

## Research paper

# Childhood maltreatment, trait resilience and prenatal distress among expecting mothers and fathers in the FinnBrain Birth Cohort Study

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## ABSTRACT

**Background:** In this study we examined the association between childhood maltreatment exposure (CME) and psychological distress, including symptoms of depression and anxiety, during pregnancy. Additionally, we explored the potential moderating effect of trait resilience on these associations.

**Methods:** The study is part of the ongoing FinnBrain Birth Cohort Study. The sample consisted of 3016 mothers and 1934 fathers. The data were collected using self-report questionnaires, including EPDS, SCL-90, CD-RISC-10 and TADS. We conducted ANOVAs and linear logistic regression analyses to examine the associations between depression, anxiety, resilience, and CMEs.

**Results:** CMEs were associated with increased psychological distress, including depression symptoms and anxiety, and decreased trait resilience among both mothers and fathers. Additionally, trait resilience had a moderating effect on the association between fathers' CMEs and psychological distress, while no significant moderating effect was found among mothers. Furthermore, among both mothers and fathers, higher trait resilience was associated with decreased anxiety and depressive symptoms.

**Limitations:** Due to cross-sectionality, it is not possible to establish a causal relationship between CMEs, resilience, and parental distress. Additionally, the study does not provide insights into the underlying factors or processes that contribute to the development of trait resilience.

**Conclusions:** Trait resilience may have a positive impact on parents' mental health during pregnancy. This study is the first to investigate the significance of fathers' trait resilience during pregnancy. In clinical settings, it is essential to identify parents with low levels of resilience and provide them with appropriate support, recognizing them as a vulnerable group.

## 1. Introduction

Pregnancy and childbirth represent a crucial phase in an individual's life, characterized by simultaneous and significant changes across neurobiological, psychosocial, and behavioral domains, necessitating the acquisition of new and specific abilities and support systems (Saxbe et al., 2018). Therefore, it is not surprising that psychological distress is common during pregnancy, with prevalence rates of prenatal maternal depression and anxiety disorders ranging from 10 % to 30 % (Andersson

et al., 2006; Howard et al., 2014; Leigh and Milgrom, 2008; Loomans et al., 2013). For fathers, perinatal mental health issues are less studied, but depression prevalence estimates range from 4 % to 25 % (Bruno et al., 2020; Paulson and Bazemore, 2010; Vänskä et al., 2017) while anxiety disorder prevalence ranges from 2 % to 18 % (Leach et al., 2016).

Another factor that may contribute to psychological distress during pregnancy is parents' own adverse childhood experiences. Adverse Childhood Experiences (ACEs) have been repeatedly associated with an

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increased risk of mental health disorders (Kessler et al., 2010). ACEs encompass a variety of negative events and can be broadly divided into maltreatment and other potentially traumatic events, that are experienced before the age of 18 (Felitti et al., 1998). Childhood maltreatment exposures (CME) include emotional and physical neglect and abuse, as well as sexual abuse. CMEs are rather common in the general population, with approximately of 36 % of adults reporting emotional abuse, 23 % reporting physical abuse, and 8 % of men and 18 % of woman reporting sexual abuse (Stoltenborgh et al., 2015). Subjective reports of childhood maltreatment have been associated with an elevated risk of psychopathology, and the significance of subjective reporting is considerable even when compared to objective measures indicating maltreatment exposure (Danese and Widom, 2020).

In a review exploring the transition to parenthood, it was found that parents with a history of maltreatment were at greater risk of mental health problems, with women in particular at higher risk of developing depression during the perinatal period (Christie et al., 2017). In addition to individual parental mental health problems, CMEs have also been associated with disrupted parent-child relationships (Christie et al., 2017; Souch et al., 2022). In this study, we use maltreatment scores, referring to different types of abuse or neglect, as a proxy for CMEs.

Despite the known significant association between CMEs and mental health, further amplified by the transition phase to parenthood, only some of the new parents face these negative consequences. One protective factor might be resilience – the ability that enables one to maintain performance in the face of adversity and/or helps recuperation after experiencing difficulties in life (Connor and Davidson, 2003; Fletcher and Sarkar, 2013; Masten, 2018). Even though the research in the field of resilience has increased remarkably during the past few decades, it is quite common that the exact definition and operationalization may vary from study to study. Two common research orientations define resilience either as an outcome or a trait. When considering resilience as an outcome, resilience is commonly perceived as a function or behavioral outcome that can effectively overcome and assist individuals in recovering from adversities (Hu et al., 2015; Nishimi et al., 2021). As an example of this viewpoint, resilient individuals are those who have faced adversities but haven't experienced the expected negative consequences, such as depression. Instead, they have maintained their functioning well during challenging times and even embraced new positive aspects, such as high life satisfaction or positivity.

In the second definition, when talking about resilience as a trait, it is viewed as a personal characteristic that enables individuals to effectively handle adversities and attain good adjustment (Connor and Davidson, 2003; Hu et al., 2015). Researchers endorsing this perspective perceive resilience as a protective shield, helping individuals withstand and navigate through adversities or traumatic events (Connor and Davidson, 2003; Ong et al., 2006). It encompasses personal qualities such as hardiness and perseverance, and is primarily assessed through self-assessments (Campbell-Sills and Stein, 2007; Connor and Davidson, 2003). Individuals subjectively reflect on their adaptability to changes, their coping with unexpected events or illnesses, and their ability to manage failures, ultimately progressing beyond them (Campbell-Sills and Stein, 2007). While comprehensive longitudinal studies on trait resilience are limited, existing evidence suggests its relative stability compared to external protective factors (Hu et al., 2015). Nevertheless, trait resilience is also susceptible to changes (Davidson et al., 2005; Mealer et al., 2014).

In this study, we examined the resilience of expecting mothers and fathers as a trait, a self-perceived capacity to cope adaptively with stressors (Connor and Davidson, 2003).

Resilience has been associated with lower levels of stress, depression, and anxiety symptoms in both clinical and non-clinical populations (Anyan and Hjemdal, 2016; Cheng et al., 2020; Hu et al., 2015; Laird et al., 2019). Moreover, there has been research on the role of resilience between ACEs and mental disorders; there is increasing evidence of the buffering effect of resilience against the negative impact of ACEs,

especially in depression (Liu et al., 2020; Watters et al., 2023; Wingo et al., 2010; Youssef et al., 2017). In addition to the main effect of resilience, the evidence also indicates that resilience plays a moderating role in the relationship between ACEs and mental disorders and psychological distress (Campbell-Sills and Stein, 2007; Sexton et al., 2015; Wingo et al., 2010).

Thus far, there have only been a few studies considering resilience and mental health during the perinatal period. In one study, carried out among pregnant women, resilience was shown to have a significant, independent protective effect against pregnancy stress and prenatal anxiety, as well depression (Ma et al., 2019). In addition, during the perinatal period there have been studies indicating a protective effect for trait resilience between childhood trauma and maltreatment history in relation to mental health problems, including depression, anxiety, and post-traumatic stress disorder (Osofsky et al., 2021; Sexton et al., 2015; Young-Wolff et al., 2019). To our knowledge, there have not been any studies considering the mental health and trait resilience of fathers.

In this study, our aim was to investigate the moderating role of trait resilience between self-reported childhood maltreatment exposure (CME) and symptoms of distress (depressive and anxiety symptoms) during the prenatal period. Our sample is based on the large FinnBrain Birth Cohort study covering both mothers and fathers during pregnancy. Our first hypotheses are that CMEs are associated with increased distress symptoms (H1) and decreased resilience (H2). We also hypothesize that resilience will be associated with decreased distress symptoms (H3), and resilience will moderate the association between CMEs and distress (H4).

## 2. Methods

This study is a part of an ongoing FinnBrain Birth Cohort Study ([www.finnbrain.fi](http://www.finnbrain.fi)) that was established to prospectively study the effects of early life stress, including prenatal stress, on child brain development and health.

### 2.1. Participants

The participants were recruited at their first ultrasound visit in gestational week (gwk) 12 at three maternal welfare clinics located in Southwest Finland between December 2011 and April 2015 (Karlsson et al., 2018). The eligibility criteria for participating in the study included having sufficient proficiency in either Finnish or Swedish and receiving a normal screening result in the ultrasound. Following an explanation of the study's purpose and protocol, the parents provided written informed consent. Questionnaire research was used to collect data from the participants during pregnancy. Initially, 3808 mothers and 2623 fathers agreed to participate in the study, forming the full study cohort. The sample is ethnically homogeneous, Scandinavian-Caucasian. The participants were largely representative of the source-population of expecting parents in Southwest Finland (Karlsson et al., 2018).

However, only 3091 mothers and 2003 fathers returned the first pregnancy questionnaire at gwk 14. Due to completely missing data from those who did not complete even the first questionnaire although initially agreed to participate, we were unfortunately unable to conduct attrition analysis of this phase. Only parents who completed both the Trauma Distress Scale (TADS) and Connor Davidson Resilience Scale 10 (CD-RISC-10) questionnaires at gwk 14 were included in this study. Thus, the sample for this study consisted of 3016 mothers and 1934 fathers leaving out an additional  $N = 75$  mothers and  $N = 69$  fathers. An attrition analysis was carried out for those who returned the gwk 14 questionnaire but did not respond to the TADS and CD-RISC-10 surveys, including age, level of education, income level, depression symptoms and anxiety symptoms. Non-responding mothers were almost a year younger ( $p < .001$ ), but there was no difference for fathers ( $p > .05$ ). For both mothers and fathers, there were no significant differences in

education or income. Notably, the majority of the excluded 75 mothers and 69 fathers also did not respond to the depression and anxiety questionnaires.

In this study, questionnaire data from three different time points was utilized. Data for the main variables was collected as follows: CD-RISC-10 and TADS were obtained during gwk 14, while Edinburgh Postnatal Depression Scale (EPDS) and Symptom Checklist (SCL-90), measures were acquired at three different time points - gwk 14, gwk 24, and gwk 34. Background variables (age, educational level, and monthly income) were obtained from self-reported questionnaires completed in gwk 14. The Ethics Committee of the Hospital District of Southwest Finland approved the study protocol.

## 2.2. Measures

### 2.2.1. Assessing childhood maltreatment exposures (CMEs)

Parents' exposure to maltreatment before the age of 18 was assessed by the Trauma Distress Scale (TADS). The purpose of developing TADS was to evaluate various kinds of childhood trauma and distressing experiences (Salokangas et al., 2016). TADS is a self-report questionnaire that retrospectively assesses the experience of emotional or physical abuse, sexual abuse and emotional or physical neglect (Salokangas et al., 2016). It contains 43 items, and the frequency of exposure to maltreatment is assessed with a five-point Likert scale ranging from never (0) to almost always (4). The internal consistency of TADS was high,  $\alpha = 0.92$  for mothers and  $\alpha = 0.88$  for fathers.

### 2.2.2. Assessing psychological distress during pregnancy

The psychological distress of the mothers and fathers was assessed with depression and anxiety symptoms questionnaires. The average sum score for depression or anxiety symptoms during pregnancy (gwk 14, 24, and 34) were used in the analyses.

The Edinburgh Postnatal Depression Scale (EPDS) was used to assess depression symptoms (Cox et al., 1987). The EPDS is used to detect prenatal depression and has been validated in different contexts, including pregnancy, geography, culture and fathers (Edmondson et al., 2010; Matijasevich et al., 2015; Rubertsson et al., 2011). It is a commonly used questionnaire with a total score ranging from 0 to 30. It comprises 10 questions that are all scored on a 4-point Likert scale (0, 1, 2, or 3). The internal consistency of the EPDS was good at all measurement points, for both the mothers and fathers (Cronbach's Alpha ranging from 0.80 to 0.84).

General anxiety symptoms were assessed with the Symptom Checklist (SCL-90), an anxiety subscale that includes 10 questions on anxiety (Derogatis et al., 1973). This subscale comprises questions that are all scored on a 5-point Likert scale (0, 1, 2, 3, or 4), the total provides an aggregate scale of 0 to 40 points. The subscale has been verified within the Finnish population (Holi et al., 1998). In our study, the internal consistency was good for all measurement points and for both parents ( $\alpha = 0.83$ –0.84).

### 2.2.3. Assessing trait resilience

Resilience was measured with the Connor Davidson Resilience Scale 10 (CD-RISC-10) which is a self-report measure with good psychometric properties (Cheng et al., 2020; Connor and Davidson, 2003; Wang et al., 2010). The scale measures the perceived capacity of an individual to cope adaptively with stressors. The CD-RISC-10 consists of 10 questions and is measured on a 5-point Likert scale (from 0 "not true at all", to 4 "true nearly all the time), resulting in an aggregate level scoring scale of 0 to 40, with a higher score reflecting higher resilience. The internal consistency of CD-RISC-10 was high,  $\alpha = 0.85$  for mothers and  $\alpha = 0.85$  for fathers.

## 2.3. Statistical analysis

Correlations and ANOVAs were performed with an SPSS Statistics

version 27. Because the distribution of the response variables were not normally distributed according to the Shapiro-Wilk test a Spearman's correlation was used. The moderation analyses were performed in R 4.0.5 (R Core Team, 2021). The moderation analyses were formulated using linear regression models with the following structure:

$$\text{Distress} = \text{TADS} + \text{CD} - \text{RISC} + \text{TADS} \times \text{CD} - \text{RISC}$$

Here, the response variable *Distress* is either EPDS or SCL average sum score, calculated as the mean of the three sum scores measured during pregnancy (gwk 14, gwk 24 and gwk 34). In cases of missing values, the average sum score was calculated based on the available sum scores, e.g., if a mother had only answered the EPDS questionnaire in gwk 14 and gwk 34, her average EPDS sum score was the mean of these two sum scores. The TADS score is the sum of the five factors in the TADS questionnaire, calculated by using the highest (worst) value for each item at the three age intervals (0–6 years, 7–12 years, or 13–18 years). The missing values in the TADS items were imputed using missForest (Stekhoven and Bühlmann, 2012). Lastly, the CD-RISC is the CD-RISC sum score. All the variables were standardized for the analyses.

As the distributions of the response variables, i.e., EPDS and SCL, were rather skewed, we also calculated the bias-corrected and accelerated (BCa) bootstrap confidence intervals (Efron, 1987) (based on 5000 bootstrap samples) for the regression parameters. BCa confidence intervals were used as they do not assume normality for the residuals. The mothers' analyses were also performed separately for nullipara and multipara mothers. In addition, a sensitivity analysis was performed regarding education and income levels. Furthermore, as part of a sensitivity analysis, the analyses were repeated after excluding parents who had taken SSRIs during pregnancy. In conducting the supplementary analyses that involved examining resilience groups and exploring associations with income and education, we employed ANOVA. Given that the data did not meet the assumptions of normality and homogeneity of variances essential for standard ANOVA, as determined by the Levene's test and normality test, we opted for the Welch ANOVA and utilized Games-Howell post-hoc comparisons for the analysis. To address multiple comparisons, we also implemented the Bonferroni correction for the *p*-values.

## 3. Results

### 3.1. Participant characteristics

The study sample contained 3016 mothers and 1934 fathers. The characteristics of the study sample are displayed in Table 1. The participants' level of education was categorized in three classes: less than twelve years of schooling, 12 to 15 years, and 15 or more years of study. Monthly income was also categorized into four classes: <1500 €, 1501–2500 €, 2501–3500 € and over 3500 €.

### 3.2. Resilience, CMEs, and psychological distress characteristics

Table 1 displays the mean scores for trait resilience (CD-RISC-10), childhood maltreatment exposure (TADS), depression symptoms (EPDS), and anxiety symptoms (SCL). Considering CMEs, the most common maltreatments were emotional neglect and physical neglect; at least one experience indicating emotional neglect was reported by 79 % of the mothers and 82 % of the fathers, and experience of physical neglect was reported by 73 % and 80 %, respectively. Additionally, experience of emotional abuse was reported by 56 % of the mothers and 54 % of the fathers; physical abuse was reported by 43 % and 51 %, respectively, and sexual abuse by 14 % and 4 %.

### 3.3. The associations of resilience, distress, and CMEs

Correlational analyses revealed strong positive associations between distress variables (EPDS and SCL) ( $p < .001$ ), while the associations

**Table 1**  
Characteristics of the study sample.

N	Mothers		Fathers	
	3016		1934	
Age, mean (SD; range)		30.4 (4.5; 17–46)		32.1 (5.3; 17–60)
Education (%)	<12 years	37.8		49.2
	12–15 years	29.1		26.2
	15 < years	33.1		24.6
Income, €/month (%)	≤1500	39.2		19.4
	1501–2500	51.2		55.2
	2501–3500	8.1		20.6
	>3500	1.5		4.7
Questionnaire scores, mean (SD; range)				
Resilience (CD-RISC-10)		27.9 (5.1; 4–40)		29.4 (5.1; 9–40)
Childhood maltreatment exposure (TADS)		10.0 (10.9; 0–86)		9.4 (8.6; 0–67)
Depressive symptoms (EPDS)		5.1 (3.6; 0–25)		3.6 (3.1; 0–19)
Anxiety symptoms (SCL)		3.5 (3.6; 0–28)		2.4 (3.2; 0–32)

Resilience and Childhood maltreatment exposure were obtained in the gwk 14. The Depressive and Anxiety symptoms are average sum scores of the three different time points (gwk 14, gwk 24 and gwk 34).

between distress variables and CMEs (TADS) were moderate and positive ( $p < .001$ ). There was a moderate negative correlation between resilience (CD-RISC-10) and distress variables ( $p < .001$ ). In both the mothers and fathers, there was a moderate negative correlation between resilience and CMEs ( $p < .001$ ). Please see Table 2 for the correlation coefficients.

**3.4. The moderating effect of resilience on the association between distress symptoms and CMEs**

The results of the regression analyses are shown in Table 4. First, in mothers, we observed no interaction ( $b = -0.01$ , 95 % CI  $[-0.04; 0.02]$ ,  $p = .60$ ), i.e., the association between TADS and EPDS did not depend on the CD-RISC-10 (see Fig. 1a). In fathers, however, there was a significant interaction ( $b = -0.08$ ,  $[-0.12; -0.05]$ ,  $p < .001$ ); i.e., the TADS – EPDS association was stronger in less resilient fathers compared to more resilient fathers (Fig. 1b).

Second, we found that in the mothers the association between TADS and SCL-90 was weaker in the mothers with higher resilience compared to those with lower resilience. However, although the interaction was

**Table 2**  
Strength of association between EPDS, SCL, CD-RISC-10 and TADS as indicated by correlation coefficients.

Mothers (N = 3016)				
	EPDS	SCL	CD-RISC-10	TADS
EPDS	1.0	0.66**	-0.39**	0.34**
SCL		1.0	-0.34**	0.34**
CD-RISC-10			1.0	-0.22**
TADS				1.0
Fathers (N = 1934)				
	EPDS	SCL	CD-RISC-10	TADS
EPDS	1.0	0.65**	-0.39**	0.38**
SCL		1.0	-0.29**	0.36**
CD-RISC-10			1.0	-0.26**
TADS				1.0

\*\*  $p < .01$ .

**Table 4**  
The results of the regression models. All variables were standardized in the analyses.

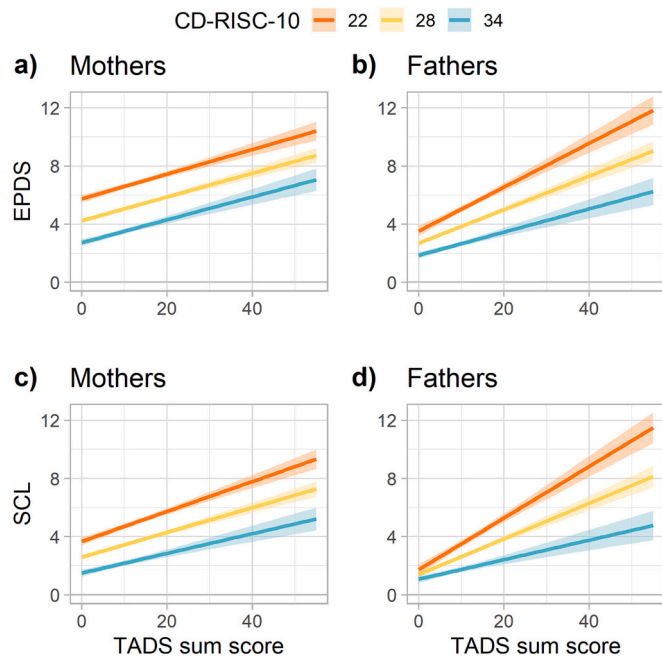
Mothers, EPDS					
	b	95 % CI	95 % BCa CI	p value	$\eta^2$
Intercept	0.00	$[-0.03; 0.03]$	$[-0.03; 0.03]$	.936	
TADS	0.25	$[0.22; 0.28]$	$[0.21; 0.29]$	<.001	0.059
CD-RISC	-0.36	$[-0.40; -0.33]$	$[-0.40; -0.33]$	<.001	0.127
TADS × CD-RISC	-0.01	$[-0.04; 0.02]$	$[-0.05; 0.04]$	.599	<0.001
R <sup>2</sup> = 0.226 Adjusted R <sup>2</sup> = 0.225					
Fathers, EPDS					
	b	95 % CI	95 % BCa CI	p value	$\eta^2$
Intercept	-0.02	$[-0.06; 0.02]$	$[-0.06; 0.02]$	.342	
TADS	0.30	$[0.26; 0.34]$	$[0.25; 0.34]$	<.001	0.083
CD-RISC	-0.32	$[-0.36; -0.28]$	$[-0.36; -0.28]$	<.001	0.096
TADS × CD-RISC	-0.08	$[-0.12; -0.05]$	$[-0.12; -0.04]$	<.001	0.008
R <sup>2</sup> = 0.226 Adjusted R <sup>2</sup> = 0.225					
Mothers, SCL					
	b	95 % CI	95 % BCa CI	p value	$\eta^2$
Intercept	-0.01	$[-0.04; 0.02]$	$[-0.04; 0.02]$	.646	
TADS	0.26	$[0.23; 0.29]$	$[0.22; 0.30]$	<.001	0.064
CD-RISC	-0.3	$[-0.33; -0.26]$	$[-0.34; -0.26]$	<.001	0.085
TADS × CD-RISC	-0.04	$[-0.07; -0.02]$	$[-0.09; -0.01]$	.003	0.002
R <sup>2</sup> = 0.226 Adjusted R <sup>2</sup> = 0.225					
Fathers, SCL					
	b	95 % CI	95 % BCa CI	p value	$\eta^2$
Intercept	-0.03	$[-0.07; 0.01]$	$[-0.07; 0.01]$	.173	
TADS	0.29	$[0.25; 0.33]$	$[0.25; 0.35]$	<.001	0.08
CD-RISC	-0.22	$[-0.27; -0.18]$	$[-0.27; -0.18]$	<.001	0.047
TADS × CD-RISC	-0.13	$[-0.16; -0.09]$	$[-0.18; -0.07]$	<.001	0.018
R <sup>2</sup> = 0.226 Adjusted R <sup>2</sup> = 0.225					

statistically significant, the size of the effect was weak ( $b = -0.04$ , 95 % CI  $[-0.07; -0.02]$ ,  $p = .003$ ) (see Fig. 1c). In fathers the interaction was stronger ( $b = -0.13$ ,  $[-0.16; -0.09]$ ,  $p < .001$ ), i.e., there was a clear difference in the TADS – SCL associations between the more and the less resilient fathers (see Fig. 1d).

There were no relevant differences in the results when the analyses were performed separately for nulliparous and multiparous mothers (results not shown). Similarly, the results remained consistent when education and income levels were taken into account (results not shown). There were also no relevant changes in the results when the analyses were performed excluding those parents taking SSRI medication (results not shown).

**3.5. Additional analysis of distress symptoms and CMEs in different resilience groups**

Additionally, due to the unique context of our study as the first to explore this subject within a large cohort study, we considered it



**Fig. 1.** Estimated associations between TADS (Trauma Distress Scale) and EPDS (Edinburgh Postnatal Depression Scale)/SCL (Symptom Checklist, anxiety subscale) in mothers and fathers based on the interaction models (with non-standardized variables). The associations are shown in three different levels of CD-RISC-10 (Connor-Davidson Resilience Scale 10) score: 22 (low), 28 (mid) and 34 (high), corresponding roughly to the 10 %, 50 % and 90 % quantiles of CD-RISC-10, respectively. Note that the CD-RISC-10 was treated as a continuous variable in the models but only three of its values have been chosen for illustrative purposes in the figure. The shaded areas are pointwise 95 % CIs.

essential to conduct further analyses on trait resilience alongside the primary findings. Subsequently, we undertook further examinations building upon the categorization of the resilience variable, a framework also employed in other trait resilience studies (Davidson, 2021). For this purpose, the CD-RISC-10 scores were categorized quarterly: the median for the mothers was 28, in the first quartile (Q1) it was 0–25, the second (Q2) 25.1–28, the third (Q3) 28.1–31 and the fourth quartile (Q4) 31.1–40. The median for the fathers was 29, and the quartiles as follows: 0–26 (Q1), 26.1–29 (Q2), 29.1–33 (Q3) and 33.1–40 (Q4). The relationships between different resilience groups, distress symptoms and CMEs were investigated through a one-way ANOVA. The distribution for the mothers and fathers, together with the means and standard deviations of resilience groups are displayed in Table 3.

Table 3 also presents the means and standard deviations of distress symptoms and CMEs in different resilience groups. Significant differences were found in depression symptoms among the different resilience groups (mothers:  $Welch's F(3, 1666.59) = 146.44, p < .001, \eta^2 = 0.133, 95\% \text{ CI } [0.111, 0.155]$ ; fathers:  $Welch's F(3, 1057.3) = 83.13, p < .001, \eta^2 = 0.013, 95\% \text{ CI } [0.103, 0.157]$ ), anxiety symptoms (mothers SCL:  $Welch's F(3, 1669.06) = 100.37, p < .001, \eta^2 = 0.010, 95\% \text{ CI } [0.081, 0.121]$ ; fathers:  $Welch's F(3, 1054.2) = 39.44, p < .001, \eta^2 = 0.073, 95\% \text{ CI } [0.051, 0.095]$ ), and CMEs (mothers:  $Welch's F(3, 1663.84) = 27.43, p < .001, \eta^2 = 0.027, 95\% \text{ CI } [0.016, 0.038]$ ; fathers =  $Welch's F(3, 1056.8) = 28.70, p < .001, \eta^2 = 0.045, 95\% \text{ CI } [0.028, 0.063]$ ). Post hoc comparisons indicated significant differences, with a  $p$ -value of  $< .05$ , in the mean scores between the different resilience groups and distress symptoms, with each group comparison demonstrating significant differences among mothers. Among fathers, the post hoc comparisons uncovered significant differences in depression, while in anxiety symptoms, only the lowest resilience group differed from all other groups. In addition, significant differences emerged between the number of CMEs and the resilience groups for mothers, except between the two

**Table 3**

Participants' CD-RISC-10 score distribution in quartiles and means of distress symptoms and CMEs in different resilience groups (Q1 = quartile 1, Q2 = quartile 2, Q3 = quartile 3 and Q4 = quartile 4).

Mothers resilience	N (%)	Mean (SD)	Depressive symptoms	Anxiety symptoms	Childhood maltreatment
Q1	850 (28)	21.86 (3.31)	6.89 (3.86)	5.13 (4.36)	12.60 (11.48)
Q2	772 (26)	28.02 (0.83)	5.27 (3.29)	3.51 (3.35)	10.28 (10.93)
Q3	682 (23)	29.90 (0.78)	4.22 (3.14)	2.74 (2.86)	8.11 (9.42)
Q4	712 (24)	34.34 (2.22)	3.47 (2.89)	2.15 (2.60)	8.61 (10.89)
Total	3016 (100)	27.94 (5.07)	5.06 (3.59)	3.47 (3.60)	10.05 (10.90)

Fathers resilience	N (%)	Mean (SD)	Depressive symptoms	Anxiety symptoms	Childhood maltreatment
Q1	498 (26)	22.74 (3.11)	5.30 (3.63)	3.83 (4.37)	12.23 (9.05)
Q2	472 (24)	28.11 (0.84)	3.60 (2.78)	2.41 (2.78)	9.67 (8.43)
Q3	543 (28)	31.30 (1.14)	2.99 (2.62)	1.95 (2.61)	8.29 (8.14)
Q4	421 (22)	36.06 (1.86)	2.21 (2.39)	1.49 (2.21)	7.35 (8.07)
Total	1934 (100)	29.36 (5.13)	3.57 (3.12)	2.45 (3.24)	9.44 (8.63)

highest resilience groups. Among fathers, differences emerged between the other groups, except for the middle and highest groups.

### 3.6. Associations between educational and income levels with trait resilience

We also conducted additional analyses to explore the association between participants' level of education and monthly income with resilience, employing ANOVA. Our findings indicated significant differences in trait resilience based on the educational level of both mothers ( $Welch's F(2, 1978.66) = 36.81, p < .001, \eta^2 = 0.025, 95\% \text{ CI } [0.015, 0.037]$ ) and fathers ( $Welch's F(2, 1070.15) = 9.99, p < .001, \eta^2 = 0.010, 95\% \text{ CI } [0.003, 0.020]$ ). Post-hoc analyses revealed that individuals with the lowest level of education had lower resilience compared to those with higher levels; however, no significant differences were observed between the two highest categories of education. These results were consistent across both mothers and fathers. Similarly, the study demonstrated that trait resilience differed significantly across different income groups for both mothers ( $Welch's F(3, 188.35) = 32.12, p < .001, \eta^2 = 0.032, 95\% \text{ CI } [0.021, 0.045]$ ) and fathers ( $Welch's F(3, 374.90) = 17.88, p < .001, \eta^2 = 0.026, 95\% \text{ CI } [0.013, 0.040]$ ). Further post-hoc comparisons indicated that among mothers all other group comparison differed significantly, except the two highest groups. Among fathers, other comparisons were significantly different except comparison between the two lowest and with two highest groups.

## 4. Discussion

In this study, our aim was to examine how childhood maltreatment exposure (CME) is associated with psychological distress (depressive and anxiety symptoms) during pregnancy, while also exploring the independent relationship of trait resilience and its potential moderating effect on these associations. We found that CMEs were associated with increased psychological distress (both depression symptoms and anxiety) (H1) and decreased trait resilience (H2) among both parents. Furthermore, trait resilience was associated with decreased distress

symptoms (H3). These results support both the previous studies and our hypotheses. Trait resilience also transpired to have a moderating effect on the association between the CMEs and psychological distress (H4) of the fathers; this is a novel result for expecting fathers. Among the mothers we did not find any significant moderating effect for CMEs and distress, so we had to reject our fourth hypothesis with mothers.

We also conducted supplementary analyses in which participants were categorized into four different resilience groups based on their levels of trait resilience (see Davidson, 2021). When we compared the level of depression and anxiety in the different resilience groups, both mothers and fathers consistently demonstrated that the lowest resilience group differed from the other groups in terms of both depressive and anxiety symptoms and CMEs. Our analysis also revealed that the lowest education and income groups tended to show less resilience than their higher education and income counterparts. To the best of our knowledge, this study is the first to consider the mental health associations, trait resilience, and CMEs of fathers. Moreover, it stands as one of the very few on this topic that addresses these associations during pregnancy.

Our findings on the association of resilience with lower depression and anxiety symptoms are in line with previous results (Anyan and Hjemdal, 2016; Hu et al., 2015; Laird et al., 2019; Ma et al., 2019; Watters et al., 2023). Our findings considering the mitigating association of resilience with distress symptoms among parents with a history of CMEs is consistent with the few studies that have explored this topic during the perinatal period (Osofsky et al., 2021; Sexton et al., 2015; Young-Wolff et al., 2019). In addition, the finding concerning the moderating effect of resilience on the impact of CMEs on psychological distress among fathers is consistent with previous studies that discovered a comparable interaction effect (Campbell-Sills and Stein, 2007; Sexton et al., 2015; Wingo et al., 2010; Youssef et al., 2017). Conversely, among the mothers the moderation effect was not significant in our study.

#### 4.1. Limitations and future directions

Our study has limitations, including the potential for self-report biases due to the nature of the self-reported data. It should be noted that the TADS has not been validated for use with pregnant individuals, which warrants consideration. Additionally, the observed attrition requires consideration, particularly in terms of generalizability to high-risk populations. The cohort represents the source population of the area well, with the exception of higher education levels among mothers. It is possible that those who did not respond to the gwk 14 questionnaires are different from those who did respond, for example, in terms of education or distress symptom levels. Similarly, it is important to note that our study sample is not representative of clinical populations since participants were not selected based on symptom severity or clinical diagnoses. Therefore, the results cannot be generalized to clinical populations. Also, given the homogeneity of our sample, which consisted entirely of Scandinavian-Caucasian individuals, it's important to consider this factor when considering the generalizability of our findings. Furthermore, the cross-sectional design of the study prevents us from establishing causality between CME, resilience, and parental stress symptoms. Despite these limitations, this study has a unique and large study group that includes both fathers and mothers, providing important and novel information especially on the mental health of fathers during pregnancy. To our knowledge, this is the first study that investigates the relevance of trait resilience during pregnancy to both parents simultaneously.

Research on trait resilience is increasing, and it is therefore important to understand the different pathways and mechanisms through which resilience develops. While resilience is perceived as a trait-like with enduring qualities, research suggests that it is also subject to change (e.g., Davidson et al., 2005; Mealer et al., 2014). Targeted interventions aimed at enhancing trait resilience could be beneficial,

particularly since they would not rely heavily on environmental factors such as social support. Understanding the nature and significance of trait resilience can create new ways of promoting wellbeing in preventive mental health programs and as a part of treatment procedures in mental health interventions and therapy.

## 5. Conclusion

The findings of this study draw attention to the significance of trait resilience as a protective factor that can help to prevent psychological distress during pregnancy. Moreover, resilience seems to provide some extra protective effects against the negative consequences of CMEs, especially in fathers. Previous research has shown that resilience can moderate the relationship between childhood maltreatment and traumas in relation to mental health outcomes such as major depressive disorder and post-traumatic stress disorder. Therefore, it is crucial to recognize individuals with a history of maltreatment or traumas as a potentially vulnerable group, and to develop targeted interventions to support them during pregnancy. Overall, our findings corroborate the well-acknowledged impact of childhood maltreatment and traumas on mental health, particularly in the context of pregnancy. Furthermore, as a rather novel approach, our study highlights the importance of trait resilience in promoting mental well-being during this critical phase, providing valuable insights that can inform interventions and policies aimed at promoting the well-being of expectant parents.

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## CRediT authorship contribution statement

Viivi Mondolin: Conceptualization, Methodology, Data Analysis, Investigation, Writing, Review & Editing. Hasse Karlsson: Founding acquisition, Methodology, Supervision, Writing. Jetro J. Tuulari: Conceptualization, Writing. Juho Peltö: Data Curation, Data Analysis, Methodology, Writing. Linnea Karlsson: Founding acquisition, Conceptualization. Elisabeth Nordenswan: Conceptualization. Eeva-Leena Kataja: Conceptualization, Methodology, Founding acquisition, Supervision, Writing, Review a& Editing.

## Declaration of competing interest

None.

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