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

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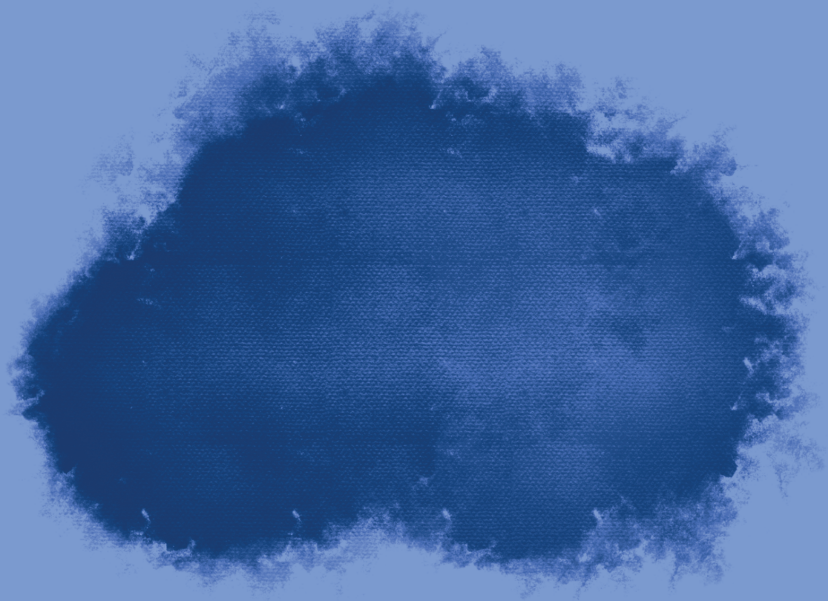

RECOLLECTING CHILDHOOD

2

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

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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

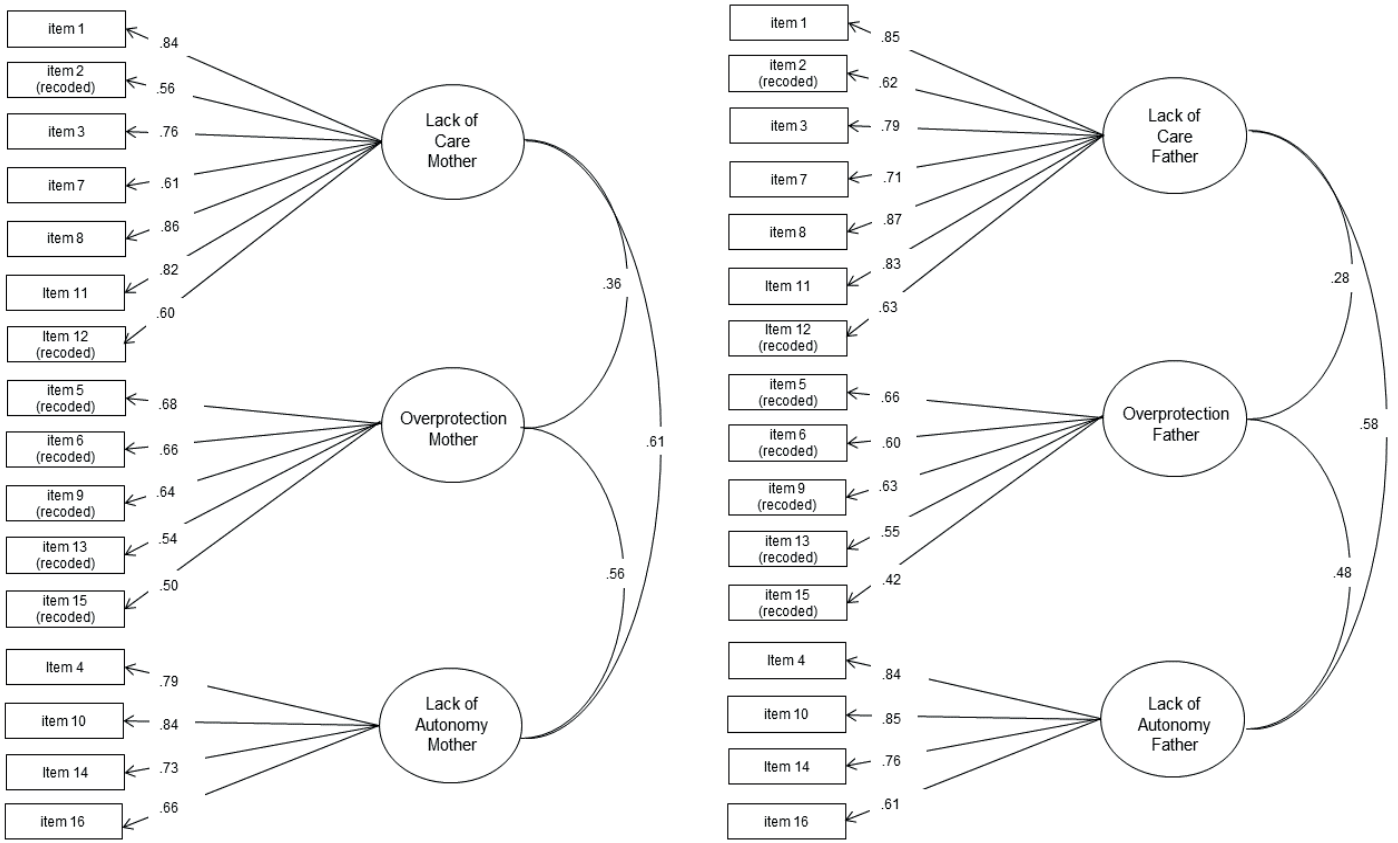
Two versus Three Factor Structure

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

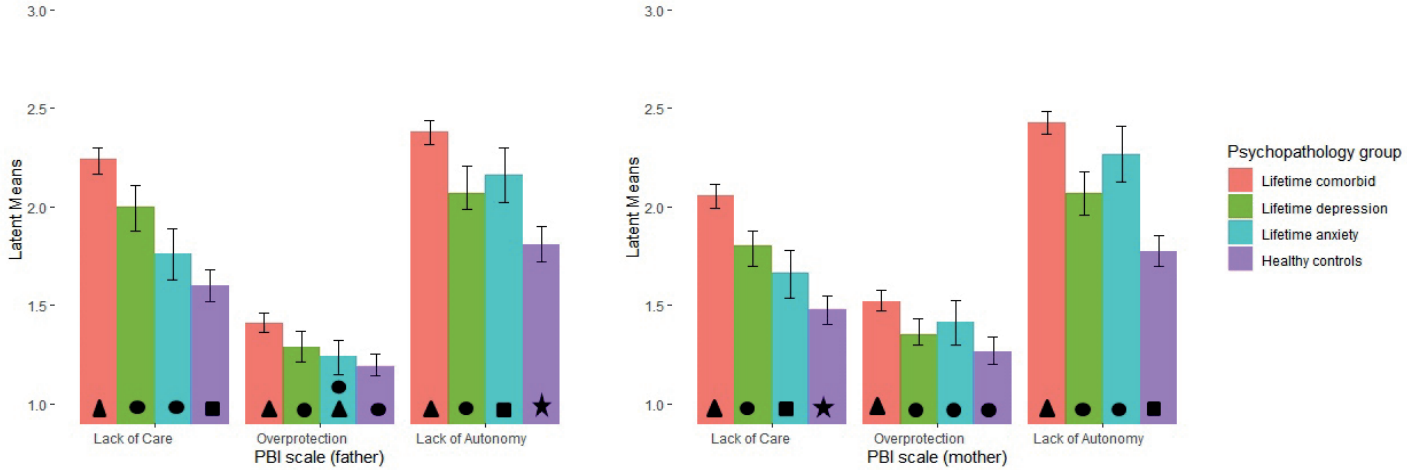
Note: CFI =comparative fit index; ΔCFI = change in CFI; TLI = Tucker–Lewis Index; RMSEA = root mean-square error of approximation; SRMR = standardized root mean-square residual; Given our large sample and as χ^2 is sensitive to sample size, we only used χ^2 for descriptive purposes (Kline et al., 2010)

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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