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Research paper

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

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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.

1. 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

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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.

1.1. 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 and Burt, 2014). For instance, a study on infant attachment at 12–14 months after birth showed that there is moderate correspondence among siblings (intra-class correlations: 0.23–0.37; van IJzendoorn et al., 2000). In adults however, twin sibling correlations of retrospective self-reports on PB during childhood are rather lower, ranging from 0.11 for dizygotic to 0.49 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 and Waldron, 2000). The resemblance of PB experiences among non-twin adult siblings remains to be further investigated.

1.2. 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 et al., 2002; Enns et al., 2002; Kashani et al., 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 et al., 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 and Hetherington, 2001; McGuire et al., 1995). Differential bonding, e.g. reporting less maternal warmth compared to the other siblings, is linked to youth internalizing problems (Tamrouti-Makkink et al., 2004), such as depression (Shanahan et al., 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 et al., 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 and 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 and Hetherington, 2001; Jenkins et al., 2016; Oliver and 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.

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

One person may not experience any adverse consequences of sub-optimal 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 et al., 2000; Plomin et al., 2001). Until now, most studies on recollections of PB in relation to anxiety and depression included one person per family (Enns et al., 2002; Overbeek et al., 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 et al., 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 et al., 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 et al., 2002). This in turn is known to make one less vulnerable to psychological problems (Gariépy et al., 2016), specifically to depression and anxiety (Jylhä and Isometsä, 2006; Spinhoven et al., 2011b). In addition, one's perceived level of mastery (Pearlin and 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 et al., 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 et al., 2001). Although personality characteristics have shown to be rather stable, they may also change over time and are malleable to a certain extent (Costa et al., 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 et al., 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 fewer depressive 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.

1.4. 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 et al., 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.

2. 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, 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

2.1. 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.

2.2. 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.

2.3. 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 et al., 2014).

Missing data on the outcomes (IDS and BAI) were completely at random (MCAR), $\chi^2(27) = 25.37, p = .553$, indicating that non-completers did not differ from completers on lifetime psychopathology, PB, gender, age and years of education (all p -values >0.05).

First, the sibling concordance regarding the parental bond with father and mother was assessed by calculating covariate-adjusted intra-class correlation coefficients (ICC; between family variance / total variance; Higgins and Keller, 1975; Shoukri and Ward, 1989; Shoukri

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	−0.006	−0.091*	.279**	.186**	−0.164**	−0.059	.041	−0.009
2. Female N (%)	372 (62.4)	−0.006	1	−0.032	.004	.120**	.062	−0.080	.102*	.146**
3. Years of education	13.28 (3.1)	−0.091*	−0.032	1	−0.004	−0.057	.034	.087*	−0.112**	−0.112**
4. Poor parental bonding father	31.43 (8.4)	.279**	.004	−0.004	1	.478**	−0.286**	−0.200**	.303**	.223**
5. Poor parental bonding mother	31.06 (8.6)	.186**	.120**	−0.057	.478**	1	−0.261**	−0.250**	.285**	.257**
6. Extraversion	38.27 (7.19)	−0.164**	.062	.034	−0.286**	−0.261**	1	.399**	−0.411**	−0.287**
7. Internal locus of control (iLoc)	14.22 (4.27)	−0.059	−0.080	.087*	−0.200**	−0.250**	.399**	1	−0.677**	−0.555**
8. Depressive symptoms	14.40 (10.37)	.041	.102*	−0.112**	.303**	.285**	−0.411**	−0.677**	1	.740**
9. Anxiety symptoms	7.26 (7.66)	−0.009	.146**	−0.112**	.223**	.257**	−0.287**	−0.555**	.740**	1

* $p < .05$.

** $p < .01$.

et al., 2013). ICC values ≥ 0.3 were considered ‘large’, indicating a strong concordance between the data collected from individuals within the same family (Scherbaum and Ferrerter, 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 and 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/a5j72/>) to reproduce all analyses.

3. Results

3.1. 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 = 0.43) as compared to father (ICC = 0.28, $z = 2.97$, $p = .002$). 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.

3.2. Poor PB in the family context and levels of current psychopathology

3.2.1. Depression

First, a covariate adjusted unconditional means model of depressive symptoms was built (ICC = 0.20), 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: $coeff = 0.23$, $SE = 0.09$, $p = .009$, father: $coeff = 0.35$, $SE = 0.08$, $p < .001$) and family-wide poor bonding (mother: $coeff = 0.18$, $SE = 0.07$, $p = .012$, father: $coeff = 0.28$, $SE = 0.08$, $p < .001$) contributed simultaneously to current elevated depressive symptom levels.

3.2.2. Anxiety

The covariate adjusted unconditional means model of anxiety symptoms yielded an ICC of 0.15, 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: $coeff = 0.16$, $SE = 0.07$, $p = .021$, father: $coeff = 0.17$, $SE = 0.07$, $p = .009$) and family-wide poor bonding (mother: $coeff = 0.15$, $SE = 0.05$, $p = .003$, father: $coeff = 0.14$, $SE = 0.06$, $p = .013$) were simultaneously associated to current elevated anxiety symptoms (see Table 5).

3.2.3. 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 ($coeff = -0.42$, $SE = 0.07$, $p = 0.001$) and iLoC ($coeff = -1.39$, $SE = 0.09$, $p = .001$) were linked to lower depressive symptom levels. For the moderator analysis, a significant interaction between extraversion and family-wide maternal bonding ($coeff = -0.02$, $SE = 0.01$, $p = .034$) 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 Fig. 1). For family-wide paternal bonding no interaction between extraversion or iLoC was found (all p -values > 0.05). All model statistics can be found in Table S3 of the supplementary materials.

3.2.4. 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 ($coeff = -0.27$, $SE = 0.05$, $p =$

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 ($\alpha = 0.88$) and father ($\alpha = 0.88$). 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 et al., 1996, 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 ($\alpha = 0.95$) 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 ($\alpha = 0.98$). Moreover, a good validity and reliability were found (Beck et al., 1988). BAI sum scores are available for 625 participants.
NEO Five-Factor Inventory: Extraversion	The NEO Five-Factor Inventory (NEO-FFI; Hoekstra and 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 0.79, reflecting a good internal consistency. Data were obtained at baseline for the probands 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 probands and siblings will not affect the results.
Mastery scale: Locus of Control	Locus of control (LoC) is assessed through the self-report measure Pearlman and Schooler Mastery Scale. The Mastery Scale measures a person's level of mastery, namely the extent to which one regards

Table 4 (continued)

Instrument	Description and psychometric properties
	that one's chances and events are under one's own control (iLoC) as opposed to being fatalistically ruled (external LoC; Pearlman and 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 0.88. Data was obtained at W6 for NESDA probands and their siblings.

<0.001) and iLoC ($coeff = -0.80$, $SE = 0.08$, $p = <.001$) were 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 Fig. 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 > 0.05). All model statistics can be found in Table S4 of the supplementary materials.

4. 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.

4.1. Individual reports of PB and sibling experiences

In line with previous studies in children (Feinberg and 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

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	<0.001	7.29	0.33	22.31	<0.001
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	<0.001	0.17	0.07	2.62	0.009
Family-mean poor PB - father	0.28	0.08	3.55	<0.001	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.

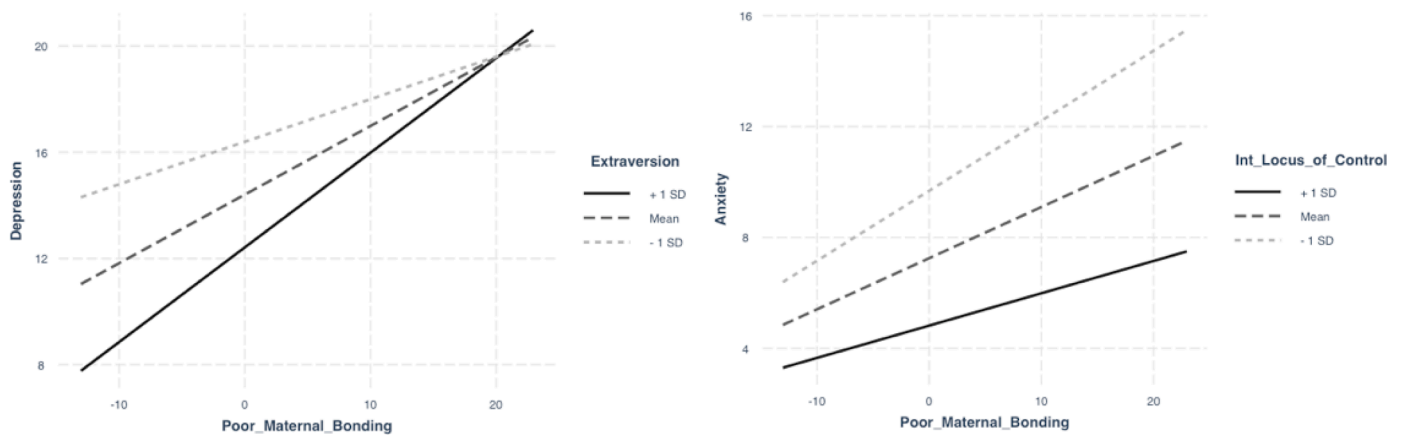


Fig. 1. Family-wide Poor Maternal Bonding and Current Depression Levels: Moderation effect of Extraversion (left) and Family-wide Poor Maternal Bonding and Current Anxiety Levels: Moderation effect of internal Locus of Control (right).

worse by father or mother compared to siblings has a large impact on wellbeing (Jensen et al., 2013; Peng et al., 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 and Knafo, 2014), which could negatively affect offspring’s mental wellbeing (Shanahan et al., 2008; Solmeyer and 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 and 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 et al., 1981; Nichols et al., 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.

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

Moderate family resemblance of current depressive (ICC = 0.20) and anxiety (ICC = 0.15) 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 et al., 2016; Spinhoven 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 and 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 et al., 2014). As such, in persons with a negative perception of maternal bonding strengthening the sense of mastery, for instance by Socratic questioning (Braun et al., 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).

4.3. 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 et al., 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 et al., 2019). Findings of prospective research on the association of the parent-child relationship and adult internalizing psychopathology are mixed (Overbeek

et al., 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 et al., 2010; Wilhelm et al., 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: $r=-0.41$, anxiety: $r=-0.29$), as was iLoC (depression: $r=-0.68$, anxiety $r=-0.56$). Hence, these factors may also mediate the association between poor PB and internalizing symptoms (Garber and Flynn, 2001). In line, external LoC, for example, has been found to partially mediate the link between overprotective parenting and social anxiety (Spokas and 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 et al., Rooij, Penninx et al., 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 et al., 2011).

4.4. 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.

Contributors

B.P. developed the study concept and design of NESDA. B.E. and A.v.H. were closely involved in the design of the sibling part of NESDA. M.K. and E.D.v.S. prepared the data for the analyses. M.K. performed the data

analysis and interpretation under the supervision of C.v.S. and B.E. M.K. drafted the manuscript, and B.E., C.v.S., E.D.v.S., C.H., A.v.H and B.P. provided critical revisions. All authors approved the final version of the paper for submission.

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Declaration of Competing Interest

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

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:[10.1016/j.jad.2020.12.045](https://doi.org/10.1016/j.jad.2020.12.045).

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