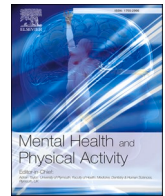




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## Physical activity moderates the association between parenting stress and quality of life in working mothers during the COVID-19 pandemic

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### ABSTRACT

**Statement of problem:** Working mothers are a population experiencing heightened levels of parenting stress during the COVID-19 pandemic. The purpose of the current study was to evaluate the associations between parenting stress, quality of life, and physical activity in a national sample of working mothers who endorsed having been forced to work from home full-time due to the COVID-19 pandemic and examine if physical activity moderates the association between parenting stress and quality of life in this sample of working mothers.

**Methods:** Participants in this cross-sectional study were 200 full-time working mothers from the United States (mean age = 33.50 years; SD = 6.25; 70.0% White). Participants were recruited from a Qualtrics research panel and completed the International Physical Activity Questionnaire Short-Form, the World Health Organization Quality of Life Scale-Brief Version, the Parental Stress Scale, and a demographic questionnaire.

**Results:** After controlling for socio-demographic variables (i.e., maternal marital status, annual income, maternal highest level of education), greater parenting stress was associated with poorer maternal quality of life across domains (standardized beta coefficients ranged from  $-0.26$  to  $-0.47$ ;  $p < .001$ ). The interaction between parenting stress and moderate intensity physical activity was associated with social relationships quality of life and environment quality of life (standardized beta coefficients ranged from  $0.15$  to  $0.17$ ;  $p < .05$ ) in our sample of working mothers. The negative effect of parenting stress on maternal social relationships and environmental quality of life was weaker for working mothers who engaged in higher levels of moderate intensity physical activity.

**Conclusions:** Our findings suggest that moderate intensity physical activity may attenuate the negative impact of parenting stress on social relationships and satisfaction with one's environment in working mothers during the COVID-19 pandemic.

On March 19, 2020 the Coronavirus Disease 2019 (COVID-19) was declared a pandemic, resulting in most states issuing "shelter in place" orders, which forced many non-essential workers to work remotely from home and schools and daycares to close. These changes have placed increased demands on parents, particularly working mothers, who make-up 71.5% of mothers in the United States with at least one child under 18 years (United States Department of Labor, 2019), and tend to take on a disproportionate percentage of household labor, including child rearing, compared to their male partners (Chesley & Flood, 2017; Craig & Powell, 2018). During the COVID-19 pandemic, many working mothers have been faced with trying to balance the responsibilities of working from home, being the primary caregiver of infants and toddlers who are typically in daycare, homeschooling school-aged children, and taking care of the daily needs of their families. The balancing of

competing work and family responsibilities can be associated with elevated levels of stress in working mothers (Bekker et al., 2000; Zhou et al., 2018), including increased parenting stress (i.e., stress related to managing the demands of parenting; Abidin, 1992; Forgays, 2001).

Higher levels of parenting stress are associated with diminished quality of life in parents (Dardas & Ahmad, 2015; Johnson et al., 2011; Lee et al., 2009; Pisula & Porebowicz-Dorsmann, 2017). This is noteworthy since parental quality of life is closely related to child well-being and development (Eiser et al., 2005; Lee et al., 2009), as well as family functioning (Pisula et al., 2017). Interventions aimed at addressing parenting stress have largely focused on empowerment and parental skills development (Golfenshtein et al., 2016). While these interventions have been efficacious in producing short-term reductions in parenting stress and related outcomes, overall they have failed to lead to long-term

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reductions in parenting stress (Golfenshtein et al., 2016). As such, there is a need to identify mechanisms that lessen the negative impact of parenting stress on parental quality of life.

Physical activity has been identified as one mechanism that mitigates the negative impact of stress on well-being and psychological functioning (Brand et al., 2019; Ludyga et al., 2020; Sadeghi et al., 2020). Physical activity attenuates the association between occupational stress and burnout (Gerber et al., 2020) and promotes emotional recovery from stressors (Bernstein & McNally, 2017, 2018). While physical activity is associated with lower levels of general perceived stress (Brockmann et al., 2020; Ge et al., 2020), no studies to date have specifically examined whether physical activity attenuates the association between parenting stress and quality of life in working mothers, a population that is experiencing heightened levels of parenting stress during the COVID-19 pandemic. The purpose of the current study was to 1) evaluate the associations between parenting stress, quality of life, and physical activity in a national sample of working mothers who have transitioned to working from home due to the COVID-19 pandemic, and 2) examine if physical activity moderates the association between parenting stress and quality of life in this sample of working mothers. Based on the extant literature described above, we hypothesized that higher levels of parenting stress and lower levels of moderate and vigorous intensity physical activity would be associated with lower levels of quality of life. We also predicted that the negative effect of parenting stress on quality of life would be weaker for working mothers who engaged in higher levels of moderate and vigorous intensity physical activity.

## 1. Methods

### 1.1. Participants

Two-hundred women made up the study sample. To be eligible to participate in this study, an individual had to be a woman 18 years or older with at least one child 5-years-old or younger who lives with them at least 50% of the time. Consistent with the Internal Revenue Service's (IRS) definition of full-time work (Internal Revenue Service, 2020), mothers also had to work a minimum of 30 h per week and had to endorse that they normally work outside of their home but have been forced to work from home full-time due to COVID-19. The rationale for restricting the sample to mothers with at least one child 5-years-old or younger was that younger children necessitate more direct supervision; therefore, it was expected that working from home would be especially stressful for this population of mothers. Mothers who were not literate in English and were not from the United States were excluded from the study.

### 1.2. Measures

**Physical Activity.** Self-reported physical activity was assessed using the International Physical Activity Questionnaire-Short Form (IPAQ, 2002). Participants reported on the number of days and minutes/hours per day over the last 7 days that they engaged in walking, moderate intensity physical activity (e.g., carrying light loads, bicycling at a regular pace, or doubles tennis), and vigorous intensity physical activity (e.g., heavy lifting, digging, aerobics, or fast bicycling). Utilizing the IPAQ scoring guidelines, Metabolic Equivalent for Task (MET) scores were computed for walking, moderate intensity physical activity, and vigorous intensity physical activity. Higher MET scores are indicative of greater levels of physical activity in each domain. The MET scores for moderate intensity physical activity and vigorous intensity physical activity were used in the current study.

**Quality of Life.** The World Health Organization Quality of Life Scale -Brief Version (WHOQOL-BREF) was used to evaluate quality of life in the present study (De Girolamo et al., 2000). This is a 26-item measure that includes 2 questions related to overall quality of life and general

health and assesses 4 domains of functioning: Physical health (7 items; e.g., To what extent do you feel that physical pain prevents you from doing what you need to do, How much do you need any medical treatment to function in your daily life, Do you have enough energy for everyday life), Psychological health (6 items; e.g., Are you able to accept your bodily appearance, How well are you able to concentrate, How often do you have negative feelings such as blue mood, despair, anxiety, depression), Social relationships (3 items; e.g., How satisfied are you with your personal relationships, How satisfied are you with your sex life, How satisfied are you with the support you get from friends), and Environmental health (8 items; e.g., How safe do you feel in your daily life, How healthy is your physical environment, How satisfied are you with the conditions of your living place, How satisfied are you with access to health services). Participants were asked to rate each item as it pertained to them in the last 7 days on a 5-point Likert scale, which varied depending on the domain assessed. Higher scores represent better quality of life on the WHOQOL-BREF. The Cronbach's alphas for the Physical health, Psychological health, Social relationships, and Environmental health scores ranged from 0.71 to 0.79 in the current study.

**Parenting Stress.** The Parental Stress Scale (PSS) was utilized to measure perceived levels of parenting stress over the last 7 days (Berry & Jones, 1995; Zelman & Ferro, 2018). This is an 18-item measure that taps into the impact of children on the parental role (e.g., caring for my children sometimes takes more time and energy than I have to give, having children leaves little time and flexibility in my life, it is difficult to balance different responsibilities because of my children). Participants responded on a 5-point Likert scale that ranged from 1 (strongly disagree) to 5 (strongly agree). A total parenting stress score was computed in the present study, ranging from 18 to 90, with higher scores representing greater levels of parenting stress. The Cronbach's alpha for the total parenting stress score in the current study was 0.89.

**Demographic Information.** Participants completed a demographic questionnaire that assessed the following information: maternal age, number of children 18 years and younger, ages of children, maternal race/ethnicity, maternal singular annual income, overall household annual income, maternal marital status, maternal highest level of education, height, and weight. Body Mass Index. Body Mass Index was computed by dividing weight in kilograms (kg) divided by height in meters (m) squared. Body Mass Index below 18.5 kg/m<sup>2</sup> was categorized as underweight, 18.5–24.9 kg/m<sup>2</sup> was categorized as healthy weight, 25–29.9 kg/m<sup>2</sup> was categorized as overweight, and 30 kg/m<sup>2</sup> or greater was categorized as obese (Centers for Disease Control and Prevention, 2020).

### 1.3. Procedures

Participants were recruited between April 6th and April 13th, 2020. Recruitment was facilitated through Qualtrics online panels. Specifically, Qualtrics panels has a pre-arranged pool of individuals who have agreed to be contacted to respond to surveys. An email was sent by Qualtrics panels to a pool of potential participants asking them to complete a set of screening questions to assess their eligibility for the research study. As noted above, the inclusion criteria for the present study were being a woman 18 years or older with at least one child 5-years-old or younger who lives with them at least 50% of the time, working a minimum of 30 h per week, and endorsing they normally work outside of their home but have been forced to work from home full-time due to COVID-19. Mothers who were not literate in English and were not from the United States were excluded from the study. Based on responses to the screening questions, potential participants were either exited from the survey or provided with a short description of the study and given the choice to move forward with the online consent form that provided more detailed information about the study. Potential participants who wanted to continue with the study were asked to read the consent form and provide their consent to participate in the study by checking a box on the screen. Study questionnaires were then completed

by participants online through Qualtrics. Approximately 10 days after completing the questionnaires online, participants received compensation between \$1.50 and \$2.00 from Qualtrics online panels. These study procedures were approved by the Institutional Review Board at the authors' university.

#### 1.4. Statistical analysis

All statistical analyses were conducted using SPSS Version 26 and a *p* value less than 0.05 was considered statistically significant. Pearson's Product Moment Correlations were computed between the Parental Stress Scale Total Score, International Physical Activity Questionnaire Vigorous and Moderate Intensity Metabolic Equivalent for Task Scores, World Health Organization Quality of Life Scale Physical Health, Psychological Health, Social Relationships Health, and Environment Health Scores, and socio-demographic characteristics.

Multiple linear regression analysis was conducted. In order to determine the necessary sample size for the regression analysis, formula  $50 + 8K$ , where *K* represents the number of predictors in each model, was used. A minimum sample size of 98 mothers was needed based on this formula  $[50 + (8)(6)]$ . For the first 4 models, Physical Health, Psychological, Social Relationships, and Environment Quality of Life Scores were the outcomes. Each model utilized hierarchical entry with socio-demographic characteristics (i.e., maternal marital status, annual income, maternal highest level of education) entered in block 1 as control variables. In block 2, the Parental Stress Scale Total Score and International Physical Activity Questionnaire Moderate Intensity Metabolic Equivalent for Task Score were entered. The interaction term between the Parental Stress Scale Total Score and International Physical Activity Questionnaire Moderate Intensity Metabolic Equivalent for Task Score was entered in block 3 to assess if it incremented the prediction of maternal quality of life. The last 4 multiple linear regression models were identical to the first 4 with the exception that in block 2 the International Physical Activity Questionnaire Vigorous Intensity Metabolic Equivalent for Task Score was entered. The interaction term between the Parental Stress Scale Total Score and International Physical Activity Questionnaire Vigorous Intensity Metabolic Equivalent for Task Score was entered in block 3.

## 2. Results

### 2.1. Sample characteristics

The socio-demographic characteristics of the 200 working mothers in our sample are presented in Table 1. The mean age of the sample was 33.50 years (*SD* = 6.25; Range = 19–60 years). On average, mothers in the sample had 1.72 children (*SD* = 1.25; Range = 1–10) living in their home who were 18 years or younger. Most working mothers were married (75%) and identified as White (70%). With regard to highest level of education, 80.5% of working mothers had obtained a minimum of a 4-year college degree. Approximately 80% of mothers reported that the daycare or school of their child (ren) 5 years or younger had closed due to COVID-19 and 94% indicated that they were the primary person in their home responsible for caring for their child or children during the COVID-19 pandemic. The majority of mothers (61.5%) reported a minimum overall annual household income of at least \$75,000 per year.

### 2.2. Bivariate correlations

Table 2 presents intercorrelations among the Parental Stress Scale Total Score, International Physical Activity Questionnaire Vigorous and Moderate Intensity Metabolic Equivalent for Task Scores, World Health Organization Quality of Life Scale Physical Health, Psychological Health, Social Relationships Health, and Environment Health Scores, and socio-demographic characteristics. Greater levels of parenting stress were associated with lower physical health quality of life, lower

**Table 1**  
Demographic variables for the sample.

Characteristic	<i>N</i> or Mean	% or <i>SD</i>	Range
Age	33.5	6.25	19–60
Number of Children 18 Years and Younger at Home	1.72	1.25	1–10
Maternal Marital Status			
Married	150	75	–
Divorced	7	3.5	–
Single	37	18.5	–
Separated	3	1.5	–
Widowed	3	1.5	–
Body Mass Index			
Underweight	10	5.0	–
Healthy	91	45.5	–
Overweight	46	23.0	–
Obese	50	25.0	–
Missing	3	1.5	–
Daycare or school of child 5 years or younger closed due to COVID-19			
Yes	156	78.0	–
No	44	22.0	–
Mother identifies as the person in the home primarily responsible for caring for the child or children during COVID-19 pandemic			
Yes	188	94.0	–
No	12	6.0	–
Maternal Highest Level of Education			
High School Degree	11	5.5	–
Some College	28	14.0	–
4-year College Degree	88	44.0	–
Master's Degree	61	30.5	–
Doctorate Degree	12	6.0	–
Maternal Race/Ethnicity			
White	140	70.0	–
Black	12	6.0	–
Hispanic	22	11.0	–
Asian	23	11.5	–
Other	3	1.5	–
Maternal Singular Annual Income			
Under \$10,000	1	.5	–
\$10,000 to \$19,999	5	2.5	–
\$20,000 to \$39,999	38	19.0	–
\$40,000 to \$74,999	95	47.5	–
\$75,000 to \$150,000	53	26.5	–
More than \$150,000	8	4.0	–
Combined Annual Income			
\$10,000 to \$19,999	4	2.0	–
\$20,000 to \$39,999	16	8.0	–
\$40,000 to \$74,999	45	22.5	–
\$75,000 to \$150,000	84	42.0	–
More than \$150,000	39	19.5	–
Missing	12	6.0	–

psychological quality of life, lower social relationships quality of life, and lower environment quality of life. Higher levels of vigorous intensity and moderate intensity physical activity were associated with better social relationships quality of life. Higher educational status and being married were associated with better social relationships quality of life. Higher levels of moderate intensity physical activity were associated with lower physical health quality of life.

### 2.3. Multiple linear regression analysis

Tables 3 and 4 present significant and non-significant standardized beta coefficients for the models for which the primary outcomes were Physical, Psychological, Social Relationships, and Environment Quality of Life Scores. After controlling for socio-demographic variables (i.e., maternal marital status, annual income, maternal highest level of education), parenting stress was associated with all maternal quality of life domains. The interaction between parenting stress and moderate intensity physical activity was associated with social relationships quality of life (Table 3) in that the negative effect of parenting stress on maternal social relationships quality of life was weaker for working mothers who

**Table 2**  
Bivariate correlations.

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Parenting Stress	1	-.42***	-.28***	-.21**	-.19**	.09	.05	.08	.17*	.20**	.08	.01	-.05	.11	-.08
Physical Health Quality of Life	-.42***	1	.61***	.40***	.60***	-.08	-.20**	-.03	.11	.07	.10	.01	.08	-.09	.04
Psychological Quality of Life	-.28***	.61***	1	.56***	.61***	.13	.04	.06	.03	.05	.05	.01	.09	.06	.00
Social Relationships Quality of Life	-.21**	.40***	.56***	1	.49***	.29***	.17*	.06	.16*	.21**	.02	.02	.11	-.04	-.06
Environment Quality of Life	-.19**	.60***	.61***	.49***	1	.11	.09	.00	.20**	.12	.21**	.03	.10	-.06	.05
Physical Activity Vigorous Intensity	.09	-.08	.13	.29***	.11	1	.56***	.11	.00	-.02	-.01	-.12	-.11	.20**	.01
Physical Activity Moderate Intensity	.05	-.20**	.04	.17*	.09	.56***	1	.12	.06	.07	.01	-.05	-.01	.12	.09

Note: 1 = Parenting Stress; 2 = Physical Health Quality of Life; 3 = Psychological Quality of Life; 4 = Social Relationships Quality of Life; 5 = Environment Quality of Life; 6 = Physical Activity Vigorous Intensity; 7 = Physical Activity Moderate Intensity; 8 = Number of Children 18 years and younger; 9 = Maternal Highest Level of Education; 10 = † Marital Status; 11 = Combined Annual Income; 12 = † Race/Ethnicity; 13 = Maternal Age; 14 = Daycare closed during COVID-19; 15 = Primary caregiver of child(ren) during COVID-19; \*Significant at  $p < .05$  level; \*\*Significant at  $p < .01$  level; \*\*\* Significant at  $p < .001$  level. †race/ethnicity was coded as 0 = Non – White and 1 = White. †marital status was coded as 0 = Non – Married and 1 = Married.

**Table 3**  
Multiple linear regression analysis: IPAQ moderate intensity physical activity moderation.

Predictors	Physical Health Quality of Life	Psychological Quality of Life	Social Relationships Quality of Life	Environment Quality of Life
<i>Block 1</i>				
R <sup>2</sup>	.01	.00	.06	.05
Maternal Annual Income	.07	.05	-.04	.13
Maternal Highest Education	.13	.02	.13	.14
†Marital Status	.12	.10	.22**	.09
<i>Block 2</i>				
R <sup>2</sup> Δ	.25***	.10***	.10***	.07**
Parenting Stress	-.47***	-.32***	-.30***	-.27***
Moderate Intensity Physical Activity	-.20**	.05	.17*	.08
<i>Block 3</i>				
R <sup>2</sup> Δ	.01	.01	.03**	.02*
Parenting Stress X Moderate Intensity Physical Activity Cumulative R <sup>2</sup>	.09	.11	.17**	.15*

Note: Betas presented are standardized betas for the full model. \*\*\*Significant at  $p < .001$  level.  
\*\* Significant at  $p < .01$  level; \* Significant at  $p < .05$  level; † marital status was coded as 0 = not married, 1 = married.

engaged in higher levels of moderate intensity physical activity (Fig. 1). Similarly, the interaction between parenting stress and moderate intensity physical activity was associated with environment quality of life (Table 3) in that the negative effect of parenting stress on maternal environment quality of life was weaker for working mothers who engaged in higher levels of moderate intensity physical activity (Fig. 2).

**3. Discussion**

The purpose of the current study was to evaluate the associations between parenting stress, quality of life, and physical activity in a national sample of working mothers who have transitioned to working

**Table 4**  
Multiple linear regression analysis: IPAQ vigorous intensity physical activity moderation.

Predictors	Physical Health Quality of Life	Psychological Quality of Life	Social Relationships Quality of Life	Environment Quality of Life
<i>Block 1</i>				
R <sup>2</sup>	.01	.00	.06	.05
Maternal Annual Income	.05	.02	-.10	.11
Maternal Highest Education	.13	.04	.17*	.16*
†Marital Status	.11	.10	.24**	.10
<i>Block 2</i>				
R <sup>2</sup> Δ	.21***	.12***	.18***	.08***
Parenting Stress	-.45***	-.34***	-.31***	-.26***
Vigorous Intensity Physical Activity	-.04	.16*	.34***	.12
<i>Block 3</i>				
R <sup>2</sup> Δ	.01	.00	.00	.00
Parenting Stress X Vigorous Intensity Physical Activity Cumulative R <sup>2</sup>	-.07	.06	.02	.01

Note: Betas presented are standardized betas for the full model. \*\*\*Significant at  $p < .001$  level.  
\*\* Significant at  $p < .01$  level; \* Significant at  $p < .05$  level; † marital status was coded as 0 = not married, 1 = married.

from home due to the COVID-19 pandemic and examine if physical activity moderates the association between parenting stress and quality of life in this sample of working mothers. Similar to previous research (Dardas et al., 2015; Johnson et al., 2011; Lee et al., 2009; Pisula et al., 2017), we found that increased parenting stress was associated with lower parental quality of life. The associations between parenting stress and physical health, psychological, social relationships, and environment quality of life remained statistically significant after controlling for socio-demographic variables (i.e., maternal marital status, annual income, maternal highest level of education).

Our findings highlighting the importance of identifying mechanisms that mitigate the negative impact of parenting stress on quality of life in working mothers, a population that is experiencing heightened levels of

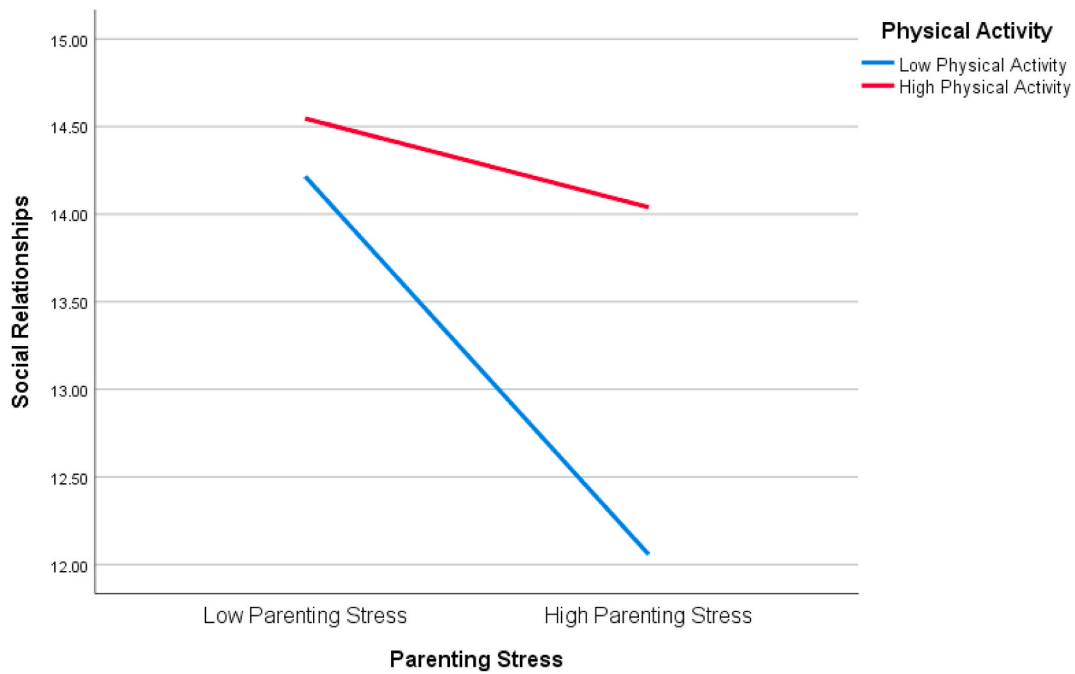


Fig. 1. The interaction term between parenting stress and moderate intensity physical activity associated with social relationships quality of life.

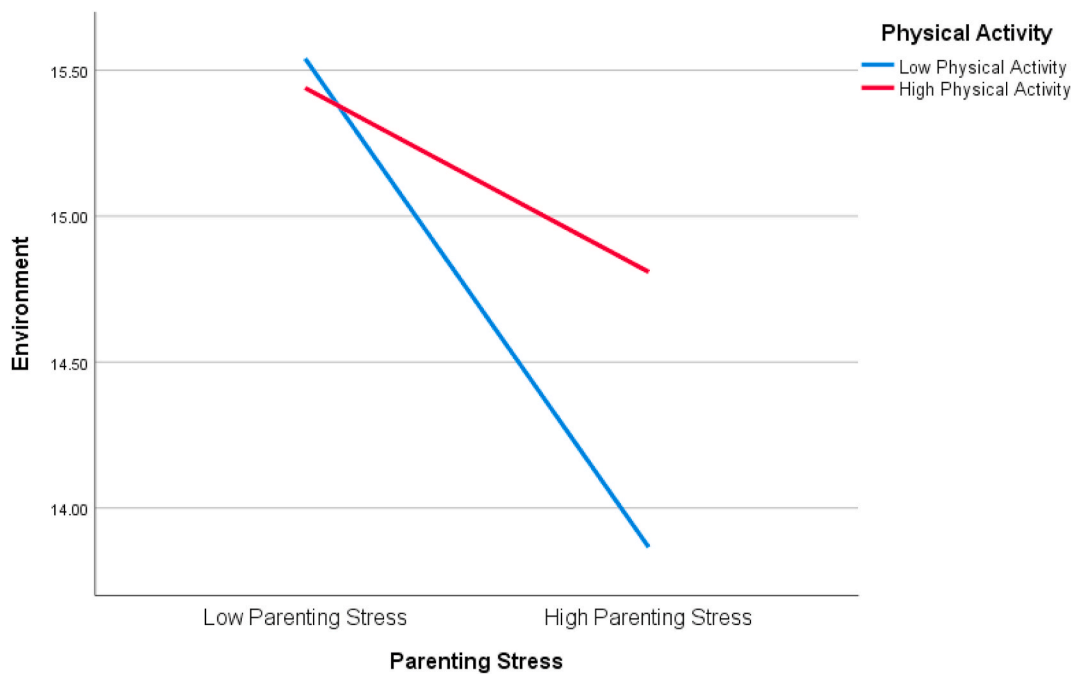


Fig. 2. The interaction term between parenting stress and moderate intensity physical activity associated with environment quality of life.

parenting stress during the COVID-19 pandemic. Although the present study is cross-sectional and causation can't be inferred, the results from the multiple linear regression analysis suggest that moderate intensity physical activity may be one mechanism that attenuates the association between parenting stress and diminished social relationships quality of life. Our finding suggests that encouraging more moderate intensity physical activity among working mothers may lessen the adverse impact of parenting stress on perceived social support, personal relationships, and sexual activity. This finding may be especially important for working mothers during the COVID-19 pandemic as individuals are experiencing heightened feelings of isolation and loneliness. While our

study did not specifically assess the types of moderate intensity physical activity mothers engaged in, it may be beneficial for future research to assess if different types of moderate intensity physical activity differentially impact the association between parenting stress and social relationships quality of life. Encouraging working mothers to engage in a regular exercise routine with their partner or peers is one method that may facilitate meeting recommended guidelines for moderate intensity physical activity (Mailey et al., 2014).

We also found that moderate intensity physical activity attenuated the association between parenting stress and diminished environment quality of life. Thus, when working mothers in our sample engaged in



greater levels of moderate intensity physical activity, the negative impact of parenting stress on satisfaction with the conditions of one's environment was less. This is noteworthy since "shelter in place" orders during the COVID-19 pandemic have required many people to spend a substantial amount of time in their home environment. Increased feelings of satisfaction with the conditions of one's living environment has the potential to impact family relationships and perceptions of work productivity and job satisfaction among mothers who have been forced to work home full-time. It will be valuable for future research to evaluate whether environment quality of life impacts work-related constructs like work productivity and job satisfaction in mothers who are employed from home full-time during the COVID-19 pandemic.

In the current study, the bivariate correlations between moderate and vigorous intensity physical activity and physical health quality of life indicated that higher levels of moderate and vigorous intensity physical activity were associated with decreased physical health quality of life in working mothers. These findings were not consistent with our study hypotheses. One possible explanation for these findings is the measure of quality of life we used that included items such as sore muscles, more difficulty getting around, and fatigue for the physical health domain. When working mothers did participate in moderate and vigorous intensity physical activity in the previous 7 days, it is possible it was associated with sore muscles, more difficulty getting around, and fatigue. It will be important for future studies to examine the associations between moderate and strenuous intensity physical activity and physical quality of life in working mothers using other validated measures of quality of life or health-related quality of life (e.g., SF-36). While we did not assess for barriers to moderate and vigorous intensity physical activity in our sample of working mothers, it could be useful for future research to specifically evaluate barriers and facilitators of this type of physical activity in this population during a pandemic. Guilt, scheduling constraints, a lack of support, work responsibilities, and family responsibilities have been identified as important physical activity barriers for working mothers (Mailey et al., 2014).

The current study had some limitations. As noted previously, due to the cross-sectional design, causation can't be inferred. Future longitudinal studies are needed to assess the temporal associations between parenting stress and quality of life in working mothers. Our sample of working mothers was predominantly white, married, and most had obtained at least a 4-year college degree. Consequently, our findings may not be generalizable to working mothers as a whole, particularly those who are divorced, racial/ethnic minorities, and with a lower educational attainment. We did not have information about how long working mothers had been working from home or the specific types of physical activities they were engaging in. Our sample was recruited via an online data collection platform (Qualtrics panels). While this data collection platform allowed us to reach mothers working from home during the height of the COVID-19 pandemic, and participants completed screening questions to determine study eligibility, it was not possible to objectively confirm that all participants met the study inclusion criteria. Finally, while the International Physical Activity Questionnaire-Short Form is a widely used and validated measure of physical activity, self-reported physical activity levels may have been affected by recall bias and reported inaccurately.

In summary, we found parenting stress was associated with physical, psychological, social relationships, and environment quality of life in our sample of working mothers who endorsed working from home full-time due to the COVID-19 pandemic. The interaction between parenting stress and moderate intensity physical activity was associated with maternal social relationships quality of life and environment quality of life. These findings indicate that moderate intensity physical activity may attenuate the negative impact of parenting stress on social relationships and satisfaction with one's environment in working mothers during the COVID-19 pandemic.

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## Declaration of competing interest

No conflicts of interest declared.

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