

Investigation of the Relationship Between Physical Activity Levels and Sleep Quality in Mothers of Children with Intellectual and/or Physical Disabilities

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ABSTRACT:

The aim of this study was to investigate the relationship between physical activity levels and sleep quality in mothers of children with disabilities. In addition, the study aimed to evaluate the association between physical activity levels and sociodemographic characteristics, including age, body mass index, and educational status. The findings of this study are expected to contribute to the planning of preventive and supportive programs aimed at promoting the health of mothers of children with disabilities.

This cross-sectional analytical study was conducted to examine the relationship between physical activity levels and sleep quality in mothers of children with disabilities. A total of 184 volunteer mothers living in Uşak, Türkiye, who had a child with a disability, were included in the study. The participants completed a sociodemographic information form developed by the researchers, the International Physical Activity Questionnaire–Short Form (IPAQ-SF), and the Pittsburgh Sleep Quality Index (PSQI) through face-to-face interviews. The sociodemographic information form included questions regarding the participants' age, height, body weight, and educational status.

The data obtained within the scope of the study were transferred to an electronic database and analyzed using IBM SPSS Statistics. In addition to descriptive statistics, appropriate parametric or non-parametric statistical methods were used to evaluate the relationship between physical activity levels and sleep quality. The level of statistical significance was set at $p < 0.05$.

The results showed that exercise scores did not differ significantly according to age groups ($p > 0.05$) or BMI groups ($p > 0.05$). However, exercise scores differed significantly according to educational status ($p \leq 0.05$). University graduates had higher exercise scores than participants in the other educational groups. A statistically significant, negative, and weak correlation was found between exercise scores and Pittsburgh Sleep Quality Index (PSQI) scores ($r = -0.230$; $p \approx 0.002$). This finding indicates that PSQI scores tended to decrease as exercise scores increased. Since lower PSQI scores indicate better sleep quality, the results suggest

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that higher levels of physical activity may be associated with better sleep quality.

Keywords: Physical activity; sleep quality; mothers of children with disabilities; intellectual disability; Pittsburgh Sleep Quality Index

INTRODUCTION

Physical activity is defined as any bodily movement produced by skeletal muscles that requires energy expenditure (WHO, 2020). Physical inactivity refers to the failure to engage in physical activity at levels recommended for health. Individuals who do not engage in sufficient movement in their daily lives and spend a substantial proportion of their time sitting or engaging in activities involving low energy expenditure are generally considered sedentary. A sedentary lifestyle is currently recognized as an important risk factor threatening public health. Regular physical activity has been reported to play a significant role in the prevention and reduction of the risk of chronic diseases such as cardiovascular disease, diabetes, hypertension, and dyslipidemia (Akgün et al., 2019). Nevertheless, according to data from the World Health Organization, approximately one-quarter of the adult population worldwide does not engage in sufficient levels of physical activity (WHO, 2020).

Sleep is a fundamental biological process that contributes to the maintenance of rest and physiological restoration in the human body. In addition, it plays an important role in supporting learning and memory processes and maintaining overall well-being. Insufficient or poor-quality sleep may have various adverse effects on individuals' physical and psychological health (Irwin, 2015). Sleep disorders, particularly insomnia, are among the common health problems observed in the population and have been reported to affect approximately 10% of adults and 20% of the general population (Morin & Jarrin, 2022). The Pittsburgh Sleep Quality Index (PSQI) is one of the widely used instruments for assessing sleep quality and is considered a valid and reliable tool for evaluating individuals' sleep characteristics over the previous month (Buysse et al., 1989).

A reciprocal relationship has been reported between physical activity levels and sleep quality. Regular physical activity may positively influence sleep duration and sleep quality, whereas insufficient physical activity has been associated with sleep problems (Kredlow et al., 2015; Vancampfort et al., 2018). Previous studies have shown that physical activity may contribute to a reduction in sleep onset latency, improvement in sleep efficiency, and overall enhancement of sleep quality (Yang et al., 2012). However, the relationship between sleep and physical activity is considered bidirectional; changes in sleep quality may influence an individual's physical activity level, while changes in physical activity may also affect sleep characteristics (Chennaoui et al., 2015). Therefore, the concurrent evaluation of physical activity levels and sleep quality is of considerable importance.

Disability is defined as limitations in fulfilling the daily and social roles expected of an individual based on their age, sex, and social environment due to existing impairments (Dyson, 1991). Intellectual and physical disabilities are characterized by limitations in independence and the ability to perform activities of daily living resulting from impairments in physical, neurological, or cognitive functioning (Shapiro, 1983). Physical disability may arise from partial or complete loss of function in various systems, particularly the musculoskeletal and nervous systems, whereas intellectual disability is associated with significant limitations in cognitive and adaptive functioning relative to age (Özdiğer, 2002; Molnar & Alexander 1999). These conditions may make it difficult for individuals to independently perform activities of daily living and adapt to their social environment (Enç et al., 1987).

Caring for a child with a disability may lead to substantial changes in family life and various limitations in parents' daily lives (Sanders &

Morse, 2005). The increased need for parental support in meeting children's daily needs may result in caregiving responsibilities being disproportionately assumed by mothers. This intensive caregiving responsibility may impose an additional burden on mothers' physical and psychosocial health (Baltaş, 1986). In particular, physical caregiving tasks such as lifting, transferring, and assisting the child with activities of daily living require mothers to possess adequate muscle strength and physical capacity. The prolonged and repetitive performance of these tasks may increase the risk of musculoskeletal problems and physical injuries among mothers (İnan et al., 2013). Therefore, evaluating physical activity levels and sleep quality in mothers of children with disabilities is important for addressing their health status from a holistic perspective.

The caregiving responsibilities of mothers of children with disabilities may substantially affect their daily routines due to the intensity of their children's needs and the continuous nature of caregiving. As the time devoted to childcare increases, the time mothers can allocate to themselves may decrease, potentially limiting their participation in physical activity. In addition, continuous caregiving needs and the responsibilities encountered in daily life may adversely affect mothers' rest and sleep patterns. Increased caregiving burden among parents of children with disabilities has been associated with sleep problems, fatigue, and reduced quality of life. The fact that mothers often assume primary responsibility for caregiving further highlights the importance of evaluating their physical activity levels and sleep quality. Therefore, this study aimed to investigate the physical activity levels and sleep quality of mothers of children with intellectual and/or physical disabilities and to evaluate the relationship between these variables.

METHODS

Study Design

This cross-sectional analytical study was conducted to investigate the relationship between physical activity levels and sleep quality in

mothers of children with intellectual and/or physical disabilities.

Study Population and Participants

The study population consisted of mothers of children with intellectual and/or physical disabilities living in Uşak, Türkiye. A total of 184 mothers who voluntarily agreed to participate and met the study eligibility criteria were included. Participants were recruited through institutions and centers providing services to individuals with disabilities in Uşak.

Data Collection Instruments

The data collection instruments used in the study included a Personal Information Form developed by the researchers, the International Physical Activity Questionnaire–Short Form (IPAQ-SF), and the Pittsburgh Sleep Quality Index (PSQI).

Personal Information Form

A Personal Information Form developed by the researchers was used to assess the participants' sociodemographic characteristics. The form included questions regarding the mothers' age, body weight, height, educational status, and body mass index.

International Physical Activity Questionnaire–Short Form

The International Physical Activity Questionnaire–Short Form (IPAQ-SF) was used to assess the participants' physical activity levels. The questionnaire evaluates walking, moderate-intensity physical activity, vigorous-intensity physical activity, and sitting time during the previous seven days. Physical activity levels are assessed based on metabolic equivalent of task-minutes per week (MET-min/week), calculated according to the duration and frequency of the activities. The Turkish validity and reliability study of the questionnaire was conducted by Sağlam et al.

The following formulas were used to calculate the physical activity scores:

1. **Walking score (MET-min/week) = $3.3 \times \text{walking duration} \times \text{number of walking days}$**

2. **Moderate-intensity physical activity score (MET-min/week) = 4.0 × moderate-intensity activity duration × number of activity days**

3. **Vigorous-intensity physical activity score (MET-min/week) = 8.0 × vigorous-intensity activity duration × number of activity days**

4. **Total physical activity score (MET-min/week) = Walking score + Moderate-intensity physical activity score + Vigorous-intensity physical activity score**

Physical activity levels were classified as follows:

1. **Low:** <600 MET-min/week
2. **Moderate:** 600–3000 MET-min/week
3. **High:** >3000 MET-min/week

Pittsburgh Sleep Quality Index

The Pittsburgh Sleep Quality Index (PSQI) was used to assess the participants' sleep quality. The PSQI is an assessment instrument that evaluates individuals' sleep characteristics over the previous month. The scale consists of seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. The total score ranges from 0 to 21, with higher scores indicating poorer sleep

quality. The Turkish validity and reliability study of the scale was conducted by Ağargün et al.

Data Collection

Study data were collected on a voluntary basis after the participants were informed about the purpose of the study and the data collection procedures. The Personal Information Form, IPAQ-SF, and PSQI were administered to the participants. Throughout the data collection process, the confidentiality of participants' personal information was protected, and the collected data were evaluated solely for scientific purposes.

Statistical Analysis

The data obtained in the study were analyzed using IBM SPSS Statistics. Descriptive statistics included means, standard deviations, and frequencies. The normality of the variables was assessed based on appropriate normality tests and distributional characteristics. For comparisons between two groups, appropriate parametric or non-parametric tests were used, whereas appropriate analysis of variance tests or the Kruskal–Wallis test was used for comparisons involving three or more groups. Correlation analysis was performed to evaluate the relationship between physical activity levels and sleep quality. Statistical significance was set at $p < 0.05$.

RESULTS

Table 1. Distribution of the demographic characteristics of the 184 participants comprising the study sample

Variable	Frequency (n)	Percentage (%)
Age		
<35 years	84	45.7
35–44 years	60	32.6
≥45 years	40	21.7
Body Mass Index (BMI)		
Normal ($18.5 \leq \text{BMI} < 25$)	56	30.4
Overweight ($25 \leq \text{BMI} < 30$)	68	37.0
Obesity ($\text{BMI} \geq 30$)	60	32.6

Educational status		
Primary education	104	56.5
High school	56	30.5
University	24	13.0
Total	184	100.0

Among the 184 participants comprising the study sample, 84 (45.7%) were younger than 35 years, 60 (32.6%) were aged 35–44 years, and 40 (21.7%) were aged 45 years or older. Regarding BMI, 56 participants (30.4%) were classified as having a normal BMI, 68 (37.0%) as overweight,

and 60 (32.6%) as obese. In terms of educational status, 104 participants (56.5%) had completed primary education, 56 (30.5%) had completed high school, and 24 (13.0%) had a university education.

Table 2. Summary statistics for exercise and Pittsburgh Sleep Quality Index (PSQI) scores in the study sample

	Minimum	Maximum	Median	Mean	Standard deviation	Skewness	Kurtosis
Exercise score	132	6520	1485	1816.91	1359.40	0.946	1.133
PSQI score	0	20	6	7.13	4.51	0.888	0.483

Among the 184 participants, the minimum and maximum exercise scores were 132 and 6520, respectively. The median exercise score was 1485, the mean was 1816.91, and the standard deviation was 1359.40. The skewness and kurtosis values for the exercise scores were 0.946 and 1.133, respectively.

The minimum and maximum PSQI scores were 0 and 20, respectively. The median PSQI score was 6, the mean was 7.13, and the standard deviation was 4.51. The skewness and kurtosis values for the PSQI scores were 0.888 and 0.483, respectively.

Skewness and kurtosis values were considered to assess the assumption of normality. Values between -2 and $+2$ were considered indicative of an approximately normal distribution, whereas values outside this range were considered

indicative of a deviation from the normality assumption.

Accordingly, the skewness and kurtosis values for both exercise and PSQI scores were within the range of -2 to $+2$. Therefore, the normality assumption was considered to be met, indicating that the sample was consistent with a normally distributed population.

The following table presents the distribution of exercise scores according to the demographic variables. Since the assumption of normality was met and all demographic variables consisted of at least three independent groups, differences between groups were assessed using one-way analysis of variance (ANOVA). Tukey's post hoc test was used to identify the groups contributing to statistically significant differences. All analyses were performed at a 95% confidence level.

Table 2. Distribution of exercise scores according to demographic variables in the study sample

Variable		Exercise Score
Age		
<35 years	Mean $\pm$ SD	1981.62 $\pm$ 1204.73
35–44 years		1655.73 $\pm$ 1163.90
≥ 45 years		1712.80 $\pm$ 1850.29
	<i>p</i> -value	0.317
Body Mass Index (BMI)		
Normal (18.5 $\leq$ BMI<25)	Mean $\pm$ SD	1827.21 $\pm$ 1041.37
Overweight (25 $\leq$ BMI<30)		1850.41 $\pm$ 1208.47
Obesity (BMI $\geq$ 30)		1769.33 $\pm$ 1748.95
	<i>p</i> -value	0.943
Educational status		
Primary education	Mean $\pm$ SD	1693.96 $\pm$ 1445.42
High school		1728.93 $\pm$ 1055.21
University		2555.00 $\pm$ 1424.43
	<i>p</i> -value	0.016*

Exercise scores did not differ significantly according to age groups ($p > 0.05$). Similarly, no statistically significant difference was found in exercise scores according to BMI groups ($p > 0.05$). However, exercise scores differed significantly according to educational status ($p \leq 0.05$). Participants with a university education had higher exercise scores than participants with primary or high school education.

Because the exercise and PSQI scores were assumed to be derived from a normally distributed population, Pearson's correlation coefficient (r) was used to assess the relationship

between the scores. The correlation coefficient ranges from -1 to $+1$. A positive value indicates a direct relationship between two variables, whereas a negative value indicates an inverse relationship. As the correlation coefficient approaches -1 or $+1$, the strength of the relationship increases. A correlation coefficient of 0 indicates the absence of a linear relationship between two variables, and the strength of the relationship decreases as the coefficient approaches 0 . The correlation coefficient is presented in the table, with the corresponding p -value provided in parentheses.

	Exercise Score	PSQI Score
Exercise Score	1.000	-0.230^{**} (≈ 0.002)
PSQI Score	-0.230^{**} (≈ 0.002)	1.000

****Correlation is significant at the 0.01 level.**

A statistically significant, negative, and weak correlation was found between exercise scores and Pittsburgh Sleep Quality Index (PSQI) scores ($r = -0.230$; $p \approx 0.002$). This finding indicates that PSQI scores tended to decrease as exercise scores increased. Since lower PSQI scores indicate better sleep quality, the results suggest that higher physical activity levels may be associated with better sleep quality.

DISCUSSION

In this study, a significant relationship was found between physical activity levels and sleep quality in mothers of children with intellectual and/or physical disabilities. Specifically, higher physical activity levels were associated with lower PSQI scores and, consequently, a tendency toward better sleep quality. This finding is consistent with previous studies reporting a reciprocal relationship between physical activity and sleep quality. In a meta-analytic study, Kredlow et al. (2015) reported that physical activity may have positive effects on sleep characteristics. Similarly, Yang et al. (2012) indicated that exercise training may improve sleep quality. Chennaoui et al. (2015) emphasized that the relationship between physical activity and sleep may be bidirectional. Accordingly, the lower PSQI scores observed among mothers with higher physical activity levels in our study suggest that regular physical activity may be associated with better sleep quality.

In our study, physical activity levels differed significantly according to educational status, with university-educated mothers having higher exercise scores than those in the other educational groups ($p=0.016$). This finding suggests that educational attainment may be associated with physical activity behaviors. Greater access to health-related information, higher awareness of the positive effects of physical activity on health, and greater knowledge regarding the incorporation of healthy lifestyle behaviors into daily life may be among the possible explanations for this difference. Nevertheless, physical activity levels among mothers of children with disabilities may be influenced not only by individual characteristics

but also by environmental and family-related factors, such as caregiving responsibilities and time constraints. The study conducted by Dalbudak and Evyapan Aydın, which examined the relationship between physical activity levels and general health status in mothers of children with autism, highlights the importance of physical activity as a health-related variable in this population. In this context, the higher exercise scores observed among university-educated mothers in our study may indicate an association between educational attainment and awareness of physical activity. However, this relationship should be evaluated together with the child's caregiving needs and the mother's daily responsibilities.

In our study, physical activity levels did not differ significantly according to age or BMI groups. This finding suggests that physical activity levels cannot be explained solely by age or body composition. Particularly among mothers of children with disabilities, individual and environmental factors such as caregiving responsibilities, the demands of daily life, and the time available for physical activity may play a more decisive role in physical activity behaviors. Therefore, when evaluating physical activity levels in mothers, caregiving burden and living conditions should be considered in addition to demographic characteristics.

CONCLUSION

This study investigated the relationship between physical activity levels and sleep quality in mothers of children with intellectual and/or physical disabilities. The findings demonstrated a statistically significant and negative association between physical activity levels and sleep quality. Mothers with higher physical activity levels had lower PSQI scores. These findings suggest that physical activity levels may be associated with sleep quality in mothers of children with disabilities.

Physical activity levels also differed significantly according to educational status, with university-educated mothers demonstrating higher exercise scores. In contrast, physical activity levels did not differ significantly according to age or BMI

groups. Overall, the concurrent evaluation of physical activity levels and sleep quality in mothers of children with disabilities may be

important for supporting the health of this population.

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