

Physical activity in working mothers: Running low impacts quality of life

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Abstract

Objectives: The transition to motherhood is associated with declines in physical activity in women. Working mothers may be particularly at-risk for low levels of physical activity, since they have to balance the competing interests of work and family life, and exercise often takes a backseat to more seemingly pressing concerns. The potential benefits working mothers can experience from physical activity are numerous. The objectives of this study were to evaluate the percentage of working mothers from the United States who met the World Health Organization's and the American College of Sports Medicine's recommended guidelines for weekly physical activity and investigate the associations between physical activity, quality of life, and self-rated work productivity in this sample of working mothers.

Methods: Participants were 334 working mothers from the United States (mean age = 35.00 years; standard deviation (SD) = 5.85; 77.8% White) recruited from a Qualtrics research panel. To be eligible to participate in the study, a woman had to be 18 years or older with at least one child aged 5 years or younger, work at least 30 h per week at a job, live with her child(ren) at least 50% of the time, and have a minimum of a bachelor's degree. Participants completed the Godin leisure time exercise questionnaire, the World Health Organization—five well-being index, a single-item indicator of self-rated work productivity, and a demographic questionnaire.

Results: Of the working mothers in the sample, 45.5% met the recommended guidelines of at least 150 min of moderate exercise in the past week. Approximately 39% of working mothers reported engaging in no 30-min bouts of strenuous exercise in the past week. Non-white working mothers, working mothers with a higher singular annual income, and working mothers who obtained a higher educational level were more likely to meet the recommended guidelines for physical activity in the past week. Meeting the recommended physical activity guidelines in the past week was associated with better quality of life ($r=0.39$; $p<0.001$) and self-rated work productivity ($r=0.13$; $p<0.05$). Only the association between physical activity and quality of life remained significant in a multivariate analysis (standardized beta coefficient = 0.33; $p<0.001$) after controlling for race/ethnicity, maternal singular annual income, and maternal highest level of education.

Conclusion: Our findings highlight that working mothers in the United States are a group at risk for low levels of physical activity. Given the great benefits that these women do experience as a function of getting exercise, it is critically important we pay more attention to how individual, organizational, and societal-level interventions might assist them in attaining target levels of physical activity.

Keywords

physical activity, quality of life, self-rated work productivity, working mothers

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Introduction

For many women, the transition to motherhood is marked by numerous stressors including role changes,¹ social isolation,² variations in sleep patterns,³ and post-partum depression.⁴ The transition to motherhood is also associated with declines in physical activity in women.^{5,6} Clearly, physicians restrict

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new mothers from vigorous exercising in the first 6–8 weeks after giving birth, but thereafter, exercise typically becomes a very healthy and recommended outlet for women. Despite expressing a desire to be more physically active,⁷ women with children report lower levels of physical activity than women without children.⁸ In one study of women aged 28–35 years,⁹ number of children accounted for a significant amount of variance in women's perceptions of their barriers to physical activity. Working mothers, who comprise 71.5% of mothers in the United States with at least one child under 18 years,¹⁰ may be particularly at-risk for low levels of physical activity since they have to balance the competing interests of work and family life.^{11,12} Constraints on scheduling, guilt, an absence of support, work responsibilities, and family commitments have been identified as key barriers to physical activity in working mothers.¹³

The potential benefits working mothers can experience from physical activity are numerous. Not only is physical activity associated with a decreased risk for physical health problems such as cardiovascular disease, cancer, diabetes, and hypertension,¹⁴ it helps many mothers cope with the challenges of motherhood, restores some important focus on the self, and allows mothers an important respite to the stresses of work and/or family.¹⁵ Mothers who engage in physical activity report less psychological stress related to being a mother^{16,17} and feel more able to cope with the demands of motherhood.^{18–20} Quality of life, which refers to the subjective well-being of an individual, has been increasingly recognized as an important outcome for population health monitoring.^{21,22} One study with mothers of preschool children in Croatia found small, statistically significant correlations between physical activity during free time and quality of life.²³ However, the mothers in this sample were both working and stay-at-home mothers. To the best of our knowledge, no studies to date have specifically examined the associations between physical activity and quality of life in a sample of working mothers from the United States, despite these mothers being identified as a population at-risk for low levels of physical activity.¹²

In addition to the physical and psychological health benefits of physical activity, numerous studies have demonstrated higher levels of physical activity are associated with greater self-rated work productivity.^{24–28} One study conducted across dental health care workplaces in Sweden found that employees who were randomized to an intervention that involved removing 2.5 h of a 40-h work week and having them engage in physical exercise during that time off led to greater self-rated productivity, increased quantity of work, and work-ability relative to a control condition that simply involved removing 2.5 h of a 40-h work week.²⁸ Similarly, Sjøgaard et al.²⁹ found health care employees in Denmark who were randomized to a physical activity program that involved approximately 1 h per week of supervised exercise during work hours resulted in a significant increase in self-rated occupational

productivity after 3 months.²⁹ The existing studies have been conducted primarily with male employees or a combination of male and female employees not knowing whether the female employees were mothers or not. Consequently, there is a need to better understand the associations between physical activity and self-rated work productivity in working mothers. This information could be used in the development of workplace supported programs aimed at increasing physical activity levels among working mothers.

Given the paucity of research examining physical activity, quality of life, and self-rated work productivity in working mothers in the United States, the objectives of this study were to (1) evaluate the percentage of working mothers from the United States who met the World Health Organization's and the American College of Sports Medicine's recommended guidelines for weekly physical activity and (2) investigate the associations between physical activity, quality of life, and self-rated work productivity in this sample of working mothers. Based on the extant literature,^{11,12} we hypothesized that less than 50% of working mothers would meet the recommended guidelines for weekly physical activity. We also predicted there would be positive, statistically significant associations between physical activity and quality of life²³ and physical activity and self-rated work productivity in working mothers.^{28,29}

Methods

Participants

The sample was comprised of 334 women from the United States. To be eligible to participate in the study, women had to be 18 years or older with at least one child aged 5 years or younger who lives with them at least 50% of the time. The decision to restrict our sample in this way was based on data that suggest mothers of younger children who require more direct supervision for extended periods of time experience more barriers to physical activity due to a lack of childcare.¹³ Mothers also had to work at least 30 h per week in their job, which is consistent with what the Internal Revenue Service (IRS) in the United States considers full-time work.³⁰ In order to have a more homogeneous sample and based on data that indicate level of education differentially affects health behaviors, including physical activity,^{31,32} we limited our sample to working mothers who obtained a bachelor's degree or higher. Table 1 provides descriptive statistics for the sample. The mean age of the sample was 35.00 years (SD=5.85). Participants ranged in age from 18 to 50 years. On average, mothers in the sample had 1.90 children (SD=0.87; range=1–5) living in their home who were 18 years or younger. Most participants were married (87.4%) and identified as White (77.8%). While all mothers had earned at least a 4-year

Table 1. Demographic variables and descriptive statistics for the sample.

Characteristic	N or mean	% or SD	Range
Age	35.00	5.85	18–50
Number of children 18 years and younger at home	1.90	0.87	1–5
Number of children 5 years and younger at home	1.33	0.54	1–3
Maternal marital status			
Married	292	87.4	–
Divorced	10	3.0	–
Single	29	8.7	–
Separated	2	0.6	–
Widowed	1	0.3	–
Body mass index			
Underweight	8	2.4	–
Healthy	109	32.7	–
Overweight	102	30.5	–
Obese	108	32.3	–
Missing	7	2.1	–
Maternal highest level of education			
Four-year college degree	198	59.3	–
Master’s degree	107	32.0	–
Doctorate degree	29	8.7	–
Maternal race/ethnicity			
White	260	77.8	–
Black	37	11.1	–
Hispanic	18	5.4	–
Asian	15	4.5	–
Other	4	1.2	–
Maternal singular annual income			
\$19,999 and under	7	2.1	–
\$20,000–\$39,999	35	10.5	–
\$40,000–\$74,999	134	40.1	–
\$75,000–\$150,000	143	42.8	–
More than \$150,000	15	4.5	–
Combined annual income			
\$19,999 and under	2	0.6	–
\$20,000–\$39,999	11	3.3	–
\$40,000–\$74,999	85	25.4	–
\$75,000–\$150,000	190	56.9	–
More than \$150,000	43	12.9	–
Missing	3	0.9	–
Measure			
Godin leisure time exercise questionnaire number of 30-min bouts of moderate exercise in past week			
0	93	27.8	–
1	39	11.7	–
2	68	20.4	–
3	51	15.3	–
4	31	9.3	–
5	22	6.6	–
6 or more	30	8.9	–
Godin leisure time exercise questionnaire number of 30-min bouts of strenuous exercise in past week			
0	129	38.6	–

(Continued)

Table 1. (Continued)

Characteristic	N or mean	% or SD	Range
1	29	8.7	–
2	36	10.8	–
3	52	15.6	–
4	31	9.3	–
5	28	8.4	–
6 or more	25	7.5	–
Godin leisure time exercise questionnaire			
Met World Health Organization’s recommendation	152	45.5	–
Did not meet World Health Organization’s recommendation	182	54.5	–
World Health Organization—five well-being index total score	56.06	21.81	4–100
How productive do you feel you have been in your job in the past week			
Not at all	3	0.9	–
Not very much	12	3.6	–
A little	11	3.3	–
Moderately	44	13.2	–
A fair amount	80	24.0	–
Very much	121	36.2	–
Exceedingly so	63	18.9	–

SD: standard deviation

college degree, 32.0% had also obtained a master’s degree and 8.7% had also earned a doctorate degree. The majority of mothers (56.8%) reported an overall annual household income between \$75,000 and \$150,000 per year. With regard to body mass index (BMI), 32.7% of mothers in the sample fell within the healthy range, 30.5% fell within the overweight range, and 32.3% fell within the obese range.

Measures

Physical activity. Participants completed a modified version of the Godin leisure time exercise questionnaire.^{33,34} They were asked in the last 7-day period how many times on average did they do the following kinds of exercise for 30 min or more: Strenuous exercise (heart beats rapidly; e.g. running, jogging, hockey, football, soccer, squash, basketball, cross-country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling), Moderate exercise (not exhausting; e.g. fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing), and mild/light exercise (minimal effort; e.g. yoga, archery, fishing from river bank, bowling, horseshoes, golf, snow-mobilizing, easy walking). Responses to the moderate and strenuous exercise questions were summed together in this study to determine if working mothers met the World Health

Organization's and the American College of Sports Medicine's recommendation that adults engage in at least 150 min of moderate-intensity aerobic exercise per week.^{35,36} Consistent with the study by Jung and Brawley,³⁴ respondents were specifically asked to report on 30-min or more bouts of exercise since the American College of Sports Medicine recommends 150 min of moderate-intensity aerobic exercise per week be met through 30–60 min bouts of moderate-intensity exercise.³⁶

Quality of life. Participants completed the World Health Organization—five well-being index.^{37,38} This measure was developed from the World Health Organization—ten well-being index and is comprised of five items: “I have felt cheerful and in good spirits,” “I have felt calm and relaxed,” “I have felt active and vigorous,” “I woke up feeling fresh and rested,” and “My daily life has been filled with things that interest me.” Participants were asked to rate the extent to which these positive feelings were present during the past week using a six-point Likert-type scale ranging from “not present” to “constantly present.” In this study, the five items were summed to create an overall raw score, which was then multiplied by 4 to produce a quality of life summary score ranging from 0 to 100, with higher scores representing better quality of life.

Self-rated work productivity. Participants were asked, “how productive do you feel you have been in your job in the past week?” A seven-point Likert-type scale ranging from “not at all” to “exceedingly so” was utilized. This single-item indicator of self-rated work productivity was adapted from the Lam employment absence and productivity scale.³⁹

Demographic information. A demographic questionnaire was completed by participants to obtain the following information: maternal age, number of children 18 years and younger, number of children 5 years and younger, maternal race/ethnicity, maternal singular annual income, overall household annual income, maternal marital status, and maternal highest level of education. Mothers were also asked to report on their height and weight in order to calculate BMI. BMI was calculated by taking dividing weight in kilograms (kg) divided by height in square meters (m²). Participants with a BMI below 18.5 kg/m² were classified as underweight, 18.5–24.9 kg/m² were classified as healthy weight, 25–29.9 kg/m² were classified as overweight, and 30 kg/m² or greater were classified as obese.⁴⁰

Procedures

Participants in this cross-sectional study were recruited from a Qualtrics research panel. Through Internet advertising, potential research participants from the United States were invited by Qualtrics to submit an initial registration

form and answer a standardized set of questions to develop their profile. These profiles were used by Qualtrics to identify individuals who potentially meet inclusion criteria for research studies. As noted previously, inclusion criteria for this study was being a woman aged 18 years or older with at least one child aged 5 years or younger, working at least 30 h per week in a job, living with their child(ren) at least 50% of the time, and obtaining a minimum of a bachelor's degree. An email was sent by Qualtrics to a panel of women from the United States who met this inclusion criteria (based on their profiles) inviting them to participate in the study. Potential participants were initially provided with brief study information and then given the option to continue to the online consent form that contained detailed study information. Potential participants were instructed to review the consent form and indicate their consent to participate in the study by checking a box on the form. Participants then completed the study questionnaires online via Qualtrics. Compensation valued between \$1.50 and \$2.00 was provided to participants by Qualtrics 10–20 days after completion of the surveys, or once the participant met a certain threshold from participation in multiple studies. The study procedures were approved by the university's Institutional Review Board.

Statistical analysis

Statistical analyses were conducted using IBM Statistical Package for the Social Sciences, Version 25. The formula $50 + 8K$, where K represents the number of predictors in the regression analysis, was used to determine the necessary sample size. Based on this formula ($50 + (8)(4)$), it was determined that a minimum sample size of 82 mothers would be needed for this study. The sample collected for this study was comprised of 339 working mothers, which exceeded the minimum sample size requirement. Missing data were examined using Little's test; data that were missing at random were imputed using expectation-maximization (EM). Five cases were deleted listwise and excluded from the final statistical analysis because the data were not missing at random or contained outliers, resulting in a final sample of 334 working mothers. The percentage of mothers who met the physical activity recommendation of at least 150 min of moderate-intensity aerobic exercise per week was determined by dividing the number of working mothers who endorsed at least 5, 30-min bouts of moderate or strenuous exercise during the past week by the total number of working mothers. Chi-square and independent samples t-tests were run to determine if there were demographic differences between working mothers who met the 150-min physical activity recommendation in the previous week and those who did not.

Pearson correlations were computed to examine the associations between meeting the physical activity recommendation of at least 150 min of moderate-intensity aerobic

Table 2. Bivariate correlations.

Variables	1	2	3	4	5	6	7	8	9	10	11	12
Godin leisure time exercise	1	0.39***	0.13*	-0.02	-0.10	0.17**	0.02	0.19**	0.02	-0.15**	-0.10	-0.07
World Health Organization—five well-being index total score	0.39***	1	0.39***	-0.07	-0.09	0.12*	-0.01	0.25**	0.11	-0.13*	-0.04	-0.16**
Self-rated work productivity	0.13*	0.39***	1	0.04	0.02	0.15**	0.01	0.24***	0.10	0.13*	-0.05	-0.01

1: Godin leisure time exercise; 2: World Health Organization—five well-being index total score; 3: self-rated work productivity; 4: number of children 18 years and younger; 5: number of children 5 years and younger; 6: maternal highest level of education; 7: marital status; 8: maternal singular annual income; 9: combined annual income; 10: †race/ethnicity; 11: age; 12: BMI categories.

*Significant at $p < 0.05$ level; ** $p < 0.01$ level; *** $p < 0.001$ level.

†Race/ethnicity was coded as 0 = non-White and 1 = White.

exercise per week, quality of life, and work productivity. Pearson correlations were classified as small (0.10–0.29), medium (0.30–0.49), and large (>0.50).

Hierarchical multiple linear regression analysis was used to examine multivariate associations between physical activity and quality of life. The World Health Organization—five well-being index total score was the criterion variables in the first regression model. Socio-demographic variables (maternal singular annual income, highest level of education, and race/ethnicity) were entered into Block 1 as control variables. Race/ethnicity was coded as 0 = Non-White and 1 = White for the purposes of this analysis. In Block 2, a dichotomous variable that indicated whether a working mother met the physical activity recommendation of at least 150 min of moderate-intensity aerobic exercise in the past week or not was entered to determine if it incremented the prediction of quality of life. Polynomial logistic regression analysis was used to examine the multivariate associations between physical activity and self-rated work productivity while accounting for socio-demographic variables. While the self-rated work productivity item had seven response choices, for the purposes of the polynomial logistic regression analysis, the response choices were collapsed into three categories (not at all, not very much, a little = 0, moderately, a fair amount = 1, and very much, exceedingly so = 2). The collapsing of response choices was done because there were not enough participants in each cell to run the analysis with the original seven response choices. Similar to the first regression model, maternal singular annual income, highest level of education, and race/ethnicity were entered into Block 1 as control variables. The dichotomous variable that indicated whether a working mother met the physical activity recommendation of at least 150 min of moderate-intensity aerobic exercise in the past week or not was entered in Block 2.

Results

Table 1 contains descriptive statistics for the study variables. Of the 334 working mothers in the sample, 45.5% met recommended guidelines for physical activity in the

past week. Approximately 39% of working mothers reported engaging in no 30-min bouts of strenuous exercise in the past week and 28% of working mothers reported engaging in no 30-min bouts of moderate exercise in the past week. According to Chi-square tests, race/ethnicity, maternal singular annual income, and maternal highest level of education were significantly associated with meeting the recommendation for physical activity. Specifically, non-white working mothers, working mothers with a higher singular annual income, and working mothers who obtained a higher educational level were more likely to meet the physical activity recommendation of at least 150 min of moderate-intensity aerobic exercise in the past week.

Table 2 presents Pearson correlations between the study variables and demographic characteristics. There was a statistically significant positive, medium-range correlation between the World Health Organization—five well-being index total score and the dichotomous variable that indicated whether a working mother met the recommendation of at least 150 min of moderate-intensity aerobic exercise in the past week or not ($r = 0.39$; $p < 0.001$). There was a statistically significant positive, small-range correlation between the self-rated work productivity item and the dichotomous variable that indicated whether a working mother met the physical activity recommendation of at least 150 min of moderate-intensity aerobic exercise in the past week or not ($r = 0.13$; $p < 0.05$).

Race/ethnicity ($r = -0.15$; $p < 0.01$), maternal singular annual income ($r = 0.19$; $p < 0.01$), and maternal highest level of education ($r = 0.17$; $p < 0.01$) were significantly associated with meeting the physical activity recommendation of at least 150 min of moderate-intensity aerobic exercise in the past week. In addition, race/ethnicity ($r = -0.13$; $p < 0.05$), maternal singular annual income ($r = 0.25$; $p < 0.001$), and maternal highest level of education ($r = 0.13$; $p < 0.05$) were significantly associated with the five well-being index total score. And finally, race/ethnicity ($r = 0.13$; $p < 0.05$), maternal singular annual income ($r = 0.24$; $p < 0.001$), and maternal highest level of education ($r = 0.15$; $p < 0.01$) were significantly associated with the self-rated work productivity item. BMI was associated

Table 3. Multiple linear regression analysis.

Predictors	World Health Organization—five well-being index total score
Block 1	
R^2	0.09
Maternal singular annual income	0.19***
Maternal highest education	0.02
Race/ethnicity [†]	-0.12*
Block 2	
$R^2\Delta$	0.11***
Godin leisure time exercise dichotomized	0.33***
Cumulative R^2	0.20

Betas presented are standardized betas for the full model. When the Godin leisure time exercise variable is entered as a continuous variable in the regression analysis, the results are consistent with the findings for when the Godin leisure time exercise variable is entered as a dichotomous variable.

*Significant at $p < 0.05$ level; *** $p < 0.001$ level.

[†]Race/ethnicity was coded as 0 = non-White and 1 = White.

with the World Health Organization—five well-being index total score ($r = -0.16$; $p < 0.001$) in that being in an elevated BMI range was associated with lower quality of life. All of these correlations were in the small range.

Table 3 presents both significant and non-significant standardized beta coefficients (e.g. the value of the beta when all predictors were included) for the hierarchical multiple linear regression analysis. After controlling for demographic variables (e.g. maternal singular annual income, highest level of education, race/ethnicity), the dichotomous variable that indicated whether a working mother met the physical activity recommendation of at least 150 min of moderate-intensity aerobic exercise in the past week or not significantly correlated with the World Health Organization—five well-being index total score (standardized beta coefficient = 0.33; $p < 0.001$). The addition of the dichotomous variable that indicated whether a working mother met the physical activity recommendation in the past week or not in Block 2 significantly incremented the prediction of quality of life in the final adjusted model ($R^2 \Delta = 0.11$; $p < 0.001$).

Tables 4 and 5 present the odds ratios and 95% confidence intervals for the polynomial logistic regression analysis for which the primary outcome variable was self-rated work productivity. Meeting the physical activity recommendation in the past week was not significantly associated with self-rated work productivity after controlling for maternal singular annual income, highest level of education, and race/ethnicity.

Discussion/conclusion

The objectives of this study were to evaluate the percentage of working mothers from the United States who met

Table 4. Polynomial logistic regression analysis: self-rated work productivity primary outcome.

Predictors	Odds ratio	95% confidence interval
Maternal singular annual income	0.67**	0.51–0.87
Maternal highest education	0.84	0.45–1.57
Race/ethnicity [†]	0.35*	0.14–0.88
Godin leisure time exercise dichotomized	1.85	0.74–4.64

In this table, working mothers who reported being not at all, not very much, or a little productive in work in the last week are being compared to the referent group of working mothers who reported being very much or exceedingly productive in work in the last week. When the Godin leisure time exercise variable is entered as a continuous variable in the regression analysis, the results are consistent with the findings for when the Godin leisure time exercise variable is entered as a dichotomous variable.

*Significant at $p < 0.05$ level; ** $p < 0.01$ level.

[†]Race/ethnicity was coded as 0 = non-White and 1 = White.

Table 5. Polynomial logistic regression analysis: self-rated work productivity primary outcome.

Predictors	Odds ratio	95% confidence interval
Maternal singular annual income	0.86	0.74–1.02
Maternal highest education	0.64*	0.45–0.91
Race/ethnicity [†]	0.84	0.47–1.50
Godin leisure time exercise dichotomized	1.38	0.85–2.24

In this table, working mothers who reported being moderately or a fair amount productive in work in the last week are being compared to the referent group of working mothers who reported being very much or exceedingly productive in work in the last week. When the Godin leisure time exercise variable is entered as a continuous variable in the regression analysis, the results are consistent with the findings for when the Godin leisure time exercise variable is entered as a dichotomous variable.

*Significant at $p < 0.05$ level.

[†]Race/ethnicity was coded as 0 = non-White and 1 = White.

recommended guidelines for weekly physical activity and to assess the associations between physical activity, quality of life, and self-rated work productivity in this sample of working mothers. Consistent with our hypothesis, we found less than half of the mothers in our sample met the recommended guidelines for weekly physical activity in the past week. Nearly two out of every five mothers reported engaging in no 30-min bouts of strenuous exercise in the past week and one out of every three mothers reported engaging in no 30-min bouts of moderate exercise in the past week. Importantly, and in line with our predictions, meeting the recommended guidelines for weekly physical activity was associated with better quality of life in our sample of working mothers. This association remained significant in a multivariate analysis after controlling for race/ethnicity, maternal singular annual income, and maternal highest level of education.

Taken as a whole, our findings highlight that working mothers in the United States are a group at risk for low levels of physical activity and underscore the importance of interventions that target low levels of physical activity in this population. One set of interventions might be to target the women themselves. For instance, Mailey and McAuley¹² had mothers attend two interactive group sessions focusing on behavior modification in which they each developed short-term physical activity goals, viewed videos of other working mothers engaged in regular physical activity, and gained advice on how to be physically active. The sessions were held during non-work hours (e.g. evenings, weekends) and onsite child care was provided to increase the feasibility of participation for working mothers. Although this intervention resulted in initial increases post-intervention, the gains were not fully maintained 6 months later. Similar research suggests such programs may be more effective at increasing exercise motivation when women are involved in group-based first solo physical activity.⁴¹ Exercising with others can increase working mom's accountability, allow them to benefit from interacting with others who are similarly trying to balance competing demands, and provide social support and encouragement to others who are also trying to exercise.

A second set of interventions to help mothers gain more exercise focus on how organizations, societal structures, and social norms of partners/spouses might work to benefit working moms with young children. That is, rather than feel like one more thing (e.g., exercise) that mothers need to do and thus potentially experience exercise as yet another unattainable goal to having it all and doing it all, interventions that take the burden off of the woman and focus elsewhere might be critically important for the health of new mothers. Organizations can bear some of this responsibility. For instance, organizations that allow women to take even a small amount of time off during their workday actually see benefits (and not losses) to their bottom line. Thus, exercise may be something that women can do while at work.²⁸ Organizations might invest not only in onsite exercise facilities but also in onsite childcare available for exercising mothers.

Societal-level interventions also can bear some of the challenges of enabling and encouraging working mothers with young children to exercise. For instance, one suggestion is an increased availability of quality, onsite babysitting services at exercise facilities.⁴² Another suggestion, and one that is gaining traction, is the creation of more exercising alternatives that allow mothers to participate with their infants and/or young children (e.g. kangatraining, baby-wearing fitness classes, stroller fitness classes, toddler-and-me fitness classes⁴³). Partners/spouses of working moms also can and should play a bigger role in promoting and enabling exercise in mothers with young children.^{44,45} Because it offers many known health and other benefits to women, there is little doubt that it also

offers yet unmeasured benefits to the babies/young children, partners/spouses, and entire family unit.⁴⁶ Thus, it is critical for partners/spouses to care for, help arrange, or otherwise enable women to exercise. Working mothers may be so exhausted that partners/spouses have to find the right balance in promoting exercise. More equal distribution of childcare and housekeeping responsibility is clearly helpful to increase a mother's sleep, sanity, and exercise regimen.

The findings of this study suggest that working women with lower educational levels and lower singular annual incomes may be especially important to target with interventions. It is likely that working mothers who earn more money have greater resources that allow them to engage in more regular physical activity (e.g. membership to a gym with childcare, exercise equipment in the home). Our finding that being non-white was associated with an increased likelihood of meeting the physical activity recommendation of at least 150 min of moderate-intensity aerobic exercise in the past week should be interpreted with caution given the lack of racial/ethnic diversity in our sample. Approximately 80% of our sample identified as white. As such, the small number of non-white mothers in our sample were likely not representative of racial/ethnic minority working mothers as a whole. It will be important for future studies to examine the associations between physical activity and race/ethnicity among a more diverse sample of working mothers.

It is possible that the association between physical activity and self-rated work productivity in our study was not as strong as those reported in previous studies²⁴⁻²⁸ due to the unique challenges working mothers face related to balancing the competing interests of work and family life. Working mothers may need to make the choice at times to hold off on completing a work task in order to leave work at a reasonable time to pick their children up from daycare or go to the gym to engage in physical activity. While this study did not assess whether mothers worked from home or outside the home, future research should investigate whether this variable impacts the association between physical activity and self-rated work productivity in working mothers.

This study has some limitations. Given the cross-sectional study design, causation cannot be inferred between the study variables. Future longitudinal studies are needed to elucidate the temporal associations between physical activity, quality of life, and self-rated work productivity in working mothers. Our sample of working mothers was not representative of all working mothers from the United States. Consequently, our findings cannot be generalized to all working mothers, particularly those who identify as racial/ethnic minorities and do not have at least a college education. We did not limit our sample to mothers whose infants were older than 2 months old which may have been important since physicians restrict new mothers from

vigorous exercising in the first 6–8 weeks after giving birth. We used a single-item indicator of self-rated work productivity in this study; it is possible that utilizing a more comprehensive measure of work productivity would have yielded different findings. However, the single-item measure at least allows us to gain a global sense of rated productivity. Although the Godin leisure time exercise questionnaire is a validated instrument, self-reported physical activity data are subject to recall bias and may be misreported. Furthermore, while dichotomizing physical activity behavior is a useful and transferrable benchmark for most populations, future studies should consider using continuous and/or device-based (e.g. accelerometry) physical activity measurements. Finally, given that participants were recruited via a Qualtrics panel, there is no way to objectively confirm that they met all the study inclusion criteria despite going through a comprehensive screening process. As such, future studies might replicate and extend our findings in a sample of working mothers recruited face-to-face from workplaces.

This study has a number of strengths. The sample is comprised of a relatively large number of working mothers from the United States, which tends to be an underrepresented group in research. These working mothers went through a comprehensive screening process to increase the likelihood they met study inclusion criteria. The study used validated measures and evaluated important socio-demographic and personal factors relevant to physical activity in working mothers, including BMI. Finally, the online data collection methodology likely increased the chances of participation among working mothers with young children, since this population has many time constraints that make face-to-face data collection more difficult.

In conclusion, we found less than half of the mothers in our sample met recommended guidelines for weekly physical activity in the past week. Meeting these guidelines for weekly physical activity was associated with better quality of life and self-rated work productivity. The associations between physical activity and quality of life remained significant in a multivariate analysis after controlling for race/ethnicity, maternal singular annual income, and maternal highest level of education. These findings are critically important for the health of mothers, particularly as they continue to comprise a very strong segment of the workforce. Although working mothers must balance their many competing demands, it is critical that their health remains a top priority, and time for some amount of exercise, without the guilt of feeling like they have to do one more thing, is one key to that.

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