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Mental health of working parents during the COVID-19 pandemic: can resilience buffer the impact of psychosocial work stress on depressive symptoms?

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Abstract

Background: The COVID-19 pandemic has confronted working parents with an accumulation of stressors regarding changes in work, family, and social life, putting their mental health at risk. Stressors include altered working conditions such as working from home or changes in working hours as well as the difficulty to reconcile work and childcare due to the closure of childcare facilities. The present study examined the relationship of psychosocial work stress (i.e., work-privacy conflict and effort-reward imbalance at work) and depressive symptoms in working parents and whether this association was moderated by individual resilience.

Methods: Data of the present study ($n = 452$) were collected in Germany between May and June 2020 as part of the DREAM_{CORONA} study. A subsample of working mothers ($n = 191$) and fathers ($n = 261$) completed the subscale for work-privacy conflict (WPC) of the Copenhagen Psychosocial Questionnaire, the Effort-Reward Imbalance (ERI) Questionnaire, the Connor-Davidson Resilience Scale (CD-RISC), and the Edinburgh Postnatal Depression Scale (EPDS). Multiple linear regression analyses including moderation were performed, controlling for gender, working hours per week, and a lifetime history of depression as potential confounders.

Results: Both WPC ($\beta = 0.336, p < .001$) and ERI ($\beta = 0.254, p < .001$) were significantly associated with depressive symptoms. Resilience moderated the relationship between ERI and depressive symptoms ($\beta = -0.101, p = .018$), indicating that higher resilience weakened the relationship. However, this effect was not found regarding the relationship between WPC and depressive symptoms ($\beta = 0.055, p = .167$).

Conclusions: The results highlight the need for measures to reduce psychosocial work stressors such as WPC and ERI during the COVID-19 pandemic on the one hand and to promote resilience on the other hand. The findings partially support the potential protective role of resilience buffering the association between psychosocial stress and mental health in working parents. Longitudinal studies are needed to confirm this effect.

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Keywords: Working parents, Work-privacy conflict, Effort-reward imbalance, Resilience, Depressive symptoms, Moderation, DREAM study

Background

In March 2020, the World Health Organization (WHO) declared the outbreak of the COVID-19 virus a pandemic [1]. With the aim to control the virus, Germany among other countries imposed strict political measures to contain infections. As a result, individuals were faced with various challenges and major changes regarding family life, work, and their social interaction. Emerging stressors due to altered working conditions included being forced to work from home, the need to adapt to changes in working hours (e.g., working overtime or working short-time), financial strains, and insecurities regarding the future of one's employment [2–4]. Additionally, four million working parents were affected by the abrupt closure of childcare facilities in Germany [5]. Schools and day-care facilities were closed nationwide from March 2020 to May 2020, only offering emergency childcare. Even after the strict closures were lifted, childcare services were not available to all families again [6]. As a consequence, especially working parents were confronted with fundamental disruptions of their normal life both at work and at home. While adapting to changes in work demands, reconciling childcare and family responsibilities with work became more difficult [7]. This accumulation of psychosocial work stressors may put the mental health of working parents at risk.

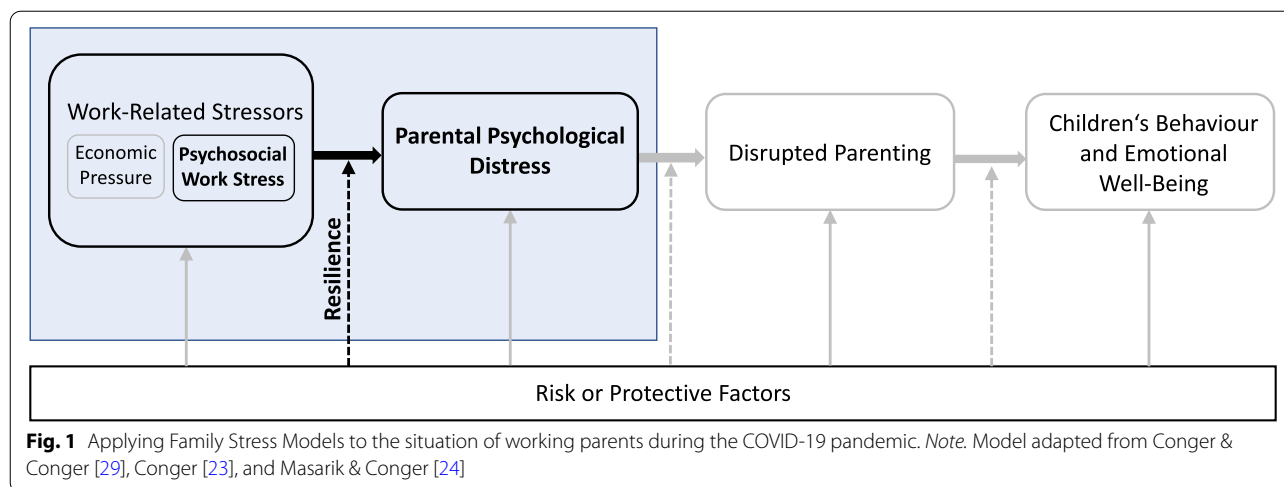
Studies shortly initiated after the outbreak of the pandemic already indicated a negative impact on mental health in the general population. Results revealed a significant deterioration of mental well-being, an increase of depressive symptoms and anxiety symptoms associated with the outbreak, as well as highly elevated stress levels [8–10]. This impact did not spare parents as first studies have shown: Parents reported high levels of psychological distress [11, 12], a deterioration of their mental health [13, 14], and an elevation in maternal depression and anxiety compared to results prior to the pandemic [15]. Especially the well-being of mothers and families with younger children seemed to be impaired [13, 16, 17]. Taking a closer look at the group of working parents during the COVID-19 pandemic, changes in working conditions have been found to be associated with lower well-being [14] and exhaustion was particularly elevated in mothers of pre-school aged children [18]. At the same time, protective factors regarding parents' mental health such as high individual resilience have been shown to be negatively associated with outcomes such as parenting-related exhaustion or depression [12, 19]. Considering

the circumstances working parents are confronted with during the COVID-19 pandemic, it is essential to take a closer look at specific potential risk and protective factors regarding their mental health. Examining parents' mental health is not only of great importance since it affects mothers and fathers as individuals but also, because it may affect mental health within their family system. Poor mental health of parents is associated with adverse child outcomes like both internalizing and externalizing problems as well as general psychopathology [20, 21]. Indication of such negative effects of parental distress on children's health, behaviour, and emotion regulation have already been suggested during the pandemic [11, 22]. Models such as the Family Stress Model [23, 24] and a process model suggested by Belsky [25] point out the crucial role of parents' well-being regarding family mental health, offering a theoretical framework to integrate both potential stressors and protective factors, the well-being of parents and children, as well as their interrelations. The models describe cascading effects of stressors like economic hardship or contextual stress (e.g., work stress), eliciting parental psychological distress. Parental distress in turn may first affect parents' individual mental health, amounting to negative effects on parenting and child behaviour and well-being [25, 26]. Especially parental depression is considered a risk factor for adverse child outcomes [27, 28]. However, protective factors can buffer the family stress process [24]. Applying family health models to the context of the COVID-19 pandemic, psychosocial work stress due to fundamental changes in work and family life might represent a potential stressor for working parents, threatening their mental health, and thereby risking triggering cascading effects (Fig. 1).

Despite the findings that particularly working parents are at high risk for mental distress during the ongoing pandemic, previous studies considered work only in a very broad manner, lacking the assessment of psychosocial work stressors in more detail and neglecting the potential protective role of resilience. The current study therefore aims at closing this gap to strive for a better understanding of mental health of working parents and to identify possible protective factors in the context of a pandemic.

Psychosocial work stress

Psychosocial work stress can stem from a variety of sources (e.g., job content, lack of autonomy, work intensity, working hours, work-life imbalance) [30].



Considering the multitude of potential psychosocial stressors working parents were confronted with during the pandemic, two well-established concepts to explain the development of psychosocial work stress will be used: work-privacy conflict (WPC) and effort-reward imbalance (ERI).

Work-privacy conflict

Based on the spill-over theory [31], WPC, sometimes also referred to as work-family conflict, picks up on the negative interference of experiences at work with experiences in the private/ family domain [32, 33]. In the context of the COVID-19 pandemic, changes such as working from home threatened distinct boundaries between work and private life, risking an increase in conflicts between these two domains. There is well-established evidence for associations of WPC with poor well-being, burnout, and depression [33–36]. A first study conducted during the pandemic indicated an association of WPC with exhaustion among employees [18]. This highlights the urge to further examine the relationship of WPC with other indicators of poor mental health, such as depressive symptoms, particularly in working parents.

Effort-reward imbalance

The Effort-Reward Imbalance Model suggests that stress occurs if there is a lack of social reciprocity between effort and reward at the workplace, caused by an imbalance between the effort spent and the perceived reward received [37]. As a consequence, high effort and low reward may result in stress, which in turn increases the risk for various adverse health effects [37]. Type of rewards include salary or wage, career promotion or job security, esteem or recognition [38]. Considering the economic challenges due to the COVID-19 pandemic,

receiving a reward at work that is perceived as appropriate can be severely threatened: Salaries might be reduced due to short-time work, career promotion may be scarce, and job security low, thereby potentially disturbing the balance of effort and reward at work. Research has shown that ERI is associated with psychological distress. Meta-analyses suggest a 1.5-fold increased risk of depressive disorders [39] and higher incidence of stress-related disorders among employees being subject to ERI [40]. During the pandemic, ERI has only been examined in individuals working in the health care sector, showing positive associations with depressive symptoms [41, 42].

Resilience

The COVID-19 pandemic imposed an immense stress load on parents. However, some mothers and fathers seem to be more affected by such an adverse life event than others. While some individuals develop psychological symptoms, others seem to be able to deal with additional or unpredicted stressors and adapt to changes without showing mental problems. An underlying factor trying to explain why some people seem to be “immune” to stress is individual psychological resilience [43, 44]. Although there is no universally accepted definition, in summary, resilience can be understood as the capacity to adapt to adverse environmental conditions, the ability to show adaptive behaviour in response to numerous stress factors, and to maintain or regain mental health despite significant adverse stressors [45, 46]. Previous findings did not only reveal a negative association of high resilience with symptoms of depression and anxiety [47], but also emphasized its buffering effect on the impact of stress on depressive symptoms [48, 49]. Recent studies conducted during the COVID-19 pandemic support the protective role of resilience reporting inverse correlations

with symptoms of depression as well as effects buffering the impact of stress [19, 50–52]. However, so far, little is known about the effect of resilience in working parents during the ongoing crisis and its influence on the association between psychosocial work stress and depressive symptoms.

Aims and objectives

To close these gaps, this study will (1) examine the association between psychosocial work stress (ERI and WPC) and depressive symptoms in working parents during the COVID-19 pandemic and (2) investigate the potential moderating effect of resilience upon the association between psychosocial work stress and depressive symptoms. This appears to be especially important if we not only consider the well-being of parents themselves but also expand our view to the negative impact of parental distress on children's well-being.

Methods

Participants and procedure

The present sample is part of the DREAM_{CORONA} study, an online sub-study of the large multi-method cohort Dresden Study on Parenting, Work, and Mental Health (DREAM; Dresdner Studie zu Elternschaft, Arbeit und Mentaler Gesundheit). The DREAM study investigates the interplay of parental roles, work participation, and health-related outcomes in (expectant) mothers and fathers [53]. In response to the outbreak of the pandemic, the DREAM_{CORONA} study was established as an addition to the regular assessments. The DREAM_{CORONA} sub-study investigates experiences of (expectant) parents during the COVID-19 pandemic (e.g., isolation, school, and daycare closures, working from home) and its impact on family health, role distributions, and relationships. Only participants of the general cohort of the DREAM study who completed follow-up questionnaires via an online version were eligible ($n = 1885$). 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. Invitations for the online survey were sent out via mail on May 12, 2020, followed by two reminders after three and 6 days, respectively. The survey was open to response until October 1, 2020, and included questions regarding socio-demographic data, COVID-19-specific questions, and several questionnaires regarding social, work, and health factors. Of all invited parents, $n = 1057$ gave consent to participate. To control for changes in political restrictions, participants who responded to the survey after June 5, 2020, were excluded for the current analyses as with June 6, 2020, new COVID-19 regulations came into effect.

Further exclusion criteria were not having children yet at the time of responding to the survey and no current employment. The following responses were accepted as being currently employed: working full-time, part-time, or in marginal employment, being in an irregular employment, in an apprenticeship, or doing a voluntary service. Being on employment ban was excluded as well as contradictory information such as working full-time and being on parental leave at the same time. In the last step, participants with incomplete data regarding either the beforementioned exclusion criteria or the outcome, i.e., depressive symptoms, were excluded (for flowchart see Additional file 1). Demographic information such as country of birth, education, and suffering from a lifetime history of depression were derived from data of the respective participant collected in previous assessments of the DREAM study.

Instruments

Psychosocial work stress

Psychosocial work stress was operationalized by assessing WPC and ERI. 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. WPC was assessed through the corresponding scale of the Copenhagen Psychosocial Questionnaire [54, 55]. The scale contains seven items, which are rated on a 5-point Likert scale ranging from 1 (*to a very low degree*) to 5 (*to a very large degree*). Scores were transformed to fit the range 0–100, with higher scores indicating a stronger interference of work with private life. With reference to Nübling and colleagues [55], missing values were replaced by the individual's mean if the participant responded to at least 50% of the items. The scale showed good internal consistency (Cronbach's $\alpha = .86$).

The Effort-Reward-Imbalance Questionnaire [56, 57] was used to assess ERI at work. The questionnaire consists of three subscales: *effort*, *reward*, and *overcommitment*. Regarding the present research question, we used a short version of the questionnaire [57], including the *effort* (three items) and *reward* (seven item) scales. All items were rated on a 4-point Likert scale with responses ranging from 1 (*totally agree*) to 4 (*totally disagree*). Sum scores for each scale were calculated, with higher scores reflecting higher effort and higher reward, respectively. Stress was operationalized by the relationship between effort and reward, the ERI ratio. To compute the ERI ratio, the *effort* sum score was divided by the *reward* sum score, multiplied by a factor to correct for the unequal number of items of the two scales [58]. A ratio below 1 indicates that the reward exceeds the effort while a ratio equal to 1 indicates a balance of effort and reward. Values

greater than 1 indicate an imbalance of high effort and low reward which is considered stressful [59]. To improve statistical power, we used the ERI ratio as a continuous variable in regression analyses, calculating the logarithm of the ERI ratio [59]. Compared to the raw ratio, the log-transformed ratio places the inverse imbalance of the same magnitude in the same distance from 1 [58, 60] and assigns a meaningful value to zero which is helpful for interpreting main effects in a moderated regression analysis. Any missing values regarding the effort scale led to exclusion of the participant for the analyses. Regarding the reward scale, missing values were replaced by the individual's mean if the participant replied to at least four of seven items. Both scales showed sufficient internal consistencies (Cronbach's $\alpha_{\text{effort}} = .66$, Cronbach's $\alpha_{\text{reward}} = .77$).

Resilience

The Connor-Davidson Resilience Scale (CD-RISC) [61] was used to assess individual resilience as the ability to cope with internal and external stressors. We used the short version consisting of ten items. Response categories range from 1 (*not true at all*) to 5 (*true nearly all of the time*), with higher scores indicating greater resilience. Missing values were replaced by the individual's mean if at least 80% of the items were answered. Participants were asked to refer their responses to the previous month. Internal consistency was good (Cronbach's $\alpha = .86$).

Depressive symptoms

Depressive symptoms were assessed using the Edinburgh Postnatal Depression Scale (EPDS) [62, 63]. Even though the questionnaire was designed to assess depressive symptoms in women during the perinatal period, it has been shown to be valid for the assessment in non-postnatal women and fathers as well [64–66]. The scale contains ten items with four response categories assessing the frequency of the described symptoms during the previous 7 days. The sum score of all items was calculated with higher scores of the EPDS indicating stronger depressive symptoms. For the sample description, the most common cut-off scores were used to distinguish between indication of the absence or low symptoms, respectively, (≤ 9), minor depression [10–12], and major depression (≥ 13) [62, 63]. Missing values were replaced by the individual's mean value to calculate the sum score if at least 80% of the items were answered. Reliability was good (Cronbach's $\alpha = .86$).

All measures rely on self-report. For all questionnaires, the corresponding validated German version was used.

Confounders

Based on prior evidence and significant correlations with the outcome, i.e., depressive symptoms, potential confounders were selected. Following these criteria, gender, number of working hours per week, and lifetime history of depression (LHD) were included as potential confounders in all regression analyses. LHD was assessed as a dichotomous variable, indicating whether participants had a LHD or not. The variable is based on participants' data from the general DREAM study.

Data analysis

First, scores for all scales were calculated and checked for outliers. Second, descriptive analyses of sociodemographic variables, selected confounders (gender, number of working hours per week, LHD), the predictors (WPC, ERI), moderator (resilience), and outcome (depressive symptoms) were carried out. To test for gender differences, t-tests for independent samples were computed for all. Third, Pearson correlational analyses were conducted to explore the associations of all included variables. Fourth, multiple linear regression models using forced entry were conducted to investigate the association between psychosocial work stress and depressive symptoms and the moderating role of resilience while controlling for the selected confounders. To make coefficients more interpretable, the values of the respective predictor and moderator were centered around their mean prior to analysis. WPC and ERI were tested in separate models to individually determine their association with the outcome and their interaction with resilience. The procedure of entering the variables in the regression models was identical for both measures of psychosocial work stress. In the first model, only potential confounders were included to examine their influence on the outcome. In the next step, the respective indicator of psychosocial work stress was added, followed by resilience and the interaction term (psychosocial work stress \times resilience) to examine moderation. Standard errors and 95% confidence intervals (CI) of B were based on bootstrapping with 1000 iterations. CI were bias corrected and accelerated. The level of significance was set to $p < .05$.

Before the final regression analysis, data were examined regarding extreme values and the main assumptions for linear regression according to Field [68] were checked. All analyses were carried out using IBM SPSS Statistics (Version 27.0). Due to missing data, n varied slightly between the different analyses.

Results

Sample characteristics

The final sample consisted of $n = 452$ parents (42.3% mothers, 57.7% fathers; Table 1). Mean age was

Table 1 Sample description

Sample characteristics	Mothers (n = 191)	Fathers (n = 261)	Total sample (n = 452)
Age	32.98 ± 4.06 (21–43)	34.56 ± 5.00 (24–55)	33.90 ± 4.69 (21–55)
Country of birth			
Germany	183 (96.3)	254 (98.1)	437 (97.3)
Other	7 (3.7)	5 (1.9)	12 (2.7)
Permanent relationship			
Yes	185 (96.9)	259 (99.2)	444 (98.2)
No	6 (3.1)	2 (0.8)	8 (1.8)
Children			
One	150 (78.5)	206 (78.9)	356 (78.8)
Two	39 (20.5)	45 (17.3)	84 (18.5)
Three or more	2 (1.0)	10 (3.8)	12 (2.7)
Educational level			
No university degree	56 (29.3)	81 (31.6)	137 (30.6)
University degree	135 (70.7)	175 (68.4)	310 (69.4)
Employment status^a			
Full-time employment	59 (30.9)	215 (82.4)	274 (60.6)
Part-time employment	123 (64.4)	42 (16.1)	165 (36.5)
Marginal employment	4 (2.1)	5 (1.9)	9 (2.0)
Irregular employment	5 (2.6)	4 (1.5)	9 (2.0)
Apprenticeship	5 (2.6)	2 (0.8)	7 (1.5)
Voluntary service	1 (0.5)	–	1 (0.2)
Working conditions			
Working hrs/w	28.27 ± 11.29 (2–60)	35.48 ± 12.33 (2–72)	32.44 ± 12.42 (2–72)
Short-time work (yes)	16 (8.4)	32 (12.3)	48 (10.6)
Home office (yes)	121 (63.4)	163 (62.5)	284 (62.8)
LHD			
Yes	26 (13.8)	31 (11.9)	57 (12.7)
No	162 (86.2)	229 (88.1)	391 (87.3)
WPC^b (0–100)	40.11 ± 22.69 (0–100)	36.71 ± 20.96 (0–100)	38.15 ± 21.75 (0–100)
ERI			
Effort scale (Range 1–12)	7.45 ± 2.21 (3–12)	7.79 ± 2.01 (3–12)	7.65 ± 2.10 (3–12)
Reward scale (Range 1–28)	19.36 ± 3.63 (10–28)	19.82 ± 3.48 (7–28)	19.63 ± 3.55 (7–28)
ERI ratio	0.95 ± 0.38 (0.26–2.00)	0.95 ± 0.35 (0.28–3.67)	0.95 ± 0.36 (0.26–3.67)
> 1	76 (40.4)	92 (35.5)	168 (37.6)
≤ 1	112 (59.6)	167 (64.5)	279 (62.4)
Resilience (Range 0–40)	25.41 ± 5.73 (9–39)	27.19 ± 5.35 (8–39)	26.44 ± 5.58 (8–39)
Depressive symptoms (Range 0–30)	7.03 ± 4.74 (0–22)	4.88 ± 4.49 (0–20)	5.79 ± 4.71 (0–22)
no/ low symptoms (≤ 9)	137 (71.7)	221 (84.7)	358 (79.2)
minor depression (10–12)	30 (15.7)	19 (7.3)	49 (10.8)
major depression (≥ 13)	24 (12.6)	21 (8.0)	45 (10.0)

Note. n (%) or M ± SD (Range)

hrs/w hours per week, LHD lifetime history of depression, WPC work-privacy conflict, ERI effort-reward imbalance

^a Multiple answers possible

^b Subscale of the Copenhagen Psychosocial Questionnaire

M = 33.90 years (SD = 4.69) and participants were between 21 and 55 years old. Most participants were born in Germany (96.7%), in a permanent relationship

(98.2%), and had one child (78.8%). With 68.6% of all participants holding a university degree, the sample consisted of women and men with a higher educational

level compared to the average population of Dresden [69]. Regarding current employment, 60.6% indicated to work full-time, and 36.5% were working part-time. The distribution of employment status between genders was not equal, as 82.4% (16.1%) of fathers were working full-time (part-time) compared to 30.9% (64.4%) of mothers, respectively. However, this distribution is representative for the general population in Germany [70]. Mean working hours per week were $M=35.77$ ($SD=10.85$), with mothers working significantly less hours per week than fathers ($M_{\text{mothers}}=31.50$, $M_{\text{fathers}}=38.89$; $t(450)=-6.392$, $p<.001$). Regarding changes due to the outbreak of the pandemic, 10.6% of the parents reported to be affected by working short-time, and 62.8% by working from home.

Regarding the variables assessing psychosocial work stress, mean score was $M=38.15$ ($SD=21.75$) for WPC, $M=7.65$ ($SD=2.10$) for the ERI effort scale, and $M=19.63$ ($SD=3.55$) for the ERI reward scale. Mean ERI ratio was $M=0.95$ ($SD=0.36$), with 37.2% of all parents showing a ratio greater than 1, indicating that the perceived effort spent exceeded the reward. There were no significant gender differences regarding any of the indicators of psychosocial work stress. Mean resilience score was $M=26.44$ ($SD=5.58$), with mothers showing a lower score than fathers ($M_{\text{mothers}}=25.41$, $M_{\text{fathers}}=27.19$; $t(426)=-3.293$, $p=.001$). The mean EPDS score was $M=5.79$ ($SD=4.71$) and 20.8% of participants had scores of at least 10, indicating at least a minor depression (Bergant et al., 1998; Cox et al., 1987). T-tests revealed that mothers had a significantly higher mean score than fathers ($M_{\text{mothers}}=7.03$, $M_{\text{fathers}}=4.88$; $t(450)=4.914$, $p<.001$) and a higher percentage of scores indicating minor or major depression ($M_{\text{mothers}}=0.283$, $M_{\text{fathers}}=0.153$; $t(450)=3.385$, $p=.001$). Of all parents, 12.6% reported a LHD.

Correlational analysis

Results of the correlational analyses examining associations between confounders, predictors, moderator, and outcome can be found in Table 2. All indicators of psychosocial work stress showed significant associations with depressive symptoms ($p<.001$): Depressive symptoms were positively associated with the WPC score ($r=.385$) as well as with the effort scale of the ERI ($r=.173$) and the ERI ratio ($r=.326$). The ERI reward scale showed a negative association with depressive symptoms ($r=-.338$). WPC and the ERI ratio showed a moderate association ($r=.458$). Resilience showed significant negative associations with WPC, the ERI ratio, and depressive symptoms.

Regression and moderation analysis

Work-privacy conflict

Detailed results of all models of the regression analyses including WPC are displayed in the supplement (see Supplementary Table 1, Additional file 2). Introducing only the confounders gender, working hours per week, and LHD in the first model explained 7.3% of the variance in depressive symptoms. Adding WPC as a predictor significantly improved R^2 ($\Delta R^2=.132$, $F_{1, 417}=69.022$, $p<.001$), as well as did adding resilience ($\Delta R^2=.142$, $F_{1, 416}=91.540$, $p<.001$) in the next step. In the last model including the interaction term, both WPC ($\beta=0.336$, $p<.001$) and resilience ($\beta=-0.397$, $p<.001$) remained significant predictors of depressive symptoms (Table 3), indicating that both a higher WPC and lower resilience are associated with stronger depressive symptoms. However, this model did not show any additional explanatory value ($\Delta R^2=.003$, $F_{1, 415}=1.137$, $p=.167$) and the interaction term did not become significant ($\beta=0.055$, $p=.167$). Only gender was a significant confounder in

Table 2 Pearson correlation matrix including predictors, confounders, moderator, and outcome

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Gender	-								
2. Working hrs/w	.287***	-							
3. LHD	-.028	-.068	-						
4. WPC ^a	-.077	.029	.072	-					
5. ERI effort	.080	.193***	.050	.455***	-				
6. ERI reward	.065	.119*	-.105*	-.238***	-.165***	-			
7. ERI ratio	.012	.052	.088	.458***	.798***	-.650***	-		
8. Resilience	.158**	.075	-.219***	-.100*	-.098*	.225***	-.184***	-	
9. Depressive symptoms	-.226***	-.157**	.177***	.385***	.173***	-.338***	.326***	-.459***	-

Note. Sample size for analyses varied due to missing values of respective variables

hrs/w hours per week, LHD lifetime history of depression, WPC work-privacy conflict, ERI effort-reward imbalance

^a Subscale of the Copenhagen Psychosocial Questionnaire

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

the last model ($\beta = -0.089, p = .034$). The final model accounted for 35.1% of variance in depressive symptoms.

Effort-reward imbalance

Detailed results of all models of the regression analysis including the ERI ratio are displayed in the supplement (see Supplementary Table 2, Additional file 2). The confounders entered in the first model explained 7.6% of the variance in depressive symptoms. Adding the log-transformed ERI ratio as a predictor significantly improved R^2 ($\Delta R^2 = 0.097, F_{1, 414} = 48.644, p < .001$), as well as did adding resilience in the next step ($\Delta R^2 = 0.125, F_{1, 413} = 73.713, p < .001$). In the last model including the interaction term (Table 3), both the ERI ratio ($\beta = 0.254, p < .001$) and resilience ($\beta = -0.371, p < .001$) remained significant predictors of depressive symptoms. The interaction term became significant as well ($\beta = -0.101, p = .018$), however, the bias corrected and accelerated 95% CI for B was $[-0.418, 0.005]$ including zero. The final model explained 30.8% of variance in depressive symptoms ($\Delta R^2 = 0.010, F_{1, 414} = 5.668, p = .018$), with gender ($\beta = -0.117, p = .007$) as well as working hours per week ($\beta = -0.092, p = .031$) both being significant confounders.

Post-hoc analysis

To further investigate the moderating role of resilience on the relationship between the ERI ratio and depressive symptoms, a simple slope analysis was conducted using the SPSS tool PROCESS [67] (Fig. 2). The unstandardized simple slope for a mean resilience score was $B = 3.041$ (95% CI $[2.627, 5.703], t = 5.328, p < .001$). If the resilience score was 1 SD below and 1 SD above the mean of resilience, the unstandardized slope was $B = 4.165$ (95% CI $[2.016, 4.067], t = 5.830, p < .001$) and $B = 1.917$ (95% CI $[0.7073, 3.1272], t = 3.115, p = .002$), respectively.

Discussion

The aim of this study was to examine the association between psychosocial work stress and depressive symptoms in working parents during the COVID-19 pandemic on the one hand and to investigate whether this relationship was moderated by resilience on the other hand. Previous studies have found that work-related factors can be risk factors for parents' mental health in general [14, 71]. The current study provides a more differentiated insight into the nature of possible work-related risk factors as specifically WPC and ERI were investigated as indicators

Table 3 Multiple linear regression of depressive symptoms on indicators of psychosocial work stress (WPC, ERI), resilience, and their interaction, controlled for potential confounders

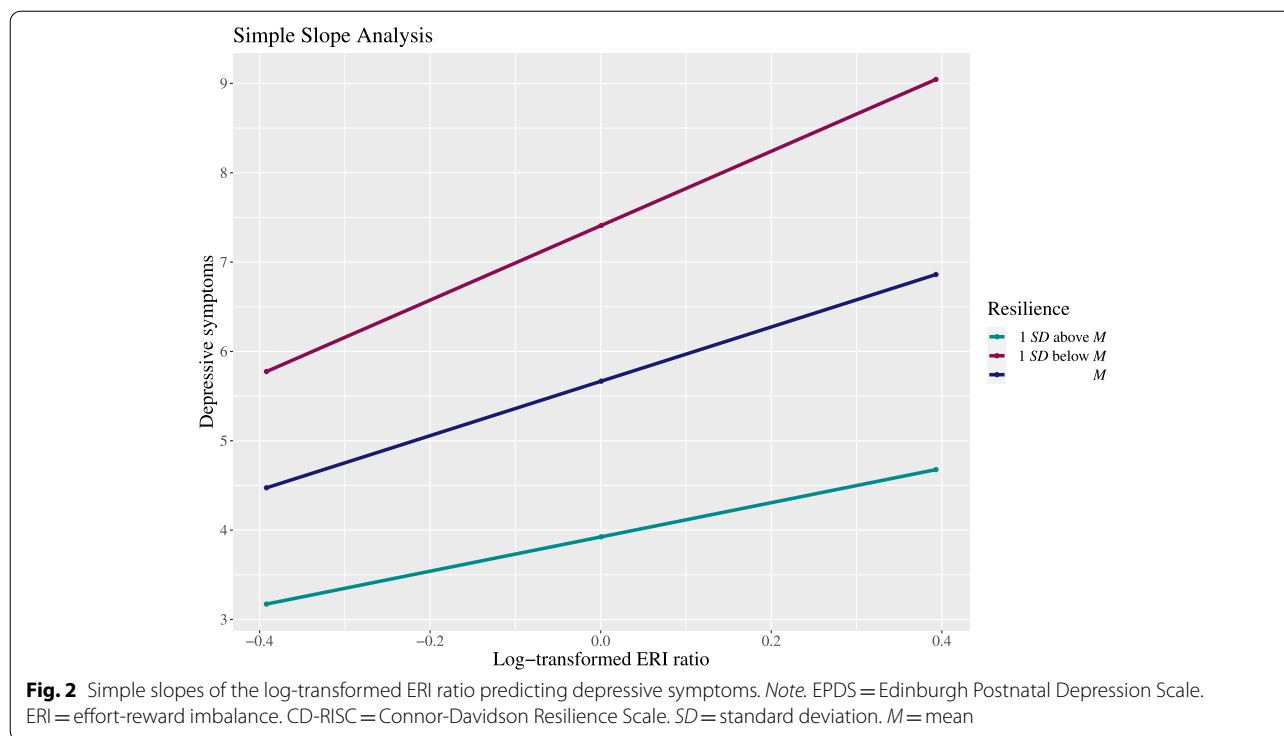
	B	SE B	β	95% CI		p	R ²
				upper	lower		
Model including WPC							.351
Constant	7.183	0.610		6.019	8.495	.000	
Gender	-0.841	0.394	-0.089	-1.551	-0.180	.034	
Working hrs/ week	-0.030	0.016	-0.079	-0.062	0.003	.056	
LHD	0.804	0.684	0.058	-0.506	2.156	.155	
WPC ^{a,b}	0.073	0.010	0.336	0.053	0.092	.000	
Resilience ^b	-0.334	0.042	-0.397	-0.412	-0.246	.000	
WPC ^{a,b} x resilience ^b	0.002	0.002	0.055	-0.001	0.006	.167	
Model including ERI ratio							.308
Constant	7.373	0.618		6.083	8.673	.000	
Gender	-1.118	0.400	-0.117	-1.961	-0.319	.007	
Working hrs/ week	-0.036	0.017	-0.092	-0.068	-0.004	.031	
LHD	0.872	0.683	0.063	-0.518	2.218	.139	
ERI ratio ^b	3.041	0.552	0.254	1.918	4.104	.000	
Resilience ^b	-0.315	0.039	-0.371	-0.391	-0.230	.000	
ERI ratio ^b x resilience ^b	-0.203	0.102	-0.101	-0.418	0.005	.018	

Note. Standard errors of B and 95% bias corrected and accelerated confidence intervals are based on 1000 bootstrap samples.

WPC work-privacy conflict, LHD lifetime history of depression, ERI effort-reward imbalance.

^a Subscale of the Copenhagen Psychosocial Questionnaire

^b Mean-centered



of psychosocial work stress. Beyond that, the potential protective role of individual resilience was examined.

Analyses revealed that higher WPC may be associated with more depressive symptoms in working parents during the COVID-19 pandemic. The potential of WPC as a risk factor is in line with previous findings from pre-pandemic studies [34, 36, 72]. To our knowledge, no other study has investigated this association in a sample of working parents during the pandemic so far, but a few studies found results supporting the relevance of WPC regarding mental health: López and colleagues [73] found WPC to be a significant predictor of depression in the general population while Meyer and colleagues [18] identified WPC to be associated with exhaustion in a sample of employees. These findings support the assumption that especially during the pandemic, interference of work with private life needs to be considered as a risk factor for mental health. With the majority of parents in our study being required to work from home as a consequence of the pandemic, integrating work at home is likely to cause blurry boundaries between family and work context, requiring several role transitions within one day and increasing the risk for experiencing a conflict between the two domains during the pandemic [74].

Regarding the buffering role of resilience on the association between WPC and depressive symptoms, our hypothesis could not be confirmed. High resilience did not weaken the association between WPC and depressive

symptoms. This could be due to different reasons. First, resilience can be seen as a process of adaptation [75, 76], therefore requiring time. Hence, our results might not have revealed a buffering effect of resilience on the association between WPC and depressive symptoms because the process of adaptation had still been ongoing. The COVID-19 pandemic represents a novel situation in which aspects such as the time it takes to adapt to the drastic changes working parents were confronted with, still need to be explored. Therefore, longitudinal studies with assessments at a later stage should further investigate the moderating role of resilience, which had not yet unfolded at the time of the first DREAM_{CORONA} assessment. Second, this study only investigated resilience at an individual level. Resilience however can be context-dependent [77], and WPC clearly involves the context of one's family and workplace. Therefore, other protective resilience factors like family resilience [78] or social support provided by supervisors, colleagues, spouses, or family [79, 80] might be more crucial in this context than individual resilience. Third, there are different conceptual models of resilience, elaborating the way resilience might affect mental health and well-being [81]. In the compensatory model, resilience can exert its influence as a promoting factor, counteracting the exposure to risk by directly affecting the outcome [77, 81, 82]. In the protective factor model, resilience is assumed to moderate the effect of a present risk on the outcome [77, 81,

82]. The latter mechanism was investigated in the present study. However, as resilience can be context-dependent [77], WPC might represent a situation in which resilience rather relates to mental health as a promoting factor as suggested in the compensatory model, thereby counteracting the negative association between WPC and mental health. This would be in line with our findings as higher individual resilience was strongly associated with lower depressive symptoms when WPC was included in the regression model as well.

As hypothesized, ERI also showed a significant association with depressive symptoms in working parents during the pandemic, which is in line with results of pre-pandemic studies [39, 83, 84]. Findings with reference to the pandemic are limited. However, Magnavita and colleagues [85] reported a similar association of the ERI ratio with depressive symptoms in a sample of employees. As elaborated above, according to the ERI model [38], effort refers to meeting obligations and demands while rewards can either be received as financial rewards (e.g., salary), status-related rewards (e.g., career promotion or job security), or social-emotional reward (e.g., esteem or recognition). In the context of the pandemic, adaptation to changes in demands and obligations at work due to political restrictions might be perceived as high effort spent on work (e.g., demands regarding sudden adjustments to working from home if no adequate infrastructure was in place yet). Employees were required to adapt to new technologies and ways to collaborate and were forced to limit personal contact with co-workers. At the same time receiving a reward might have been scarce: The economic crisis might threaten job security or promotion while limited personal contact and face-to-face interaction might diminish possibilities to receive acknowledgment of one's work by co-workers or supervisors [2, 4, 86].

Regarding the buffering effect of individual resilience on the association between ERI and depressive symptoms, a significant moderation was found. The simple slope analysis illustrates the effect (Fig. 2), suggesting that in working mothers and fathers with greater individual resilience the negative association between ERI and depressive symptoms might be weaker than in those parents with lower individual resilience. However, the effect was only marginally significant, and the bias corrected and accelerated bootstrap confidence interval included zero, suggesting non-significance. Therefore, this result needs to be interpreted with caution. So far, no study has investigated the buffering effect of resilience on the relationship of ERI and depressive symptoms, neither before nor after the outbreak of the pandemic. However, Havnen and colleagues [50] reported that resilience moderated the effect of exposure to perceived stress on depressive symptoms during the COVID-19 pandemic, which supports the tendency of our findings.

Apart from the presence of psychosocial work stress in parents during the pandemic, the observed prevalence of depressive symptoms in our sample raises concerns. Overall, the sample showed a high prevalence of EPDS scores indicating minor or major depression (20.8%). This is in line with other studies conducted during the pandemic, which indicated both an elevation in maternal depression [15] as well as an elevation in self-reported depressive symptoms in a sample of the general population [87]. Moreover, increased clinically significant levels of mental distress [17] and a lower well-being of parents, especially of parents living with younger children and of women were reported [88]. The latter finding supports the observed gender differences regarding depressive symptoms in our study as mothers had a higher mean of depressive symptoms compared to fathers. This difference is common in data independent of the pandemic situation, as women have a higher risk of suffering from depression in their lifetime [89]. Hence, it is not surprising that gender was a significant confounder in all regression analyses. Along with gender differences regarding depressive symptoms, we also found significant gender differences regarding resilience, with fathers showing greater resilience compared to mothers. This is in line with the finding that greater resilience showed a strong negative association with depressive symptoms. No gender differences were found for indicators of psychosocial work stress.

Regarding the other control variables LHD and working hours per week, only the latter was a significant confounder in the final model investigating the association between ERI and depressive symptoms. This result indicates that working more hours was related to less depressive symptoms which is in line with findings of Witteveen and Velthorst [90]. They reported that a sudden decreased workload during the pandemic was associated with greater feelings of depression as compared to workers whose workload remained stable [90]. This effect could be explained by a decrease of workload being accompanied by financial strains or short-time work, thereby eliciting stress, which in turn might affect feelings of depression. Furthermore, being forced to work less hours might threaten one's daily structure or routine, which could normally benefit mental health [91]. However, as our cross-sectional design does not allow conclusions regarding causality, the observed association might as well suggest that better mental health enables employees to work longer hours.

Strengths and limitations

To the best of our knowledge, this study was the first to examine the association between specific psychosocial work factors and depressive symptoms in working

parents during the COVID-19 pandemic and to investigate the buffering effect of individual resilience on this association. This was possible both for mothers and fathers. In addition, participants had at least one young child aged 0 to 34 months offering valuable insights into the mental health of parents of young children. The DREAM_{CORONA} study is part of a prospective longitudinal cohort study [53] and therefore allows to build on the present findings in future assessments. As the dynamic of the pandemic required a quick response to grasp the ongoing processes during the pandemic, cross-sectional data of the first assessment were analysed as a start in order to gain a first understanding. As another major strength, our study contributes to a more comprehensive picture of potential factors promoting mental health. This is particularly valuable considering the concept of positive psychology and the importance of strengthening psychological resources in order to prevent mental disorders in the first place [92, 93].

At the same time, there are some limitations to be considered when interpreting the present results. First, the characteristics of the study sample prevent us from transferring the results to working parents in general. Our sample consisted of highly educated mothers and fathers, which is not representative for the general population. However, this is not unusual for epidemiological studies [94] and there was no significant association of parental education with the outcome, i.e., depressive symptoms, in our sample. Moreover, almost all participants were in a permanent relationship, and most of them had only one child. Therefore, psychosocial work stress, resilience, and depressive symptoms might be different in single parents or those with more children. Second, the data of the present sample of the DREAM_{CORONA} study were derived from a cross-sectional assessment and did not include a pre-pandemic baseline. Therefore, no causal interpretations can be made whether any values of our research variables have increased or decreased compared to the time prior to the outbreak. However, pre-pandemic depression prevalences in different subsamples from the general DREAM study give reason to assume that depressive symptoms are elevated during the pandemic [95–97]. Third, as the pandemic is a highly dynamic process with permanent changes regarding political restrictions and work, social, and family life, the findings of the present study explicitly refer to early stages of the pandemic, assessed from May to June 2020. This implicates that a comparison with studies conducted under non-pandemic circumstances is limited. Fourth, by calculating a ratio of effort and reward, a linear association between effort and reward is assumed thereby reducing complexity. However, this might not reflect the whole nature of this association which might only be partially linear as a

comparatively higher amount of perceived effort may be required for an increase of the perceived reward or vice versa at a certain point. Fifth, data were based on self-report only and therefore might be susceptible to biases such as social desirability. However, we only used validated instruments, which are widely used in research.

Implications and future research

Our findings have two major implications. First, as both ERI and WPC were associated with poorer mental health, measures are needed to decrease psychosocial work stress. Second, given the potential of individual resilience to buffer the association between psychosocial work stress and depressive symptoms on the one hand and to directly benefit mental health on the other hand, resilience needs to be fostered. Decreasing psychosocial work stress could be achieved by fostering family-friendly organizational conditions (e.g., supportive organizational climate, flexitime, or other arrangements to autonomously manage work demands), which have been shown to diminish WPC [98]. Apart from structural measures, individuals themselves should be supported to cope with WPC, e.g., through enhancing to manage boundaries between work and family as low boundary management has been shown to be associated with higher WPC [99]. Identifying ways to increase rewards at work during the pandemic could reduce the imbalance of effort and reward. A possible measure which might enhance rewards like job security or recognition could be establishing an adjusted organizational communication, which transmits transparency about the pandemic dynamic, actively involves the employees, and strengthens a feeling of belonging [100]. Moreover, receiving higher rewards might be a protective factor itself, as higher compared to lower perceived reward is associated with a lower risk for depression [84]. In order to foster resilience, health insurances as well as employers should provide targeted resilience trainings as interventions have been proven to effectively increase resilience both in general and in contexts of occupational stress [101–103]. Recalling the role of parents' mental health in family stress models, reducing psychosocial work stress and strengthening resilience appear even more important in order to prevent the negative effects of poor mental health of parents on both parenting and children's well-being.

Regarding future research, studies should investigate the potential protective role of resilience at a later stage of the pandemic to examine whether its buffering effect unfolds more strikingly after a longer period of adjustment. In addition, longitudinal studies are needed to draw conclusions regarding the predictive value of WPC, ERI, and resilience on depressive symptoms in working parents. Beyond that, the investigation of potential protective factors buffering

the effect of psychosocial work stress should be broadened, particularly with regard to other potential resilience factors, which might be associated with WPC (e.g., family resilience, social support at home or at work). In addition, positive effects of restrictions due to the pandemic (e.g., no commuting to work, spouses being able to mutually support each other at home) should be investigated.

Conclusions

The findings of the present study advance the current knowledge about the mental health status of working parents during the COVID-19 pandemic and potential risk and protective factors. Higher psychosocial work stress was significantly associated with more depressive symptoms, while greater resilience was associated with less depressive symptoms. Beyond that, the findings of the present study partially support the protective role of resilience buffering the association between psychosocial stress and mental health. Our findings highlight the importance to reduce psychosocial work stress and to foster resilience in order to promote mental health in working parents during the pandemic and thereby ultimately benefiting the mental health of the entire family.

Abbreviations

CI: confidence interval; CD-RISC: Connor-Davidson Resilience Scale; DREAM: Dresden Study on Parenting, Work, and Mental Health ("DResdner Studie zu Elternschaft, Arbeit und Mentaler Gesundheit"); EPDS: Edinburgh Postnatal Depression Scale; ERl: effort-reward imbalance; LHD: lifetime history of depression; WHO: World Health Organization; WPC: work-privacy conflict.

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12889-022-14582-y>.

Additional file 1. Flowchart of participation rate and exclusion criteria resulting in final sample. The flowchart illustrates the stepwise applied exclusion criteria (no consent, response outside the given time frame, not having children yet, and no current employment, incomplete data).

Additional file 2. Full results of multiple regression analysis. The included tables (Supplementary Table 1 and 2) show the full results of the multiple regression analysis of depressive symptoms on psychosocial work stress, resilience, and their interaction, while controlling for potential confounders.

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Authors' contributions

This study was conceived, research questions developed, and the conceptual model created by SB and SGN. SB performed the literature search. JM, VW, and MK supported the conduction of the study, JM and MK prepared

the data for statistical analyses. SB performed the statistical analyses and drafted the initial manuscript. Data were interpreted by SB, JM, VW, MK, SSS, and SGN. VW and MK 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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Availability of data and materials

The dataset analysed 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.

Declarations

Ethics approval and consent to participate

The study was approved by the Ethics Committee of the Faculty of Medicine of the Technische Universität Dresden (No: EK 278062015) and all procedures were performed according to the Declaration of Helsinki. Participants were informed about the purpose and procedure of the study, the pseudonymization of their data, and their right to withdraw from the study at any time. All participants provided written informed consent.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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