

## Prevalence of Sedentary Behavior and Sleep Duration among First Saudi Female Physical Education Teachers

**Mohammad Ali Alahmadi\***

*Department of Physical Education and Sport Sciences, College of Education, Taibah University, Madinah, Saudi Arabia*

**\*Corresponding Author:** Mohammad Ali Alahmadi, Department of Physical Education and Sport Sciences, College of Education, Taibah University, Madinah, Saudi Arabia.

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### Abstract

The aim of this study was to assess sedentary behavior (SB) and sleep duration in Saudi female physical education (PE) teachers. A unique group of 48 Saudi female PE teachers (mean  $\pm$  SD, age, 25.3  $\pm$  0.91 years; body mass, 61.2  $\pm$  12.2 kg; height, 160.6  $\pm$  5.5 cm) participated in this study. A self-reported questionnaire was used to assess SB activities (time spent watching television, playing electronic games, and using the Internet) and sleep duration during the week and at weekends. The cut-off point of  $\geq 2$  h/day was used to categorize the outcome. Inadequate sleep duration was defined as  $< 7$  h/night. The results showed that the mean ( $\pm$  SD) total screen time among Saudi female PE teachers was 448.0  $\pm$  215.5 (min/day). The proportion of Saudi female teachers who spent  $> 2$  h/day engaged in screened-based SB was 97.9%. Internet use was the predominant type of sedentary activity among Saudi female PE teachers (277.3  $\pm$  161.8 min/day), followed by time spent playing electronic games (101.8  $\pm$  109.6 min/day). The mean ( $\pm$  SD) sleep durations during the week and at the weekend were 6.6  $\pm$  1.6 and 7.8  $\pm$  1.5 h/night, respectively. The weekday and weekend sleep duration analysis also showed that 52.1% and 20.4% of Saudi female teachers had insufficient sleep ( $< 7$  h/night) during the week and at weekends, respectively. No statistically significant associations were found between total or other types of SB and sleep duration. We concluded that the vast majority of Saudi female PE teachers were sedentary and had insufficient sleep duration throughout the weekdays, for which they compensated at the weekend. The combined effects of prolonged SB and insufficient sleep duration may put Saudi female PE teachers at high risk of several diseases and mortality.

**Keywords:** Physical Activity; Sport; Sitting; Overweight; Obesity; Saudi Arabia

### Abbreviations

AAP: American Academy of Pediatrics; PA: Physical Activity; PE: Physical Education; SB: Sedentary Behavior; SD: Standard Deviation; WHO: World Health Organization

### Introduction

The prevalence of obesity and overweight status in Saudi Arabia is alarming, having increased dramatically in recent decades and become one of the highest overweight and obesity prevalence rates worldwide [1,2]. Physical activity (PA) among Saudi women is also extremely low and insufficient to obtain health-related benefits [3], and this low PA level is even lower than that found in women aged 54 - 59 years [4]. Moreover, short sleep duration ( $< 7$ h per night) and long sleep duration ( $> 8$ h per night) are linked to increased mortality and morbidity [5-7]. In Saudi Arabia, one in every three adults suffers from short sleep duration and this problem is more prominent

among Saudi females, as 37.3% of Saudi females have a short sleep duration of less than 7 h/night [8]. Collectively, this puts Saudi women at risk for serious health problems.

The majority (59%) of Saudi female adolescents studied did not engage in any type of PA [9] and lack of physical education (PE) at female public schools may act as a barrier limiting Saudi females' engagement in PA. The provision of PE to girls has long been a controversial issue in Saudi Arabia, as PE and fitness facilities were not available for females until recently [10,11]. In addition to physical inactivity, sedentary behavior (SB) is conceived as a separate and distinct entity with unique determinants and health consequences. In fact, physical inactivity and SB are independent entities [12-15]. SB is shown to be related to adverse cardiometabolic risk profiles and premature mortality [16,17]. A recent study found that the prevalence of SB among Saudi females is alarmingly high, as the majority (> 85%) of females spent more than three h/day engaged in sedentary activity [18].

Saudi Arabia first introduced PE for schoolgirls in 2017 and offered PE to girls in public schools in the 2018/2019 academic year. The recent implementation of PE for girls in Saudi Arabia saw the proliferation of would-be teachers from among several nutrition and fitness graduates from Princess Nourah bint Abdulrahman University in Riyadh, who are likely to be of significant benefit to the new field of PE in girls' public schools in Saudi Arabia. This presented an excellent opportunity for female graduates to become the first female PE teachers in Saudi Arabia's public schools.

### Aim of the Study

The aim of this study was to assess SB and sleep duration among the first female PE teachers in Saudi public schools.

### Materials and Methods

#### Participants and study procedure

A unique sample of 48 female PE teachers from Saudi public schools (mean  $\pm$  SD, age, 25.3  $\pm$  0.91 years; body mass, 61.2  $\pm$  12.2 kg; height, 160.6  $\pm$  5.5 cm) was selected to participate in this study during the 2018/2019 academic year. All female PE teachers had a background in nutrition and fitness, had graduated from Princess Nourah Bint Abdulrahman University in Riyadh and had obtained the professional licensing test for teachers-mainly the specialized test in PE. This test is required for those wishing to obtain a teaching license in Saudi Arabia. The study protocol and procedures conformed to International Ethical Guidelines, and all participants signed an informed consent form.

#### Sedentary behavior and sleep duration assessments

The study used a self-report SB questionnaire to assess the amount of time spent engaged in sedentary activities and sleep duration. The questionnaire was previously shown to be valid and reliable for the assessment of PA and other lifestyle habits, including sedentary activities, among youths aged 14 - 25 years [19,20]. Sedentary activities include time spent watching television, playing electronic games, using a computer, and on the Internet. Total sedentary time was also taken into consideration. The total time spent on each behavior was converted into hours and calculated for an average day. Average total sitting time (min/day) was calculated on the basis of 7 days. SB was categorized using a cut-off point of 2h in accordance with the recommendations of the American Academy of Pediatrics (AAP), which suggest limiting youths' total screen time to 2 h/day [21]. The total SB per day reported by participants was divided into two categories: participants who reported  $\geq$  7 h/day ( $\geq$  420 min/day) were categorized as having high sitting time; other participants who reported a sitting time of < 7 h/day (< 420 min/day) were categorized as having low sitting time. For sitting time, the cut-off point for mortality risk has been suggested to be approximately 7 h/day [22].

In the present study, sleep duration denotes the number of hours spent sleeping at night. Sleep duration was self-reported through two questions: "How many hours, approximately, do you usually sleep during a workday/weekday night?" and "How many hours, approxi-

mately, do you usually sleep per night during a weekend?” The response alternatives were ≤ 3, 4, 5, 6, 7, 8, 9, or ≥ 10h. Inadequate sleep duration (short sleep) was defined as < 7 h/night [23].

**Statistical analysis**

Data were analyzed using the statistical software package SPSS, version 25. Descriptive statistics were presented as mean values and standard deviation (SD). The Pearson product movement coefficient of correlation was used to determine the relationship between total SB, its types, and sleep duration during weekdays and at weekends. Statistical significance was set at  $p < 0.05$ .

**Results**

Table 1 shows the mean and SD of the characteristics and SB of Saudi female PE teachers. The results showed that the total amount of time that Saudi female PE teachers spent in SB was  $448.0 \pm 215.5$  min/day. The results also showed that Internet use was the predominant sedentary activity ( $277.3 \pm 161.8$  min/day) among Saudi female PE teachers. Table 2 shows that the majority of Saudi female PE teachers spend more than two hours sitting per day (97.9%). The results also showed that 46.8% of Saudi female PE teachers spent more than 7 h/day engaged in SB (Table 2). The mean ( $\pm$  SD) and percentage of sleep duration during the weekdays and at weekends are shown in table 3. Sleep duration analysis also shows that 52.1% of Saudi female PE teachers had insufficient sleep (< 7 h/night) during the weekdays and that they compensated for this at the weekend.

Variables	Results
Age (years)	25.3 $\pm$ 0.9
Weight (kg)	61.2 $\pm$ 12.2
Height (cm)	160.6 $\pm$ 5.5
BMI (kg/m <sup>2</sup> )	23.6 $\pm$ 3.9
Watching TV (min/day)	66.8 $\pm$ 55.7
Electronic games playing (min/day)	101.8 $\pm$ 109.6
Internet use (min/day)	277.3 $\pm$ 161.8
Total sedentary time (min/day)	448.0 $\pm$ 215.5

**Table 1:** Characteristics and sedentary behaviors of Saudi female PE teachers.

Variables	Results
Sitting $\geq$ 2 h/day (%)	97.9
Sitting < 2 h/day (%)	2.1
Sitting time $\geq$ 7 h/day (%)	46.8
Sitting time < 7 h/day (%)	53.2

**Table 2:** Percentage of sedentary behavior based on two different cut-off points.

Variables	Sleep duration	
	Weekdays	Weekends
Sleep duration (h/night)	6.6 $\pm$ 1.6	7.8 $\pm$ 1.5
Sleep duration < 7 h (%)	52.1	20.4
Sleep duration $\geq$ 7 h (%)	47.9	79.6

**Table 3:** Mean ( $\pm$  SD) and percentage of sleep duration during weekdays and at weekends.

Table 4 shows the correlations between total SB, its domains, and sleep duration. Total SB and sleep duration were not significantly correlated. Moreover, type of SB was not significantly correlated with sleep duration during weekdays and at weekends.

Variables	Sleep duration	
	Weekdays	Weekends
Total sedentary time (min/day)	.080 (P = .595)	-.204 (P = .169)
Watching TV (min/day)	.039 (P = .793)	.043 (P = .772)
Electronic games playing (min/day)	.009 (P = .951)	-.216 (P = .140)
Internet use (min/day)	.099 (P = .503)	-.092 (P = .530)

**Table 4:** Correlations among total SB and its types with sleep duration during weekdays and at weekends.

## Discussion

The present study assessed the prevalence of SB and its patterns and sleep duration among a unique sample of Saudi female public school PE teachers. The study's main finding that the prevalence of SB found among Saudi female PE teachers was remarkably high. The average daily time spent in SB reported in the present study was high among Saudi female PE teachers ( $7.5 \pm 3.6$  h/day), and the vast majority (97.9%) of them fail to observe the SB-related recommendation that screen time should not exceed 2 h/day [21]. This is in line with a similar finding previously reported for Saudi females that showed significantly high SB levels (91.2%) [24]. Research has shown that sitting time is linked to all-cause mortality risk and that a 5%-increased risk of all-cause mortality was found for each one-hour increment of sitting time for adults sitting >7 h/day when adjusted for PA [8]. Almost half (47%) of Saudi female PE teachers spent more than 7 h/day in sedentary activities, which may increase their risk of adverse health outcomes, such as cardiovascular disease, type 2 diabetes, cancer, and mortality [25,26]. Moreover, Saudi female PE teachers spend considerable amounts of time engaged in sedentary activities, such as Internet use-which emerged as the predominant sedentary activity (3.8 h/day)-but they are less likely to watch TV (1.1 h/day). Although TV viewing, as an indicator of sedentariness, may be one of the most readily available types of SB [27], TV viewing is not common among young girls (mean age 15 years) [28]. Research suggests that males and females engage in differential types of sedentary activities: males typically spend more time watching TV and videos or playing computer games, while females are more likely to engage in communication-based SB, such as talking on the phone, texting, and instant messaging [29].

In addition to SB, the average sleep durations of Saudi female PE teachers during weekdays and at weekends were 6.6 and 7.8 (h/night), respectively. Saudi female PE teachers reported insufficient sleep duration during the week, for which they compensated at the weekend by sleeping for longer, as 80% of them had a sleep duration of  $\geq 7$  h/night. This compensatory approach to sleep is well attested, suggesting that insufficient sleep during the week may be compensated for during the weekend [30-32]. This may also have implications for mortality [32]. Although the exact role of extended weekend sleep remains poorly understood, weekend compensatory sleep is attested in obese children [31] and hypertensive adults [33]. Moreover, in recent decades, research has charted a decline in average sleep duration and quality, resulting in adverse consequences for general health [34]. Increased use of electronic media devices may be one factor that has had a negative impact on sleep [35] and this has led to a call for new recommendations regarding healthy media consumption, including restrictions on electronic devices. Interestingly, we found that more than half (52%) of Saudi female PE teachers reported insufficient sleep duration (< 7h) during weekdays. In women, short sleep duration correlates with central obesity [36] and may be a significant risk factor for the development of metabolic syndrome [37]. Moreover, revealing results from the Nurses' Health Study-a 10-year follow-up survey-indicated that short ( $\leq 5$  h/night) and long sleeping durations ( $\geq 9$  h/night) in women aged 30 - 55 years were associated with the development of symptomatic diabetes [6].

In our study, no statistically significant associations were found between total or other types of SB and sleep duration among Saudi female PE teachers. This is in line with studies that examined the association between SB and sleep duration and showed no evidence of

association between SB and sleep duration among adults and adolescents [38-41]. The association between total SB or other type of SB and sleep duration is not clear.

### Conclusion

However, it is important to note the fact that the research area of SB is relatively new. SB was also recognized as a gap area in the Global Recommendations on Physical Activity for Health by the World Health Organization (WHO) [42]. This is why SB has just been added in the new WHO 2020 global guidelines on physical activity and SB [43]. Thus, more research with precise measurements is needed to understand the complete picture of possible associations between SB and sleep duration.

### Limitations of the Study

The present study has several limitations. The first is that our SB questionnaire is limited to three types of sedentary activity. Inevitably, the inclusion of more categories of sedentary activities (e.g., sitting while listening to music, sitting while talking on the phone, doing paperwork or office work, sitting and reading, playing a musical instrument, doing arts and crafts, and driving/riding in a car, bus, or train) may offer a more comprehensive picture of the sedentary lifestyle [44,45]. The second limitation is that we were unable to investigate whether weekday-weekend differences in sedentary time exist among Saudi female PE teachers. Research has shown that weekends-mostly Sundays-are generally the most sedentary days compared to weekdays [46].

Our study revealed that SB was evident among Saudi female PE teachers, who spend significant portions of time engaged in sedentary activities. Our findings also demonstrated that Internet use is the most common type of sedentary activity among Saudi female PE teachers. Moreover, the vast majority of Saudi female PE teachers reported insufficient sleep duration during the weekdays and that they compensated for during the weekend. The combined effects of excessive SB and insufficient sleep duration may put Saudi female PE teachers at high risk for several diseases and mortality.

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### Conflicts of Interest

The author declares no conflicts of interest.

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