

Parental Pre- and Postpartum Mental Health Predicts Child Mental Health and Development

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Abstract

Objective: To identify interplay of early maternal and paternal mental health symptoms for predicting child mental health and development.

Background: Research on family mental health has largely excluded fathers, although the well-being of both parents is likely to be important for child development. In this study, we analysed (a) intrafamilial dynamics between mothers' and fathers' early mental health symptoms, and (b) the importance of separate (mother and father) and joint (additive, hierarchical, and buffering) theoretical models of parental mental health for predicting child mental health and development.

Method: Finnish mothers and fathers ($N = 763$), half having conceived through assisted reproductive treatments (ART), reported their symptoms of psychological distress and depression from the pregnancy to 2 months and 12 months postpartum. Later, when the child was 7–8 years of age, they ($N = 485$) reported the child's internalizing and externalizing symptoms and social and cognitive developmental problems.

Results: We identified both co-occurrence and compensation in intrafamilial early parental mental health. Further, mothers' symptoms alone (separate mother model) predicted child internalizing symptoms, whereas joint parental symptoms (additive model) predicted problems in executive function.

Conclusion: The pre- and postnatal mental health of both mothers and fathers is important for later child development.

Implications: To support healthy child development, both parents need to be screened for early mental health problems and psychological help should be offered to families across the pre- and postpartum period.

Keywords: child development, child mental health, maternal depression, parental mental health, paternal depression, pre- and postpartum period

Parental Pre- and Postpartum Mental Health Predicts Child Mental Health and Development

For decades, the family systems perspective has emphasized that families function as organized, holistic systems. Nevertheless, the vast majority of research on family mental health continues to focus on individual family members. Maternal and paternal mental health is often studied separately, although each is known to influence the other (Goodman, 2008; Paulson & Bazemore, 2010) as well as child development (Connell & Goodman, 2002). In the present study, we examine overlap between maternal and paternal early symptoms of psychological distress and depression, expecting to find co-occurrence and compensation, and we analyze how early parental symptoms predict children's internalizing and externalizing symptoms as well as cognitive and social developmental problems at school age.

Co-occurrence and Compensation in Early Maternal and Paternal Mental Health

Research on family mental health shows co-occurrence between mothers' and fathers' symptoms, possibly reflecting spill-over from one parent to the other. For instance, depression and anxiety at mid-pregnancy is more common and severe in fathers-to-be when their pregnant partner is depressed (Field et al., 2006), and roughly a quarter of postnatal depressed mothers have depressed partners (Goodman, 2008). Prospective follow-up studies have suggested that strength of symptom co-occurrence might vary across the pre- and postpartum period. Specifically, some studies have found that co-occurrence gets stronger toward the end of child's first year (e.g., Matthey, Barnett, Ungerer, & Waters, 2000). However, others have reported that in families with one depressed parent, the likelihood of depression in the other parent is equally increased across the pre- and postpartum period (e.g., Escribá-Agúir & Artazcoz, 2011).

In addition to co-occurrence, interparental compensation may also occur (Edhborg, Lundh, Seimyr, & Widström, 2003; Markey, Funder, & Ozer, 2003; Nelson, O'Brien, Blankson, Calkins, & Keane, 2009). That is, because maternal depression can jeopardize her ability to provide sensitive parenting, some fathers may take increased responsibility for the family and parenthood, thereby showing especially low levels of depression symptoms (Hossain et al., 1994). In line with this view, father–infant dyadic interaction in families with maternal depression tends to be more positive than mother–infant interaction in these families (Edhborg, Lundh, Seimyr, & Widström, 2003; Hossain et al., 1994) or father–infant interaction in families without maternal depression (Edhborg, Lundh, Seimyr, & Widström, 2003). Similarly, a study among families with school-aged children found that both mothers and fathers compensated for their spouses' depression by providing heightened support to their children (Nelson, O'Brien, Blankson, Calkins, & Keane, 2009). However, not all studies support the idea of compensation; Goodman (2008), for example, reported less optimal dyadic communication between fathers and infants in families with depressed mother.

In the present study, we attempt to identify intrafamilial co-occurrence and compensation between mothers' and fathers' early mental health symptoms. We analyze the overlap between maternal and paternal latent mental health trajectory classes that we identified in previous studies (Vänskä et al., 2011; Vänskä et al., 2016). The trajectories depicted distinct parental subgroups, each showing unique patterns of depressive and psychological distress symptoms that rose to clinically meaningful levels at certain times during the course of pre- and postpartum period (e.g., during pregnancy only or in the early or late postpartum period only).

Parental Mental Health Predicting Child Development

In addition to affecting each other, maternal and paternal mental health symptoms can negatively impact child development. A majority of research has focused solely on maternal impact (for a review, see Sanger, Iles, Andrew, & Ramchandani, 2015), a minority solely on paternal impact (for a review, see Ramchandani & Psychogiou, 2009), and only a few studies on the joint parental impact on children (e.g., Weinfield, Ingerski, & Moreau, 2009). Yet, theory and research suggest five possible models depicting parental mental health effects on child development: two separate (mother and father) and three joint (additive, hierarchical, and buffering) parental models (Coyne, Downey, & Boergers, 1992; Weinfield et al., 2009).

First, the *separate mother* model assumes that mother's symptoms alone, independent of father's symptoms, predict problems in child development. Due to mother's physical connection during the pregnancy and her typical status as a child's primary caregiver, maternal mental health problems may have a relatively large impact on children. Early maternal depression and anxiety have indeed been found to predict internalizing and externalizing symptoms among pre-school and school-aged children (Bureau, Easterbrooks, & Lyons-Ruth, 2009). Further, mothers' problems can negatively affect children's cognitive development (Sohr-Preston & Scaramella, 2006). The effect of mothers' prenatal symptoms on later child development is most likely mediated via biochemical paths of maternal-fetal stress physiology (Glover, O'Donnell, O'Connor, Ramchandani, & Capron, 2015), whereas the postpartum effects are probably transmitted through non-optimal early interactions (Bureau et al., 2009; Feldman et al., 2009). Yet, when examining the effects of mothers' symptoms on children, fathers' symptoms have usually been neither analyzed nor controlled, which prevents any conclusions concerning the relative importance of both parents.

Second, analogously to the separate mother model, the *separate father* model suggests that paternal symptoms only, regardless of maternal symptoms, increase children's symptoms. Research on the effect of fathers' mental health on children is scarce. We found three studies analyzing the explicit role of fathers' postnatal depression in predicting children's mental health and development. One study found that children whose fathers had postpartum depression showed more problems in early language acquisition, particularly in vocabulary, at 2 years of age (Paulson, Keefe, & Leiferman, 2009). Fathers' postpartum depression has also been found to predict children's internalizing and externalizing problems at 2 to 3 years of age (Carro, Grant, Gotlib, & Compas, 1993) and at 3 to 5 years of age (Ramchandani, Stein, Evans, & O'Connor, 2005), and behavioral and social developmental problems at 7 years of age (Ramchandani, Stein et al., 2008). The impact of mother's mental health was controlled in each of these three studies.

When considering every-day family life, it seems likely that mothers' and fathers' mental health have a joint influence on children. Third, the *joint additive* model suggests that each parent's symptoms contribute independently to child development, above and beyond the contribution of the other parent's symptoms. The model thus assumes that both parents are separately important for children. Fourth, the *joint hierarchical* model instead assumes that father's mental health problems exacerbate risk to children only when they are already at risk due to maternal problems. The model thus posits that, as primary caregivers, mothers are pivotal for child development, whereas the father's role becomes important only in situations where maternal abilities are compromised. Finally, the *joint buffering* model suggests that the availability of one healthy parent, either mother or father, may serve as a protective factor against problems in the other parent. Thus, in essence, one parent's mental health problems do not negatively affect the child if the other parent is healthy.

We found two cross-sectional studies that provide evidence for the joint additive model, showing that both mothers' and fathers' mental health problems were uniquely

associated with child externalizing symptoms in toddlerhood (Weinfield et al., 2009) and in adolescence (Brennan, Hammen, Katz, & Le Brocque, 2002). Two studies are also available to support the joint hierarchical model. A cross-sectional study confirmed that fathers' mental health problems were associated with school-aged children's externalizing and internalizing symptoms only in families where the mother was also depressed (Goodman, Brogan, Lynch, & Fielding, 1993). The other study supporting the hierarchical model showed that in families where both parents were depressed during the child's infancy, fathers' mental health problems predicted pre-school aged children's internalizing symptoms, but only if the father had spent a high amount of time with the infant (Mezulis, Hyde, & Clark, 2004). Two studies have also supported the joint buffering model, showing with cross-sectional designs that the presence of a non-depressed father (Conrad & Hammen, 1993) and positive father-child relationship (Tannenbaum & Forehand, 1994) could buffer school-aged children's mental health from the negative impact of maternal depression. In contrast, the study by Mezulis et al. (2004) found no evidence of non-depressed fathers protecting children's well-being against the negative impact of maternal postpartum depression.

Available studies examining the separate and joint effects of parental mental health on children can be criticized for focusing solely on depression, involving simple cross-sectional designs, and lacking comprehensive testing of alternative models. Two studies have reported follow-up data of parental postpartum depression predicting child development (Carro et al., 1993; Mezulis et al., 2004). None of the earlier studies have precisely tested all of these theoretical models. Instead, studies have focused on maternal depression, with paternal problems treated as a potential moderator. Three prior studies have focused on both parents, by examining the main and interactive effects of maternal and paternal depression symptoms on children (Brennan et al., 2002; Carro et al., 1993; Weinfield et al., 2009). The present study contributes to this existing research, first, by providing a wider conceptualization and assessment of parental mental health, involving multiple distress symptoms in addition to depression, with symptoms measured once in pregnancy and twice during the child's first year. Second, our study is prospective by nature. Third, we explicitly test each separate and joint model of early parental mental health for predicting child outcome.

Present Study

Our first aim was to identify possible intrafamilial co-occurrence and compensation in early parental mental health by analyzing the overlap in mothers' and fathers' symptoms of psychological distress and depression at specific time-points (i.e., pregnancy, early postpartum, and late postpartum) as well as across the pre- and postpartum period (from pregnancy to child's first year). We did not formulate hypotheses concerning the intrafamilial parental mental health at specific time points because prior research has been inconclusive, but across the entire period we expected to find the following intrafamilial early parental mental health groups: *healthy parents*, who would both show good mental health; families with *solely maternal or solely paternal problems*; and families with *both maternal and paternal mental health problems*.

Our second aim was to examine how the intrafamilial early parental mental health predicted children's internalizing and externalizing symptoms, as well as cognitive and social development, at 7–8 years of age. We tested the five theoretical models—two separate (mother and father) and three joint parental (additive, hierarchical and buffering) models—that are conceptually illustrated in Table 1. To indicate (1) the separate mother or (2) the separate father model, we hypothesized that children would show high levels of mental health and developmental problems in families where either solely mothers or both parents (or, in the separate father model: solely fathers or both parents) had clinically meaningful early

mental health problems, as compared to children in families with healthy parents or solely paternal (or, in the separate father model: healthy parents or solely maternal) problems. To indicate (3) the joint additive model, we assumed that children would show high levels of problems in families with both maternal and paternal early mental health problems, moderate levels of problems in families where either but only one parent had clinically meaningful problems, and low levels of problems in families with healthy parents. To confirm (4) the joint hierarchical model, we hypothesized that children would show high levels of problems in families with both maternal and paternal problems, moderate levels of problems in families with solely maternal problems, and low levels of problems in families with solely paternal problems or healthy parents. To indicate (5) the joint buffering model, we assumed that children would show low levels of problems in families with healthy parents and in families where only one parent had clinically meaningful mental health problems, and that children would show high levels of problems in families with both maternal and paternal problems.

Method

Participants and Procedure

The participants consisted of 763 married or cohabiting Finnish Caucasian couples with singleton pregnancies, participating during the pre- and postpartum period; specifically, the second trimester of pregnancy (T1, 18–20 weeks of gestation) and when the child was 2 months (T2) and 12 months (T3) old. The families were again contacted when the children were 7–8 years old (T4), and 485 families (64%) participated at that point. Half of the sample involved couples with infertility history and a successful assisted reproduction treatment with their own gametes (ART group; $n = 406$) and another half had naturally conceived (NC group; $n = 357$). Couples with multiple pregnancies were excluded and only women above 25 years of age were included in the NC-group. The Ethical Committees in participating clinics approved the study, initially for time periods of T1– T3, then again for T4.

Maternal and paternal participation at each wave of the study is presented in Table 2. Concerning the pre- and postpartum period (T1–T3), fathers' participation at T3 was higher in the ART group than in the NC group, 69% vs. 62%, $\chi^2(1, 761) = 4.17, p = .04, \Phi = -.07$, whereas mothers' participation was independent of the fertility history. Both maternal and paternal participation were independent of education, age, parity, length of the partnership, earlier mental health, as well as the child's gender and birth weight. At T4, when the children were 7–8 years of age, maternal and paternal participation did not differ according to family's fertility history. However, the parents who participated were somewhat older, mothers: $t(724) = 2.25, p = .03, d = 0.18$; fathers: $t(708) = 3.45, p < .01, d = 0.26$, and the participating fathers, but not mothers, were more educated than the drop-outs, $\chi^2(3, 696) = 13.48, p < .01, v = .14$. Both maternal and paternal participation at T4 was independent of earlier mental health, parity, and length of the partnership, as well as the child's gender and birth weight.

Measures

Parental mental health trajectory classes. Mothers' and fathers' latent mental health classes were identified in two previous studies (Vänskä et al., 2011; Vänskä et al., 2016), indicating the timing and course of parental mental health problems from pregnancy (T1) through 2 months (T2) to 12 months (T3) postpartum. The analysis was based on two mental health indicators. *Psychological distress* was assessed with the 36-item General Health Questionnaire (GHQ-36; Goldberg & Hiller, 1979), covering symptoms of depression, anxiety, sleeping difficulties, and social dysfunction. *Depressive symptoms* were measured by

the 13-item Beck's Depression Inventory (BDI-13; Beck, Ward, Mendelsohn, Mock, & Erbaugh, 1961), consisting of low mood, hopelessness, and somatic signs of depression.

In these studies we analyzed the original data with Mplus 5 using factor mixture modeling (Muthén, 2001), which identifies naturally occurring subpopulations from the data, called latent classes, and provides statistical tests to evaluate the number of these classes. The identification of classes was based on differences in mean values of the observed variables, involving both GHQ and BDI at three assessments (6 variables). To avoid identifying an artificially high number of classes, due to highly correlating variables, we added a level factor with loadings fixed at one to indicate the individual variation in the level of symptoms across T1 to T3 (Lubke & Neale, 2006).

The analyses identified five maternal and five paternal mental health trajectory classes that present parallel timings and courses of symptoms between the parents (see Figure 1). First, 76% of mothers and 79% of fathers were identified as members of classes with stable and low levels of mental health symptoms. Second, 6% of mothers and 5% of fathers were members of classes with high, clinically meaningful levels of symptoms only during pregnancy. In the postpartum period their symptom levels were relatively low. Third, 9% of mothers and 3% of fathers suffered mental health problems only in the early postpartum, 2 months post-birth. In pregnancy and during the late postpartum period their symptom levels were relatively low. Fourth, 6% of mothers and 9% of fathers were members of classes with symptom courses that gradually increased from pregnancy on. However, whereas the maternal symptoms were clinically meaningful by 12 months post-birth, paternal symptoms were not. Fifth, trajectory classes with severe, either chronically high or heterogeneously timed high levels of problems were identified among 4% of mothers and 3% of fathers.

Both parents reported the child's mental health and cognitive and social development at T4, and the means of their assessments were calculated. In families where only one parental report was available ($n = 209$; 27%), the scales include only this report.

Children's mental health symptoms. Children's mental health symptoms were measured using the Behavioral Assessment System for Children (BASC; Reynolds & Kamphaus, 1992). It consists of 12 symptom scales (138 items), four of which were chosen for this study on the basis of representativeness and reliability for internalizing and externalizing problems: *anxiety* (12 items), *depression* (12 items), *somatization* (13 items), and *aggression* (13 items). A mean response score was calculated for each scale (range of Cronbach's α : .70–.85). Maternal and paternal reports were statistically ($p < .01$) correlated for all scales (r range: .33–.53). For the analysis, we constructed a mean of three scales of internalizing symptoms (BASC anxiety, depression and somatization scales) and a mean of two scales of externalizing symptoms (BASC aggression scale and five items of attention problems from the executive functions domain of cognitive developmental problems; attention problems' α 's were .81 and .78 for mothers and fathers, respectively, and maternal and paternal report $r = .61$, $p < .01$).

Children's cognitive developmental problems. Children's cognitive developmental problems were assessed by the Five to Fifteen (FTF) developmental screening questionnaire for early childhood onset of neuropsychological disorders (Kadesjö et al., 2004). It consists of eight domains (181 items), four of which were chosen for this study based on developmental considerations: *executive functions* (subdomain planning and organizing, 7 items), *perception* (subdomains time concepts, body perception, and visual perception, 13 items), *memory* (subdomains semantic and episodic memory and recall, 11 items) and *language* (subdomains expressive language skills and communication, 16 items). A mean of response score was

calculated for each scale. The α 's were acceptable (range: .70–.90), and maternal and paternal reports were statistically correlated ($p < .01$) for all domains (r range: .52–.71).

Children's social developmental problems. Children's social developmental problems were measured by two subscales: one from the Social Skills Rating System (SSRS; Gresham & Elliot, 1990) and the other from the Child Behavior Scale (CBS; Ladd & Profilet, 1996). The *assertion* subscale of the SSRS (10 items) measures a child's initiative and ability to bond with peers. The *excluded by peers* subscale of the CBS (7 items) measures a child's popularity versus rejection among peers. Means of response scores were calculated for both subscales and the reliabilities (α) were .79 (mothers) and .78 (fathers) for assertion, and .78 (mothers) and .80 (fathers) for excluded by peers. Maternal and paternal reports were statistically correlated for both dimensions: assertion $r = .57, p < .01$ and excluded by peers $r = .56, p < .01$. For the analysis, a mean of both scales of social developmental problems was constructed.

Statistical Analyses

We used SPSS cross tabulation to identify the intrafamilial co-occurrence and compensation in parental mental health. The χ^2 -test determined whether there were statistical associations between maternal and paternal timing of symptoms, and standardized adjusted residuals ($> |1.96|$) specified where these were located. Based on this, we constructed an intrafamilial early parental mental health variable, with four categories: healthy parents, solely maternal and solely paternal problems, and both maternal and paternal problems.

To analyze early parental mental health as a predictor of child mental health and development, we conducted main effect ANCOVAs of intrafamilial early parental mental health on children's internalizing and externalizing symptoms and cognitive and social developmental problems. Child's gender (0 = boy and 1 = girl) was included as a covariate, because it was found to correlate with the child outcome variables, $p = .03$. Because fertility history (ART vs. NC) and demographic variables did not statistically differ between the intrafamilial early parental mental health groups (see Table 3), and did not show associations with child mental health or developmental outcomes (for all correlations, $p > .25$), they were not included as covariates. Furthermore, due to similarities between participants and T4 dropouts (see background variables in the Participants and Procedure section), imputation was not conducted.

We tested five possible contrast models (two separate and three joint parental) by using post-hoc tests with custom (L-Matrix) contrasts (see Table 1). When more than one contrast estimate was a statistical predictor of child outcome, we used hierarchical regression to detect the most valid and parsimonious model. For the hierarchical regressions, we recoded the intrafamilial early parental mental health variable into five new categorical variables, according to the five contrast models. The changes in R^2 and F-statistics allowed us to assess the unique contribution of joint models over and above the more simple separate models.

Results

Descriptive Statistics

At the time of the first assessment (T1), 75% of mothers and 67% of fathers worked either as high or low professionals, and about a quarter worked either as skilled or unskilled workers. In most families the couple was married (71%), and expected their first child (59%). Mean age of mothers was 33.1 years ($SD = 3.8$) and of fathers was 34.5 years ($SD = 4.9$), and

the mean length of the partnership was 8.6 years ($SD = 4.7$). Fifty-one percent of the children were boys, and almost all children were born full term (92%) and with normal weight ($M = 3550\text{g}$; $SD = 487\text{g}$).

Intrafamilial Early Parental Mental Health

Our first task was to identify intrafamilial early parental mental health dynamics by examining how the mothers' and fathers' trajectory classes overlapped in families. Cross tabulation of the maternal and paternal trajectory classes is presented in Table 4. Statistically significant χ^2 -test indicated that there were associations between maternal and paternal trajectories and possible overlap in mothers' and fathers' mental health at pre- and postpartum time points. Results based on the standardized adjusted residuals show a strong co-occurrence between the maternal and paternal trajectories of stable low levels of mental health symptoms. In other words, in families with one consistently healthy parent, the other parent was also likely to be healthy. Co-occurrence was also found between mothers' and fathers' mental health symptoms during the pregnancy and at 12 months post-birth. In contrast, no connection was found between maternal and paternal mental health problems at 2 months post-birth or between maternal and paternal severe, either chronic high or heterogeneously timed high levels of mental health problems.

As expected, results revealed four intrafamilial early parental mental health groups. The *healthy parents* group, in which both mothers and fathers belonged to trajectory classes without clinically meaningful levels of mental health problems, comprised 68% ($n = 522$) of the families. The *solely maternal problems* group, reflecting possible paternal compensation for maternal problems, comprised 19% ($n = 148$) of the families. In this group the mother was a member of one of the four trajectory classes with clinically meaningful levels of mental health problems (prenatal, early postpartum, late postpartum, or heterogeneous high), and the father was a member of a class without clinical levels of symptoms (stable low or moderate increasing). The *solely paternal problems* group, reflecting possible maternal compensation for paternal problems, was smaller (8%, $n = 58$) and involved families where the father was a member of one of the three trajectory classes with clinically meaningful levels of mental health problems (prenatal, early fatherhood, or heterogeneous high), and the mother was a member of the stable low trajectory class. Finally, the group of *both maternal and paternal problems*, in which co-occurrence of parental mental health problems was observed, included only 5% ($n = 35$) of families. In this group, both parents were members of trajectory classes with clinically meaningful levels of mental health problems (mother: prenatal, early postpartum, late postpartum, or heterogeneous high; father: prenatal, early fatherhood, or heterogeneous high).

The four intrafamilial early parental mental health groups had similar backgrounds in terms of fertility history (ART vs. NC), child's gender, parental marital status, number of children, and education of mothers and fathers (see Table 3). Furthermore, the groups were similar in the age of mother, $F(3, 722) = 1.45$, $p = .23$, partial $\eta^2 = .01$, and father, $F(3, 706) = 0.66$, $p = .58$, partial $\eta^2 = .00$, and duration of the partnership, $F(3, 704) = 0.47$, $p = .70$, partial $\eta^2 = .00$.

Predicting Child Mental Health and Development

Our second aim was to test models of the ways that the intrafamilial early parental mental health predicted child mental health and development at early school age. Concerning child mental health, the results showed a statistically significant main effect of intrafamilial early parental mental health on children's internalizing symptoms, but not on externalizing

symptoms (see Table 5). Post hoc tests with contrasts revealed that separate mother, $diff = .15$, $p < .01$, and joint parental additive, $diff = .10$, $p = .04$, models statistically predicted children's internalizing symptoms. A hierarchical regression analysis further specified that the separate mother variable predicted internalizing symptoms, $F(3, 474) = 5.04$, $p < .01$, $R^2 = .03$, and adding the joint parental additive variable to the regression model did not increase predictive value, $\Delta F = 1.07$, $p = .30$, $\Delta R^2 = .00$; $F(4, 473) = 4.04$, $p < .01$, $R^2 = .03$. Thus, we concluded that maternal mental health alone was sufficient for predicting child internalizing symptoms. Child's gender was a statistically significant covariate on externalizing symptoms, indicating that boys showed more problems than girls.

Concerning child development, the results showed a statistically significant main effect of intrafamilial early parental mental health on cognitive developmental problems, but not on social developmental problems. As shown in Table 5, early parental mental health statistically predicted children's executive functions. Post hoc tests with contrasts revealed that the joint parental additive model was the only statistical predictor of executive functions, $diff = .15$, $p < .05$. Child's gender was a statistically significant covariate on all cognitive variables, indicating that boys showed more problems than girls.

Discussion

Family systems theory suggests that parental mental health problems can co-occur, often through spillover of emotions, or take compensatory turns by one parent being strong when the other one is weak. In this study, we found both co-occurrence and possible compensation between mothers' and fathers' symptoms of psychological distress and depression in the pre- and postpartum period. We further analyzed the role of early parental symptoms in predicting child development, by testing two separate (mother and father) and three joint parental (additive, hierarchical and buffering) theoretical models. Both the separate and joint models were valid for predicting child mental health and cognitive development, but the results were domain-specific. Maternal problems alone predicted children's internalizing symptoms, whereas additive effects of both maternal and paternal problems predicted executive function.

From the perspective of families and clinical work, it is crucial to learn about interconnections between maternal and paternal mental health. Our study is novel in examining early intrafamilial parental mental health by using latent trajectory classes. About two-thirds (68%) of the families had two healthy parents with no clinical levels of psychological distress or depression symptoms at any time point during the pre- and postpartum. In contrast, in about a third (32%) of the families, either one or both parents had clinically meaningful levels of symptoms in at least one time-point.

Co-occurrence was found between mothers' and fathers' symptoms during pregnancy as well as in the late postpartum period, when the child was 12 months old, but not in the early postpartum, when the child was 2 months old. The lack of early postpartum symptom co-occurrence in our study may reflect a fundamental gender discrepancy in adjusting to parenthood. Among mothers, biological and hormonal changes underlie a temporary psychological reorganization that involves full concentration on the baby during the first few weeks and months after the birth (Stern, 1995). At this point, mothers typically dedicate themselves to caring for young infants, who often need frequent bodily contact, feeding, soothing and help with sleep. Fathers, instead, may remain more independent during this period (Escribá-Agüir & Artazcoz, 2011). For instance, Finnish fathers typically return to work at few weeks after the child's birth. These different experiences and roles during the first few postnatal months may partly explain why maternal and paternal mental health

problems did not co-occur in the early postpartum period, as they did during the pregnancy and in the late postpartum.

In addition to co-occurrence, compensation—efforts to make up for the other's mental health problems by maintaining psychological health (Hossain et al, 1994; Markey et al., 2003)—was evident in about a quarter (27%) of the families, where one parent suffered mental health problems at some point during the pre- and postpartum period, while the other did not. Inter-parental compensation is important in early parenthood to ensure that the developing infant receives all the available family resources. Beyond the obvious benefits of having one parent maintain psychological health while the other experiences problems, compensation may also be a crucial family resource for therapeutic interventions intended to address the problems.

The present study provides evidence of both separate maternal and joint parental additive models to explain the role of intrafamilial early parental mental health for predicting child mental health and development. Maternal psychological distress and depression symptoms alone were important predictors of children's internalizing symptoms, whereas fathers' symptoms alone or together with maternal symptoms did not explain child mental health outcomes. The result may reflect a gender-typical difference in parental roles and behaviors. The mother-child relationship can be described as a *soothing relationship*, with its primary purpose in calming and comforting children's distress (Paquette, 2004). Mothers with early depression and anxiety face difficulties calming their own emotions and stress reactions as well as the child's early somatic and affective states, which can have a negative long-term impact on child emotional development (Feldman et al., 2009; Glover et al., 2015). The father-child relationship, in turn, has been described as an *activation relationship*, developed mainly through physical play and aimed at exciting, surprising, and momentarily destabilizing children (Paquette, 2004). However, according to our results, these typical father-child relational characteristics do not seem to play an important role in children's early emotional development, although they may become more salient during the course of child development.

Fathers' early mental health was, however, important for children's cognitive development, as the additive model of joint parental mental health predicted children's executive function (EF). Thus, according to our results, both maternal and paternal early symptoms make distinct contributions to children's cognitive development, yet perhaps through different underlying mechanisms. Dysregulated maternal hormonal systems that underlie mental health problems during pregnancy can negatively affect fetal development of brain regions vital for cognitive operations (Singh et al., 2012). Furthermore, both maternal pre- and postnatal mental health problems can adversely affect the development of child hypothalamic-pituitary-adrenal (HPA) axis (Sohr-Preston & Scaramella, 2006) that may in turn lead to chronic over-arousal interfering with executive function (Blair, Granger, & Peters Razza, 2005).

Paternal mental health problems may find their way to children's cognitive development through more physical activities, such as early father-child rough-and-tumble play (Flanders, Leo, Paquette, Pihl, & Séguin, 2009). Research on father-child interaction shows that depressed fathers spend less time with their children, and when they do spend time with their children, these fathers are more passive in their play behaviors (Wilson & Durbin, 2010). In the postpartum period, depressed fathers appear to be particularly passive about touching and reading to their infants (Sethna et al., 2015). Based on our results, one can speculate that fathers with early mental health problems may not activate infants enough, leading to children's lack of courage and self-efficacy, and thus vulnerability to difficulties in cognitive development.

Practical Implications

Importantly, this study raises a number of aspects that can benefit clinical practice. First, despite increasing awareness of fathers' mental health in family well-being, fathers are not usually screened in maternity clinics and child health centers. Our findings emphasize the importance of screening and directly asking about problems experienced by both mothers and fathers. Second, treatment of fathers' pre- and postnatal mental health problems is largely lacking, although suggestions for interventions have been made (e.g. Habib, 2012). Our study speaks for the importance of providing early psychological help for fathers together with mothers to avoid parental mental health problems impairing child development.

Third, our study also pointed a possibility of positive compensation in symptoms between the spouses. This means that in many families with one symptomatic parent the other parent remains healthy, and may thus be able to provide security and support for the child as well as the symptomatic parent. Professionals should acknowledge the valuable role this healthy parent can play in enhancing family well-being. They could provide support directed at helping the healthy parent to remain well-functioning, and to courage him or her to take an active role in caring and raising the child. Importantly, however, not all families possess this or other protective resources. In contrast, a proportion of families (5% in our study) have two symptomatic parents, who both need active help and support in their early parenting. According to our study, such families have the highest risk of child mental health and developmental problems, thus making recognition and intervention with them of the utmost importance.

Limitations and Future Directions

Although this study has several notable strengths, such as a relatively large sample size and prospective design, it also has limitations. First, child mental health and development was assessed by parents, which makes the assessment susceptible to bias. Distressed parents, for example, may be prone to negative appraisals and pessimistic evaluations of child functioning (Raskin, Fosse, & Easterbrooks, 2015). Although we tried to balance that by using multiple informants (i.e., combining mother and father reports), future research should use standardized tests or additional informants, such as teachers and perhaps even the children themselves, to produce a more reliable assessment of child functioning.

Second, attrition in the final assessment was substantial among both parents, but especially among fathers, which tempered our ability to interpret and generalize of our findings. Although there was no statistical difference in dropout rates between the early parental mental health subgroups, attrition as a whole also resulted in small cell sizes for our ANCOVA analyses. Finally, the participating mothers and fathers were older and fathers also had a higher education level than the those who had dropped out. Thus, attrition may have biased or weakened our results.

Third, the mothers in our sample were older than mothers in the larger population due to our exclusion criteria in the NC sample as well as the fact that half of the sample had a history of infertility and some ART mothers had taken years to achieve pregnancy. Importantly, ART and NC families did not differ in intrafamilial early parental mental health (see Table 3). Nonetheless, these sample characteristics may limit the generalizability of our findings, which should be viewed with due skepticism until replicated in future research and with a sample more representative of the general population.

Finally, several possible confounds were not accounted for in the present study. In particular, when examining child development, parental mental health symptoms subsequent to the pre- and postpartum period were not analyzed. Elevated levels of symptoms have

probably occurred more frequently in mothers and fathers with early mental health problems. Further, we did not examine children's early development or parenting quality, although both could have provided important information concerning the link between early parental mental health and later child development. These factors should be accounted for in future research.

Conclusion

In summary, we found evidence of both co-occurrence and compensation between mothers' and fathers' early psychological distress and depression symptoms. Our results further suggest that mental health of both parents play unique roles in child cognitive development, while mothers' symptoms alone are important for child mental health. Both maternal and paternal early mental health problems should be screened and treatments tailored according to intrafamilial dynamics to ensure healthy child development.

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Table 1

Planned Contrasts to Indicate Separate (Mother and Father) and Joint (Additive, Hierarchical, and Buffering) Theoretical Models of Early Parental Mental Health

Early parental mental health group	Hypothesized theoretical model				
	Separate		Joint		
	1. Mother	2. Father	3. Additive	4. Hierarchical	5. Buffering
Healthy parents	-1	-1	-1	-1	-1
Solely maternal problems	1	-1	0	0	-1
Solely paternal problems	-1	1	0	-1	-1
Both maternal and paternal problems	1	1	1	2	3

Note. Healthy parents = Both parents members of trajectory classes without mental health problems; Solely maternal problems = Mother member of trajectory class with and father without mental health problems; Solely paternal problems = Father member of trajectory class with and mother without mental health problems; Both maternal and paternal problems = Both parents members of trajectory classes with mental health problems.

Table 2

Maternal and Paternal Participation at Each Wave of the Study (T1, T2, T3 and T4), Across the Pre- and Postpartum Period (T1–T3) and Throughout the Study (T1–T4)

Wave	Mothers		Fathers	
	<i>n</i>	%	<i>n</i>	%
T1	758	99	756	99
T2	632	83	615	81
T3	556	73	506	66
T4	485	64	290	38
T1–T3	532	70	497	65
T1–T4	360	47	238	31

Note. T1 = Pregnancy (2nd trimester), T2 = 2 months post-birth, T3 = 12 months post-birth, T4 = 7–8 years post-birth. The sample for T1 is incomplete (99%), because ART families were contacted before T1 to ask for their willingness to participate. Some families (1%; *n* = 6) agreed to participate, but did not participate at T1. Overall *N* = 763.

Table 3
Demographic Variables and Fertility History According to Intrafamilial Early Parental Mental Health Groups (N = 763)

	I. Healthy parents (n = 522)		II. Solely maternal problems (n = 148)		III. Solely paternal problems (n = 58)		IV. Both maternal and paternal problems (n = 35)		χ^2 (df, n)
	n	%	n	%	n	%	n	%	
Fertility history									5.45 (3, 761)
ART	285	54.7	81	55.1	24	41.4	15	42.9	
NC	236	45.3	66	44.9	34	58.6	20	57.1	
Child's gender									5.42 (3, 754)
Boy	253	49.2	82	55.8	33	56.9	13	37.1	
Girl	261	50.8	65	44.2	25	43.1	22	62.9	
Marital status									2.21 (3, 710)
Married	358	72.3	83	65.9	39	68.4	23	71.9	
Cohabitant	137	27.7	43	34.1	18	31.6	9	28.1	
Parity									5.51 (3, 763)
Primiparous	308	59.0	94	63.5	28	48.3	17	48.6	
Multiparous	214	41.0	54	36.5	30	51.7	18	51.4	
Father's SES									4.03 (9, 696)
High professional	175	35.9	44	36.4	18	32.1	8	25.0	
Low professional	146	30.0	39	32.2	17	30.4	12	37.5	
Skilled worker	132	27.1	28	23.1	16	28.6	8	25.0	
Unskilled worker	34	7.0	10	8.3	5	8.9	4	12.5	
Mother's SES									9.33 (9, 702)
High professional	164	33.5	45	36.0	21	38.2	11	34.4	
Low professional	207	42.2	51	40.8	15	27.3	13	40.6	
Skilled worker	85	17.3	21	16.8	16	29.1	4	12.5	
Unskilled worker	34	6.9	8	6.4	3	5.5	4	12.5	

Note. ART = Families with infertility history and successful assisted reproductive treatment. NC = Naturally conceiving families. SES = Socioeconomic status. All χ^2 tests were nonsignificant, $p > .13$.

Table 4
Cross Tabulation of Mothers' and Fathers' Mental Health Trajectory Classes (N = 763)

Mother	1. Stable low levels of mental health symptoms (n = 604)			2. Moderate increasing levels of mental health symptoms (n = 68)			3. Prenatal mental health problems (n = 36)			4. Mental health problems in early fatherhood (n = 24)			5. Heterogeneous high levels of mental health problems (n = 33)		
	n	%	Adj. Res.	n	%	Adj. Res.	n	%	Adj. Res.	n	%	Adj. Res.	n	%	Adj. Res.
1. Stable low levels of mental health symptoms (n = 580)	482	63.2	5.1	40	5.2	-3.5	24	3.1	-1.3	12	1.6	-3.0	22	2.9	-1.3
2. Prenatal mental health problems (n = 44)	28	3.7	-2.6	4	0.5	0.0	6	0.8	2.9	3	0.4	1.4	3	0.4	0.8
3. Early postpartum mental health problems (n = 67)	49	6.4	-1.2	9	1.2	1.4	1	0.1	-1.3	4	0.5	1.4	4	0.5	0.7
4. Late postpartum mental health problems (n = 42)	25	3.3	-3.2	9	1.2	2.9	2	0.3	0.0	3	0.4	1.5	3	0.4	0.9
5. Heterogeneous high levels of mental health problems (n = 30)	18	2.4	-2.6	6	0.8	2.2	3	0.4	1.4	2	0.3	1.1	1	0.1	-0.3

Note. $\chi^2(16,763) = 44.33, p < .001$. Adj. Res. = Standardized adjusted residuals. Bolded residual values indicate statistically significant associations ($> |1.96|$). Difference in background color represents each intrafamilial early parental mental health group: White = Healthy parents, Light grey = Solely maternal problems, Medium grey = Solely paternal problems, Dark grey = Both maternal and paternal problems.

Table 5

Means, Standard Errors, and ANCOVA Statistics of Children's Mental Health Symptoms and Cognitive and Social Developmental Problems According to Intrafamilial Early Parental Mental Health Groups (N = 478)

	Intrafamilial early parental mental health								ANCOVA statistics	Partial η^2	Statistically significant contrasts
	I. Healthy parents (<i>n</i> = 323)		II. Solely maternal problems (<i>n</i> = 91)		III. Solely paternal problems (<i>n</i> = 41)		IV. Both maternal and paternal problems (<i>n</i> = 23)				
	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>	<i>F</i> (3,473)		
Child mental health symptoms											
Internalizing symptoms	1.43	.01	1.52	.02	1.47	.03	1.53	.04	5.41**	.03	1**, 3*
Externalizing symptoms	1.56	.02	1.59	.03	1.59	.05	1.62	.06	0.49	.00	
Child cognitive developmental problems											
Executive functions	1.43	.02	1.51	.04	1.52	.06	1.58	.08	2.58*	.02	3*
Perception	1.25	.01	1.28	.02	1.24	.03	1.27	.04	0.57	.00	
Memory	1.27	.01	1.30	.03	1.34	.04	1.38	.05	2.19	.01	3*
Language	1.15	.01	1.14	.02	1.16	.03	1.23	.04	1.29	.01	
Child social developmental problems	2.71	.02	2.68	.03	2.68	.04	2.68	.06		.00	
									0.44		

Note. Contrasts depicted in Table 1: 1 = separate mother, 2 = separate father, 3 = joint additive, 4 = joint hierarchical, and 5 = joint buffering models.

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

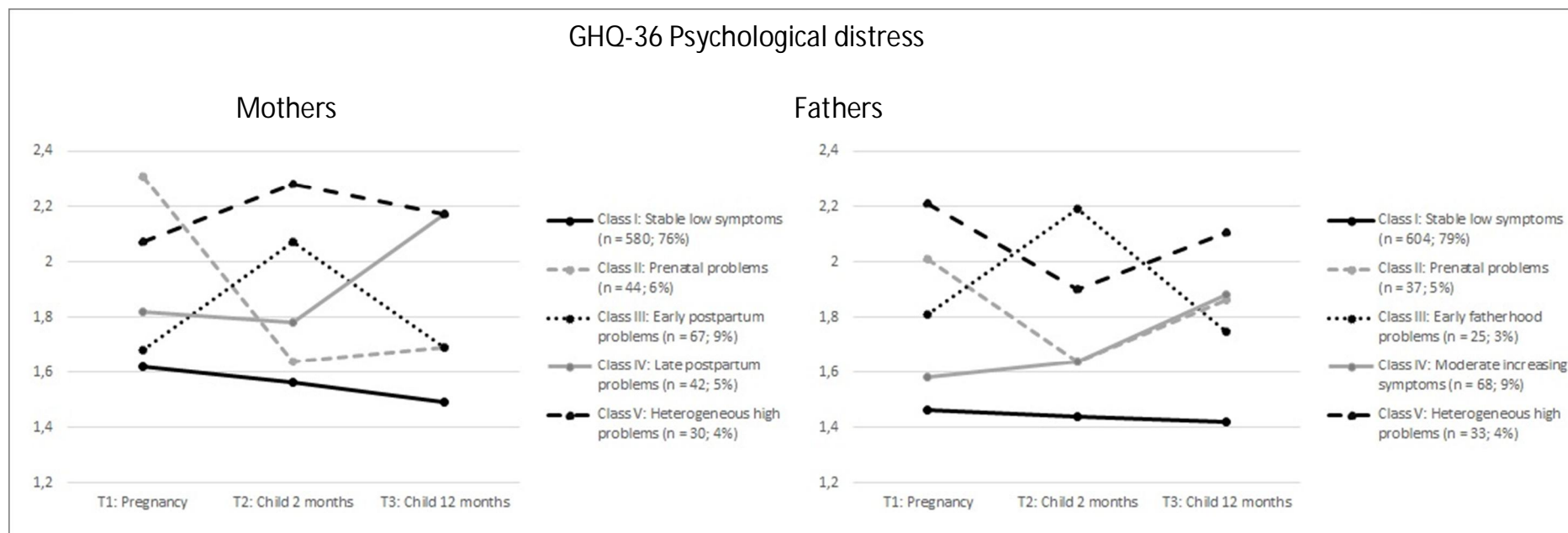


Figure 1. Means of reported GHQ-Psychological distress according to mothers' and fathers' early mental health trajectory class. The identification of trajectory classes was based on the mean values of two observed variables, involving both GHQ and BDI at three assessments (6 variables). GHQ and BDI showed similar courses over time (T1–T3) and thus only GHQ scores are presented here. $N = 763$.