

# Mothers Daily Perceived Stress Influences their Children's Mental Health During SARS-CoV-2-pandemic

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## Research article

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# Abstract

## Background

The current situation caused by the SARS-CoV-2-pandemic is associated with serious losses for everyone and has worldwide effects on social life, politics, the economy and the media worldwide. Preventive isolation and social distancing strategies faced the families with a large number of different challenges. The current epidemic and quarantine restrictions have a verifiable influence on the emotional and social development of children and adolescents. In the current situation, children of parents who have already been mentally stressed seem particularly at risk.

## Objective

We aimed to assess the role of maternal daily perceived stress on children's mental health during SARS-CoV-2-pandemic.

## Method

A "SARS-CoV-2-pandemic survey" was developed assessing to record the child's mental health since the beginning of the SARS-CoV-2 pandemic. To describe the maternal perceived everyday stress data from a longitudinal survey was used. For estimation we use Tobit models.

## Results

Our results show a positive and significant relationship between the maternal perceived everyday stress and both the emotional stress and hyperactivity of the child. In summary, we find the maternal perceived everyday stress to increase child's mental distress.

## Conclusions

Analyses illustrate effects on child's mental distress during pandemic everyday life. Future research needs to identify influencing factors both with regard to political, economic and social restrictions in order to prevent mental health of children.

## Keywords

SARS-CoV-2-pandemic, emotional and social development of children and adolescents, mental stress, life quality, psychosocial impact

## Introduction

The current situation caused by the SARS-CoV-2-pandemic is associated with serious losses for everyone and has worldwide effects on social life, politics, the economy and the media worldwide (economic shutdown, contact restrictions, restriction of public life) [1].

The associated effects and consequences of the SARS-CoV-2-pandemic pose a major challenge, not least for children and their parents. In order to combat the SARS-CoV-2-pandemic, preventive isolation and social distancing strategies were developed around the world from mid-March 2020 to contain the risk of a wave of infection (like regional and national containment measures or lockdowns) [2]. This means that families are faced with a number of challenges (sudden closure of schools and childcare, the loss of community programs and jobs, increasing pressure from recession / unemployment, home schooling, lack of social support like from grandparents) [3, 4].

The epidemic and quarantine restrictions that have been introduced seem to be particularly stressful for the families. Brooks and colleagues [5] point out that epidemic and quarantine restrictions bear a plethora of psychological burden, varied neuropsychiatric manifestations and psychosocial stigma [5]. An earlier study by Sprang and colleagues [6] showed that post-traumatic stress significantly rises for children after quarantine. Furthermore, the probability of acute stress disorder and adjustment disorder increases [6]. In addition, Shen and colleagues [2] refer to the long-term adverse consequences for children and adolescents [2] whereby the type and extent of the effects of such a pandemic depends on many factors such as developmental age, special needs, the mental health status and even the economic situation [3, 7, 8, 9].

Initial studies showed that the quality of life of children and adolescents in Germany decreased during the pandemic due to the changes and restrictions associated with social life [10]. Being locked in, fearing for one's own grandparents and lacking contact with friends causes an immediate and persistent psychosocial effect for children due to drastic changes in their lifestyle, physical activity and mental excursions [8, 9]. Thus, the current epidemic and quarantine restrictions have a verifiable influence on the emotional and social development of children and adolescents. Particularly for younger children (3-6 years), studies provide evidence for stress symptoms such as excessive clinging to one parent and increased anxiety. Older children (6-18 years) show behaviors like increased inattention, anxiety and a persistent interest in the current situation regarding the SARS-CoV-2 pandemic [11]. Viner and colleagues [12] confirmed these findings and referred to increased irritability, inattentiveness and increased nervousness, as well as more intense contact with the caregiver, regardless of child age [12]. In addition, parents perceived their children to be more insecure, anxious and isolated than before the current situation. Furthermore, they report about increasing sleep disorders, nightmares, loss of appetite, restlessness, inattentiveness and fear of separation [13, 14, 15, 16].

Finally, current research shows that the health risks and fears associated with SARS-CoV-2 affect parental stress and, as a result, children's well-being [17]. In addition, experience from previous economic recessions has shown that factors like unemployment, decreasing income, excessive debt and parental history of psychological stress pose a serious threat to the mental health of a family like for example a decrease in mental well-being, an increasing rate of various mental disorders, substance-related disorders or suicidal behavior [3, 18, 19, 20]. The current pandemic, however, demonstrably harbors the risk of increasing psychological stress for parents reinforced by factors such as economic hardship, like a reduction in the scope of parental employment and thus difficulties in covering basic needs [16, 21]. Whereas, especially in times of paramount stress and uncertainty

triggered by a pandemic, in particular young children severely need a secure and stable family environment [22].

Shen and colleagues [2] point out that this pandemic may continue to have long-term adverse consequences for children and adolescents compared to adults [11]. The well-being of children does not only depend on nutrition and medical care, but also on parental guidance [23]. One of the first studies to investigate psychological stress due to the SARS-CoV-2 pandemic provides empirical evidence for a positive relationship between the psychological stress of parents and that of their children [18, 21, 24]. Considering current research, we not only take into account psychological stress caused by the current pandemic but equally refer to pre-pandemical perceived stress.

Therefore, the aim of our study is to analyze the effects of maternal stress level since the birth of child on the children's mental health during SARS-CoV-2 pandemic.

## Methods

### Study Design

TRANS-GEN is an interdisciplinary study consortium investigating in a prospective approach the pathways leading to resilience or vulnerability in the transgenerational transmission of childhood maltreatment (CM) by focusing psychological, biological and social factors. The study was funded by the Federal Ministry of Education and Research and was approved by the Ethics Committee of Ulm University.

After recruiting in the maternity unit of the Ulm University Hospital all mother-child dyads were followed up thrice: 3 months (t<sub>1</sub>), 12 months (t<sub>2</sub>) after birth and at age 3.

Measuring the impact of the SARS-CoV-2-pandemic on child's mental health we asked all participating mothers to take part in a conducted online "SARS-CoV-2-pandemic survey" which was available from May 18th–July 31st 2020.

### Participants

Since October 2013, 533 mother-child-dyads were recruited in the women's hospital of the University Hospital of Ulm within 1 to 6 days after parturition and voluntarily participated in the screening interview. The following inclusion criteria were used for sample selection: age >18, more than 37 weeks of pregnancy, sufficient knowledge of the German language, no complications during parturition or health problems of mother and/or child as well as no current drug consumption or a history of severe psychiatric disorders or current infections. 240 mother-child-dyads could be invited for a follow-up 3 months (t<sub>1</sub>) after birth in both laboratory as well as in home visit and 158 mother-child-dyads participated in a further laboratory and home visit around 12 months of child's age (t<sub>2</sub>) and in a further home visit around 3 years of age. All 158 mother-child-dyads were asked to fill in the online "SARS-CoV-2-pandemic survey". 74 mothers completed the online survey until the end of July 2020. For our analysis, we only considered complete data sets of mother-child-dyads.

Mothers' age at time of the "SARS-CoV-2-pandemic survey" was between 31 and 46 years (mean 38.17 years [SD 4.07 years]) and child's age were between 4.98 and 7.14 years (mean 6.03 years [SD 0.61 years]). 79.1% of the mothers reported to be married or living in a partnership and 89.6% of all mothers had German citizenship. Mothers' level of education in comparison to the educational background of the German population showed, that 72.8% had a grammar school degree, 20.7% a secondary school degree, 5.4% a basic secondary school degree and 1.1% no school diploma (see table 1).

### Measures

The "SARS-CoV-2-pandemic survey" included on the one hand socio-demographic questions such as the age of the mother, the educational level, the occupation, the marital status, number of persons under 18 years living in the household and the number of own children. In addition, it was recorded whether the mother and her potential partner are currently working in a systemically relevant area and whether household income has decreased by more than a quarter since the beginning of the SARS-CoV-2 pandemic [25,26].

Childs' mental health was assessed by selected items of the German version of the Strengths and Difficulties Questionnaire (SDQ) [27], an established and short behavioral screening questionnaire rated by the parents. The SDQ addresses positive and negative behavioral attributes of children on 5 scales including both strengths and difficulties. The questionnaire is made up of 25 items, each with five items on the five scales emotional problems, externalizing behavioral problems, hyperactivity / attention problems, problems with peers and prosocial behavior to distribute. For the "SARS-CoV-2-pandemic survey" we selected items concerning emotional problems, externalizing behavioral problems and hyperactivity / attention problems.

The maternal perceived everyday stress was measured starting with the birth of the child at t<sub>1</sub>, t<sub>2</sub> and t<sub>3</sub> using the Perceived Stress Scale 14 [28]. The PSS<sub>14</sub> is a widely and well-established self-report scale measuring perceived stress on a 5-point response scale. High values indicate a high level of perceived stress. Since the PSS is not a diagnostic tool, there are no limit values. The level of perceived everyday stress was recorded for all participating mothers in the first (t<sub>1</sub>), second (t<sub>2</sub>) and third follow-up (t<sub>3</sub>). In order to provide an overall measure of the maternal perceived everyday stress, we added up z-standardized values from all 3 measurement times.

In our model we control for the age of the mothers, changes in working hours and income as well as social support. Changes in working hours and income was assessed by the questions "Has the income available in your household fallen by more than a quarter since the beginning of the crisis?" and "Has your amount of work changed since the beginning of the crisis?". Changes in working hours were asked for by the following answering options: Yes, I work more, Yes, I work less, No, I work the same amount. Changes in income were gathered by a binary coded answer. The scope of experienced support of the mothers' was measured by a ten point scale by assessing the following statement "I have people who I can talk to about my problems and who understand me".

## Model and estimation

Tables 1 and 2 show the descriptive statistics for the (standardized) variables as well as the correlations. We standardize variables  $X_{Std}$  according to Formula 1 below with the mean  $\mu$  and standard deviation  $\sigma$ .

$$\text{Formula 1: } X_{Std} = \frac{X - \mu}{\sigma}$$

For estimation we use Tobit Models due to our limited dependent variables [29]. The following four equations illustrate models used for empirical estimation. Abbreviations correspond to the list below.

1.  $EPC = \alpha + \beta_1 \cdot MPS + \beta_2 \cdot AM + \beta_3 \cdot ACE + \beta_4 \cdot CW + \beta_5 \cdot DI + \beta_6 \cdot SSU + \varepsilon$ .
2.  $BPC = \alpha + \beta_1 \cdot MPS + \beta_2 \cdot AM + \beta_3 \cdot ACE + \beta_4 \cdot CW + \beta_5 \cdot DI + \beta_6 \cdot SSU + \varepsilon$ .
3.  $HCC = \alpha + \beta_1 \cdot MPS + \beta_2 \cdot AM + \beta_3 \cdot ACE + \beta_4 \cdot CW + \beta_5 \cdot DI + \beta_6 \cdot SSU + \varepsilon$ .
4.  $MDC = \alpha + \beta_1 \cdot MPS + \beta_2 \cdot AM + \beta_3 \cdot ACE + \beta_4 \cdot CW + \beta_5 \cdot DI + \beta_6 \cdot SSU + \varepsilon$ .

with  $MDC = EPC + BPC + HCC$

ACE	Adverse childhood experiences of mother
AM	Age of mother
BPC	Behavioral problems of child during SARS-CoV-2-pandemic
CW	Change in working hours
DI	Decrease in income
EPC	Emotional problems of child during SARS-CoV-2-pandemic
HCC	Hyperactivity of child during SARS-CoV-2-pandemic
MDC	Mental distress of child during SARS-CoV-2-pandemic
MPS	Maternal perceived everyday stress
SSU	Social support

## Results

To test for multicollinearity we calculate the variance inflation factor (VIF) for our models (VIF=1.18). We go in line with literature [30] that suggests a VIF below 10 to prevent multicollinearity. Tables 3-4 show the results for the Tobit Models. We find a positive and significant effect of the maternal perceived everyday stress on emotional problems of the child during time of the pandemic both in the full-model (Model 2 with  $\beta_1 = 0.33$ ;  $p < 0.1$ ) and in Model 1 ( $\beta_1 = 0.27$ ;  $p < 0.1$ ). Furthermore, results show a positive and significant relationship between the decrease in income and the child's emotional stress ( $\beta_5 = 1.11$ ;  $p < 0.1$ ).

Model 3 and 4 show the results for the relationship between the mother's perceived everyday stress before the pandemic and behavioral problems of the child during SARS-CoV-2 crisis. Based on the results in Table 3 we cannot find significant effects. Model 5 and 6 show the results for the influence of the mother's perceived stress before pandemic on the child's hyperactivity during SARS-CoV-2 crisis. The assumption of a positive relationship can be supported both for Model 5 ( $\beta_1 = 0.28$ ;  $p < 0.01$ ) and Model 6 ( $\beta_1 = 0.24$ ;  $p < 0.05$ ). A decrease in income shows a positive and significant effect on the hyperactivity of the child ( $\beta_5 = 0.70$ ;  $p < 0.05$ ). Additionally, Model 6 provides support for a negative and significant relationship between the age of the mother and hyperactivity of the child ( $\beta_2 = -0.45$ ;  $p < 0.1$ ).

Model 7 and 8 show the results for the aggregated outcomes. We find a positive effect of the maternal perceived everyday stress and the child's mental distress during the pandemic for both models (Model 7 with  $\beta_1 = 0.61$ ;  $p < 0.05$  and Model 8 with  $\beta_1 = 0.65$ ;  $p < 0.05$ ). Furthermore, we find evidence for a positive effect of the decrease in income on the child's mental distress during the pandemic ( $\beta_5 = 2.12$ ;  $p < 0.05$ ).

## Discussion

The current pandemic situation affects children, adolescents and their families in an exceptional way. The restrictions in everyday life required to contain the pandemic, such as school closures or home schooling (UNESCO), limited private shielding or quarantine but also the cancellation of out-of-home leisure time activities [8, 9, 31] can overtax loaded family situations easily [3]. Furthermore external support by both other family members and institutional social systems have fallen away [3].

However, a stable and secure family environment is a strong protective factor for children [22] in their everyday life. Current research focusing the effects of the pandemic situation on young children between 3 and 6 of age shows that, in contrast to older children, they are significantly more likely to experience stress symptoms in the area of emotional and social development [12]. With our study we contribute to literature by focusing on a lack in pre-pandemic protective factors and its influence on mental health during pandemic. The current studies on the mental stress on parents and their children mainly focusing the stress level of parents and their children caused by the pandemic with regard to a possible correlation on this [32]. To the best of our knowledge, the present study is the first one estimating the relationship between longitudinal assessed maternal mental stress before SARS-CoV-2 crisis and child's mental health during the pandemic.

In our study we illustrate that children of mothers with a higher pre-pandemic level of stress show significantly higher levels of mental distress during the pandemic. In detail we find empirical evidence that children of stressed mothers have significantly higher values concerning both their emotional stress level as well as with regard to hyperactivity and attention problems during the time of the pandemic. Looking at the recorded aggregated behavioral problems of the child during SARS-CoV-2 pandemic, it is shown that the extent of maternal perceived stress since the birth of the child has a positive effect. This highlights that the mother's individual stress experience in which life is perceived as unpredictable, uncontrollable, and overloading, regardless of the current crisis caused by SARS-CoV-2, has a direct influence on the stress experience or on the behavioral attributes of the child. Accordingly, the current parental stress should urgently be viewed as a risk factor in relation to the positive coping with the stress of a child caused by the pandemic [32]. Our results go in line with the findings of Davico et al. [24], Patrick et al. [21] as well as Crescentini et al. [33] who detected a positive relationship between the psychological stress of parents and that of their children [21, 24, 33]. However, by contrast to the formerly mentioned studies we contribute to literature by estimating models based on longitudinal data that capture the examined maternal stress level beginning from the birth of the child. By this, we are able to map the course of maternal stress development over time. In summary, findings show that the mother's psychological stress exposure, regardless of its temporal origin, has a considerable influence on a child's experience of stress during the pandemic highlighting the relevance of a secure and stable base in the form of a child's caregiver.

Literature that estimates the effect of a combined measure of both the effects of pre-pandemic stressors and distress during pandemic on health outcomes is lacking. Since an interaction of both effects can be assumed future research should focus on this issue. Results can also provide a basis for long term practical measures.

Nevertheless, we have to address several basic limitations of our study. First, our sample is restricted to participants from an online survey. Second, due to the short time period for data collection at the beginning of pandemic we focus on a small sample. Further research could estimate models with a larger sample size to verify results. Last, the assessment of both the maternal perceived everyday stress and of the behavioral attributes of children are retrospectively self-reported by mothers. Thus, answers may be biased due to social desirability.

## Conclusion

Preventive isolation and social distancing strategies faced the families with a large number of different challenges. Especially in times of crisis, children once again need a secure and stable family environment. Maternal perceived everyday stress is a significant predictor for an increase in child's mental distress during the SARS-CoV-2-pandemic. These findings underline the relevance for future research to identify risk and protective factors to prevent mental health of children in an exceptionally stressful situation like the current pandemic.

## List of abbreviations

ACE: Adverse childhood experiences of mother; AM: Age of mother; BPC: Behavioral problems of child during SARS-CoV-2-pandemic; CW: Change in working hours; DI: Decrease in income; EPC: Emotional problems of child during SARS-CoV-2-pandemic; HCC: Hyperactivity of child during SARS-CoV-2-pandemic; MDC: Mental distress of child during SARS-CoV-2-pandemic; MPS: Maternal perceived everyday stress; SSU: Social support

## Declarations

### **Ethics approval and consent to participate**

The study was approved by the Ethics Committee of (Ulm) University.

### **Consent for publication and authors' contributions**

FKD; VC and SL analyzed and interpreted the data regarding the effect of maternal daily perceived stress on child's mental health during SARS-CoV-2-pandemic. All authors read and approved the final manuscript.

### **Availability of data and materials**

The datasets analysed during the current study are available on a database of the University Hospital of (Ulm).

### **Competing interests**

VC states that she has no conflict of interests.

FKD states that she has no conflict of interests

SL states that she has no conflict of interests

FK states that she has no conflict of interests

UZ states that she has no conflict of interests

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Not applicable

## Literature

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## Tables and figures

Variable	Mean	S. D.	Min	Max	%
1. Mental distress of child during SARS-CoV-2 pandemic	11.59	3.49	2	22	
2. Emotional problems of child during SARS-CoV-2 pandemic	6.88	2.17	2	13	
3. Behavioral problems of child during SARS-CoV-2 pandemic	1.78	0.77	0	3	
4. Hyperactivity of child during SARS-CoV-2 pandemic	2.93	1.34	0	6	
5. Maternal perceived everyday stress	62.30	24.79	20	145	
6. Age of mother during the survey	38.17	4.07	31	46	
7. Adverse childhood experiences of mother	6.64	2.87	5	17	
8. Change in working hours	-0.07	0.65	-1	1	
9. Decrease in income	0.07	0.25	0	1	
10. Social support	7.84	2.21	0	10	
11. Age of child during the survey	6.03	0.61	4.98	7.14	
12. Marital status: married					79.1%
13. German citizenship					89.6%
14. Level of education of mother					
grammar school degree					72.8%
secondary school degree					20.7%
basic secondary school degree					5.4%
no school diploma					1.1%

Table 1: Descriptive statistics.

Variable	Mean	S. D.	Min	Max	5	6	7	8	9	10
1. Mental distress of child during SARS-CoV-2 pandemic	-1.74*10 <sup>-7</sup>	5.15	-14.03	15.60						
2. Emotional problems of child during SARS-CoV-2 pandemic	-4.32*10 <sup>-8</sup>	3.38	-7.54	9.63						
3. Behavioral problems of child during SARS-CoV-2 pandemic	-9.17*10 <sup>-9</sup>	1	-2.31	1.58						
4. Hyperactivity of child during SARS-CoV-2 pandemic	-5.44*10 <sup>-8</sup>	1.91	-4.19	4.39						
5. Maternal perceived everyday stress	0.16	2.58	-4.20	8.99	1.00					
6. Age of mother	-4.05*10 <sup>-9</sup>	1	-1.76	1.92	0.16	1.00				
7. Adverse childhood experiences of mother	-1.60*10 <sup>-8</sup>	1	-0.57	3.61	0.44***	0.02	1.00			
8. Change in working hours	-1.44*10 <sup>-8</sup>	1	-1.44	1.65	0.12	-0.10	0.006	1.00		
9. Decrease in income	1.36*10 <sup>-8</sup>	1	-0.26	3.77	0.003	-0.07	-0.09	-0.22 <sup>†</sup>	1.00	
10. Social support	-1.94*10 <sup>-9</sup>	1	-3.55	0.98	-0.21 <sup>†</sup>	0.16	-0.30**	-0.02	-0.16	1.00

Table 2: Descriptive statistics of standardized variables and correlations.

Notes:<sup>†</sup> $p < 0.1$ ; \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .



Table 3: Results for Tobit estimations (Model 1-4).

Dependent Variable	EPC	EPC	BPC	BPC
Independent Variable	Model 1	Model 2	Model 3	Model 4
Maternal perceived everyday stress	0.27 <sup>†</sup> (0.16)	0.33 <sup>†</sup> (0.19)	0.05 (0.05)	0.07 (0.06)
Age of mother		-0.08 (0.47)		0.07 (0.13)
Adverse childhood experiences of mother		-0.16 (0.53)		-0.13 (0.15)
Change in working hours		0.04 (0.49)		-0.23 (0.14)
Decrease in income		1.11 <sup>†</sup> (0.65)		0.32 <sup>†</sup> (0.19)
Social support		-0.17 (0.53)		-0.23 (0.15)
Constant		0.52 (0.46)		0.07 (0.13)
N	74	59	74	59
VIF		1.18		1.18
Pseudo R <sup>2</sup>	0.01	0.02	0.01	0.06

Notes: <sup>†</sup> $p < 0.1$ ; \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

Table 4: Results for Tobit estimations (Model 5-8).

Dependent Variable	HCC	HCC	MDC	MDC
Independent Variable	Model 5	Model 6	Model 7	Model 8
Maternal perceived everyday stress	0.28** (0.08)	0.24* (0.10)	0.61* (0.23)	0.65* (0.28)
Age of mother		-0.45 <sup>†</sup> (0.23)		-0.48 (0.68)
Adverse childhood experiences of mother		0.06 (0.26)		-0.22 (0.77)
Change in working hours		0.09 (0.25)		0.10 (0.72)
Decrease in income		0.70* (0.32)		2.12* (0.95)
Social support		0.24 (0.27)		-0.14 (0.78)
Constant		0.19 (0.23)		0.81 (0.67)
N	74	59		59
VIF		1.18		1.18
Pseudo R <sup>2</sup>	0.03	0.06		0.03

Notes: <sup>†</sup> $p < 0.1$ ; \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .