overgehouden aan die jaren.

Lieve **Sven, Wessel, Cedric, Christel, Annelies, Thomas** en **Lude** ik waardeer dat we zijn zoals we zijn als groep. Dank voor alle feestjes, reisjes en andere avonturen. Lieve **Krista**, je bent een hele belangrijke vriendin, ik breng zoveel uren met je door en dat is altijd fijn. Dankjewel.

Lieve **Aniek, Cecile, Kristianne, Marieke, Marion, Marisa** en **Sophietje**, inmiddels allemaal Leiden verlaten maar jullie waren mijn thuis gedurende afgelopen twaalf jaar, dank voor jullie fijne vriendschap. Lieve **Margriet**, Hansie, niemand heeft het proces zo dichtbij meegemaakt als jij, samenwonen was me een enorm genoegen. Lieve **Anne**, ik ben blij dat ik voor, tijdens én na mijn promotietraject zoveel met jou kan delen. **Liselot**, bij pieken en dalen, je bent en blijft mijn BFF. Lieve **Solange**, gesprekken met jou geven me altijd energie. Je bent een geweldige onderzoeker en een fenomenale vriendin. Liefste **Suus** en **Rosa**, beiden zijn jullie zo getalenteerd en inspirerend, dank voor jullie gigantische betrokkenheid, jullie zijn belangrijke steunpilaren.

Loes en **Melis**, jullie zijn niet voor niks mijn paranimfen. Ik bewonder jullie. Lieve Loes, binnen het onderzoek kon ik alles aan je vragen en fijn met je samenwerken, maar daarbuiten betekende je nog honderd keer meer voor me. Bedankt dat je er altijd bent. Lieve Mel, door brieven te schrijven tijdens misschien wel het meest bizarre jaar ooit, heb ik het gevoel dat weinigen mensen beter kennen dan jij. Bedankt voor je eeuwige steun.

Lieve opa **Adriaan** en oma **Loes**, wie heeft er nou grootouders die webinars kijken en kritische vragen gaan stellen? Ik ben dat. Dank voor jullie grenzeloze enthousiasme en interesse.

Lieve oma **Julie**, je leest dit niet meer en hebt geen idee dat ik promotieonderzoek deed, toch wil ook jou hier noemen. In eerdere fasen droeg jij namelijk bij aan wie ik nu ben, dankjewel.

Lieve **Kees-Jan**, ik weet niet waar ik moet beginnen, jouw steun, enthousiasme, openheid, humor en interesse... jij haalt het beste in mij naar boven en je bent een bron van inspiratie, dankjewel. Ik hou van alles van jou. Lieve **Alie** en **Jaap**, nieuwe familie is ook familie, ik voel me helemaal thuis bij jullie, dank daarvoor.

Lieve familie, aan jullie draag ik dit proefschrift op. Want zoals ik afgelopen pagina's aan de lezer duidelijk probeerde te maken, zijn familierelaties fundamenteel. **Roos**, **Pim**, **Linde** en 'nieuwe mini', **Sybe** en **Sol**, **Roos** en **Annabel**, ik wens iedereen zo'n verrijking van z'n familie toe. **Suus** en **Heert**, jullie stellen allebei de juiste vragen en geven me waardevolle adviezen, jullie zijn onmisbaar. Lieve **Liesje**, een betere schoonzus kan ik me niet wensen. **Bob** en **Willem**, jullie zijn me ongelofelijk veel waard. Wum, mama zei ooit: "je mag soms best wat meer zoals Willem zijn", je onbevangenheid en gedrevenheid zijn bewonderenswaardig. Bob, je bent een ongekend goede wetenschapper, maar belangrijker, je bent een van de twee beste broers en een inspirerend mens. Lieve **papa** en **mama**, ik heb jullie 15 jaar niet meer in een ademteug genoemd, maar dit is daar wel het moment voor: Jullie zijn geweldige, liefdevolle ouders, dankjewel en ik hou van jullie.