Paternal mental health trajectory classes and early fathering experiences: Prospective study on a normative and formerly infertile sample

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Abstract

A father's mental health is important for family well-being, but research is scarce on paternal symptoms during the transition to fatherhood. This study identified fathers' latent mental health trajectory classes from the pre- to postnatal period and examined their associations with early fathering experiences. It further analysed, whether a family's infertility history was associated with mental health trajectory classes and moderated their effects on fathering experiences. Finnish fathers ($N = 773$) reported psychological distress (General Health Questionnaire; GHQ-36) and depressive symptoms (Beck Depression Inventory; BDI-13) in pregnancy (T1), and at 2 months (T2) and 12 months (T3) postpartum. They further reported their fathering experience (Parenting Stress Index; PSI-36) at T2 and T3. Results revealed five paternal mental health trajectory classes, differing in timing and course of symptoms across the pre- and postpartum: stable low (79%) and moderate increasing (9%) levels of symptoms, and prenatal (5%), early fatherhood (3%) and heterogeneous high levels of (4%) problems. The trajectory classes were associated with fathering experiences within parental, interactive and child domains, across the child's first year. The stable low levels of symptoms-class showed the most positive experiences and the heterogeneous high levels of problems-class the most negative ones; mental health problems in the early fatherhood-class reported negative fathering experience, but only when the child was 2 months old. A family's infertility history neither showed any significant association with trajectory classes nor moderated their impact on early fathering, supporting the growing evidence that infertility treatments do not place an additional burden on early fatherhood.

Keywords

Paternal mental health, paternal depression, infertility, fathering experience, parenting stress

Introduction

Traditionally, considering fathers predominantly as breadwinners has undermined their contribution to family well-being. Yet, a shift has occurred in Western families, and the paternal role today is characterized by increasing involvement and responsibility for children (di Torella, 2014). Research confirms the importance of paternal mental health for family well-being and child development (Ramchandani, Stein, O'Connor, Heron, Murray, & Evans, 2008; Ramchandani et al., 2011). However, little is known about the variability in timing, course and effects of paternal mental health symptoms during the transition to fatherhood. This study applied a person-oriented approach to identify fathers' longitudinal latent mental health classes from pregnancy to the end of the child's first year, and analysed how the classes associated with early fathering experiences.

Paternal Pre- and Postpartum Mental Health

Mental health problems affect approximately 10% of fathers in the pre- and postpartum period (Paulson & Bazemore, 2010), but conflicting views exist concerning the timing and course of symptoms.

Regarding *timing*, that is, the occurrence of mental health problems at a particular time point, a meta-analysis by Paulson and Bazemore (2010) reported that depression was most common in early fatherhood when the child was three to six months old. Other studies have instead found fathers' depression to be more common in the late, rather than early postpartum (Areias, Kumar, Barros, & Figueiredo, 1996), or suggested it to be most common during pregnancy. For instance, one study ($N = 157$) found that over 5% of fathers were depressed prenatally, but less than 3% during the early postpartum

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(Matthey, Barnett, Ungerer, & Waters, 2000). Furthermore, some research shows no timing differences: in an extensive epidemiological study ($N = 13\ 228$) (Ramchandani et al., 2008), paternal depression was almost as common (3.5%) during the second trimester of pregnancy as during early postpartum (3.3%).

Regarding the *course* of paternal mental health problems, research suggests both stability and change in symptoms. Two studies have showed that fathers' symptoms were highly stable throughout the transition (Ballard, Davis, Cullen, Mohan, & Dean, 1994; Zelkowitz & Milet, 2001). Ballard et al. (1994) revealed, for example, that among fathers who were depressed when their child was 6 weeks old, more than a half still suffered the disorder at six months. However, other studies show considerable variability in the course of symptoms. Matthey et al. (2000) reported that a majority of the fathers who were depressed during the pre- and postpartum period showed clinically significant depression only at one point in time. For instance, 70% of those who were depressed at late postpartum had been depressed neither prenatally nor during the early postpartum.

These conflicting views concerning the timing and course of symptoms might reflect the existence of unique subgroups of fathers in transition to parenthood. Some fathers with mental health problems may, for instance, be symptomatic only during pregnancy, others only in early fatherhood and yet others may suffer more chronic problems. We could not, however, find any prior research concerning fathers' mental health trajectories that could reveal these patterns and subgroups. Furthermore, most research concerning early paternal mental health has focused solely on depression. Our latent trajectory class analysis extends this by also including psychological distress (encompassing symptoms of anxiety, sleeping difficulties and social dysfunction) in addition to depression, as we identify paternal trajectory classes from pregnancy through the child's first year.

Early Fathering Experience

Transition to fatherhood involves major psychological reorganization. Much of the change is usually experienced positively, including a new sense of life purpose and responsibility (Chin, Hall, & Daiches, 2011). New fathers explore parental roles actively, often identifying themselves more as emotional supporters, playmates and caregivers, and less as traditional breadwinners or simple maternal helpers (Habib & Lancaster, 2006). During this transition, fathers redefine their relationship with the partner, which can lead to increased unity and companionship (Chin et al., 2011).

However, if the partners do not share beliefs about parental roles and responsibilities, marital well-being is likely to decrease from pre- to postpartum (Adamsons, 2013). The first year of parenthood has sometimes been described as a time of mismatch between expectations and child-care realities, with negative changes for fathers in, for example, the sexual relationship and the amount of time spent with the partner (Gensoni & Tallandini, 2009). Furthermore, some babies are temperamentally demanding, showing negative emotionality and a constant need for parental regulation; consequently, new parents may feel that these demands exceed their resources (Oddi, Murdock, Vadnais, Bridgett, & Gartstein, 2013).

Hand-in-hand with positive emotions, new parents are thus prone to negative experiences that have also been conceptualized as parenting stress (Abidin, 1995). Mothers and fathers with negative parenting experience are prone to adverse parenting behaviours such as decreased sensitivity and warmth, and increased negative feelings, hostility and rejection towards the child (Rodgers, 1998). Early negative parenting experience also increases the risk for concurrent and later emotional, social and cognitive problems in the children (Guajardo, Snyder, & Petersen, 2009).

Research is scarce concerning the link between fathers' early mental health and parenting experience, and completely lacking on specific timings of mental health problems. We can hypothesize that mental health problems during pregnancy are especially harmful for early fathering, because they interfere with intensive prenatal preparation to fatherhood. Research suggests that paternal attachment to the child begins in early pregnancy (Habib & Lancaster, 2006) and remains fairly similar until the late postpartum (Vreeswijk, Maas, Rijk, Braeken, & van Bakel, 2014). Furthermore, men undergo physiological and hormonal changes, such as a decline in testosterone, during the pregnancy, allowing a biological basis for prenatal child-care preparation (Gray & Campbell, 2009). Some evidence confirms that fathers' prenatal mental health predicts early fathering experience. For instance, a study by Saisto, Salmela-Aro, Nurmi and Halmesmäki (2008) followed families ($N = 214$) from pregnancy to toddlerhood and found that fathers' prenatal depression predicted negative fathering experience at two to three years.

We can further assume paternal postpartum mental health problems to impair the early fathering experience, for example, through decreased sensitivity to a child's needs (Wilson & Durbin, 2010). To increase knowledge about the role of mental health in early fathering, the present study analyses whether problems at specific time-points play a role in the early fathering experience.

Former Infertility

Infertility, the inability to conceive or carry a pregnancy to full term, can be extremely painful for both men and women (Burns, 2007). Half of the couples in our study had a history of infertility and became parents through assisted reproductive treatment (ART). Conflicting views prevail concerning mental health and parenting after ART. Some studies suggest that identification with the label "infertile" is strong and enduring, with infertility-related distress continuing to interfere with parental life (Hjelmstedt, Widström, Wramsby, & Collins, 2004). In contrast, other studies suggest none or minor differences in mental health and parenting experience between ART and naturally conceiving (NC) parents (for review, see Hammarberg, Fisher, & Wynter, 2008).

Research concerning ART fathers is very limited. Higher prenatal levels of aggression and anxiety (Hjelmstedt et al., 2004) and lower self-esteem (McMahon & Gibson, 2002) have been reported. However, one study reported similar (Cohen, McMahon, Tennant, Saunders, & Leslie, 2001) and one even lower (Repokari et al., 2005) levels of prenatal depression among ART fathers. Concerning early fathering, two studies reported similar experiences (Colpin, De Munter, Nys, & Vandemeulebroecke, 1999; Repokari et al., 2006), but one detected more negative experience (Baor, Bar-David, & Blickstein, 2004) among ART fathers.

These conflicting findings suggest that there may be latent subgroups of ART fathers in terms of their mental health across the pre- and postpartum. Furthermore, the proportion of fathers belonging to each subgroup may differ between ART and NC groups. For instance, due to psychological burden and medical worries caused

by infertility, more ART than NC fathers may be prone to mental health problems during pregnancy. Further differences may be found in associations between mental health and the fathering experience. For example, ART fathers who have waited for and invested a great deal in fatherhood may be especially well-prepared for parental responsibilities, and their possible mental health problems may thus not impair early fathering. Findings based on the current data showed that ART and NC fathers had similar prenatal expectations concerning their relationship to the future child, and that ART fathers even constructed their parental identity somewhat faster, possibly due to longer preparation (Flykt et al., 2009). To our knowledge, no prior studies among ART fathers have analysed latent mental health trajectory classes or their connection to early fathering.

Current Study

Our first aim was to identify longitudinal latent classes of fathers according to early depressive and other psychological distress symptoms (including anxiety, social dysfunction and sleeping difficulties). The trajectories depict the timing and course of paternal symptoms from pregnancy (T1) to the child's age of 2 months (T2) and 12 months (T3). Our second aim was to examine how the trajectory classes associated with early fathering experience across the child's first year (T2–T3). Finally, we examined whether a family's fertility history (ART vs. NC group) predicted membership of the trajectory classes, and whether it moderated the association between the trajectory class and fathering experience.

Methods

Participants and Procedure

The sample comprised 773 Finnish Caucasian couples, who participated in the study during the second trimester of pregnancy (T1, 18–20 weeks of gestation) and when the child was 2 (T2) and 12 months (T3) old. Fifty-three per cent of the couples had suffered from infertility (duration $M = 57$ months; $SD = 33$ months) and undergone a successful assisted reproductive treatment with their own gametes (ART group). Forty-seven per cent were NC couples. All the couples entering the infertility clinics were asked to participate in the study (ART group), and the NC group consisted of couples taking part in a routine ultrasound examination offered by community maternal care clinics. The Ethical Committees in participating clinics approved the study.

During pregnancy at T1 $N = 756$ (99.1%) fathers took part in the study. Later participation rates were $N = 615$ (80.6%) for T2 and $N = 506$ (66.3%) for T3. Approximately five hundred ($N = 497$, 65.1%) fathers participated in all three assessments. Participation at T3 was higher in the ART than in the NC group, 69.2% vs. 62.2%, $p < 0.05$. Participation was also dependent on maternal mental health: at each time-point the wives of the participating fathers reported lower levels of psychological distress and/or depressive symptoms than the wives of the fathers who did not take part, General Health Questionnaire (GHQ): T1 $t = 2.2$, $p < 0.05$; T3 $t = 2.3$, $p < 0.05$; Beck's Depression Inventory (BDI): T1 $t = 2.4$, $p < 0.05$; T2 $t = 3.2$, $p < 0.01$; T3 $t = 3.2$, $p < 0.01$. However, participation was independent of the paternal mental health measured at previous stages. It was also independent of paternal and maternal education and age, length of the partnership, child's birth weight and parity.

Measures

Psychological distress was measured at T1–T3 using the 36-item GHQ (GHQ-36; Goldberg & Hiller, 1979), covering anxiety, depression, social dysfunction and sleeping difficulties. Fathers estimated how the symptom descriptions matched their state over the previous few weeks on a Likert scale (1 = *not at all* to 4 = *much more than usual*). In this study, averaged sum variables were constructed for time points T1 (Cronbach's $\alpha = 0.92$), T2 ($\alpha = 0.92$) and T3 ($\alpha = 0.93$). The Finnish version of the GHQ has shown to be both valid and reliable in detecting symptoms of psychological distress (Holi, Marttunen, & Aalberg, 2003). To indicate clinical significance, dichotomic variables were computed based on the cutoff point in Finnish samples (Holi et al., 2003).

Depression was assessed at T1–T3 by a shortened version of the BDI (BDI-13; Beck, Ward, Mendelsohn, Mock, & Erlaugh, 1961). It consists of 13 descriptions of low mood, hopelessness and somatic signs of depression. Participants estimated how they felt on a Likert scale (0 = *symptom not present* to 4 = *symptom present most of the time*). Averaged sum variables were constructed for time points T1 ($\alpha = 0.81$), T2 ($\alpha = 0.80$) and T3 ($\alpha = 0.84$). The Finnish version of the BDI has been found valid and reliable in detecting depressive symptoms (Kaltiala-Heino, Rimpelä, & Laippala, 1999). Clinical significance was assessed using dichotomized variables with the cut-off points used in Finnish samples (Kaltiala-Heino et al., 1999).

Fathering experience was assessed at T2–T3 using the short form of Parenting Stress Index (PSI-36; Abidin, 1995). The scale conceptualizes three components of parenting experience: The *parent domain* (12 items) represents the experience of resources and limitations one posits as a parent; the *interaction domain* (12 items) represents the experience of the dyadic relationship with the child; and the *child domain* (12 items) measures the child's early characteristics contributing to his/her difficulty from the caretaker's point of view. Fathers estimated how the descriptions matched their experiences on a Likert scale (1 = *completely agree* to 5 = *completely disagree*), with higher values indicating more positive experience. All three domains correlated at both time-points (r's ranging from 0.50 to 0.60, p's < 0.01). The Finnish version of the PSI has previously been used in a large, longitudinal family study in Finland, providing validity of the measure (Saisto et al., 2008). Three averaged sum variables were constructed for time-points T2 (parent $\alpha = 0.82$, interaction $\alpha = 0.83$, and child $\alpha = 0.85$) and T3 (parent $\alpha = 0.84$, interaction $\alpha = 0.83$, and child $\alpha = 0.83$).

Statistical Analyses

To identify fathers' mental health trajectory classes from pregnancy to the child being 2 months and 12 months old, we used factor mixture modelling in Mplus 5 (Lubke & Muthén, 2005; Muthén & Muthén, 1998–2007). It identifies subpopulations from the observed data, in a longitudinal setting called latent trajectory classes. Figure 1 presents the model of the present study. The identification of latent classes was based on psychological distress (GHQ-36) and depressive symptoms (BDI-13) assessed at T1, T2 and T3. Level factors with loadings fixed at one were included into the model to indicate the overall individual level of GHQ and BDI. Variances, covariances and residual variances were set equal between classes. All mental health variables (GHQ and BDI at T1–T3) were non-normally distributed. Skewness in variables ranged from 1.22 to 1.83 and kurtosis from 2.30 to 5.76, all $p < 0.001$.
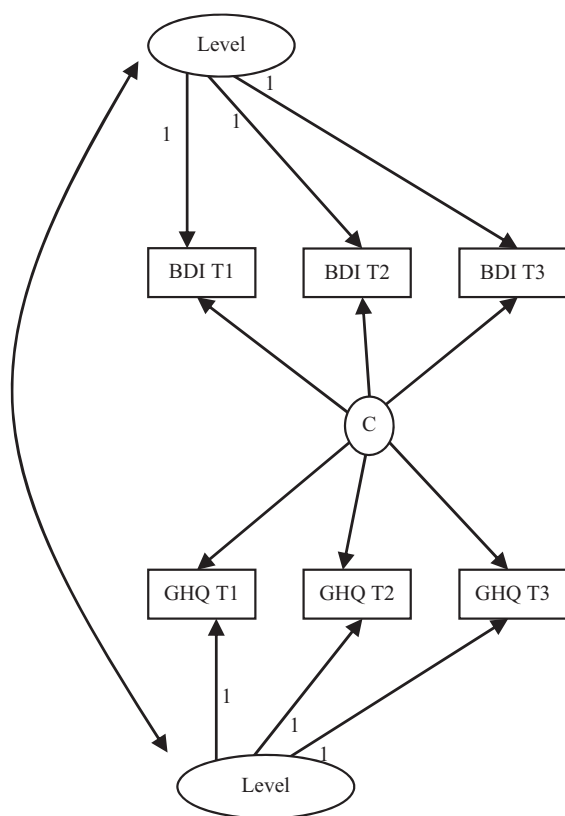
Figure 1. Factor mixture analysis design of fathers' mental health across the pre- and postpartum period.
Note. BDI = Beck's Depression Inventory (13-item); GHQ = General Health Questionnaire (36-item); T1 = pregnancy; T2 = child 2 months old; T3 = child 12 months old; C = paternal mental health latent variable; Level = level factor.

Thus, robust standard errors (MLR) with maximum likelihood estimation were used, which also handles missing data by using all the information available (Muthén & Muthén, 1998–2007).

The optimal number of latent classes was evaluated through seven statistical criteria: three information criteria, three tests and entropy (see Table 1). Our decision was based particularly on the Bayesian information criterion (BIC) and the bootstrap likelihood ratio test (BLRT) that have been found to be the most reliable criteria (Nylund, Asparouhov, & Muthén, 2007). The quality of classifications was evaluated using average posterior probabilities for each class.

To answer our second question concerning the associations between fathers' mental health trajectory classes and early fathering experiences, we applied repeated-measures multivariate analyses of variance (MANOVA) on parent, interaction and child domains of the PSI from T2 to T3. Univariate analyses as well as Tukey's honest significant difference (HSD) *post-hoc* analyses were conducted. We compared the general level (average of T2 and T3) and the change (from T2 to T3) of fathering experience between the trajectory classes. The use of covariates was decided based on differences between the classes according to demographic variables (see Descriptive Statistics).

Finally, to examine how the family's fertility history (ART vs. NC) associated with paternal mental health trajectory class, we used Pearson's chi-square test (χ^2), and to analyse whether fertility history moderated the effect of trajectory class on fathering experience, we included a 5 (trajectory class) * 2 (fertility history)-interaction term into the MANOVA.

Results

Descriptive Statistics

Table 2 shows the demographic variables according to families' fertility history. Results show that the ART and NC groups differed in marital status (ART parents being more often married), number of previous partnerships (ART parents having less earlier partnerships), parity (ART parents being more often primiparous), and maternal socioeconomic status (ART mothers being less often high professionals and more often skilled workers). Further, the partnership had endured longer in the ART group, $t(706) = 4.20, p < 0.001$. In contrast, the ART and NC groups did not differ in gender of the child or father's socioeconomic status. Likewise, maternal age, $t(724) = -0.59, p = 0.56$, and paternal age, $t(708) = 1.78, p = 0.07$, were similar between the groups.

Table 3 presents the means, standard deviations and ranges of paternal psychological distress and depressive symptoms at T1–T3. It further shows the means, standard deviations and ranges of the parent, interaction and child domains of fathering experience at T2 and T3.

Identifying Fathers' Mental Health Trajectory Classes

Our first goal was to identify fathers' mental health trajectory classes across the pre- and postpartum period. As displayed in Table 1, the information criteria (Akaike information criterion, BIC, sample-size-adjusted BIC) and statistical tests (Vuong–Lo–Mendell–Rubin likelihood ratio test (VLMR), Lo–Mendell–Rubin adjusted likelihood ratio test (LMR), BLRT) of the analysis gave somewhat conflicting results. The three information criteria as well as the BLRT test suggested that solutions with nine or ten classes would fit best to our data, whereas LMR and VLMR tests preferred solutions with two or seven classes. Entropy decreased slightly when adding classes in the model, but all values indicated proper solutions. Based on the highest reliability of BIC and BLRT as statistical criteria (Nylund et al., 2007), the 9-class-solution appeared most suitable. Importantly, however, log-likelihoods of the solutions with nine and ten classes could be only rarely replicated, even though as many as 1000 starting values were used. This indicated instability for these solutions. According to BIC and BLRT, the best stable solution was the one with eight classes. We compared visually the mean courses and class sizes in the 8- vs. 9-class-solutions, and found only minor differences. From the 8- to 9-class-solution one small trajectory was split into two, and rest of the classes remained fairly stable. Therefore, we selected the solution with eight classes.

The 8-class-solution had acceptable average posterior probabilities for class membership, ranging from 0.81 to 1.00. The solution comprised four trajectory classes that were representative of the sample (covering 96% of the data) and had courses that were theoretically meaningful. The remaining four classes comprised only a few fathers (total $N = 33$; 4.3%), who reported high levels of problems in at least one assessment, but whose symptom courses did not fit any of the four larger classes. These small classes were

Table 1. Information criteria and statistical tests of mixture modelling identifying fathers' mental health trajectory classes.

	Information criteria			Statistical tests				Class sizes based on estimated model
Number of groups	AIC	BIC	aBIC	VLMR	LMR	BLRT	Entropy	
1	−305.89	−236.13	−283.77	-	-	-	1.0	N = 773
2	−610.36	−508.06	−577.92	0.0322	0.0342	<0.0001	0.979	748/25
3	−829.19	−694.33	−786.42	0.4915	0.4963	<0.0001	0.919	48/23/703
4	−970.69	−803.28	−917.60	0.1192	0.1223	<0.0001	0.912	23/680/28/42
5	−1040.87	−840.90	−977.45	0.5975	0.6006	<0.0001	0.900	6/27/44/653/42
6	−1104.03	−871.51	−1030.83	0.3018	0.3041	<0.0001	0.850	593/37/28/6/96/13
7	−1158.64	−893.58	−1074.58	0.0797	0.0816	<0.0001	0.863	2/41/15/7/92/583/32
8	−1197.28	−899.66	−1102.89	0.5172	0.5199	<0.0001	0.855	567/40/14/30/97/18/5/2
9	−1231.19	−901.02	−1126.48	0.4285	0.4293	<0.0001	0.858	16/27/6/28/570/88/5/2/30
10	−1249.01	−886.29	−1139.97	0.6051	0.6056	<0.05	0.855	52/4/20/11/63/54/543/8/10/8

Notes: Lower values of the information criteria, lower p-values of the statistical tests and higher values of entropy indicate better fitting models. AIC = Akaike information criterion; BIC = Bayesian information criterion; aBIC = sample-size-adjusted BIC; VLMR = Vuong–Lo–Mendell–Rubin likelihood ratio test; LMR = Lo–Mendell–Rubin adjusted likelihood ratio test; BLRT = bootstrap likelihood ratio test.
$N = 773$.

Table 2. Demographic variables according to family's fertility history.

	Assisted reproductive treatment (ART) group (n = 405)			Naturally conceiving (NC) group (n = 356)			χ^2
	%	95% CI	n	%	95% CI	n	(df, n)
Child's gender							0.08 (1, 754)
Boy	50.4	[45.5, 55.3]	201	50.7	[45.5, 55.9]	180	
Girl	49.6	[44.7, 54.5]	198	49.3	[44.1, 54.5]	175	
Marital status							8.07** (1, 700)
Married	74.9	[70.7, 79.1]	269	65.1	[60.2, 70.1]	222	
Cohabitant	25.1	[20.9, 29.3]	90	34.9	[30.0, 39.9]	119	
Previous partnerships							7.37* (2, 712)
None	72.0	[67.6, 76.4]	265	62.5	[57.5, 67.5]	215	
One	22.0	[18.0, 26.0]	81	29.9	[25.1, 34.7]	103	
Two or more	6.0	[3.7, 8.3]	22	7.6	[4.9, 10.4]	26	
Parity							75.86*** (1, 694)
Primiparous	69.9	[65.4, 74.4]	258	36.9	[31.9, 41.9]	120	
Multiparous	30.1	[25.6, 34.6]	111	63.1	[58.1, 68.1]	205	
Socioeconomic status							
Mother							14.14** (3, 702)
High professional	30.3	[25.8, 34.8]	111	38.7	[33.6, 43.8]	130	
Low professional	41.0	[36.2, 45.8]	150	40.5	[35.4, 45.6]	136	
Skilled worker	22.7	[18.6, 26.8]	83	12.8	[9.3, 16.3]	43	
Unskilled worker	6.0	[3.7, 8.3]	22	8.0	[5.2, 10.8]	27	
Father							6.52 (3, 696)
High professional	31.6	[27.1, 36.1]	112	38.9	[33.8, 44.0]	133	
Low professional	30.5	[26.0, 35.0]	108	31.0	[26.2, 35.8]	106	
Skilled worker	30.2	[25.7, 34.7]	107	22.5	[18.2, 26.8]	77	
Unskilled worker	7.6	[5.0, 10.2]	27	7.6	[4.9, 10.4]	26	

Notes: $N = 761$. ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$.

highly heterogeneous in timing and severity of symptoms. Although perhaps representing meaningful subpopulations of fathers, our sample was not large enough for statistical inferences. However, we did not want to leave them out of the subsequent analyses, which is why we combined them into one new trajectory class named as heterogeneous high levels of mental health problems.

Figure 2 displays the courses of fathers' psychological distress and depressive symptoms in each mental health trajectory class from pregnancy (T1) to child being 2 months (T2) and 12 months (T3) old. The figure is based on the original reported mean scores,

and thus does not show the clinically significant cut-off points. The identified five trajectory classes were as follows:

I Stable low levels of mental health symptoms -class (78.9%, $N = 604$) was the largest. Characteristic of fathers in this class were low levels of psychological distress and depressive symptoms during pregnancy and when the child was 2 months and 12 months old. The trajectory (average) does not exceed the clinically significant cut-off point for psychological distress or depressive symptoms at any time-point.

II Moderate increasing levels of mental health symptoms -class (8.9%, $N = 68$) involved fathers who started out with low levels of

Table 3. Means, standard deviations and ranges of paternal mental health symptoms from pregnancy through child's first year (T1–T3) and fathering experience across the child's first year (T2–T3).

	M	SD	Range
Paternal mental health			
Psychological distress (GHQ-36)			
T1: Pregnancy (N = 756)	1.56	0.29	1.00–3.22
T2: Child 2 months (N = 615)	1.54	0.27	1.00–3.19
T3: Child 12 months (N = 506)	1.56	0.39	1.00–3.39
Depressiveness (BDI-13)			
T1: Pregnancy (N = 756)	0.51	0.32	0.00–2.00
T2: Child 2 months (N = 615)	0.48	0.30	0.00–2.15
T3: Child 12 months (N = 506)	0.50	0.33	0.00–2.08
Fathering experience (PSI-36) T2–T3			
Parent-domain			
T2: Child 2 months (N = 615)	4.27	0.49	2.42–5.00
T3: Child 12 months (N = 504)	4.25	0.51	2.00–5.00
Interaction-domain			
T2: Child 2 months (N = 615)	4.48	0.44	1.92–5.00
T3: Child 12 months (N = 504)	4.61	0.35	2.92–5.00
Child-domain			
T2: Child 2 months (N = 615)	4.33	0.47	2.42–5.00
T3: Child 12 months (N = 504)	4.36	0.42	2.75–5.00

Notes: GHQ-36 = General Health Questionnaire (Goldberg & Hiller, 1979); BDI-13 = Beck's Depression Inventory (Beck et al., 1961); PSI-36 = Parenting Stress Index (Abidin, 1995). Higher values of mental health symptoms indicate more problems and higher values of fathering experience indicate more positive experience. Theoretical ranges: psychological distress (GHQ): 1–4; depressiveness (BDI-13): 0–4; fathering experience (PSI-36): 1–5. N = 761.

symptoms during pregnancy, but whose symptoms gradually increased towards child's age of 2 months and especially 12 months. Similar to the stable low-class (I), this trajectory does not exceed the clinically significant cut-off point for psychological distress or depressive symptoms at any time-point.

III Prenatal mental health problems -class (4.7%, N = 37) involved fathers showing a relatively high level of mental health problems during pregnancy, but whose symptoms then decreased to low or moderate levels when the child was 2 months and 12 months old. The trajectory crosses the clinically significant cut-off points for psychological distress and depressive symptoms in pregnancy, but not any more during the first year of fatherhood.

IV Mental health problems in early fatherhood -class (3.1%, N = 24) comprised fathers with a peak in mental health problems when the child was 2 months old. In pregnancy and at 12 months the symptom levels were relatively low. The trajectory exceeds the clinically significant cut-off point for psychological distress, but not for depressive symptoms, at the child's age of 2 months.

V Heterogeneous high levels of mental health problems -class (4.3%, N = 33) combined four small classes that showed variable but severe mental health symptom profiles. Some fathers (2.3%, N = 18) suffered high levels of problems that increased towards the child's age of 12 months; others (1.1%, N = 8) showed extremely high symptom levels in pregnancy and at 2 months, that then decreased to low levels towards 12 months; others (0.6%, N = 5) suffered chronically high levels of problems; and yet others (0.3%, N =2) reported extremely low levels in pregnancy, but extremely high scores at 12 months. The trajectory exceeds the clinically significant cut-off points for both psychological distress and depressive symptoms in pregnancy and at 2 months, and for psychological distress only at 12 months.

Table 4 shows that the fathers' trajectory classes did not differ in demographic variables of paternal education, marital status, number of previous marriages, gender of the child, or parity. Furthermore, the age of the father, $F(4,709) = 0.33$, $p = 0.86$, and the duration of the partnership, $F(4,686) = 0.41$, $p = 0.80$, did not differ between the trajectories. Based on the demographic similarity of the trajectory classes, no covariates were included in the MANOVA analysis.

## Mental Health Trajectories and Fathering Experience

Our second task was to examine how the paternal trajectory classes associated with early fathering experience. Table 5 presents the means and standard deviations of the three domains of PSI from 2 months (T2) to 12 months (T3) postpartum according to the five trajectory classes. Multivariate results showed that trajectory classes were associated with both the *general level* (average of T2 and T3), $F_{\text{Wilk's }\lambda}(12, 1291) = 14.47$, $p < 0.001$, partial $\eta^2 = 0.11$, and the *change* (from T2 to T3), $F_{\text{Wilk's }\lambda}(12, 1291) = 3.78$, $p < 0.001$, partial $\eta^2 = 0.03$, of fathering experience.

Univariate results in Table 5 reveal that differences between the trajectory classes in the *general level* of fathering experience were significant in the parent, interaction and child domains. Figure 3 illustrates, first, that the fathers in the stable low-class (I) reported an especially positive fathering experience. *Post-hoc* tests specified that on the parent domain, their experience was more positive than that of any other class, and on the interaction and child domains, it was more positive than among fathers in the moderate increasing (II), early fatherhood (IV) and heterogeneous high (V)-classes. Second, the fathers in the heterogeneous high -class (V) reported an especially negative fathering experience. *Post-hoc* tests specified that they differed significantly from the fathers in the stable low-class (I) on all three domains, and from the fathers in the moderate increasing-class (II) on parent domain. Third, the fathers in the early fatherhood-class (IV) reported more negative fathering experience than fathers in the stable low (I) and prenatal (III)-classes on the parenting and interaction domains.

Univariate results in Table 5 further reveal that differences between the trajectory classes in the *change* of fathering experience were significant on the parent, interaction and child domains. As Figure 3 illustrates, typical to fathers in the early fatherhood-class (IV) was highly negative fathering experience when the child was 2 months old that then sharply improved towards 12 months. *Post-hoc* tests specified that on the parent domain, their change from T2 to T3 differed from all other classes, and on the interaction and child domains, it differed from the moderate increasing (II), prenatal (III) and heterogeneous high (V)-classes.

Role of Former Infertility

Our third task was to examine, whether a family's fertility history (ART vs. NC group) associated with the trajectory class and moderated its effect on early fathering experience. Results of the chi-square test in Table 4 showed that the trajectory classes did not associate with fertility history, suggesting similar early mental health among ART and NC fathers. Alike, fertility history did not moderate the association between mental health trajectory classes and fathering experience. The interaction between trajectory class and fertility history was non-significant on the general level
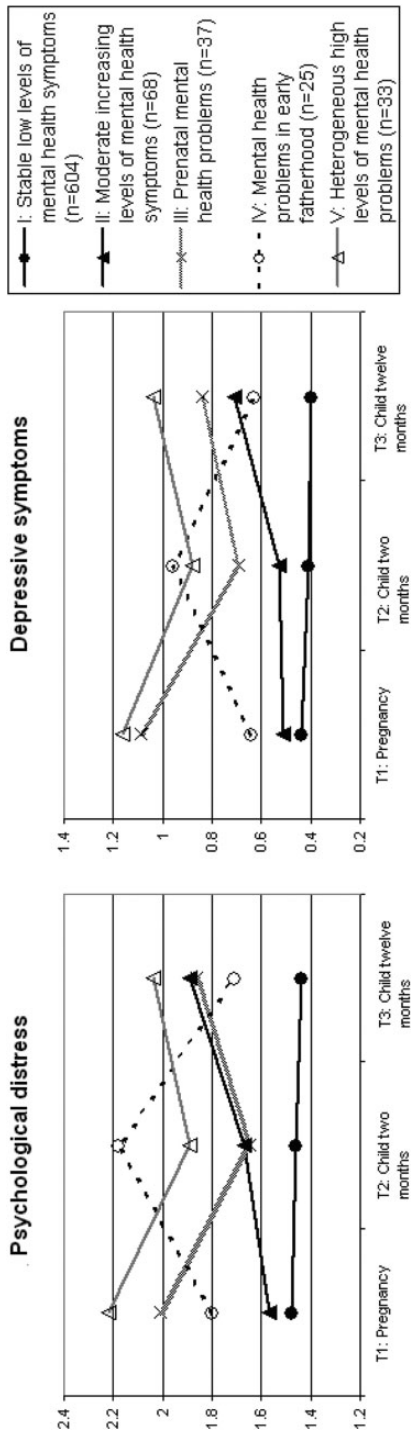
Figure 2. Means of reported mental health symptoms according to paternal mental health trajectory class.
Note: N = 767.

Table 4. Demographic variables and fertility history according to paternal mental health trajectory classes.
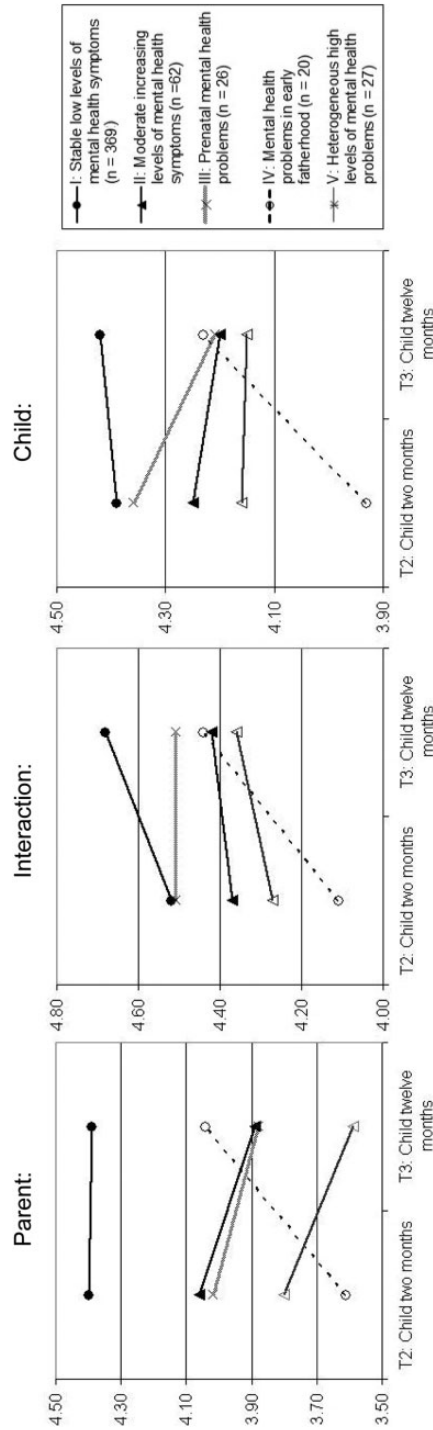
	I Stable low levels of mental health symptoms (N = 604)			II Moderate increasing levels of mental health symptoms (N = 68)			III Prenatal mental health problems (N = 37)			III Mental health problems in early fatherhood (N = 25)			V Heterogeneous high levels of mental health problems (N = 33)			χ^2 (df, n)
	%	95% CI	n	%	95% CI	n	%	95% CI	n	%	95% CI	n	%	95% CI	n	
Fertility history																8.26 (4, 761)
Assisted reproductive treatment	55.3	[51.3, 59.3]	332	50.0	[38.1, 61.9]	34	47.2	[31.1, 63.3]	17	29.2	[11.4, 47.0]	7	45.5	[28.5, 62.5]	15	
Naturally conceiving	44.7	[40.7, 48.7]	268	50.0	[38.1, 61.9]	34	52.8	[36.7, 68.9]	19	70.8	[53.0, 88.6]	17	54.5	[37.5, 71.5]	18	
Child's gender																0.61 (4, 754)
Boy	50.6	[46.6, 54.6]	300	51.5	[39.6, 63.4]	35	47.2	[31.1, 63.3]	17	45.8	[26.3, 65.3]	11	54.5	[37.5, 71.5]	18	
Girl	49.4	[45.4, 53.4]	293	48.5	[36.6, 60.4]	33	52.8	[36.7, 69.0]	19	54.2	[34.7, 73.7]	13	45.5	[28.5, 62.5]	15	
Marital status																0.79 (4, 710)
Married	71.5	[67.9, 75.1]	403	66.7	[55.5, 77.9]	38	67.6	[52.5, 82.7]	23	69.6	[51.6, 87.6]	16	71.9	[56.6, 87.2]	23	
Cohabitant	28.5	[24.9, 32.1]	161	33.3	[22.1, 44.5]	19	32.4	[17.3, 47.5]	11	30.4	[12.4, 48.4]	7	28.1	[12.8, 43.4]	9	
Previous partnerships																11.08 (8, 697)
None	67.9	[64.2, 71.6]	374	58.6	[46.9, 70.3]	34	52.9	[36.8, 69.0]	18	77.3	[60.9, 93.7]	17	62.5	[46.0, 79.0]	20	
One	26.1	[22.6, 29.6]	144	31.0	[20.0, 42.0]	18	44.1	[28.1, 60.1]	15	18.2	[3.1, 33.3]	4	25.0	[10.2, 39.8]	8	
Two or more	6.0	[4.1, 7.8]	33	10.3	[3.1, 17.5]	6	2.9	[0.0, 8.3]	1	4.5	[0.0, 12.6]	1	12.5	[1.2, 23.8]	4	
Parity																7.19 (4, 694)
Primiparous	56.9	[53.0, 60.9]	314	48.3	[36.4, 60.2]	28	38.7	[23.0, 54.4]	12	42.9	[23.5, 62.3]	9	46.9	[29.9, 63.9]	15	
Multiparous	43.1	[39.2, 47.1]	328	51.7	[39.8, 63.6]	30	61.3	[45.6, 78.0]	19	57.1	[37.7, 76.5]	12	53.1	[36.1, 70.1]	17	
Socioeconomic status: father																13.43 (12, 696)
High professional	37.5	[33.6, 41.4]	206	22.0	[12.2, 31.9]	13	21.2	[8.0, 34.4]	7	39.1	[20.0, 58.2]	9	31.2	[15.4, 47.0]	10	
Low professional	30.2	[26.5, 33.9]	166	32.2	[21.1, 43.3]	19	36.4	[20.9, 51.9]	12	26.1	[8.9, 43.2]	6	34.4	[18.2, 50.6]	11	
Skilled worker	25.0	[21.6, 28.5]	137	39.0	[27.4, 50.6]	23	30.3	[15.5, 45.1]	10	30.4	[12.4, 48.4]	7	21.9	[7.8, 36.0]	7	
Unskilled worker	7.3	[5.2, 9.4]	40	6.8	[0.8, 12.8]	4	12.1	[1.6, 22.6]	4	4.3	[0, 12.3]	1	12.5	[1.2, 23.8]	4	

Note: N = 767.

Table 5. Fathering experiences (PSI-36) in paternal mental health trajectory classes and effects of classes and time on fathering experience.

PSI-36	T2: Child 2 months					T3: Child 12 months					Repeated Measures ANOVA			
	I	II	III	IV	V	I	II	III	IV	V	Classes	N_p^2	Classes X Time	N_p^2
	M (SD) 95% CI	M (SD) 95% CI	M (SD) 95% CI	M (SD) 95% CI	M (SD) 95% CI	M (SD) 95% CI	M (SD) 95% CI	M (SD) 95% CI	M (SD) 95% CI	M (SD) 95% CI				
Parent-domain	4.40 (0.39) [4.36, 4.44]	4.06 (0.48) [3.94, 4.19]	4.02 (0.47) [3.82, 4.23]	3.61 (0.57) [3.33, 3.89]	3.80 (0.61) [3.55, 4.04]	4.39 (0.40) [4.35, 4.44]	3.89 (0.43) [3.78, 4.00]	3.88 (0.45) [3.68, 4.07]	4.04 (0.51) [3.80, 4.29]	3.59 (0.85) [3.25, 3.92]	44.98***	.27	10.56***	.08
Inter-action-domain	4.52 (0.42) [4.48, 4.57]	4.37 (0.47) [4.25, 4.49]	4.51 (0.37) [4.35, 4.67]	4.11 (0.49) [3.88, 4.34]	4.27 (0.48) [4.08, 4.47]	4.68 (0.30) [4.65, 4.70]	4.42 (0.42) [4.31, 4.52]	4.51 (0.34) [4.36, 4.65]	4.44 (0.41) [4.25, 4.64]	4.36 (0.53) [4.15, 4.56]	11.75***	.09	2.97*	.02
Child-domain	4.39 (0.42) [4.34, 4.43]	4.0 (0.48) [4.13, 4.37]	4.36 (0.47) [4.15, 4.56]	3.93 (0.59) [3.65, 4.21]	4.16 (0.46) [3.95, 4.38]	4.42 (0.39) [4.38, 4.46]	4.20 (0.47) [4.08, 4.32]	4.21 (0.42) [4.03, 4.39]	4.23 (0.38) [4.04, 4.41]	4.15 (0.55) [3.94, 4.37]	8.25***	.06	2.64*	.02

Notes: I = stable low levels of mental health symptoms ($N = 373$); II = moderate increasing levels of mental health symptoms ($N = 62$); III = prenatal mental health problems ($N = 23$); IV = mental health problems in early fatherhood ($N = 19$); V = heterogeneous high levels of mental health problems ($N = 27$). Fathering experience was measured using the Parenting Stress Index (PSI-36; Abidin, 1995). Analysis of variance degrees of freedom: $F(4, 495)$. N_p^2 = partial eta squared. $N = 504$. ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$.

Parent:

4.50
4.30
4.10
3.90
3.70
3.50

T2: Child two months   T3: Child twelve months

Interaction:

4.80
4.60
4.40
4.20
4.00

T2: Child two months   T3: Child twelve months

Child:

4.50
4.30
4.10
3.90

T2: Child two months   T3: Child twelve months

Legend:
I: Stable low levels of mental health symptoms (n = 369)
II: Moderate increasing levels of mental health symptoms (n =62)
III: Prenatal mental health problems (n = 26)
IV: Mental health problems in early fatherhood (n = 20)
V: Heterogeneous high levels of mental health problems (n = 27)

Figure 3. Estimated marginal means of parent, interaction and child domains of fathering experience (Parenting Stress Index-36; Abidin, 1995) from child being two (T2) to twelve (T3) months across the fathers' mental health trajectory classes.

Notes: Tukey (HSD) post-hoc tests: (1) parent domain: average (T2–T3) level differences: I > II, III, IV, V ($p < 0.001$), II > III, IV, V ($p < 0.05$); differences in the change from T2 to T3: IV ≠ II, III ($p < 0.001$), IV ≠ V ($p < 0.01$) and IV ≠ I ($p < 0.05$); differences in the change from T2 to T3: IV ≠ II, III ($p < 0.001$) and III > IV ($p < 0.05$); (2) interaction domain: average (T2–T3) level differences: I > II, IV, V ($p < 0.001$) and III > IV ($p < 0.05$); differences in the change from T2 to T3: IV ≠ III ($p < 0.01$) and IV ≠ II, V ($p < 0.05$); (3) child domain: average (T2–T3) level differences: I > II, IV, V ($p < 0.05$). $N = 504$.

(average of T2 and T3), $F_{\text{Wilk's }\lambda}$ (12, 1291) = 1.73, $p = 0.06$, partial $\eta^2 = 0.01$, and the change (from T2 to T3), $F_{\text{Wilk's }\lambda}$ (12, 1291) = 0.95, $p = 0.50$, partial $\eta^2 = 0.01$, in fathering experience. However, the main effect of fertility history was significant on the general level of fathering experience, $F_{\text{Wilk's }\lambda}$ (3, 488) = 3.49, $p < 0.05$, partial $\eta^2 = 0.02$, indicating that ART fathers reported more negative fathering experience on the parent domain, $F(1, 490) = 3.88$, $p < 0.05$., partial $\eta^2 = 0.01$. Concerning interaction and child domains, there were no differences between ART and NC fathers. There was no main effect of fertility history on the change of fathering experience from T2 to T3, $F_{\text{Wilk's }\lambda}$ (3,488) = 1.80, $p = 0.15$, partial $\eta^2 = 0.01$.

Discussion

In our study, the timing and course of fathers' mental health symptoms from pregnancy to the child's first year were best described by five distinct trajectory classes: stable low (79%) and moderate increasing (9%) levels of symptoms, and prenatal (5%), early fatherhood (3%) and heterogeneous high levels of (4%) mental health problems. Previous research has been controversial regarding the course of paternal mental health symptoms during the pre- and postpartum period, with some studies suggesting stability (Ballard et al., 1994; Zelkowitz & Milet, 2001) and others variability (Matthey et al., 2000). Our findings demonstrate a heterogeneous, dynamic and timing-specific nature of paternal mental health problems.

Paternal Mental Health Symptoms

In our study, nearly nine out of ten fathers belonged to trajectory classes without clinical levels of mental health problems, in line with previous research suggesting mental health problems to affect approximately 10% of new fathers (Paulson & Bazemore, 2010). Among the mentally healthy fathers we detected two distinct classes: a larger group of fathers (79% of the entire sample) showed relatively stable and low symptom courses across the pre- and postpartum; and a smaller group (9%) reported low levels of symptoms during pregnancy that then gradually increased towards the child being two and especially 12 months old, yet, not reaching clinical significance.

The substantial number of fathers with an increasing course of symptoms from pregnancy and across the child's first year present an interesting class. It concurs with some earlier studies that have found paternal depression to be more common in the late than the early postpartum (Areias et al., 1996; Matthey et al., 2000). One explanation may be that mental health problems in fathers follow earlier onset of problems in their wives, who give birth and are intensively tied up with early child care, and thus more vulnerable to symptoms during the early postpartum (Areias et al., 1996).

Fathers with clinically significant mental health problems, a tenth in our sample, typically suffered the disorder only at a specific time-point. They were symptomatic either only during pregnancy (5%) or only when the child was 2 months old (3%). The rest of the symptomatic fathers (4%) suffered either chronic or high sporadic problems, belonging to the highly heterogeneous and unstable trajectory class. To our knowledge there are no prior paternal trajectory studies; this impedes proper comparison of the occurrence and frequency of the symptoms. Ramchandani et al. (2008) found a smaller number of fathers (2%) who were symptomatic only during

pregnancy, but somewhat similarly to ours, 2% of fathers were depressed only when the child was 2 months old. They also reported a group of fathers who were depressed at both times (1%). The study was, however, based on clinical cut-off scores, not trajectories, and focused solely on depressive symptoms, which can explain somewhat lower percentages.

Interestingly, our study did not find a unified class of fathers suffering from chronic mental health problems, but instead, severe problems were highly heterogeneous in their timing and course. This has implications for clinical practice in maternal and child care. Despite increasing awareness of paternal mental health on family well-being (Ramchandani et al., 2011), paternal symptoms are not usually screened. Our findings emphasize the importance of screening fathers for mental health symptoms and providing support to them at multiple time-points during their transition.

Mental Health and Fathering Experience

Transition to parenthood is a period of profound change, with high demands set on new parents. Fathers face challenges particularly in balancing their time between work and family, managing the changes in family economy and accepting decreased time and intimacy with the partner (Genesoni & Tallandini, 2009). Therefore, although exciting and delightful, transition to parenthood is often experienced as stressful, and especially so among parents who suffer from mental health problems.

Previous research has reported connection between prenatal mental health problems and later negative fathering experience (Saisto et al., 2008). Our study extended this finding by investigating how specific timings and courses of paternal problems, depicted in mental health trajectory classes, associated with early fathering experience. Notably, the fathers with stable and low levels of mental health symptoms throughout the transition also experienced fathering most positively. Instead, the most negative fathering experience throughout the child's first year was found among the small group of fathers who suffered chronic or heterogeneously timed high levels of mental health problems.

Due to possibly intensive prenatal preparation for fatherhood (Habib & Lancaster, 2006; Vrejsweek et al., 2014), we assumed that paternal mental health problems during pregnancy would be harmful for early parenting. However, we did not find such a connection. Instead, it was fathers with mental health problems in early fatherhood, but not during pregnancy or the end of the child's first year, who showed more negative fathering experience than other fathers when the child was 2 months old. Once the child was a year old, the fathers no longer suffered mental health problems and their fathering experience was more positive. This rehabilitating course may reflect that, instead of prominent prenatal preparation, the adjustment to fathering primarily takes place in postpartum. In line with this view, Genesoni and Tallandini (2009) have suggested that the paternal prenatal image of and bonding with the foetus may actually be quite weak and much less concrete than the maternal one, due to the absent bodily connection.

Because the association between early fatherhood mental health problems and fathering experience was cross-sectional in nature, it is not possible to draw conclusions about causality. It may well be that early feelings of parenting incompetence and non-rewarding interactions lead to symptoms, or symptoms interfere with fathering tasks. With increasing adjustment to fatherhood during the child's first year, both mental health and fathering experience of these

fathers improved. The result brings forth the benefit of psychological treatment on the early father–child dyadic relationship. As it appears that the amelioration of either mental health problems or negative fathering experience can positively affect the other, supporting the early father–child relationship may also reduce the effect of paternal depression on later family interaction and child development.

The Role of Former Infertility

Half of the parents in our study had experienced infertility and became pregnant through assisted reproductive treatment (ART). Conflicting views exist concerning mental health and parenting after ART. Our results correspond with those arguing for normative transition to fatherhood (Cohen et al., 2001; Colpin et al., 1999; Repokari et al., 2005), as we found similar mental health trajectory classes among ART and NC fathers. We further found that the trajectory classes similarly predicted fathering experience in ART and NC groups. The results are encouraging as they suggest that fathers' distress and negative emotions related to infertility (Burns, 2007) are relieved and balanced to normative levels once the treatment is successful and pregnancy proceeds.

Some earlier research has suggested more foetal- and child-related worry (Dunnington & Glazer, 1991) and higher parenting stress (Baor et al., 2004) among ART than NC parents. Our study partly concurs, as ART fathers reported more negative fathering experience on parenting domain, reflected in perceived lack of parenting resources. In contrast, their experiences of early dyadic interaction and infant characteristics were similar to NC fathers. The result may reflect that it takes longer to find self-assurance and parental competence after painful and frustrating experience of infertility (Dunnington & Glazer, 1991).

Limitations

Despite the relatively large sample and the longitudinal data, this study has limitations. First, we relied on self-reporting to determine fathers' mental health and parenting experience, although clinical interviews would have guaranteed more objective detection of problems. Second, challenges of including and maintaining fathers as respondents in developmental research are well-known. In our study, nearly 35% of the fathers missed at least one of the three measurement points, and drop-out rate was higher among NC than ART fathers and in families with maternal mental health problems. This may have caused bias towards optimal paternal mental health in our results. Third, as our primary interest in the latent class analysis was in detecting the unique courses of fathers' mental health, some variation in the level of symptoms was accepted within each class. Therefore, some ambiguity remains in weighting the clinical significance of the identified trajectories. Fourth, the present study sample is not nationally representative. The participants were older than the average age of new fathers in Finland and they included low levels of at-risk families. Therefore, our results can be generalized only to relatively low-risk populations.

Clinically, our findings emphasize the critical role of maternity clinics and child health centres in screening fathers, as well as mothers, for mental health symptoms. Providing help to families at multiple time-points during the pre- and postnatal period should aim at avoiding mental health problems to impair early parenting and further on child development.

References

Abidin, R. A. (1995). *Parenting Stress Index: Professional manual*. 3rd edition. Odessa, FL: Psychological Assessment Resources.

Adamsons, K. (2013). Predictors of relationship quality during the transition to parenthood. *Journal of Reproductive and Infant Psychology*, 31(2), 160–171. doi: 10.1080/02646838.2013.791919.

Areias, M. E. G., Kumar, R., Barros, H., & Figueiredo, E. (1996). Comparative incidence of depression in women and men during pregnancy and after childbirth. *British Journal of Psychiatry*, 169(1), 30–35. doi: 10.1192/bjp.169.1.30.

Ballard, C. G., Davis, R., Cullen, R. N., Mohan, R. N., & Dean, C. (1994). Prevalence of postnatal psychiatric morbidity in mothers and fathers. *British Journal of Psychiatry*, 164(6), 782–788.

Baor, L., Bar-David, J., & Blickstein, I. (2004). Psychosocial resource depletion of parents of twins after assisted versus spontaneous reproduction. *International Journal of Fertility and Women's Medicine*, 49(1), 13–18.

Beck, A. T., Ward, C. H., Mendelsohn, M., Mosck, L., & Erlaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry*, 4(6), 561–571.

Burns, L. H. (2007). Psychiatric aspects of infertility and infertility treatments. *Psychiatric Clinics of North America*, 30(4), 689–716. doi: 10.1016/j.psc.2007.08.001.

Chin, R., Hall, P., & Daiches, A. (2011). Fathers' experiences of their transition to fatherhood: A metasynthesis. *Journal of Reproductive & Infant Psychology*, 29(1), 4–18. doi: 10.1080/02646838.2010.513044.

Cohen, J., McMahon, C., Tennant, C., Saunders, D., & Leslie, G. (2001). Psychosocial outcomes for fathers after IVF conception: a controlled prospective investigation from pregnancy to four months postpartum. *Reproductive Technologies*, 10(3), 126–131.

Colpin, H., De Munter, A., Nys, K., & Vandemeulebroecke, L. (1999). Parenting stress and psychosocial well-being among parents with twins conceived naturally or by reproductive technology. *Human Reproduction*, 14(12), 3133–3137.

di Torella, E. C. (2014). Brave new fathers for a brave new world? Fathers as caregivers in an evolving European Union. *European Law Journal*, 20(1), 88–106. doi: 10.1111/eulj.12033.

Dunnington, R. M., & Glazer, G. (1991). Maternal identity and early mothering behavior in previously infertile and never infertile women. *Journal of Obstetric, Gynecologic and Neonatal Nursing*, 20(4), 309–318.

Flykt, M., Lindblom, J., Punamäki, R.-L., Poikkeus, P., Repokari, L., Unkila-Kallio, L., Vilska, S. . . . , & Tulppala, M. (2009). Prenatal expectations in transition to parenthood: Former infertility and family dynamic considerations. *Journal of Family Psychology*, 23(6), 779–789.

Genesoni, L., & Tallandini, M. A. (2009). Men's psychological transition to fatherhood: An analysis of literature, 1989–2008. *Birth*, 36(4), 305–318. doi: 10.1111/j.1523-536X.2009.00358.x.

Goldberg, D. P., & Hiller, V. F. (1979). A scaled version of the general health questionnaire. _Psychological Medicine_, _9_(1), 139–145.

Gray, P. B., & Campbell, B. C. (2009). Human male testosterone, pair bonding and fatherhood. In: P. T. Ellison & P. B. Gray (Eds.), _Endocrinology of Social Relationships_ (pp. 270–293). Cambridge, MA: Harvard University Press.

Guajardo, N. R., Snyder, G., & Petersen, R. (2009). Relationships among parenting practices, parental stress, child behaviour, and children's social–cognitive development. _Infant and Child Development_, _18_(1), 37–60. doi: 10.1002/icd.578.

Habib, C., & Lancaster, S. (2006). The transition to fatherhood: Identity and bonding in early pregnancy. _Fathering_, _4_(3), 235–253. doi: 1537-6680.04.235.

Hammarberg, K., Fisher, J. R. W., & Wynter, K. H. (2008). Psychological and social aspects of pregnancy, childbirth and early parenting after assisted conception: A systematic review. _Human Reproduction Update_, _14_(5), 395–414. doi: 10.1093/humupd/dmn030.

Hjelmstedt, A., Widström, A.-M., Wramsby, H., & Collins, A. (2004). Emotional adaptation following successful _in vitro_ fertilization. _Fertility and Sterility_, _81_(5), 1254–1264. doi: 10.1016/j.fertnstert.2003.09.061.

Holi, M. M., Marttunen, M., & Aalberg, V. (2003). Comparison of the GHQ-36, the GHQ-12 and the SCL-90 as psychiatric screening instruments in the Finnish population. _Nordic Journal of Psychiatry_, _57_(3), 233–238. doi: 10.1080/08039480310001418.

Kaltiala-Heino, R., Rimpelä, M., Rantanen, P., & Laippala, P. (1999). Finnish modification of the 13-item Beck Depression Inventory in screening on adolescent population for depressiveness and positive mood. _Nordic Journal of Psychiatry_, _53_(6), 451–457.

Lubke, G., & Muthén, B. (2005). Investigating population heterogeneity with factor mixture models. _Psychological Methods_, _10_(1), 21–39. doi: 10.1037/1082-989X.10.1.21.

Matthey, S., Barnett, B., Ungerer, J., & Waters, B. (2000). Paternal and maternal depressed mood during the transition to parenthood. _Journal of Affective Disorders_, _60_(2), 75–85. doi: 10.1016/S0165-0327(99)00159-7.

McMahon, C. A., & Gibson, F. L. (2002). A special path to parenthood: Parent–child relationships in families giving birth to singleton infants through IVF. _Reproductive Biomedicine Online_, _5_(2), 179–186.

Muthén, L. K., & Muthén, B. O. (1998–2007). _Mplus User's Guide_. 5th edition. Los Angeles, CA: Muthén & Muthén.

Nylund, K. L., Asparouhov, T., & Muthén, B. O. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A monte carlo simulation study. _Structural Equation Modeling_, _14_(4), 535–569. doi: 10.1080/10705510701575396.

Oddi, K. B., Murdock, K. W., Vadnais, S., Bridgett, D. J., & Gartsein, M. A. (2013). Maternal and infant temperament characteristics as contributors to parenting stress in the first year postpartum. _Infant and Child Development_, _22_(6), 553–579. doi: 10.1002/icd.1813.

Paulson, J. F, & Bazemore, S. D. (2010). Prenatal and postpartum depression in fathers and its association with maternal depression: A meta-analysis. _Journal of American Medical Association_, _303_(19), 1961–1969. doi: 10.1001/jama.2010.605.

Ramchandani, P. G., Stein, A., O'Connor, T. G, Heron, J., Murray, L., & Evans, J. (2008). Depression in men in the postnatal period and later child psychopathology: A population cohort study. _Journal of the American Academy of Child and Adolescent Psychiatry_, _47_(4), 391–399. doi: 10.1097/CHI.0b013e31816429c2.

Ramchandani, P. G., Psychogiou, L., Vlachos, H., Iles, J., Sethna, V., Netsi, E., & Lodder, A. (2011). Paternal depression: an examination of its links with father, child and family functioning in the postnatal period. _Depression & Anxiety_, _28_(6), 471–477. doi: 10.1002/da.20814.

Repokari, L., Punamäki, R.-L., Poikkeus, P., Vilska, S., Unkila-Kallio, L., Sinkkonen, J., Almqvist, F., . . . Tulppala, M. (2005). The impact of successful assisted reproduction treatment on female and male mental health during transition parenthood: A prospective controlled study. _Human Reproduction_, _20_(11), 3238–3247. doi: 10.1093/humrep/dei214.

Repokari, L., Punamäki, R.-L., Poikkeus, P., Tiitinen, A., Vilska, S., Unkila-Kallio, L., Sinkkonen, J., . . . Tulppala, M. (2006). Ante- and perinatal factors and child characteristics predicting parenting experience among formerly infertile couples during the child's first year: A controlled study. _Journal of Family Psychology_, _20_(4), 670–679. doi: 10.1037/0893-3200.20.4.670.

Rodgers, A. (1998). Multiple sources of stress and parenting behaviour. _Children and Youth Services Review_, _20_(6), 525–546. doi: 10.1016/S0190-7409(98)00022-X.

Saisto, T., Salmela-Aro, K., Nurmi, J.-E., & Halmesmäki, E. (2008). Longitudinal study on the predictors of parental stress in mothers and fathers of toddlers. _Journal of Psychosomatic Obstetrics & Gynecology_, _29_(3), 219–228. doi:10.1080/01674820802000467.

Wilson, S., & Durbin, C. E. (2010). Effects of paternal depression on fathers' parenting behaviors: A meta-analytic review. _Clinical Psychology Review_, _30_(2), 167–180. doi: 10.1016/j.cpr.2009.10.007.

Vreeswijk, C., Maas, A., Rijk, C., Braeken, J., & van Bakel, H. (2014). Stability of fathers' representations of their infants during the transition to parenthood. _Attachment & Human Development_, _16_(3), 292–306. doi: 10.1080/14616734.2014.900095.

Zelkowitz, P., & Milet, T. H. (2001). The course of postpartum psychiatric disorders in women and their partners. _Journal of Nervous and Mental Disease_, _189_(9), 575–582. doi: 10.1097/00005053-200109000-00002.