Psychosocial work stress and parent-child bonding during the COVID-19 pandemic: clarifying the role of parental symptoms of depression and aggressiveness

Mirjam I. Koerber
Institute and Policlinic of Occupational and Social Medicine, Faculty of Medicine, Technische Universität Dresden, Fetscherstr. 74, 01307 Dresden, Germany

Judith T. Mack
Institute and Policlinic of Occupational and Social Medicine, Faculty of Medicine, Technische Universität Dresden, Fetscherstr. 74, 01307 Dresden, Germany

Lara Seefeld
Institute and Policlinic of Occupational and Social Medicine, Faculty of Medicine, Technische Universität Dresden, Fetscherstr. 74, 01307 Dresden, Germany

Marie Kopp
Institute and Policlinic of Occupational and Social Medicine, Faculty of Medicine, Technische Universität Dresden, Fetscherstr. 74, 01307 Dresden, Germany

Victoria Weise
Institute and Policlinic of Occupational and Social Medicine, Faculty of Medicine, Technische Universität Dresden, Fetscherstr. 74, 01307 Dresden, Germany

Karla Romero Starke
Institute and Policlinic of Occupational and Social Medicine, Faculty of Medicine, Technische Universität Dresden, Fetscherstr. 74, 01307 Dresden, Germany

Susan Garthus-Niegel (susan.garthus-niegel@uniklinikum-dresden.de)
Institute and Policlinic of Occupational and Social Medicine, Faculty of Medicine, Technische Universität Dresden, Fetscherstr. 74, 01307 Dresden, Germany

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Research Article

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Abstract

Background: Parental work stress and impaired mental health seem to have intensified during the current COVID-19 pandemic. Both can have a negative impact on parent-child bonding: psychosocial work stress in the course of a spillover effect from work to family and symptoms of impaired mental health as part of a crossover effect from parent to child. This potentially affects the child's development in the long term.

Method: This cross-sectional study examined the relationship between psychosocial work stress and parent-child bonding during the early COVID-19 pandemic (May–July 2020). Symptoms of depression and aggressiveness were considered as mediators of this relationship. The sample consisted of employees in Eastern Germany (n = 380; 42.9% mothers, 57.1% fathers), aged 24–55 years, with children aged 0–36 months.

Results: After including potential confounders, higher psychosocial work stress predicted weaker parent-child-bonding (β = 0.148, p = .017, 95% CI [0.566, 5.614]). The older the child was (β = 0.123, p = .035, 95% CI [0.008, 0.209]) and the more a parent worked in home office (β = 0.127, p = .010, 95% CI [0.494, 3.562]), the weaker the parent-child bonding. When stratifying for parents' sex, results showed that the more hours mothers worked (β = -0.252, p = .006, 95% CI [-0.340, -0.059]) and if they did not work in home office (β = 0.181, p = .018, 95% CI [0.536, 5.672]), the stronger the mother-child bonding, which was not true for fathers. Symptoms of depression predicted father-child bonding (β = 0.420, p < .001, 95% CI [0.470, 0.944]), but mother-child bonding was associated with the confounders higher number of hours worked (β = -0.215, p = .021, 95% CI [-0.315, -0.026]) and not working in home office (β = 0.154, p = .038, 95% CI [0.146, 5.167]) and not symptoms of depression. Symptoms of depression (ab = 2.491, 95% CI [1.472, 3.577]) as well as of aggressiveness (ab = 2.091, 95% CI [1.147, 3.279]) mediated the relationship between psychosocial work stress and parent-child bonding.

Discussion: The results of this study highlight the importance of prevention as well as intervention measures in relation to psychosocial work stress that may play a debilitating role in the context of family relationships. In addition, the results suggest that both employers and employees should be made aware of the importance of psychosocial work stress, as it can have a negative impact on mental health, which in turn may have a major influence on family relationships. Since working in home office and the amount of hours at work seem to have a differential impact on mothers and fathers as well as on their family relationships, these aspects should be investigated in further research.

Introduction

Parent-child bonding has been suggested to be the "central and most important psychological process of the puerperium" (1) and to have a major impact on the young child's development (2, 3). Bonding refers to the relationship with the child from a parent's perspective and can be "described as the quality of the emotional tie from the parent to the child" (2). The term is used synonymously with parent-child relationship both in the literature (4) as well as in this paper.

A sensitive and responsive family environment fosters the development of secure parent-child bonding (5, 6). Maternal and paternal sensitivity to their infant's needs (6), immediate responsiveness to distress, and interactional synchrony are supportive regarding this process (7, 8). This, in turn, contributes to a child's healthy development during the first years of life (2, 9) in terms of behavior, emotions (10, 11), and mental health (12). In order to help children from the very beginning to grow into healthy, socially competent, and productive adults who can contribute

to society, they should be given the best possible support in terms of a positive parent-child relationship established in a safe family setting.

Not only, but also for parents, work plays a major role in life and can have a significant, beneficial impact on their health and well-being. Work provides regular income, social inclusion, and a chance for personal growth (13). However, work can also cause a tremendous amount of psychosocial stress resulting from work intensification like high workload and work pressure (14). The concept of psychosocial work stress is based on the effort-reward-imbalance (ERI) model (13). It was developed to explain health consequences of stressful work events for an individual employee (15, 16). According to the ERI model, effort at work implies demands and duties, e.g., workload, interruptions, time pressure (13). Rewards, in turn, are provided in forms of salary, esteem, career opportunities, and job security. When there is a lack of reciprocity, i.e., an imbalance between (high) efforts and (low) rewards, employees tend to develop negative emotions. Their stress may result in heightened illness susceptibility (13, 16, 17). For instance, psychosocial work stress may be facilitated by job insecurity, by job loss (18, 19), or by the growing load of information to handle due to modern technologies (18). Furthermore, it may rise during an unprecedented societal crisis like the COVID-19 pandemic, which has led to unstable and novel working conditions. The effort at work may be high because employees must adapt to new work settings, like working in home office using new kinds of digital media (20), or reorganizing their workplaces and following strict hygiene regulations (21). The rewards may be low for some employees because they face job insecurity or the obligation of short-time work, which may lead to financial restrictions.

Work stress and its impact on parent-child bonding

Many studies focused on the impact of work stress on the health of individual employees (see (22)). Numerous studies investigated detrimental effects on somatic health (cardiovascular diseases, (23, 24); coronary heart disease, (25)). Mental health (burnout, (26, 27); sleep problems (28); depression, (29, 30)) as well as subjective well-being (14, 31) may be impacted in a negative way as well.

Previous research looked at the impact of work stress on the couple's well-being and provided heterogeneous results (e.g., no association with marital-role quality (32); decrease of marital satisfaction (33)). It is assumed that the parents' work stress can affect relationships in the family (34) in the course of a spillover effect (i.e., an intra-individual transmission of stress from one domain to another: in this case, a transmission of stress from the work to the family domain (35, 36). Moreover, it is presumed that high work demands prevent parents from spending a lot of time with their offspring, causing family relationships to suffer (37). Studies showed that job stress (38), job demands (39, 40), and work characteristics, such as an organization that is not family-friendly (41) are associated with work-family conflict, which is defined as the incompatibility between work and family (42); see also (43, 44)).

Regarding the parent-child relationship, it was found that work stress has a negative effect on parenting behavior (45). Variables like prolonged hours at the workplace and work overload showed an association with a low-quality parent-child relationship (46-50). A recent study examining spillover effects found that job insecurity is negatively related with parent-child bonding (7). Research on work stress and its impact on parent-child relationships showed for both mothers (51) and fathers (52) that behavioral and emotional withdrawal occur on days with high demand or interpersonal stress at work. Parents appear to be less behaviorally and emotionally involved with their children on higher workload days (51). The impact of high work demands on the parent-child relationship needs further investigation and is focused on in this paper.

One of the few studies using the ERI construct investigated the impact of psychosocial work stress of parents on the family domain in China and identified a positive association with suicidal ideations of their adolescent offspring (11). However, as of yet, there are no studies which investigate the ERI concept and the parent-child bonding, which is the focus of this paper.

There is a particular need to examine a potential spillover effect from work to the family domain in an exceptional situation such as the COVID-19 pandemic (34, 53). The influence of the pandemic on the work-family interface is still unknown (53). In the wake of the global spread of the SARS-CoV-2 and subsequent containment efforts, people not only in Germany, but all over the world had to cope with numerous consequences in the work domain (54, 55). There was an increase in job loss, short-time work and the use of home office (54, 56, 57). Research showed that consequences of the COVID-19 pandemic could possibly influence the workforce, because employees were at risk of losing their jobs and facing economic difficulties (58). In the family domain, mothers and fathers were exposed to increased stress and responsibilities at home (59). They often had to balance work and parenting without the help from schools, childcare institutions, or other family members (60). The situation was particularly precarious for parents who continued to work full time but were unable to take advantage of emergency care for their children (61). Boundaries between the work and home domain tended to diminish potentially fueling work-family conflict. Taken together, the parents' perception of the COVID-19 pandemic as a stressor may be associated with increased parenting stress and thus in turn, with an increased risk of harsh parenting and impaired parent-child relationship (59, 60) or even child abuse (62).

Work stress and its impact on mental health

Studies from past pandemics indicated an increased risk of impaired mental health during the exceptionally stressful times like during the SARS outbreak (63). Reviews showed that the global prevalence of mental health problems has grown in the wake of the COVID-19 pandemic as well (64, 65). Other international studies underscored that the prevalence of depression (59, 66, 67) and stress reactions (68) are on the rise. Besides affective disorders, it is necessary to address the issue of aggression in the family domain in order to protect everyone involved (66). Distress reactions like anger (69) are likely to occur during the exceptional time of the COVID-19 pandemic (see also (70-73)).

Several studies have shown that increased work stress is associated with poor mental health (for a review, see (74, 75)). The present study primarily examines depressiveness, in terms of symptoms of depression, as part of internalizing behavior. Moreover, it investigates aggressiveness, in terms of anger or hostility, as part of externalizing behavior. Employees who put high effort into their occupation and experience psychosocial work stress, are likely to exhibit symptoms of impaired mental health, e.g., depressiveness and anxiety (76). Research in different occupational settings also found positive associations of work stress with anger or aggravated levels of aggressive feelings (77-79).

Mental health of parents and its impact on parent-child bonding

Not only parental work stress, but also the mother's and father's mental health (80-82), constitutes a possible factor which may compromise parent-child bonding. This would represent a crossover effect (35, 36) in the sense of an inter-individual transmission of stress (parent-child) within one domain (family).

Previous studies suggested that impaired mother-child bonding is related to maternal depression (e.g., (83, 84)). Mothers with depressive symptoms are more likely to exhibit distant behaviors towards their child (e.g., less affectionate touch, (85); fewer vocal and visual interactions, (86)) than mothers without depressive symptoms. Since affectionate mother-child interaction goes along with strong mother-child bonding, the latter may be deprived in

mothers suffering from depressiveness (87). A German study supported these results and highlighted the importance of the mother's mental state in the first year of the child's life (88). This time period seems to be a sensitive phase in which the foundation for stable bonding is laid (89), whereas the development of a disturbed relationship goes along with a mother's mental impairment. A Swedish study extended the research to both parents and found that not only the mother's but also the father's depressiveness is related to dysfunctional bonding (90, 91). The present study examines the role of mental health in both mothers' and fathers' family lives and, accordingly, extends research in this area.

Several studies indicate that parent-child relationships in families suffering from a violent or aggressive family member are severely disrupted (92, 93). In the case where the father is the abusive parent, not only the relationship between the violent father and his children is disturbed. His aggressiveness may also have negative consequences for the mother-child bonding (94, 95). This could happen as the mother may prioritize the needs of her partner over those of the children in order to discourage further outbursts of aggression (92) and as she is often traumatized by the partner's abusive behavior and limited in her ability to emotionally care for the children (96). Related studies have shown that parental effectiveness (e.g., monitoring the behavior of the child and keeping promises) and the functioning of the mother-child relationship (e.g., positive affect and verbal interaction) tend to deteriorate (93) when there is an aggressive member of the family. All these aspects potentially undermine family relationships in general (97).

Research on mother-child violence and its impact on the mother-child bonding is scarce and tends to focus on child outcomes like internalizing or externalizing behavior as well as delayed cognitive development (98, 99). A possible explanation for the scarcity may be that motherly violence against their offspring is more of a taboo (100, 101), since mothers are considered as less aggressive and as those who take the protective and caring role in the family (102). Furthermore, studies have suggested that it is often the father who is the abusing parent (95, 103). Various studies confirmed that it is male children and adolescents who show higher prevalence of physical aggression (104) and externalizing behavior (105, 106) compared to female children and adolescents. They often continue to exhibit behavioral problems, such as substance use, delinquency, and violence in later adulthood (107). This may mean that men also exhibit such aggressive behavior in their families and relationships may suffer accordingly.

Summary of objectives

Possible links between the work and the family domain in an unprecedented context like the COVID-19 pandemic need further investigation. This study aims to examine the association between psychosocial work stress and parent-child bonding in a community sample of mothers and fathers. It is hypothesized that higher levels of work stress are associated with weaker parent-child bonding and with a higher score of symptoms of depression and aggressiveness. Moreover, it is hypothesized that a higher score of symptoms of depression and of aggressiveness is associated with weaker parent-child bonding. The study also examines whether the association between psychosocial work stress and parent-child bonding is mediated by symptoms of depression and aggressiveness (see Figure 1a and 1b). Moreover, in subsequent analyses, it explores whether the results differ for mothers and fathers.

Methods

Design

The present study is part of the $DREAM_{CORONA}$ study, an online sub-study of the prospective cohort study "Dresden Study on Parenting, Work, and Mental Health" (**DR**esdner Studie zu **E**lternschaft, **A**rbeit und **M**entaler Gesundheit,

DREAM), which examines the relationship between parental work participation, role distribution, stress factors, and their effects on family mental and somatic health (108). Recruitment in the main study lasted from June 2017 until end of 2020. Participants are women who were pregnant at the time of recruitment and their partners. They live in Dresden, Germany, or in the surrounding area. For the study, the participants completed questionnaires on various physical and mental health outcomes with the choice of filling them out on paper or online. The DREAM study has currently six measurement points: T1 during pregnancy, T2 at 8 weeks, T3 at 14 months, T4 at 2 years, T5 at 3 years, and T6 at 4.5 years after birth. Further information on the DREAM study is provided in the corresponding study protocol (108).

As an addition to the regular measurement points, a subsample of the main DREAM study was invited to take part in the longitudinal sub-study $DREAM_{CORONA}$ with two measurement points. Pandemic restrictions hindered sending out study material and thereby reaching participants using the paper-pencil version. Due to feasibility reasons, parents of twins or multiples did not receive an invitation. Thus, only online participants with a singleton pregnancy got an invitation. The $DREAM_{CORONA}$ sub-study investigates experiences of (expectant) parents during the COVID-19 pandemic (e.g., isolation, school and daycare closures, working in home office) and its impact on family health, role distributions, and relationships. 1885 persons were invited to participate between May 12 to October 1, 2020. From those, 1057 took part in the study, resulting in a response rate of 56.1%. All data were derived from the $DREAM_{CORONA}$ sub-study except for the information about the academic degree, which was taken from the main DREAM study. Data were stored on the Research Electronic Data Capture (REDCap) data management platform, which is a web-based software for secure data collection and organization (109, 110). REDCap is hosted at the “Koordinierungszentrum für Klinische Studien” at the Faculty of Medicine of the Technische Universität Dresden.

Sample

In the current study, female partners of mothers were excluded, in order to prevent interference between the group of mothers and their partners, when the results of the data analyses were stratified by sex to uncover possible group differences. Inclusion criteria comprised provision of informed consent and completing the questionnaire until 5th of June, 2020, because afterwards new COVID-19 regulations came into effect in the concerned region. Main COVID-19 policies from 20th of April up to that point affected workplaces as well as childcare and education institutions in Germany. For instance, except frontline workers, employees were required to work in home office unless there was at least 10 square meters of space per person (111, 112). After closure during the first lockdown in Germany for the vast majority of the population (10th of March until 19th of April, 2020), childcare institutions and schools gradually opened again (graduation classes of elementary schools at the beginning of May (110); all classes of elementary schools and daycare in the middle of May (113). However, hygiene rules such as regular washing of hands had to be followed during school time and special events. For instance, sport event were still not carried out (114).

Participants had to be currently employed (i.e., working full-time, part-time, irregularly, or being marginally employed, undergoing an apprenticeship or federal voluntary work), in order to evaluate psychosocial work stress. Parents who provided illogical information regarding their employment situation (working zero hours per week or those who reported simultaneously being on parental leave and being employed full-time) were excluded. Participants were asked to specifically refer to their current working conditions since February 2020, i.e., the time when the first effects of the impending pandemic emerged in this region. Moreover, the index child (i.e., the child with whom the parents first took part in the study) had to be born before 20th of April, 2021 in order to measure parent-child bonding as the outcome variable. The final sample consisted of 380 participants (163 mothers and 217 fathers). The flowchart with the retention rate and exclusion criteria resulting in the final sample is shown in Figure 2.

Measures

Measure for the predictor variable psychosocial work stress: Effort-Reward Imbalance Questionnaire

Psychosocial work stress was assessed with the Effort-Reward Imbalance Questionnaire (ERI; (115, 116)), which is a self-rating scale. It measures chronic work-related stress as an imbalance between high efforts spent for the job – for instance, high work performance and low rewards like poor opportunities for advancement. In this study, the German short version (16, 117) was used. It contains ten items on a Likert scale from 1 (*strongly agree*) to 4 (*strongly disagree*) out of which four items are inverted. The range of the effort scale with three items is 3 to 12 (item example "I have constant pressure due to a heavy workload."), and of the reward scale with seven items 7 to 28 (item example "Considering all my efforts and achievements, my salary/income is adequate."). The sum scores of these ratings were recoded for the analyses, so that high scores on each scale reflect high effort and reward. The overall quotient was calculated by dividing effort by reward, then multiplied by the ratio of the number of items – three out of seven (118). The higher the imbalance between (high) expenditure and (low) reward, the higher the measure of work stress (16).

Missing item values on the reward scale were replaced by the mean value if not more than three items were missing. All three items of the effort scale had to be answered in order for ERI to be evaluated. In this sample, the reliability of the effort scale was questionable (Cronbach's α = .66), and that of the reward scale was acceptable (Cronbach's α = .78).

Measure for the outcome variable parent-child bonding: Postpartum Bonding Questionnaire

Parent-child bonding was measured by the Postpartum Bonding Questionnaire (PBQ; Brockington et al., 2001), which is a self-rating screening instrument for bonding disorders. In this study, the German version was used and completed by both, mothers and fathers (81). The questionnaire consists of 25 items, such as "I feel close to my baby.") The items were evaluated on a Likert scale from 0 (*always*) to 5 (*never*). Eight items were inverted (81). In the current study, the sum score (0-125) was used with a higher value indicating decreasing parent-child bonding. The reliability of the PBQ in this sample was good (Cronbach's α = .83).

Measures for potential mediator variables

Symptoms of depression were measured by the German version of the Edinburgh Postnatal Depression Scale (EPDS; (119, 120)). This self-rating questionnaire records symptoms of depression in the past week. Each of the ten items, seven of which are reverse scored, offers four response options on a Likert scale from 0 to 3 (item example "I was sad and miserable."). The higher the sum score, the more severe the symptoms of depression. The reliability of the EPDS in the present sample was good (Cronbach's α = .84).

Symptoms of aggressiveness were measured by the sub-scale anger-hostility of the Symptom-Check-List-90-R (SCL-90-R; (121, 122)). The SCL-90-R is a self-assessment questionnaire for detecting mental distress regarding the past week and consists of nine separate scales and 90 items. The answers are given on a Likert scale from 0 (*not at all*) to 4 (*very strongly*). A higher sum score indicates a higher level of mental distress. The sub-scale anger-hostility used in this study has a total of six items (example "How much did you suffer from feeling easily irritated or upset?") and measures anger-hostility defined as "irritability and imbalance up to strong aggressiveness with hostile aspects" (122). Its reliability in the study sample was good (Cronbach's α = .81).

Missing items in the PBQ, EPDS, and the anger-hostility sub-scale of the SCL-90-R were replaced by the mean value of the respective participant if a maximum of 20% of the items were not completed.

Measures for potential confounders

Several variables were considered as potential confounders in our analyses, as they may be associated with work stress and/or parent-child bonding. Academic degree was used as a measure for the socioeconomic status (123). It was assessed during pregnancy with the index child using a question regarding professional qualification in the main DREAM study questionnaire: “Do you have a university degree: yes or no?”. The other variables were collected as items in the $DREAM_{CORONA}$ questionnaire. The participants were asked to fill out the age of the index child and the total number of their children. Concerning work factors, participants were asked to provide information about the number of hours of work (per week), number of hours of childcare and of household work (per workday) and to indicate if they work in home office due to the COVID-19 restrictions. The variable parents' sex was not included as a confounder, because the results of the data analyses were investigated separately for mothers and fathers.

Statistical analyses

All statistical analyses were conducted using the software IBM SPSS Statistics (Version 27). Descriptive analyses were carried out for demographic characteristics of the sample (sex, age, employment status), for the potential confounders, as well as for the predictor and the outcome variables. Pearson and Kendall-Tau-b correlation analyses were performed in order to detect statistically significant confounders for the regression model.

Linear regression analyses were calculated to investigate possible associations between psychosocial work stress, psychological health factors (symptoms of depression and aggressiveness), and parent-child bonding. Standardized regression coefficients were calculated. The regression analyses were computed with and without potential confounders to check for possible differences. Finally, mediation analyses were performed in order to test the mediation effect of psychological health factors (symptoms of depression and aggressiveness) between psychosocial work stress and parent-child bonding. The mediation analyses were carried out once without and once with the potential confounders to investigate possible differences.

The linear regression as well as the mediation analyses were conducted with the SPSS modeling tool PROCESS v.3.5, which uses ordinary least squares regression to estimate model coefficients, standard errors, *p*-values, and confidence intervals (124). For the present study, bootstrapping with 5,000 iterations was used. Heteroscedasticity consistent standard errors (HC3; (125)) and 95% percentile confidence intervals were calculated. Due to missing data in several variables, *n* varied slightly between the different analyses.

Results

Sample description

The final sample consisted of 380 parents (163 mothers, 217 fathers). The characteristics of the sample are provided in Table 1. The mean age of the parents was 33.88 years (*SD* = 4.59; *Range* = 24–55) and the majority (98.2%) was born in Germany. Almost half of the participants (46.8%) had a university degree. The mean number of children in a family was 1.23 (*SD* = 0.51; *Range* = 1–4) and the age of the index child averaged 21.5 months. 70.8% of the participants worked full-time and 13.5% worked part-time. On average, mothers worked 29 hours, whereas fathers

worked 35 hours per week. More than half of the parents (63.2%) reported to work in home office due to the COVID-19 restrictions.

Correlation analyses

Correlation analyses between the predictor, mediator, outcome, and potential confounders were carried out in order to investigate possible associations (Table 2). Based on these analyses, the selected confounders comprised age of index child (in months), hours of work (per week), childcare (at home per day), and work in home office (yes/no).

Note. Kendall-Tau-b correlation coefficients were computed for the potential confounders education and home office. Pearson correlation coefficients were computed for all other variables. Significant correlations of potential confounders with the outcome variable PBQ are printed in bold. ERI = Effort-Reward Imbalance Questionnaire; PBQ = Postpartum Bonding Questionnaire; EPDS = Edinburgh Postnatal Depression Scale; SCL-90-R = Symptom-Check-List-90-Revised: sub-scale anger-hostility. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Regression and mediation analyses

Analyses with the mediator variable symptoms of depression

In the model with symptoms of depression as the mediator (Figure 3), the total effect of psychosocial work stress on parent-child bonding was not significant in the unadjusted analysis (β = 0.128, $p = .052$, 95% CI [-0.029, 5.369]; Model 1, Table 3). However, after adding the potential confounders to the model, the association between psychosocial work stress and parent-child bonding was significant (β = 0.148, $p = .017$, 95% CI [0.566, 5.614], Model 2, Table 3). This means, the total effect of psychosocial work stress on parent-child bonding was significant (path c). Additionally, an older age of the index child and working in home office significantly predicted parent-child bonding in the multiple regression model.

Note. *B* = unstandardized regression coefficient; *SE B* = standard error, based on 5,000 bootstrap samples; β = standardized beta coefficient, CI = confidence interval with α = 0.05, 95% percentile, based on 5,000 bootstrap samples. Significant associations ($p < .05$) are marked in bold. ERI quotient = Effort-reward imbalance quotient; Home office coded as 0 = not working from home, 1 = working from home. [a]Hours per week, [b]In hours per day.

Higher levels of psychosocial work stress also significantly predicted higher scores of symptoms of depression (β = 0.372, $p < .001$). These in turn significantly predicted weaker parent-child bonding (β = 0.320, $p < .001$). Moreover, tests of indirect effects indicated that the association between psychosocial work stress and parent-child bonding was mediated by symptoms of depression (indirect effect ab = 2.491, 95% CI [1.472, 3.577]). Additionally, after including symptoms of depression as a mediator, the relationship between psychosocial work stress and parent-child bonding was no longer statistically significant (path c', β = 0.029, $p = .665$; data not shown).

Analyses with the mediator variable symptoms of aggressiveness

In the model with symptoms of aggressiveness as the mediator (Figure 4), the total effect of psychosocial work stress on parent-child bonding was significant (path c, β = 0.148, $p = .017$; Model 2, Table 3). Higher levels of psychosocial work stress also significantly predicted higher scores of symptoms of aggressiveness (β = .254, $p < .001$). These in turn significantly predicted weaker parent-child bonding (β = 0.394, $p < .001$). Moreover, tests of indirect effects indicated that the association between psychosocial work stress and parent-child bonding was mediated by symptoms of aggressiveness (indirect effect ab = 2.091, 95% CI [1.147, 3.279]). Furthermore, after

including symptoms of aggressiveness as a mediator, the relationship between psychosocial work stress and parent-child bonding was no longer statistically significant (path c', β = 0.048, *p* = .369).

Regression and mediation analyses stratified for parents' sex

The analyses were then evaluated separately for mothers and fathers in order to explore differences between the sexes. The same potential confounders were considered in the analyses.

There was no association between psychosocial work stress and parent-child bonding in the models calculated for the mothers (neither for the model without the confounders, β = 0.130, *p* = .104, 95% CI [-0.585, 6.219], nor with the confounders: β = 0.160, *p* = .060, 95% CI [-0.129, 7.070], Table 4). However, the variables hours of work and home office significantly predicted mother-child bonding: the more hours of work and if not working in home office, the stronger the mother-child bonding. For the group of fathers, the association between psychosocial work stress and parent-child bonding were not statistically significant for both models as well (without the confounders: β = 0.124, *p* = .260, 95% CI [-1.839, 6.772]; with the confounders: β = 0.132, *p* = .195, 95% CI [-1.354, 6.584]; Table 4). Contrary to the analyses for mothers, the number of hours worked and working in home office did not play a role with regard to father-child bonding. According to these results, the total effect (path c) of psychosocial work stress on parent-child bonding was not significant for the mothers as well as for the fathers.

In the first mediation model stratified for the parents' sex (see Figure 5) higher levels of psychosocial work stress significantly predicted higher scores of symptoms of depression for the mothers as well as the fathers. They in turn significantly predicted a higher score of (i.e., weaker) parent-child bonding for the fathers, but not for the mothers. However, the variables hours of work and home office significantly predicted mother-child bonding: the more hours of work and if not working in home office, the lower the PBQ score, i.e., the stronger the mother-child bonding. There was a mediation effect of symptoms of depression for both parents. Furthermore, after including symptoms of depression as a mediator, the relationship between psychosocial work stress and parent-child bonding remained not significant for both parents (path c').

In the second mediation model stratified for the parents' sex (see Figure 6) higher levels of psychosocial work stress significantly predicted higher scores of symptoms of aggressiveness for the mothers, but not for the fathers. They in turn significantly predicted a higher score of (i.e., weaker) parent-child bonding and there was a mediation effect of symptoms of aggressiveness for both parents. Furthermore, after including symptoms of aggressiveness as a mediator, the relationship between psychosocial work stress and parent-child bonding remained not significant for both parents (path c')

Discussion

The present study aimed to investigate a possible association between parental psychosocial work stress and parent-child bonding during the early COVID-19 pandemic in Germany. In the total sample, an association was only found after potential confounders were included indicating that higher the psychosocial work stress is associated with a weaker bonding between the parent and child. The higher the psychosocial work stress was, the higher were the parental symptoms of depression and aggression. These in turn were related to weaker parent-child bonding. The results furthermore suggested that parental mental health symptoms of depression and aggressiveness mediate the association between psychosocial work stress and parent-child bonding.

Association between psychosocial work stress and parent-child bonding

In the bivariate analyses for the total sample, parental psychosocial work stress was not significantly associated with parent-child bonding. However, after adding possible confounders, an association could be found, indicating a weakened parent-child bonding with increasing psychosocial work stress. Two of the included confounders, age of index child and working in home office, predicted parent-child bonding. The older a child was and when a parent worked in home office, the weaker the parent-child bond was. Accordingly, a suppressor effect of the respective two confounders can be assumed.

Parents who worked in home office due to the COVID-19 restrictions seemed to have weaker parent-child bonding than parents who did not work in home office. This is contrary to research findings that showed a potentially positive impact on family relationships when parents work in home office, since doing so not only reduces potential stressors, such as commuting to work, but parents may also spend more time with their family (126). An explanation could be, however, that switching to working in home office during the COVID-19 pandemic may have added conflicts at home because parents had to adopt new routines considering a changing schedule (127, 128). Moreover, they must care for their offspring at home due to reduced opening hours of childcare facilities. Parents of toddlers that had to switch to working in home office at short notice during the COVID-19 pandemic while daycare facilities were still closed, may have in particular experienced more stress. After all, a child who is beginning to explore her/his environment by crawling and walking needs not only special supervision but also play and learning incentives. Furthermore, parents may feel that they do not work as efficiently in such a situation (129). These circumstances possibly have a deteriorating rather than uplifting impact on family relationships (59, 130-132). For instance, Chung and colleagues pointed out that stay-at-home orders may add to parenting stress, which in turn can affect the parent's relationship with their children and increase harsh parenting (60). In sum, the results of the present study support the assumption that experiencing work stress can spill over to the family domain (35, 36, 51).

The separate analyses for mothers and fathers did not reveal a significant relationship between psychosocial work stress and parent-child bonding. The analyses for the mothers suggested that increased hours at work and not working in home office were associated with better mother-child bonding. A possible explanation might be that these mothers feel less tense and resentful towards their child because they can share the emotional responsibility for their child with their partner (133) as they share the responsibility of working out of the house as well as in the family. Dividing everyday tasks and obligations can also strengthen a sense of support and commitment to the family (134, 135). Further resources that can support a harmonious family life may comprise effective conflict resolution (136) and dyadic coping (137) strategies. All these aspects can foster feelings of closeness between the family members and thus, parent-child bonding. Another interpretation of this finding could be that mothers and children who are separated from each other for a long time during the day simply miss each other and are accordingly more pleased to see each other again in the evening (138). This would also be consistent with the *family strengths perspective* (139), according to which working parents use their strengths as a family, e.g., enjoying time together and managing stress effectively. In the present study, only the number of hours and not the quality of childcare was collected. If family strengths, in line with the family strengths perspective, were utilized after coming home in the evening during childcare, this could have served as a buffer and strengthened family relationships. Additionally, according to *role enhancement theory* (140, 141), working in an enjoyable and rewarding job outside the home can exceedingly contribute to women's health. Employment can provide stimulating input and the opportunity for personal growth. The resulting energy and satisfaction can spill over into leisure time after work, contributing to fulfilling family time and thus strengthening relationships between family members.

Interestingly, for fathers, neither psychosocial work stress nor hours of work or working in home office showed an association with bonding with the child. In recent years, much has changed with respect to sex differences in

employment rates and the number of hours of childcare and household work. Nevertheless, mothers in Germany predominantly take care of the household and children even when they are employed (142, 143); for other European countries with similar results, see (144), when they work in home office (145, 146), and even during the COVID-19 pandemic (126, 147). Fathers, on the other hand, are still predominantly in paid employment (143). Although the difference of the employment rate in households with minor children is less pronounced in East Germany (92% for men, 80% for women) than it is in West Germany (93% for men, 73% for women (148)), it could be speculated that some fathers still identify more with the role of breadwinner and provider for the family (149). Therefore, the number of hours they work and whether they do so at home or in the office may not make a big difference to them concerning family relationships – possibly also because mothers tend to take the household and childcare load off them. Nevertheless, further research on differences between working mothers and fathers and the impact on family relationships is still needed.

Association between psychosocial work stress and symptoms of impaired mental health

Psychosocial work stress predicted higher scores of symptoms of depression as well as of aggressiveness. This was true *for the whole sample* as well as *for the analyses conducted separately for mothers and fathers* (the only exception was that psychosocial work stress narrowly failed to significantly predict symptoms of aggressiveness). All in all, these results confirm previous research indicating that occupational stress is positively related to depressive symptoms in different groups of employees (29, 30, 76, 150-152). Likewise, preceding research showed a positive correlation between occupational stress and symptoms of aggression (77-79, 152-154). Work-related stressors can contribute to an increasingly negative attitude toward work, exhaustion and dejection, or irritability and imbalance. During the COVID-19 crisis and associated challenges, such as working in a home office for the first time with a possible associated extension of work hours (155) and caring for children at the same time, work and personal life may become more difficult to separate (156, 157). This could lead to heightened stress due to overwork and poorer work-life balance. With limited contacts and less leisure activities outside the home, there is often a lack of social support and compensation for employment. These factors possibly promote adverse psychological behavior and thought spirals of symptoms of depressiveness and aggressiveness (158).

Association between symptoms of impaired mental health and parent-child bonding

Symptoms of depression as well as aggressiveness predicted weaker parent-child bonding in the analyses for the total sample. These results confirm previous studies that demonstrated a negative link between symptoms of depression (90, 91), of aggressiveness (92-97) and the parent-child relationship. Moreover, in exceptional situations like the COVID-19 pandemic, mental health is at risk, as shown by studies related to previous crises (159-161) or periods of prolonged stress (162-164). Russell and colleagues collected data during the first few months of the COVID-19 pandemic and found that there is a clear relationship between mental health symptoms and both parent-child conflict and closeness (59). Parents with more severe symptoms of depression reported greater conflict with their children. If there are quarrels between family members and a correspondingly tense situation at home, it can be assumed that the relationship between the family members becomes also strained. Such effects on the family can also be expected from aggressive behavior. If parents show angry or violent behavior towards their child, this disturbs trust, and the bond may suffer accordingly.

The separate analyses for the mothers and the fathers showed differences in their results. Maternal symptoms of depression unexpectedly did not predict bonding with their child. This is contrary to a lot of former research that confirmed a negative association between depression and mother-child bonding (e.g., (51, 80, 81, 83-89). Additionally, Russell and colleagues pointed out that mothers with higher depressive symptomatology reported more conflict in

their relationship to their child (59). But closeness which is also part of the mother-child bonding was not associated with their mental health. This fits the results of the present sample, as again, the two confounders – hours of work and home office – predicted the bonding between mother and child much better than the mothers' symptoms of depression. Perhaps maternal depression affects the mother-child bonding especially in the first year after birth, but later not so much, because strong bonding with the child may already have been established. Since many mothers with children under one year of age were excluded from this study, this could have had a biasing influence on the results of the analysis. Moreover, the double burden of family and work responsibilities often leads to conflict, especially for mothers (165). The results of the present study showed that the more hours at work and if not working in home office, the better the mother-child bonding. This suggests that mothers may have experienced some relief from the double pressures of work and family duties through increased and energizing work time away from home (see role enhancement theory (140, 141), thereby reducing stress and strengthening the relationship with their child.

For fathers, on the other hand, the picture presented itself to be quite different. For them, symptoms of depression were associated with bonding with the child, but work hours and home office were not. This result seems to be in line with Russell and colleagues who found that depressive fathers reported a higher score of conflict with their children than depressive mothers (59). Possibly fathers experience a higher burden of childcare which may be associated with more exhaustion and depressiveness (59). Although attitudes regarding traditional parenting roles, including responsibilities for paid and unpaid work, have changed in recent decades, there is an ongoing lack of equality for men and women in employment (149). The number of employed men (92%) in East Germany is still higher than that of women (80%) (148). According to Thoits, being a father continues to be positively associated with employment (166). This could mean either that men tend to view employment as a precondition for parenthood or that it is relatively easy for men – compared to women – to combine parenthood and employment. Work variables then may not have as much of an impact on the bonding with his child, because he does not perceive himself as threatened in his role at work (167).

All in all, work situation variables seem to have a differential impact on mothers and fathers as well as their family relationships. This should be addressed in future research and investigated in more depth (see (168)).

The mediator role of parental impaired mental health

There was a mediation effect for symptoms of depression as well as aggressiveness in the analyses of the total sample. Therefore, the results of this study highlight not only a spillover effect from the work to the family domain, but also a crossover effect within the family domain, from the parents to the children (35, 36). Being mentally distressed seems to have an impact on family relationships, namely parent-child bonding. The mediation effect for symptoms of depression as well as aggression was also evident in the separate analyses for the group of mothers as well as fathers.

The result of the mediation analysis with symptoms of depression is in line with Repetti and Woods research (51). More than 20 years ago they stated that on days when depressive mothers reported higher loads at work, they stated less involvement with and less responsiveness to their children, which may negatively impact parent-child bonding. In a more recent study with older children, Wheeler and colleagues found a mediating role of parental depressive symptoms for the association between work stress and parent-adolescent relationships (169). Similarly, Moreira and colleagues demonstrated that parental mental distress mediates the relationship between work stress and mindful parenting (170). In sum, not only previous research but also this study underscores the importance of mental health in the context of psychosocial work stress and its association with parent-child bonding.

Research on the work-family interface that examines a possible mediating role of parental aggressiveness for the association between work stress and parent-child bonding is very scarce. Previous studies focused on the family domain with investigations of a possible mediating role of poor parenting behavior for the association between parental stress and child problem behavior (e.g., (171-173)). For instance, Deater-Deckard and Scarr found that more stressed parents used more authoritarian disciplinary strategies, which in turn were related to children's misbehavior (171). The results of the present study therefore highlight the importance of addressing parental emotional dysregulation and aggressive behavior in future research.

One explanation for the mediating role of mental health symptoms in the association between parental work stress and the relationship with children may lie in the cognitive and emotional distress that is often part of depressive and aggressive symptomatology. If parents experience stress at work and become depressed or emotionally agitated as a result, they tend to be mentally and emotionally preoccupied with the sources of stress. Attention to the well-being of other family members, especially children, may suffer as mother and father are consumed with their own problems. Parents, however, who are sensitive and attentive to their children in everyday life can lay a good foundation for close parent-child bonding (174). In this context, Moreira and her colleagues ((170); see also (174, 175)) described the value of mindful parenting, which is characterized by responsiveness, attentiveness, openness towards and acceptance of the child. Furthermore, mindful parents are able to regulate emotions and behavior while interacting with their child. This may be exactly what is challenging for parents who experience psychosocial work stress and struggle with depressive or aggressive symptomatology and thus, strengthening a bond with their child may be disrupted (170).

Strengths and limitations

This study extends the research on the work-family interface. To begin with, the present paper was the one of the first to address the association between psychosocial work stress and parent-child bonding. Validated, established measurement instruments that are often used in bonding and work stress research were used. Secondly, this study was among the first to investigate this particular question in the wake of the COVID-19 pandemic. The aspect of mental health was included and looked at in more detail, as this was found to be important in previous studies in contexts of crisis. Thirdly, this study adds to international research concerning work stress and its impact on families, because so far there are only a few other recent studies that explicitly addressed parents in Germany (e.g., (176, 177). Moreover, this investigation is part of the prospective longitudinal cohort study DREAM (108), which collects data of mothers as well as of fathers. Therefore, future studies can build on the present results and explore further issues related to work and family health.

However, some limitations of this study need to be considered. Due to its cross-sectional design, psychosocial work stress and symptoms of impaired mental health (depression and aggressiveness) were measured at the same time, yielding certain challenges. There is theoretical evidence from previous research that psychosocial work stress may cause mental distress (e.g., (74, 178, 179)), which in turn may have an impact on family relationships, and parent-child bonding in particular (e.g., (80-82). However, there is still the need for extended research provided by longitudinal analyses to draw final causal conclusions. One must also consider the potential measurement error due to the timing of filling out the questionnaire, like Ford and colleagues (38) pointed out in their review. Psychosocial work stress can vary from day to day and depending on which day of the week a participant completes the questionnaire, they may respond based on the current state. On a stressful weekday, perceptions of work stress may be different than on a relaxed weekend.

In addition, since this study was a questionnaire study, there is some risk of subjectivity and social desirability in the responses given, which could lead to bias in the results (see e.g., (78, 93)). This bias might be smaller in online studies because there is no face-to-face contact between participant and researcher (180). Nevertheless, it could be advantageous to collect observational data in future studies in order to obtain more objective, standardized results (181).

Further, there seemed to be some challenges regarding the data collection instruments used. The ERI Questionnaire was chosen as a well-established measure instrument (117). Its reliability was proven to be acceptable (182) or even good (14, 118). In the present study, however, the reliability of the sub-scale effort was somewhat lower. Moreover, the PBQ (4) was originally developed for the postpartum period, conceptualized as the time period from delivery to six months after (based on (183). It was often used in parent-child bonding research for this age range (e.g., (184-188). The present study included children who were between 0–36 months of age (like only a few other studies, e.g., (189-191). Therefore, it is possible that there is a measurement bias since parent-child bonding decreased with increasing age of the child. Future research should consider alternative parent-child bonding questionnaires in studies with children older than six months.

The current community sample comprised mothers and fathers who came from a rather educated and established background. A much higher percentage had a university degree (47%) than the average population in Saxony (17.4% in 2019; (192)). Moreover, the majority (98%) of the sample was born in Germany, which is a much larger number than the number in the population in Saxony (95% in 2020; (193)). Furthermore, 98% of the participants were in a stable relationship and the average of the mental health and stress factors indicated a rather healthy sample. Therefore, the results should not be generalized to families that cope with severe mental distress or that live in vulnerable, low-income family settings. It may be important to point out that most mothers with an index child under 12 months were excluded due to lack of employment during their parental leave. Therefore, the distribution of mothers and fathers who had a very young child differs and the groups may not be well comparable concerning work stress variable and bonding to their child.

Research implications

Our results provide a number of implications for future research. For example, future studies should include working hours and home office as primary predictors as these appear to be significantly related to parent-child bonding. Additionally, studies should include other mental health factors to find possible further mediation effects. In this context, the COVID-19 pandemic also poses a challenge, as reviews showed that anxiety has increased in the population (64, 65). Previous research found that anxiety is not only positively associated with work stress (76, 151, 194) but also with impaired parent-child bonding (59, 83, 184, 195). Moreover, it may be interesting to investigate whether anxiety mediates the association between psychosocial work stress and parent-child bonding especially in mothers, since anxiety is more prevalent in the female population (196) and if there are any differences to fathers.

In addition, it would be useful to identify possible protective variables that counteract the effects of work stress on parent-child bonding, for instance job satisfaction (197, 198) or adequate communication and dyadic coping (137, 199, 200). Marital satisfaction may also have a protective as a harmonious relationship between the mother and her partner may serve as support in a stressful family life and foster parent-child bonding (11).

Practical implications

Implications for the parents' work settings. Employers should ensure that employees experience the best possible balance between effort and fair compensation and appreciation for their work contributions. Especially during the

COVID-19 pandemic it is critical for parents that companies expand their family-friendly features, which can alleviate stress among employees with children, e.g., offering flexible working hours and childcare options (201-203).

The study also indicated that paid work outside the home can have a highly health-promoting effect for women in general and for mothers in particular. In the workplace, they can develop their personal and professional skills, and thus shape their family life and relationships in an enriched and fulfilled way. To promote the health of all family members, it should be worthwhile to make parents and employers aware of this important opportunity.

Implications for prevention and awareness of parental impaired mental health. Screenings for depressive symptoms or other psychological distress could help identify parents at risk in the workplace (204, 205). In the clinical setting, psychoeducation could support awareness of stress and depression indicators in parents as well as their children (59). Not only internalizing behavior, but also externalizing behavior such as anger and verbal or physical aggression must be considered in this context. Work stress can have a detrimental effect on employees' inner balance and emotional state. It is helpful if they learn coping strategies so that there is no spillover effect of anger that puts family members and relationships at risk. This is especially important for vulnerable families, as studies show that during the COVID-19 pandemic domestic violence in Germany (206, 207) (as well as in other parts of the world (e.g., (208, 209)) has been on the rise. Therefore, Arnout and colleagues emphasized the importance of prevention and treatment of mental health problems that arise during the COVID-19 pandemic ((210); see also (211, 212)). These may include online counseling and therapy while following social distancing policies (63, 211, 213, 214). First aid interventions using social networking webpages are fit to use as they are easily accessible, fast, and cost-effective for the public (215).

Conclusion

The present study detected an association between psychosocial work stress and parent-child bonding in the context of the COVID-19 pandemic after inclusion of confounders, indicating the more psychosocial work stress, the weaker the parent-child bonding. A notable result was that working long hours away from home predicted stronger mother-child bonding, whereas this was not true for fathers. Therefore, parents and employers should be made aware of the positive impact women can experience through paid work – an impact not only for themselves but also for their family life. Furthermore, the study revealed that symptoms of impaired mental health, i.e., depression and aggressiveness, played a mediating role for the association of psychosocial work stress and parent-child bonding for both parents. Future research should examine which protective factors exist in depressed mothers as well as fathers that might contribute to the development of healthy and strong bonding with their child. The particular occupational and family stress on parents during the COVID-19 pandemic and the increased risk for aggressive behavior toward family members that may accompany it, should be considered in research as well as violence prevention programs. Implications were derived for workplaces that offer support for parents to both counteract work stress and foster mental health. This in turn may provide a solid foundation for promoting family members' relationships. The findings need to be replicated with more diverse samples and additional mental health variables to expand on the work-family interface.

Declarations

Ethics approval and consent to participate

The DREAM study, including the sub-study $DREAM_{CORONA}$, was approved by the Ethics Committee of the Medical Faculty of the TU Dresden (No: EK 278062015) and all procedures were performed according to the Declaration of

Helsinki. During recruitment, participants were provided with information on the study procedure and its objectives. They were guaranteed pseudonymization and confidential handling of their data. Furthermore, they were informed that they could discontinue the study at any time. Each participant signed an informed consent form.

Consent for publication

Not applicable.

Availability of data and materials

The dataset analyzed during the current study is not publicly available due to legal and ethical constraints. Public sharing of participant data was not included in the informed consent of the study. All enquiries about access to data should be sent to the corresponding author. All requests to access data will be handled in accordance with the Ethics Committee of the Faculty of Medicine of the Technische Universität Dresden.

Competing interests

The authors declare that they have no competing interests.

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Authors' Contributions

This study was conceived, research questions developed, and the conceptual model created by MIK, KRS, and SGN. MIK performed the literature search. JM, MK, and VW supported the conduction of the study, JM and MK prepared the data for statistical analyses. MIK performed the statistical analyses and drafted the initial manuscript. Data were interpreted by MIK, JM, LS, MK, VW, KRS, and SGN. MK and VW contributed to the conception and design of the sub-study $DREAM_{CORONA}$. SGN acquired the funding, was responsible for conception and design of the basic DREAM study with its sub-studies as well as the coordination and supervision of the data collection and the ongoing cohort study. All authors contributed to manuscript revision, read, and approved the submitted version.

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Tables

Table 1

Psychosocial work stress and parent-child bonding during the COVID-19 pandemic: clarifying the role of parental symptoms of depression and aggressiveness

	Mothers	Fathers	Total sample
	n = 163	*n* = 217	*n* = 380
Age	32.98 ± 3.87 (25–43)	34.55 ± 4.96 (24–55)	33.88 ± 4.59 (24–55)
Country of birth			
Germany	161 (98.8)	214 (98.6)	373 (98.2)
Other	2 (1.2)	3 (1.4)	7 (1.8)
Academic degree			
No	82 (50.3)	120 (55.3)	202 (53.2)
Yes	81 (49.7)	97 (44.7)	178 (46.8)
Current partnership			
Yes	156 (96.9)	213 (99.1)	369 (98.1)
No	5 (3.1)	2 (0.9)	7 (1.9)
Number of children	1.22 ± 0.46 (1–4)	1.24 ± 0.56 (1–4)	1.23 ± 0.51 (1–4)
1	129 (79.1)	174 (80.2)	303 (79.7)
2	33 (20.2)	35 (16.1)	68 (17.9)
3	0 (0.0)	6 (2.8)	6 (1.6)
4	1 (0.6)	2 (0.9)	3 (0.8)
Age of index child	21.50 ± 6.55 (1–34)	14.63 ± 9.06 (0–32)	17.58 ± 8.74 (0–34)
0–12 months	16 (9.8)	101 (46.5)	117 (30.8)
13–24 months	88 (54.0)	75 (34.6)	163 (42.9)
25–36 months	59 (36.2)	41 (18.9)	100 (26.3)
Childcare[a]	4.92 ± 2.19 (1.5–22)	2.85 ± 1.58 (0–9)	3.72 ± 2.12 (0–22)
Household work[a]	2.04 ± 1.38 (0–13)	1.70 ± 1.30 (0–8.5)	1.85 ± 1.34 (0–13)
Employment status			
Full-time	87 (53.7)	182 (83.9)	269 (70.8)
Part-time	28 (17.3)	23 (10.7)	51 (13.5)
Other[b]	10 (6.3)	14 (6.6)	24 (6.3)
Home office			
No	61 (37.4)	79 (36.4)	140 (36.8)
Yes	102 (62.6)	138 (63.6)	240 (63.2)
Hours of work[c]	28.58 ± 10.77 (2–55)	35.0 ± 12.17 (2–72)	32.29 ± 12.02 (2–72)
PBQ	13.95 ± 8.74 (0–41)	12.03 ± 7.54 (0–43)	12.85 ± 8.12 (0–43)

ERI	0.95 ± 0.38 (0.26–2.00)	0.94 ± 0.36 (0.28–3.67)	0.94 ± 3.37 (0.26–3.67)
EPDS	6.93 ± 4.68 (0–22)	4.68 ± 4.23 (0–20)	5.65 ± 4.56 (0–22)
SCL-90-R anger-hostility	3.50 ± 3.46 (0–19)	1.95 ± 2.56 (0–15)	2.60 ± 3.07 (0–19)

Note. *n* (%) or *M* ± *SD* (*Range*). PBQ = Postpartum Bonding Questionnaire, ERI = Effort-Reward Imbalance Questionnaire, EPDS = Edinburgh Postnatal Depression Scale, SCL-90-R = Symptom-Check-List-90-Revised (sub-scale anger-hostility). [a]In hours per day, [b]Other: working irregularly or marginally, undergoing an apprenticeship or federal voluntary work, [c]Hours per week.

Table 2

Correlation matrix including the predictor, mediator, outcome variables, and potential confounders of the total sample

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. ERI	–										
2. EPDS	.339**	–									
3. SCL-60-R anger-hostility	.225**	.604**	–								
4. PBQ	**.128***	**.362****	**.420****	–							
5. Education	-.003	.032	-.011	.017	–						
6. Age of index child	.027	.078	.106*	**.148****	.017	–					
7. Number of children	.062	.064	.097	.010	.017	.042	–				
8. Hours of work	.075	-.171**	-.181**	**-.154****	-.048	-.099	-.004	–			
9. Childcare	-.051	.170**	.295**	**.123***	.033	.241**	-.007	-.360**	–		
10. Household work	.045	.153**	.204**	.017	-.088	.059	.047	-.104*	.197**	–	
11. Home office	.007	.186*	.028	**.152****	.184**	.048	-.075	-.106*	.044	.061	–

Note. Kendall-Tau-b correlation coefficients were computed for the potential confounders education and home office. Pearson correlation coefficients were computed for all other variables. Significant correlations of potential confounders with the outcome variable PBQ are printed in bold. ERI = Effort-Reward Imbalance Questionnaire; PBQ = Postpartum Bonding Questionnaire; EPDS = Edinburgh Postnatal Depression Scale; SCL-90-R = Symptom-Check-List-90-Revised: sub-scale anger-hostility. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Table 3

Predictive value of psychosocial work stress on parent-child bonding for the total sample (path c)

Variable	*B*	*SE B*	β	95% CI	*p*
Model 1 (R^2 = 0.02)					
Constant	10.051	1.299		[7.497, 12.605]	< .001
ERI quotient	2.670	1.373	0.128	[-0.029, 5.369]	.053
Model 2 (R^2 = 0.08)					
Constant	8.194	2.406		[3.463, 12.925]	.001
ERI quotient	3.090	1.284	**0.148**	[0.566, 5.614]	**.017**
Age of child	0.109	0.051	**0.123**	[0.008, 0.209]	**.035**
Hours of work[a]	-0.073	0.039	-0.114	[-0.150, 0.003]	.059
Childcare[b]	0.184	0.350	0.051	[-0.503, 0.872]	.599
Home office	2.028	0.780	**0.127**	[0.494, 3.562]	**.010**

Note. *B* = unstandardized regression coefficient; *SE B* = standard error, based on 5,000 bootstrap samples; β = standardized beta coefficient, CI = confidence interval with α = 0.05, 95% percentile, based on 5,000 bootstrap samples. Significant associations ($p < .05$) are marked in bold. ERI quotient = Effort-reward imbalance quotient; Home office coded as 0 = not working from home, 1 = working from home. [a]Hours per week, [b]In hours per day.

Table 4

Predictive value of psychosocial work stress on parent-child bonding. Results stratified for parents' sex (path c)

	Mothers					Fathers				
Variables	*B*	*SE B*	β	95% CI	*p*	*B*	*SE B*	β	95% CI	*p*
Model 1 (R^2 = 0.02/0.02[a])										
Constant	10.941	1.684		[7.616, 14.267]	< .001	9.471	2.021		[5.487, 13.454]	< .001
ERI quotient	2.817	1.722	0.130	[-0.585, 6.219]	.104	2.467	2.184	0.124	[-1.839, 6.772]	.260
Model 2 (R^2 = 0.14/0.04[a])										
Constant	9.945	5.087		[-0.106, 19.996]	.052	7.187	3.100		[1.077, 13.298]	.021
ERI quotient	3.470	1.822	0.160	[-0.129, 7.070]	.060	2.615	2.013	0.132	[-1.354, 6.584]	.195
Age of child[b]	0.178	0.112	0.136	[-0.044, 0.400]	.115	0.087	0.055	0.111	[-0.021, 0.194]	.115
Hours of work[c]	-0.199	0.071	**-0.252**	[-0. 340, -0.059]	**.006**	-0.011	0.045	-0.019	[-0.099, 0.077]	.802
Childcare[d]	0.079	0.767	0.021	[-1.437, 1.594]	.918	0.153	0.434	0.034	[-0.703, 1.008]	.725
Home office	3.104	1.297	**0.181**	[0.536, 5.672]	**.018**	1.358	1.000	0.092	[-0.614, 3.331]	.176

Note. *B* = unstandardized regression coefficient; *SE B* = standard error, based on 5,000 bootstrap samples; β = standardized beta coefficient; CI = confidence interval with α = 0.05, 95% percentile, based on 5,000 bootstrap samples; significant associations ($p < .05$) are marked in bold; ERI quotient = Effort-reward imbalance quotient; Home office coded as 0 = not working from home, 1 = working from home. [a] R^2 = mothers/fathers, [b]Age of child in months, [c]Hours per week, [d]In hours per day.

Figures

Figure 1a

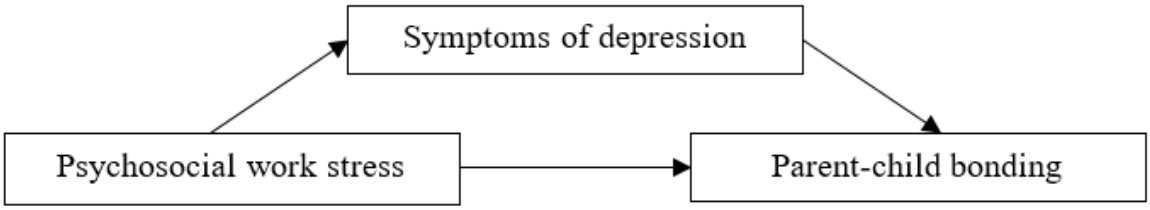


Figure 1b

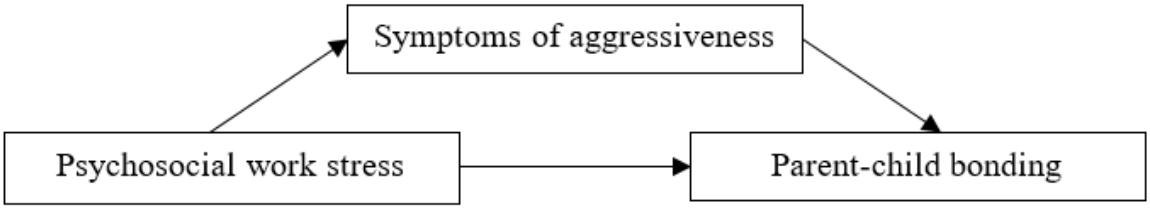


Figure 1

a

The hypothesized associations between psychosocial work stress, symptoms of depression, and parent-child bonding

b

The hypothesized associations between psychosocial work stress, symptoms of aggressiveness, and parent-child bonding

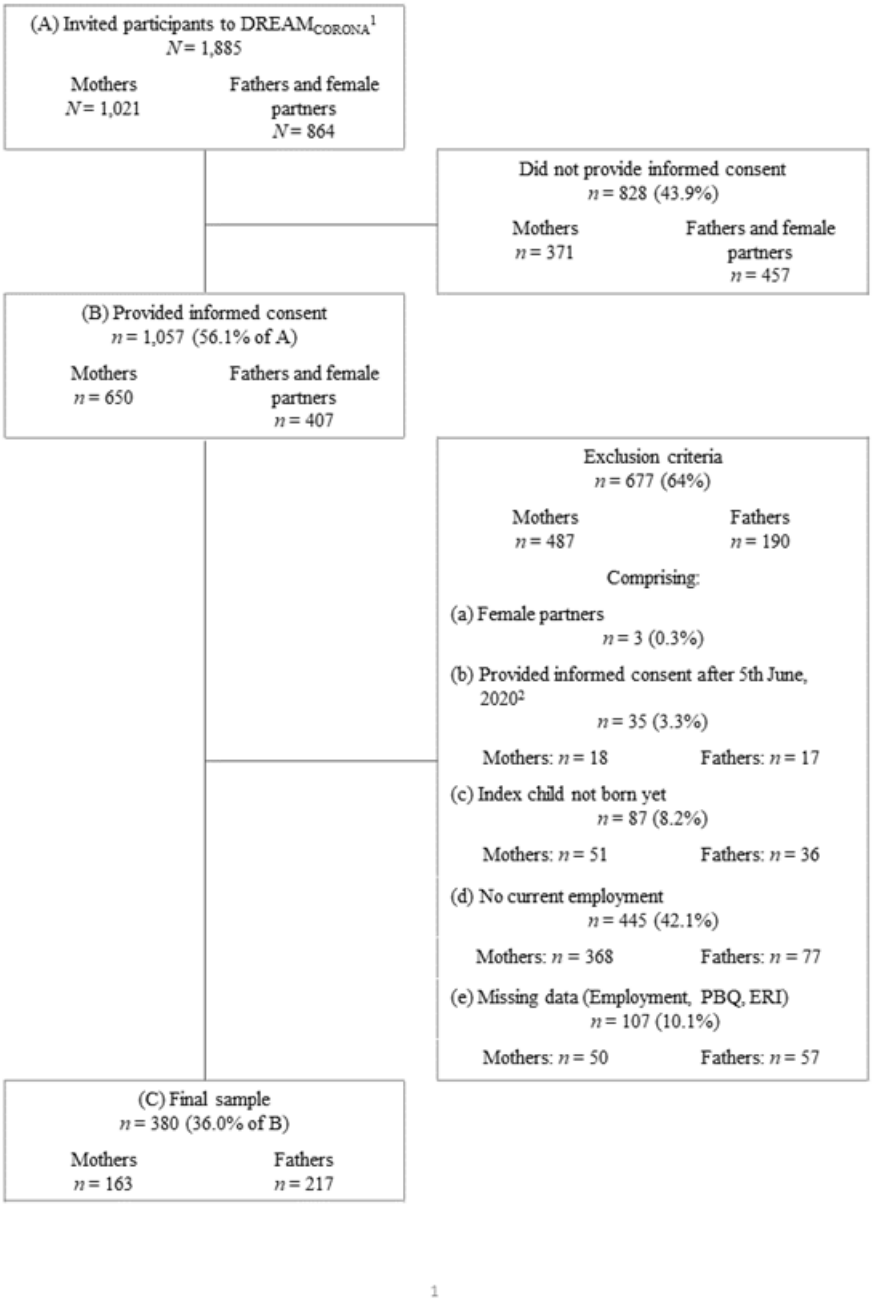


Figure 2

Flowchart of retention rate and exclusion criteria resulting in final sample

Note. [1]Online participants of the general DREAM study as of April 2020 (twin and multiple pregnancies excluded). [2]With 6th June, 2020 new corona regulations came into effect. PBQ = Postpartum Bonding Questionnaire. ERI = Effort-Reward Imbalance Questionnaire.

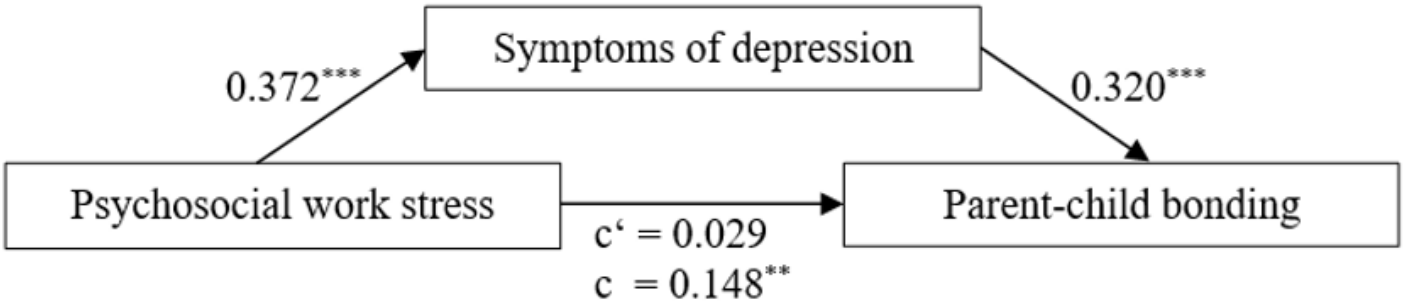


Figure 3

Standardized regression coefficients for the associations between psychosocial work stress, symptoms of depression, and parent-child bonding for the total sample (controlled for potential confounders)

Note. c = total effect; c’ = direct effect.

* = $p < .05$. ** = $p < .01$. *** = $p < .001$.

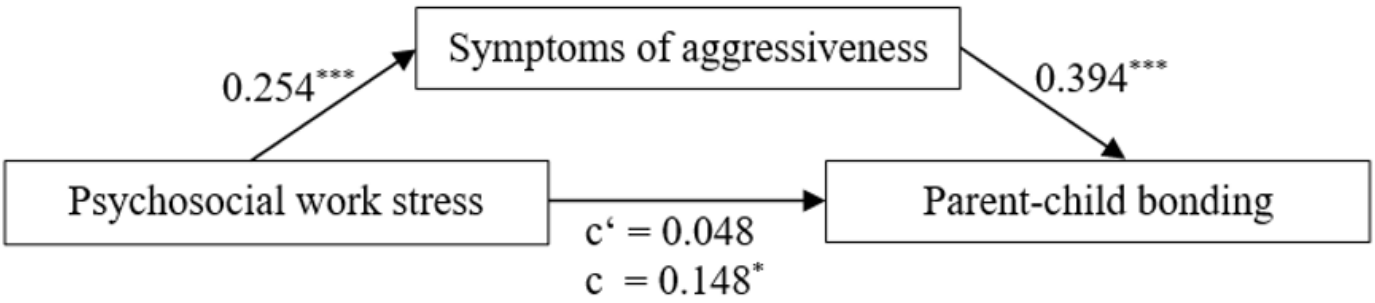


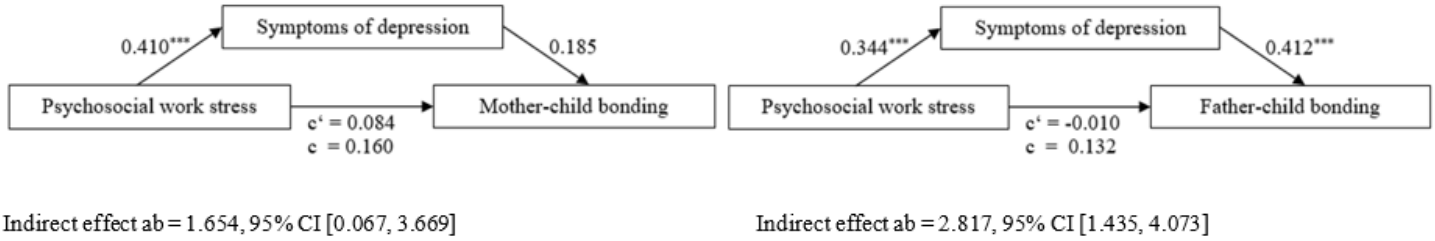
Figure 4

Standardized regression coefficients for the associations between psychosocial work stress, symptoms of aggressiveness, and parent-child bonding for the total sample (controlled for potential confounders)

Note. c = total effect; c’ = direct effect.

* = $p < .05$. ** = $p < .01$. *** = $p < .001$.

Figure 5



Indirect effect ab = 1.654, 95% CI [0.067, 3.669]

Indirect effect ab = 2.817, 95% CI [1.435, 4.073]

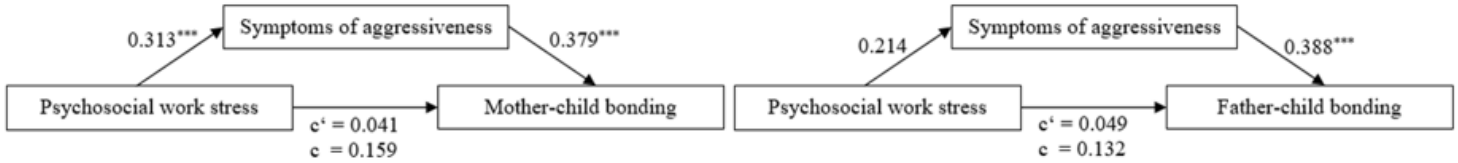
Figure 5

Standardized regression coefficients for the associations between psychosocial work stress, symptoms of depression, and parent-child bonding (controlled for potential confounders) for the group of mothers and fathers

Note. c = total effect; c' = direct effect.

* = $p < .05$. ** = $p < .01$. *** = $p < .001$.

Figure 6



Indirect effect ab = 2.578, 95% CI [1.060, 4.300]

Indirect effect ab = 1.646, 95% CI [0.483, 3.198]

Figure 6

Standardized regression coefficients for the associations between psychosocial work stress, symptoms of aggressiveness, and parent-child bonding (controlled for potential confounders) for the group of mothers and fathers

Note. c = total effect; c' = direct effect.

* = $p < .05$. ** = $p < .01$. *** = $p < .001$.