






Research Paper

A longitudinal study exploring paternal stress and well-being, maternal depressive symptoms, and the offspring's later psychosocial functioning in adolescence and young adulthood



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ABSTRACT

Background: The influence of the father's well-being on child development has been increasingly studied, but longitudinal studies remain few. This study explores how paternal stress and well-being in the offspring's middle childhood is associated with the child's internalizing and externalizing problems and competence in adolescence and young adulthood. In addition, it explores the combined effect of paternal stress and maternal depressive symptoms (MDS) trajectories, on child outcomes.

Method: The longitudinal study started in 1989 in Tampere, Finland, and included 351 normal population primiparous mothers. MDS were screened prenatally, postnatally at 2 and 6 months, and when the index child was 4–5, 8–9, 16–17, and 27 years old. Fathers participated at the 8–9 years follow-up. The children completed questionnaires when they were 16–17 and 27 years old. Complete data were available from 106 adolescents and 81 young adults.

Results: The father's long term health problems were associated with the child's poorer competence in adolescence. The simultaneous high maternal depressive symptoms trajectory increased the risk. In young adulthood, the father's poorer health and life satisfaction were associated with the offspring having a lower level of internalizing problems and better adaptive functioning. The MDS trajectory was not associated with the young adult's outcomes.

Limitations: The sample size was moderate, and high-symptomatic cases were more common among drop-outs. **Conclusions:** Exposure to paternal stress and poor well-being in middle childhood should be considered as an important risk factor for child development. On the other hand, (mild) childhood adversity may enhance psychosocial functioning in young adulthood.

1. Introduction

Research on parental psychopathology and its influence on child development started some decades ago among mothers. The negative influence of maternal depressive symptoms and other mental health

problems on child development is starting to be well established (Goodman et al., 2011; Morgan et al., 2021; Sutherland et al., 2022). Research interest in fathers has increased, yet studies are still limited and inconclusive, and they focus mainly on depressive symptoms. Growing evidence indicates that not only maternal but also paternal

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depressive symptoms increase the child's risk for psychopathology (Aaron et al., 2024; Connell and Goodman, 2002; Dachew et al., 2023; Lewis et al., 2017; Ramchandani and Psychogiou, 2009; Reeb et al., 2015; Scarlett et al., 2023; Sweeney and MacBeth, 2016; Weitzman et al., 2011; Wickersham et al., 2020).

Paternal stress factors other than mental health problems have been very little studied, although mental health problems are compounded by multiple other stress factors, such as financial problems, marital conflicts, physical health problems and parenting stress (Ansari et al., 2021; Speer et al., 2024; Wang et al., 2021). There are few studies exploring the influence of paternal stress factors on parenting stress or father-child relationship (Fang et al., 2024; Giallo et al., 2015; Nettelbladt et al., 1980). One of the first studies exploring paternal stress factors and parenting was conducted in Sweden in 1980 (Nettelbladt et al., 1980). The cross-sectional study indicated that fathers who had a low income, unsatisfying job, or a poorer relationship with their partner or parents, especially their father, were less positive towards their child than others. A longitudinal study by Giallo et al. (2015) found that fathers with persistent and increasing distress reported significantly lower parenting warmth, lower consistency, and higher hostility towards their children (Giallo et al., 2015). The quality of the marital relationship has also been identified to be associated with paternal emotional support towards the child (Mahedy et al., 2018). On the other hand, higher levels of social support may be related to lower parental stress (Fang et al., 2024).

Mental health problems often influence family interactions and relationships (Barker et al., 2017). Negative parenting and marital conflict are suggested to mediate the negative influence of paternal depressive symptoms on adolescent internalizing and externalizing problems (Cummings et al., 2005; Ramchandani and Psychogiou, 2009; Sweeney and MacBeth, 2016). There might be some gender differences; in a study by Reeb and Conger (2009), female adolescents reporting low father-adolescent closeness were particularly vulnerable to the adverse effects of paternal depressive symptoms (Reeb and Conger, 2009). In addition to paternal depressive symptoms, paternal problem drinking has been found to increase the risk for marital conflict and negative parenting over time and further have a negative influence on child development later (Connell and Goodman, 2002; Keller et al., 2008; Rossow et al., 2016; Schacht et al., 2009).

Mental health problems in mothers and fathers tend to co-occur (Connell and Goodman, 2002; Paulson and Bazemore, 2010). This co-occurrence could be via couple-selection (*assortative mating*, Merikangas, 1982) or due to a stressful family situation that also influences the unaffected parent. The risk for the child's unsatisfactory development is higher if both parents have depressive symptoms (Weitzman et al., 2011). The increased risk of the dual exposure may be explained e.g. via increased genetic risk load or higher exposure to the maladaptive parenting practices and contextual stressors (Connell and Goodman, 2002).

There may also be differences in the child's symptom outcome depending on whether the exposure is via maternal or paternal psychopathology (Connell and Goodman, 2002; Harold et al., 2011; Lewinsohn et al., 2005; Liskola et al., 2018). The differences have been explained, e.g., by the different kind of depression symptom spectrum experienced by men and women, with depressed men expressing perhaps more anger and emotion dysregulation compared to depressed women (Fisher, 2016). The influence of mediating factors such as marital conflict and parent-child interaction quality may also be different between mothers and fathers. These differences may be related to parental experiences and coping strategies, but also to child-related factors such as child age or gender (Connell and Goodman, 2002).

The father's emotional support and involvement and the absence of depressive symptoms in the father may also serve as a protective factor for the child against maternal depressive symptoms (Chang et al., 2007; Gere et al., 2013; Mahedy et al., 2018; Padaigaitė-Gulbinienė et al., 2025). Other resilience factors against parental depression include the positive emotional expression of the depressed parent, support from the

co-parent, and the adolescent having good social (peer) relationships (Collishaw et al., 2016; Padaigaitė-Gulbinienė et al., 2025). The influence of the environment also changes as the individual grows and becomes more able to control it (Kendler and Baker, 2007).

To conclude, there is an increasing number of studies exploring the associations of child outcome and paternal depressive symptoms, and some studies exploring paternal stress and parenting. However, there is a notable lack of studies exploring other paternal stress and well-being factors in relation to the child's internalizing and externalizing problems in a longitudinal setting (Reeb et al., 2015). In addition, there is a lack of studies on the potential dual influence of maternal and paternal mental health problems (Barker et al., 2017; Connell and Goodman, 2002).

The first aim of the current study was to explore how paternal stress factors like physical health and mental health problems, health habits, life-satisfaction, and the quality of close relationships (partner and own mother and father) evaluated in the firstborn's middle childhood (8–9 years) are longitudinally associated with the firstborn's self-evaluated internalizing and externalizing problems and total competences (mean adaptive functioning in young adulthood) at the ages of 16–17 and 27 years. The second aim was to explore the combined effect of paternal stress factors at the firstborn's age of 8–9 years and maternal depression trajectories from the pregnancy to the adolescence and adulthood of the firstborn on the offspring's self-evaluated internalizing and externalizing problems and total competence (mean adaptive functioning in adulthood). The first hypothesis was that paternal stress factors are associated with a higher level of self-reported internalizing and externalizing problems and the poorer competence (adaptive functioning) of the firstborn in adolescence and young adulthood. The second hypothesis was that the dual influence of paternal stress and a high trajectory of maternal depressive symptoms would increase the child's risk for a poorer outcome in terms of internalizing and externalizing problems and total competence (adaptive functioning) in adolescence and young adulthood.

2. Material and methods

2.1. Sample

This study is part of a longitudinal study that started in Tampere, Finland, in 1989. The original sample consisted of 351 consecutively selected normal population mothers expecting their first child. The sample was collected from Tampere maternity centers in 1989–1990. <10 % of those invited refused to participate. The first study stage (I) included data collection at the third trimester and two and six months postnatally. The later study stages were conducted at the child's age of 4 to 5 years (II), 8 to 9 years (III), 16 to 17 years (IV), and 27 years (V).

Fathers completed questionnaires concerning their well-being at study stage III. Altogether 146 fathers participated. Six of them were not biological fathers and were excluded from the study. Thus, data from 140 fathers were available.

The maternal depressive symptoms trajectories were based on the data collected at all stages (I–V). Data for estimating the trajectory for stages I–IV were available for 329 mothers and data for stages I–V for 332 mothers.

The child's self-reported psychosocial functioning was evaluated at study stages IV and V. The numbers of participating firstborns were 192 and 144, respectively.

Complete data – that is, the mother's depressive symptoms trajectory, the father's participation at stage III, and the child's participation – were available for 106 adolescents at stage IV and for 81 young adults at stage V.

The drop-out analyses indicated no statistically significant associations between the father's participation at stage III and adolescent outcome in self-reports at stage IV. Still, those young adults whose fathers had not participated at stage III showed a significantly poorer

outcome at stage V in terms of Externalizing problems ($p = 0.037$) and indicatively for mean Adaptive functioning ($p = 0.058$) compared to those whose fathers had participated at stage III. The drop-out analyses between study stages IV and V indicated that there were more drop-outs among males ($p < 0.001$) and those with a lower family socioeconomic status (SES; $p = 0.017$). In addition, there were more stage V drop-outs among those stage IV respondents who had a higher level of externalizing problems in self-reports ($p = 0.063$, indicative) and poorer social competence ($p = 0.069$, indicative).

3. Methods

Fathers completed a questionnaire designed for the study when the children were 8–9 years old. The questionnaire included 54 questions concerning the socioeconomic situation, index child, perceived physical and mental health, relationships and contentment with life, life habits and leisure activities, the father's family of origin, and the current family. For the current study, we selected 16 stress-related and socioeconomic questions from the above-mentioned categories (Table 1). The original sociodemographic and stress questions included 2–7 response options and they were dichotomized for the purposes of the current study (except the education level included three options). The dichotomization was conducted so that the high and the bottom ends of the question options were dichotomized as “good” or “poor” and the options in the middle were dichotomized as “poor” or “good” depending on the question formatting.

Table 1

Frequencies of paternal sociodemographic and stress factors at the child's age of 8–9 years ($n = 140$).

		%
Sociodemographic factors		
Education level ¹	Upper	48
	Lower	40
	Other	12
Employment status	Employed/Student	91
	Unemployed/other	9
Marital status	Married/cohabitation/engaged	100
	Single	0
Number of children	One	11
	Two	52
	Three or more	36
Health and life habits		
Perceived health	Good/rather good	88
	Moderate/poor	12
Long-term health problems	No	84
	Yes	16
Mental health problems	No	91
	Yes currently/earlier/can't say	9
Depressed after firstborn's birth	No/rarely	85
	Often/constantly	15
Smoking	No	80
	Yes	20
Perceived problems with alcohol	No	92
	Yes/can't say	8
Life satisfaction and relationships		
Relationship with firstborn's mother	Very good/Good	75
	Ordinary/Poor	25
Relationship with own mother	Very good/Good	64
	Ordinary/Poor	36
Relationship with own father	Very good/Good	52
	Ordinary/Poor	48
Friendships	Yes	66
	Too little/no	34
Feelings of loneliness	No/rarely	75
	Always/sometimes/can't say	25
Life satisfaction	Good	73
	Moderate/poor	27

¹ Upper including university or college, lower including comprehensive school, vocational school and high school, other including e.g. courses.

The firstborns' psychosocial functioning was evaluated with the age-appropriate versions of Achenbach System of Empirically Based Assessment (ASEBA) questionnaires at both study stages: The firstborns completed the Youth Self-Report (YSR) in adolescence (study stage IV) and Adult Self-Report (ASR) in young adulthood (study stage V). The validity of the questionnaires has been tested in previous studies (Ivanova et al., 2007; Rescorla et al., 2016). ASEBA questionnaires assess behavioral, emotional, social, and thought problems as well as competence/adaptive functioning. The Internalizing Problems score is a sum score including withdrawal, somatic complaints, and anxiety/depression items. The Externalizing Problems score is a sum score of items concerning social problems, rule-breaking behavior, and aggressive behavior. The Total Competence sum score (Mean Adaptive Functioning score in the ASR) includes scores from the activities, social skills and relationships, and school (education and job in the ASR) performance subscales. Internalizing and Externalizing raw problem scores and the Total Competence/Mean Adaptive Functioning raw score were converted into normalized T-scores and used as continuous variables. Higher Internalizing and Externalizing scores and lower Total Competence/Mean Adaptive Functioning scores indicate a poorer outcome.

Maternal depressive symptoms were assessed with the Edinburgh Postnatal Depression Scale (EPDS) at each timepoint. The EPDS is a self-report questionnaire originally designed to detect postnatal depression, but it has also shown validity in detecting depression among non-postnatal women (Cox et al., 1987, 1996). It includes ten questions, each of which has four response options scored from 0 to 3, with a maximum score of 30, higher scores indicating more severe symptoms.

3.1. Statistical analysis

Categorical variables are described in percentages, and continuous ones with means (M) and standard deviations (SD) or Medians (Md) and quartiles (Q₁, Q₃). P-values < 0.05 are considered statistically significant and those > 0.05 but < 0.10 indicative.

The trajectories describing the development of maternal depressive symptoms over time were identified using group-based trajectory modeling (Nagin, 1999; Nagin and Odgers, 2010), based on a censored normal distribution. We conducted two different trajectory analyses; the stage I–IV trajectory was based on the follow-ups from pregnancy to the adolescence of the firstborns (six timepoints) and the stage I–V trajectory on the follow-ups from pregnancy to young adulthood (seven timepoints). As group-based trajectory modeling accommodates incomplete data (Nagin, 1999), the data used in the analyses consisted of the EPDS data of mothers for whom the sum score was available at least once in the stage I–IV or I–V timepoints. The skewed EPDS sum score distributions were normalized by square root transformation before trajectory analyses. The data collection points were treated as evenly spaced. Second-, third-, and fourth-degree equations of time were used in the models, and for each of them all 1–5-group models were examined. The selection of the final model was based on Bayesian Information Criterion (BIC; Nagin and Odgers, 2010). According to the BIC values, the best trajectory models for both stages I–IV and I–V were based on the second-degree polynomial of time and consisted of four groups. The resulting trajectory groups of maternal depressive symptoms from the third trimester to adolescence (stages I–IV) were very-low ($n = 27$), low-stable ($n = 67$), intermittent ($n = 4$) and high-stable ($n = 36$). The trajectory groups from third trimester to young adulthood (stages I–V) were low ($n = 23$), middle ($n = 58$), increasing ($n = 5$), and high-stable ($n = 46$). As the intermittent group of I–IV trajectories and the increasing group of I–V trajectories were small and because dichotomous variables offer an advantage in regression interpretation, both trajectory sets were combined into two groups (low and high). The stage I–IV trajectory was used as an explanatory variable in the multivariable analyses of adolescence (stage IV) outcome and the stage I–V trajectory for young adult (stage V) outcome.

First, pairwise analyses between each outcome variable and each stress factor were conducted applying the Kruskal–Wallis or Mann–Whitney tests. Then, for each outcome variable, two linear regression analyses (enter method) were run. First, all those paternal stress factor variables that indicated statistically significant or indicative pairwise associations with the particular child outcome measure were entered into the model. In the second analysis, those paternal stress factors indicating statistically significant or indicative associations in the first regression model and maternal depressive symptoms trajectory (if indicating a statistically significant or indicative association with the outcome variable) were entered into the regression model.

The possible interaction effect of paternal stress variables and the maternal depressive symptoms trajectory was examined. The maternal depressive symptoms trajectory variable and each stress variable indicating a significant or indicative association with the child outcome variable in the regression models were combined into one variable. The association of this variable with each child outcome variable was examined with the Kruskal–Wallis test and post hoc analysis with the Mann–Whitney test.

The trajectory models were fitted using the Flexmix package, step-Flexmix option in the statistical program R, version 3.4.1. The rest of the statistical analyses were conducted with SPSS, versions 16, 23, and 25.

4. Results

Males comprised 43 % of the respondents in adolescence and 37 % in young adulthood. The mean ages were 16.6 years (SD 0.3) and 27.0 years (SD 0.3), respectively. The mean adolescent Internalizing

Problems score was 50 (SD 12), the Externalizing Problems score was 51 (SD 9), and the Total Competence score was 46 (SD 10). In young adulthood, the mean Internalizing Problems score was 48 (SD 12), the Externalizing Problems score was 48 (SD 10), and the Mean Adaptive Functioning score was 49 (SD 9). There were no statistically significant differences in these means between males and females.

The frequencies of paternal sociodemographic factors and stress variables are presented in Table 1. The fathers' mean age in the first-borns' middle childhood was 38 years (SD 4.9).

4.1. Paternal sociodemographic and stress factors in middle childhood and the child's psychosocial functioning in adolescence

4.1.1. Internalizing problems

The father's education level was statistically significantly associated with the adolescent's Internalizing Problems score ($p = 0.032$). The score was lowest among the adolescents of fathers with the highest education level (Fig. 1). No other statistically significant or indicative associations were found between paternal sociodemographic and stress factors and the adolescent's Internalizing Problems score.

4.1.2. Externalizing problems

The father's smoking ($p = 0.028$) and perceived alcohol problems ($p = 0.079$, indicative) were associated with a higher Externalizing Problems score in adolescent self-reports. In addition, if the father reported having too few or no friendships in the child's middle childhood, the adolescent scored lower in Externalizing Problems score ($p = 0.067$, indicative, Fig. 1).

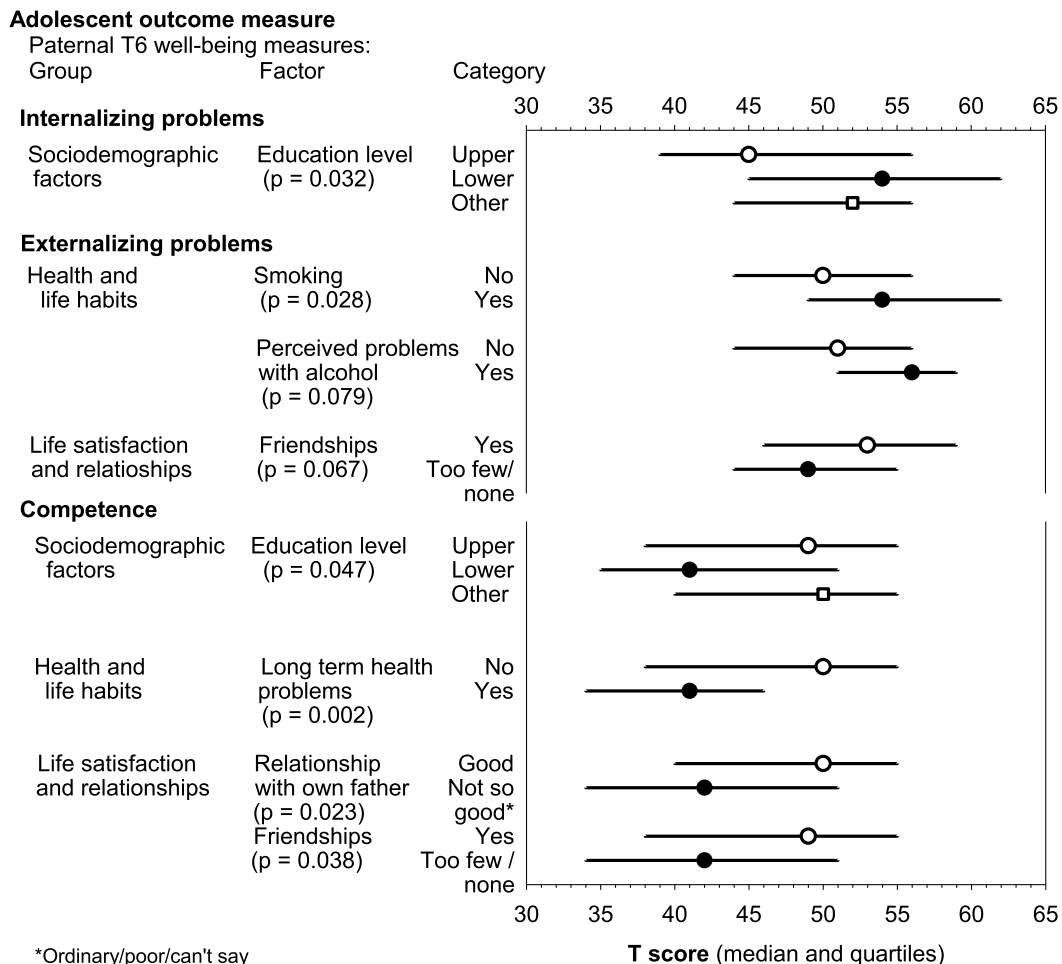


Fig. 1. Statistically significant associations between paternal sociodemographic and stress variables and adolescent outcome variables ($n = 106$).

4.1.3. Total competence

The father's education level was statistically significantly associated with Total Competence score ($p = 0.047$) in adolescent self-reports. The Total Competence score was lowest among adolescents whose fathers had a lower education level. In terms of health and life habits, long-term health problems were associated with a lower score in Total Competence ($p = 0.002$). Of the relationships and life satisfaction factors, the father's poorer relationship with his own father ($p = 0.023$) and having too few or no friends ($p = 0.038$) were associated with a lower score in Total Competence (Fig. 1).

4.2. Paternal sociodemographic and stress factors in middle childhood and the child's psychosocial functioning in young adulthood

4.2.1. Internalizing problems

Of the health and life habits, the father's poorer perceived health was associated with a lower Internalizing Problems score ($p = 0.041$). In addition, the father's moderate/poor life satisfaction was associated with a lower Internalizing Problems score in young adult self-reports ($p = 0.029$). The father's poor relationship with his own mother was indicatively associated with a lower Internalizing Problems score in young adulthood ($p = 0.069$, indicative, Fig. 2).

4.2.2. Externalizing problems

No associations between the father's sociodemographic or stress factors in middle childhood and the young adult's Externalizing Problems score were found.

4.2.3. Mean adaptive functioning

Of the health and life habits, the father's poorer perceived health ($p = 0.001$) and perceived problems with alcohol ($p = 0.036$) were associated with a higher Adaptive Functioning score in young adult self-reports. Of the life satisfaction and relationship factors, the father's feelings of loneliness were associated with a higher Adaptive Functioning score in young adult self-reports ($p = 0.014$, Fig. 2).

4.3. The associations between maternal depressive symptoms trajectories and adolescents' and young adults' psychosocial functioning

The stage I-IV dichotomous maternal depressive symptoms trajectory was associated with the adolescent Internalizing Problems score ($p = 0.079$, indicative) and Total Competence score ($p = 0.021$), but not with the Externalizing Problems score. For the Internalizing Problems score, the median was higher among those adolescents whose mothers had a high depressive symptoms trajectory (Md = 54; Q1-Q3 = 45-60 vs. Md = 48; Q1-Q3 = 41-58). For the Social Competence score, the median was lower among those adolescents whose mothers had a high depressive symptoms trajectory (Md = 42; Q1-Q3 = 35-51 vs. Md = 49; Q1-Q3 = 40-55).

The respective stage I-V trajectory was not associated with any of the young adult's outcome variables.

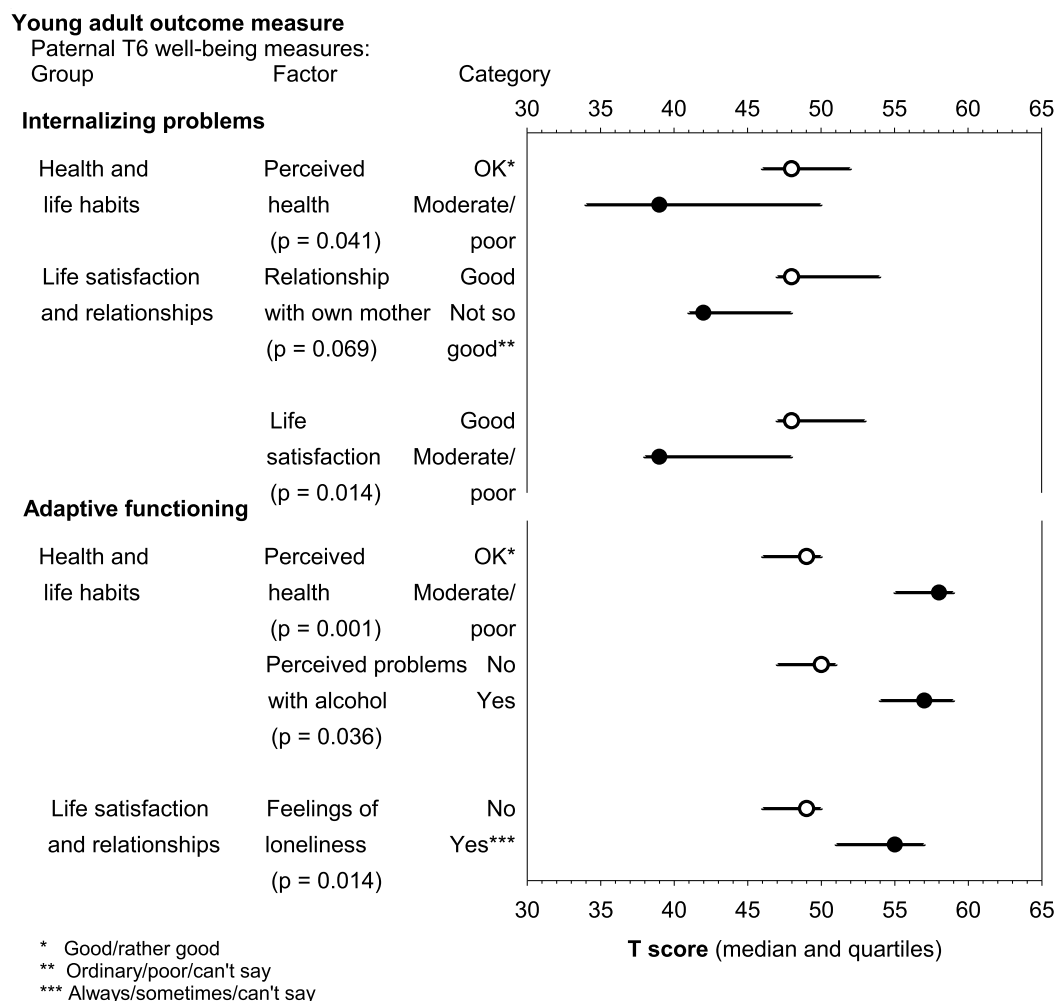


Fig. 2. Statistically significant associations between paternal stress variables and young adult outcome variables ($n = 81$).

4.4. Combined effects of paternal sociodemographic and stress factors and the maternal depressive symptoms trajectory on the child's psychosocial functioning in adolescence

For the adolescent Internalizing Problems score, the paternal education level was the only explanatory variable that showed a statistically significant effect in the pairwise association. Thus, in the first step, it was entered alone into a regression model and showed an indicative association. When the maternal depressive symptoms trajectory (stages I-IV) was added to the model, no statistically significant associations were seen (Table 2).

For Externalizing Problems, paternal smoking, perceived problems with alcohol, and number of friends were first entered into a regression model. Smoking and low number of friends showed a statistically significant effect. The second step analysis with these variables and the maternal depressive symptoms trajectory was not conducted, as in the pairwise analysis the trajectory indicated no statistically significant association with the adolescent's Externalizing Problems score (Table 2).

For Total Competence, the first step regression analysis included the father's education level, long-term health problems, the father's relationship with his own father, and friendships. Of them, paternal long-term health problems indicated a statistically significantly poorer Total Competence score in adolescence, while the rest of the explanatory variables had no significant effect. When the paternal long-term health problems variable and maternal depressive symptoms trajectory (risk category high) were entered together into the model, both indicated a

Table 2
Results of linear regression analyses on factors predicting child's emotional and behavioral problems and psychosocial functioning in adolescence (n = 106).

Model no	Variables	b	95 %CI	p
	Dependent variable: child adjustment measure (predicted category)			
	Explanatory variable: paternal factors and maternal depression trajectory (risk category)			
1a	Internalizing symptoms ¹ (higher)	Education level (upper)	-3.0 -6.2 - 0.2	0.066
1b	Internalizing symptoms ¹ (higher)	Education level (upper)	-2.5 -5.8 - 0.8	0.141
2 ³	Externalizing symptoms ¹ (higher)	Maternal depressive symptoms ² (high)	3.4 -1.6 - 8.4	0.180
		Smoking (yes)	5.5 1.3 - 9.7	0.012
3a	Total Competence ¹ (better)	Perceived problems with alcohol (yes)	4.1 -1.7 - 9.9	0.166
		Friendships (too little/no)	-3.1 (-6.5) - 0.3	0.073
		Education level (upper)	1.6 1.1 - 0.3	0.284
3b	Total Competence (better)	Long-term health problems (yes)	-5.4 -10.6 - (-0.3)	0.039
		Relationship with own father (ordinary/poor)	-2.7 -6.7 - 1.3	0.177
		Friendships (too little/none)	-2.5 -6.9 - 1.9	0.259
		Long-term health problems (yes)	-6.6 -11.6 - (-1.6)	0.010
		Maternal depressive symptoms ¹ (high)	-3.9 8.2 - 0.5	0.080

¹ According to Achenbach Adult Self Report (ASR) questionnaire.
² Maternal depressive symptoms trajectory from 3rd trimester to child's adolescence.
³ The analysis with maternal depressive symptoms trajectory was not conducted as the association between the trajectory and adolescent's externalizing problems was not statistically significant.

statistically significant or indicative effect on the Total Competence score (Table 2).

As both paternal long-term health problems and the maternal depressive symptoms trajectory indicated at least an indicative effect on the adolescent's self-reported Total Competence score, a variable combining the two variables was created to explore the possible interaction. Its four categories were no paternal/no maternal (n = 83), yes paternal/no maternal (n = 10), no paternal/yes maternal (n = 27), and yes paternal/yes maternal (n = 12). The pairwise analyses indicated a statistically significant association between the combined variable and Total Competence score (p = 0.007; Fig. 3). The median was highest among those with no risk (Md = 50; Q₁-Q₃ = 40-56) and lowest among those with dual risk (Md = 40; Q₁-Q₃ = 33-44). The post hoc analyses showed statistically significant differences between the no risk and paternal risk only group (p = 0.020) and between the no risk and dual risk group (p = 0.005).

4.5. Combined effects of paternal stress factors and maternal depression trajectories on the child's psychosocial functioning in young adulthood

For the first linear regression analysis of the young adult's Internalizing Problems, the paternal stress variables entered were perceived health, relationship with the firstborn's mother, and life satisfaction. None of the variables proved to be significant. Therefore, and because the maternal depressive symptoms trajectory indicated no pairwise associations with young adult's Internalizing Problems scores, no second step analysis was conducted (Table 3).

No regression analyses were conducted for Externalizing Problems, as there were no significant pairwise associations.

For the linear regression analysis of the young adult's Adaptive Functioning, the variables entered were paternal poorer perceived health, loneliness, and perceived problems with alcohol. Paternal poorer perceived health and loneliness indicated statistically indicatively a better Adaptive Functioning score in the first regression model. No analyses with the maternal depressive symptoms trajectory included was conducted because of the trajectory variable's missing statistically significant association with the outcome in pairwise analyses (Table 3).

5. Discussion

The current study explored the associations between paternal self-evaluated stress factors measured when the firstborn was 8-9 years old, and firstborn's self-evaluated internalizing and externalizing

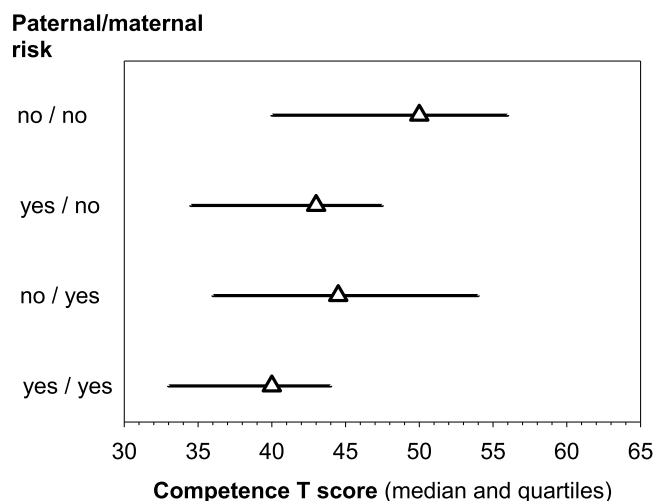


Fig. 3. Adolescent's Total competence score in the categories of the variable combining paternal long term health problems (no/yes) and maternal depressive symptoms trajectory (low = no/high = yes).

Table 3
Results of linear regression analyses on factors predicting child's emotional and behavioral problems and psychosocial functioning in young adulthood ($n = 81$).

Model		b	95 %CI	p	
no	Variables				
	Dependent variable: child adjustment measure ¹ (predicted category)				
	Explanatory variable: paternal factors (risk category)				
1 ²	Internalizing symptoms ² (higher)	Perceived health (moderate/poor)	−4.8	−13.0 - 3.3	0.241
		Relationship with firstborns mother (moderate/poor)	−1.4	−8.4 - 5.5	0.677
		Life satisfaction (poor)	−4.8	−11.8 - 2.1	0.169
2 ²	Adaptive Functioning (better)	Perceived health (moderate/poor)	5.5	−0.2 - 11.2	0.058
		Perceived problems with alcohol (yes)	2.7	−5.0 - 10.6	0.480
		Loneliness (yes)	3.9	−0.6 - 8.3	0.088

¹ Linear regressions with externalizing problems were not conducted as there were no significant associations in the pairwise analyses.

² The analyses with maternal depressive symptoms trajectory (from 3rd trimester to child's young adulthood) was not conducted as the association between the trajectory and neither young adult's Internalizing problems, nor adaptive functioning was not statistically significant.

problems and total competence/adaptive functioning at the ages of 16–17 years and 27 years. In addition, we explored the combined influence of statistically significant paternal stress factors and maternal depressive symptoms trajectory and firstborn outcomes in the above-mentioned time points and outcome variables. We hypothesized to find an association between some of the paternal stress factors and firstborn's poorer outcome, and that combined influence of paternal stress and maternal depressive symptoms would increase the risk.

5.1. Paternal well-being and adolescent outcome

The current study suggests that of the paternal stress factors, father's poorer perceived health and poorer satisfaction with close relationships were associated with the adolescent's lower competence. In addition, the father having few friends was associated with the adolescent's poorer competence as well as with a lower level of externalizing problems. The Externalizing Problems and Competence scales both include questions concerning social relationships. Previous studies have identified that parental loneliness is associated with child's internalizing problems (Elovainio et al., 2024; Luoma et al., 2018). The study by Elovainio et al. (2024) suggested that loneliness was intergenerationally transmitted and partly mediated by offspring internalizing symptoms. As family is an important context for social learning, the findings of the current study also suggest that a low number of social contacts and problems in close relationships may be intergenerationally transmitted.

Paternal smoking and perceived problems with alcohol in the index child's middle childhood were associated with a higher Externalizing Problems score in the child's adolescence. Paternal problem drinking has been found to influence child development negatively via different pathways (Keller et al., 2008; Rossow et al., 2016; Schacht et al., 2009). In addition, as the Externalizing Problems scale includes questions concerning the use of alcohol and drugs and smoking, the findings may also indicate a direct risk transmission, as earlier studies have suggested (Jääskeläinen et al., 2016; Vuolo and Staff, 2013).

A lower paternal education level was associated with poorer total competence, while a higher education level was associated with a lower level of internalizing problems in adolescence. Lower socioeconomic status, often comprising the parents' educational level, family income, and occupational status, has been identified as a risk factor for the

child's mental health (Reiss, 2013). A study by Bøe et al. suggests that parental emotional well-being and parenting practices may be two potential mechanisms through which low socioeconomic status is associated with the child's poorer outcome (Bøe et al., 2014). Parental education level, family socioeconomic status or family income may also influence the level of parental stress (Fang et al., 2024), and further on child's wellbeing.

The combined effects of paternal stress factors and the maternal depressive symptoms trajectory suggest that not only exposure to maternal depressive symptoms but also exposure to paternal health problems during childhood is a risk factor for the adolescent's poorer competence. The dual influence of these parental health problems increased the risk compared to only one parent's problems, supporting previous study findings (Weitzman et al., 2011). As good peer relationships have been identified as a protective factor against parental depression in adolescence (Collishaw et al., 2016; Padaigaitė-Gulbinienė et al., 2025), perhaps those adolescents with poorer total competence (that includes scores of peer and other relationships) might be particularly vulnerable.

5.2. Paternal well-being and young adult outcome

The findings concerning paternal well-being in the child's middle childhood and subsequent internalizing and externalizing problems and adaptive functioning as a young adult were contradictory to the hypothesis; those young adults whose fathers had reported problems in their middle childhood reported fewer internalizing problems and better adaptive functioning than those young adults whose fathers had not reported such problems. There were no statistically significant associations between paternal stress and well-being factors and externalizing problems as a young adult. The findings suggest that an adequate amount of stress may enhance resilience among some individuals. Similar findings were detected in a Finnish longitudinal cohort study concerning parental physical illness, which was associated with lower young adult psychosocial problems, although only among males (Kinnunen et al., 2021). Exposure to stressful environments may upregulate biological sensitivity to context, thereby increasing the individual's capacity and tendency to detect and respond to environmental stress (Belsky and Pluess, 2009; Ellis et al., 2011). Resilience factors also influence risk transmission, both concurrently and later. For example, good adult love relationships have been found to protect against mental health problems among individuals who have reported severe abuse in childhood (Collishaw et al., 2007). In addition, protective factors may modify and diminish the influence of risk factors on psychosocial well-being and development (Crandall et al., 2019; Gajos et al., 2022; Huang et al., 2023; Miller et al., 2020).

It should be noted, though, that as the problem evaluation was based on self-reports only, it is also possible that those young adults who had grown up in a stressful environment might have underreported or underrecognized their emotional and behavioral problems.

The trajectory of maternal depressive symptoms was not associated with young adults' problems or adaptive functioning, despite the association in adolescence. The findings thus suggest that the influence of risk factors changes as the child grows and becomes more able to control the environment, as indicated previously (Kendler and Baker, 2007). Adolescence, on the other hand, is a developmental period with vulnerabilities and individuals may thus be especially susceptible to adversity and to the influence of earlier life experiences.

There are some limitations to be considered. The major limitation of the study is the relatively high number of drop-outs. In addition, there were more males, higher mean Externalizing Problems scores, and lower Total Competence scores among those who dropped out between the adolescence and young adulthood study stages. The drop-out of symptomatic children may underestimate the harmfulness of paternal stress and partially explain the findings concerning the more favorable outcomes of those young adults exposed to paternal stress in middle

childhood. Nevertheless, the study adds valuable information to the relatively low number of resilience studies. The sample is also rather homogenous. All the participating fathers were married or cohabiting, which may suggest that those fathers with more severe problems had perhaps not participated at study stage II, as a stable family has been identified to be associated with better paternal well-being (Waldvogel and Ehlert, 2016). The sample size also limited the statistical analyses. For example, gender differences could not be analyzed. In addition, paternal stress and well-being variables were based on individual questions, while the maternal depressive symptoms trajectory was based on a validated questionnaire.

The current study suggests that paternal stress and poor well-being should be considered as important risk factors for child development, just like maternal depressive symptoms. The study also suggests that some amount of (paternal) stress in childhood may even enhance the psychosocial functioning in young adulthood. More studies using large population samples are, however, needed to confirm the findings. In addition, more studies are required to better understand the mediating and moderating factors between childhood stress factors and later psychosocial functioning as well as the dual influence of parental stress and health problems on child development.

Author statement

All authors contributed to the study conception and design. Data collection was performed by Ilona Luoma and Marie Korhonen. Material preparation and analysis were performed by Marie Korhonen and Raili Salmelin. The first draft of the manuscript was written by Marie Korhonen and all authors commented on the current and previous versions of the manuscript. All authors read and approved the final manuscript.

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CRediT authorship contribution statement

Marie Korhonen: Writing – original draft, Methodology, Funding acquisition, Formal analysis, Conceptualization. **Raili Salmelin:** Methodology, Formal analysis, Data curation. **Mika Helminen:** Methodology, Formal analysis, Data curation. **Ilona Luoma:** Validation, Project administration. **Mirjami Mäntymaa:** Validation. **Kaija Puura:** Validation, Supervision, Project administration, Funding acquisition.

Declaration of competing interest

The authors have no competing interests to declare that are relevant to the content of this article.

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