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Original Article

The Relationship Between Physical Activity and Smartphone Usage Among University Students in Riyadh, Saudi Arabia

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Abstract

Background: Physical activity is a very positive behavior that has many health benefits, so understanding current physical activity levels in specific populations is important for health policy planning.
Objective(s): to estimate physical activity patterns and to investigate the relationship between physical activity performance and using smartphone health applications among university students in Riyadh, Saudi Arabia.
Methods: This cross-sectional study estimated physical activity patterns among King Saud University students. An online survey was distributed to all students attending King Saud University. The survey included questions on socio-demographic characteristics and the International Physical Activity Questionnaire Short Form (IPAQ-SF).
Results: A total of 427 students were enrolled in the study. More than half of the students were low in physical activity (56.2%) followed by moderate and high levels (30.7 %, and 13.1% respectively). More than half of them used their smartphones five hours or more per day (53.6%), and the majority (65.1%) used applications to monitor physical activity. Bivariable analysis revealed a significant association between physical activity and using applications to monitor health and using applications or wearable devices to monitor physical activity. Additionally, a significant association between physical inactivity and hours of using a smartphone per day was detected.
Conclusion: Low physical activity was prevalent among students at King Saud University. Targeted interventions are needed to enhance physical activity and prevent sedentary behaviors to prevent long-term adverse health consequences.

Keywords: physical activity, university students, smartphones, Saudi Arabia

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INTRODUCTION

Physical activity refers to any form of bodily movement performed by skeletal muscles that increases energy expenditure [1] Most guidelines recommend 150 minutes of moderate-to-vigorous-intensity physical activity each week [2]. There is high-quality evidence that physical activity prevents chronic illnesses, reduces deaths [2, 3], and improves quality of life [3], and the World Health Organization guidelines for physical activity and sedentary behavior stress the need for physical activity for adults aged 18-64 years (average of 150–300 min of moderate-intensity physical activity or 75–150 min of vigorous-intensity physical activity) [4]. Despite the overwhelming evidence emphasizing the benefits of physical activity, about a quarter of the global population performs insufficient physical activity [5], incurring a huge burden on individual health outcomes and the economy [6].

Therefore, promoting physical activity is an important aspect of the wellness and health of society. The transition of young people from high school to university is an important life period when behaviors can be adopted and carried through to later adulthood. A systematic review reported that leaving high school was associated with a 7.04 min (95% CI, 2.82-11.26) decrease in moderate-to-vigorous physical activity each day [7], suggesting that young adulthood represents a critical period to intervene to promote physical activity [7].

In Saudi Arabia, anywhere between 50% and 95% of the population has low physical activity [8], equating to 4 to 5 hours of sedentary behavior (sitting) per day [8]. Approximately 58.0% and 62.7% of university students in southwestern Saudi Arabia [9] and Jazan [10]

were reported to be physically inactive, respectively. However, there is no recent estimate of physical activity levels in university students in Riyadh, despite the need to quantify physical activity to develop targeted public health measures. Therefore, this study aimed to estimate physical activity patterns and to investigate the relationship between physical activity performance and using smartphone health applications among university students in Riyadh, Saudi Arabia.

METHODS

Study design

This was an online cross-sectional survey conducted between June and October 2023. Data were gathered from King Saud University undergraduate students., all university students, nearly 48914 students enrolled in the university at different colleges in 2023[11] ,were invited to participate in the study by e-mail.

Data collection tool

Data were collected using the SURVS online survey tool (https://survs.com/). The questionnaire contained two sections: (i) sociodemographic variables: as age, sex, college, specialty; medical information: as suffering from medical illness or disease, weight and height; and information about the use of smartphones: as history of using smartphones, time spent on smartphones, and history of using the smartphone for monitoring health and physical activity; and (ii) measuring physical activity. For the latter, the International Physical Activity Questionnaire Short Form (IPAQ-SF) [12], a well-validated tool used to assess physical activity in different contexts [13], was used to measure physical activity. The Arabic version has previously been validated [14] and was used in this study. The IPAQ-SF records physical activity over the last seven days into days, hours, and minutes according to four activity levels: sitting, walking, moderate-intensity physical activity, and vigorous-intensity physical activity.

Statistical analysis

Descriptive statistics including frequency and percentages were calculated for categorical variables. Body mass index (BMI) was calculated using the equation kg/m^2 and was categorized into <18.5, 18.5 to <25, 25 to <30, and ≥30.0 corresponding to underweight, normal weight, overweight, and obesity respectively. The metabolic equivalent (MET) min per week was calculated using the following equations: Walking MET-minutes/week = 3.3 * walking minutes * walking days. Moderate MET-minutes/week = 4.0 * moderate-intensity activity minutes * moderate days. Vigorous MET-minutes/week = 8.0 * vigorous-intensity activity minutes * vigorous-intensity days. Then, means and standard deviations (SD) were calculated. Furthermore, physical activity levels were categorized as low, moderate, and high, based on the categorization based on the IPAQ scoring protocol[15]. Bivariate analysis was performed to determine associations between physical activity levels and the other dependent variables using Pearson chi-squared tests. A P-value less than 0.05 was deemed statistically significant. Data was analyzed using SPSS software (IBM Statistics, Armonk, New York) [16].

Ethical considerations

This study has been reviewed by the research ethics committee at King Saud University (KSU-HE-23-593). Participation in this study was voluntary. A description of the study was provided before starting to fill the survey. Identifiable data was not requested.

RESULTS

Table 1: Characteristics of the studied King Saud University students

Variable	University students (n=427)	
	No.	%
Age		
18-19	105	24.6
20-21	182	42.6
22 or more	140	32.8
Sex		
Female	324	75.9
Male	103	24.1
BMI		
Underweight	37	8.7
Normal weight	192	45.0
Overweight	83	19.4
Obesity	52	12.2
Unavailable data	63	14.8
College		
Science colleges	81	19.0
Health-related college	236	55.3
Humanity-related colleges	97	22.7
Community-related colleges	13	3.0
Suffering from health problems or diseases		
No	375	87.8
Yes	52	12.2
Years of using smartphones		
Five years or less	42	9.8
More than 5 years	385	90.2
Hours of using smartphone per day		
Three hours or less	48	11.2
Four hours	75	17.6
Five hours	75	17.6
More than five hours	229	53.6
Using application(s) to monitor health		
No	180	42.2
Yes	247	57.8
Using application(s) to monitor physical activity		
No	149	34.9
Yes	278	65.1
Using wearable device(s) to monitor physical activity		
No	278	65.1
Yes	149	34.9
Levels of physical activity		
Low	240	56.2
Moderate	131	30.7
High	56	13.1

During the study period, 1034 students viewed the survey link, of whom 427 agreed and completed the survey, a response rate among those who viewed the survey of 41%. Three-quarters (75.9%) of respondents were female, and a majority were from health-related colleges (55.4%) followed by humanity-related (22.6%) and sciences-related (19%) colleges. The age distribution was 42.6% for students aged between 20-21 years, 32.8% for students aged 22 years or more, and 24.6% for those aged between 18-19 years. Most respondents did not report a medical problem (87.8%). Forty-five percent of participants had normal BMIs, but 19.4% were overweight and 12.2% were obese.

Most respondents had used smartphones for over five years (90.2%), and over half reported using their smartphones more than five hours daily (53.6%). Over half used smartphone applications to monitor their health, 65.1% used applications to monitor their physical activity, and 34.9% used wearable devices to monitor their physical activity (**Table 1**).

Nevertheless, over half of the sample were low in their physical activity (56.2%). Only 13.1% were in the high category of physical activity and the rest were moderately physically active (30.7%). The mean vigorous MET minutes/week was 362.63±937.81, while the mean moderate MET minutes/week and walking MET minutes/week were 197.67±548.67 and 641.7±1028.50, respectively.

Sex, age, college, and years of using smartphone, (**Table 2**) and BMI levels, and suffering from medical illness were not associated with physical activity (**Table 3**). However, there was a significant association between physical activity levels and hours of using smartphones, using applications to monitor health or physical activity and using wearable devices to monitor their physical activity (**Table 2**). Low physical activity was most common in students who had used smartphones for more than five hours per day (62.4%), had not used applications to monitor their health (65%) and had not used applications to monitor physical activity (71.1%) but had not used wearable devices to monitor physical activity (61.2%). However, high physical activity was most common among students who had used smartphones for three hours or less (14.6%) or five hours per day (14.6%), had used applications to monitor their health (18.2%) and used applications to monitor physical activity (16.5%) but had not used wearable devices to monitor physical activity (14.8%) (**Table 2**).

Table 2: Univariate analysis between physical activity and sociodemographic data and pattern of smartphones use

Variable	Total n=427 No.	Physical activity Low category n=240 No. (%)	Moderate category n=131 No. (%)	High Category n= 56 No. (%)	Pearson chi-square	P-value
Age						
18-19	105	60 (57.1)	26 (24.8)	19 (18.1)		
20-21	182	102 (56.0)	62 (34.1)	18 (9.9)	5.353	0.253
22 or more	140	78 (55.7)	43 (30.7)	19 (13.6)		
Sex						
Female	324	181 (55.9)	103 (31.8)	40 (12.3)	1.174	0.556
Male	103	59 (57.3)	28 (27.2)	16 (15.5)		
College						
Science colleges	81	43 (53.1)	28 (34.6)	10 (12.3)		
Health-related college	236	141 (59.7)	70 (29.7)	25 (10.6)	8.459	0.206
Humanity-related colleges	97	47 (48.5)	30 (30.9)	20 (20.6)		
Community-related colleges	13	9 (69.2)	3 (23.1)	1 (7.7)		
Years of using smartphones						
Five years or less	42	20 (47.6)	19 (45.2)	3 (7.1)	5.096	0.078
More than five years	385	220 (57.1)	112 (29.1)	53 (19.8)		
Hours of using smartphone per day						
Three hours or less	48	18 (37.5)	23 (47.9)	7 (14.6)		
Four hours	75	42 (56.0)	25 (33.3)	8 (10.7)	14.170	0.028*
Five hours	75	37 (49.3)	27 (36.0)	11 (14.7)		
More than five hours	229	143 (62.4)	56 (24.5)	30 (13.1)		
Using application(s) to monitor health						
No	180	117 (65.0)	52 (28.9)	11 (6.1)	16.245	<0.001*
Yes	247	123 (49.8)	79 (32)	45 (18.2)		
Using application(s) to monitor physical activity						
No	149	106 (71.1)	33 (22.1)	10 (6.7)	21.667	<0.001*
Yes	278	134 (48.2)	98 (35.3)	46 (16.5)		
Using wearable device(s) to monitor physical activity						
No	278	170 (61.2)	74 (26.6)	34 (12.2)	8.223	0.016*
Yes	149	70 (47.0)	57 (38.3)	22 (14.8)		

*P<0.05

Table 3: Univariate analysis between physical activity levels, BMI and suffering from illness

Variable	Physical activity Low category n=240 No. (%)	Moderate category n=131 No. (%)	High Category n= 56 No. (%)	Pearson chi-square	P-value
BMI *					
Underweight	22 (11.2)	12 (10.6)	3 (5.6)	2.891	0.822
Normal weight	104 (52.8)	61 (54.0)	27 (50.0)		
Overweight	42 (21.3)	25 (22.1)	16 (29.6)		
Obesity	29 (14.7)	15 (13.3)	8 (14.8)		
Suffering from health problems or diseases					
No	210 (87.5)	118 (90.1)	47 (83.9)	1.439	0.487
Yes	30 (12.5)	13 (9.9)	9 (16.1)		

*Percentages were calculated for available data only

DISCUSSION

Universities should be an ideal place to support students' physical activity, mandating a greater understanding of determinants and motivation for physical activity in this environment [17]. University students are an interesting population undergoing a life transition, and the habits acquired during this period of early adulthood might influence their entire lives. This study provides an estimate of the prevalence of physical activity in university students. Over half of the study sample had low physical activity levels, consistent with other studies of students in Saudi Arabia [9, 10]. Keating et al. (2005) reported a 40-50% prevalence of physical inactivity among university students[18], and a study from Saudi Arabia found that physical activity decreased after starting university in students attending different universities [19]. Although the electronic link for the survey was sent to all university students, many more females responded than males, mirroring other studies of students attending other universities [19].

Reasons for physical inactivity include institutional, intrapersonal, and interpersonal barriers [21]. Walking seemed to be the most common type of physical activity as the mean walking MET-minutes/week was higher than vigorous and moderate MET-minutes/week. This finding is similar to Alkhateeb et al. (2019), probably because it is convenient, usually free, and easy to perform [19]. The largest barrier to physical activity is time constraints [19], and it may be that students transitioning from high school find that they have more commitments at university, promoting sedentary behavior and weight gain [22].

The study detected a signification association between smartphone use and physical activity, probably because screen time is often while sitting or during sedentary behavior [17], which is problematic as prolonged sitting is associated with many health problems [23]. However, smartphones also had benefits: the study found a significant association between using an application to monitor health and physical activity, consistent with a systematic review of the effectiveness of e-health interventions in promoting physical activity [24]. The positive effect of these applications – which use behavioral techniques that might assist in practicing physical activity such as self-monitoring, feedback on performance, and goal-setting [25] – seems to be especially prominent over the short term [26], so applications could be designed to sustain user engagement over time [26]. Such applications should consider the compatibility with most common smartphone types. Further studies are needed to examine the features and effects of using applications on university student physical activity.

This study is limited by its cross-sectional design, convenience sampling, and self-reporting of weight, height, and physical activity, which may be susceptible to recall bias. There may have also been selection bias given the self-selecting nature of recruitment. Using objective techniques such as accelerometers to measure physical activity and other parameters would increase the objectivity of the data. The context of physical activity was not assessed in this study. robust understanding of the beliefs, barriers, and facilitators of physical activity using a theoretical framework is needed, as noted in a systematic review of physical activity among women in the Gulf states [27].

Despite the limitations of this study, a high proportion of students were low in physical activity. A failure to meet recommended daily physical activity levels can have short- and long-term consequences [6], for instance, fatigue [28]. Given the presence of a sedentary profile of the student population and the fact that undertaking some physical activity is better than nothing [4], interventions are urgently needed to motivate young adults to engage more in physical activity.

CONCLUSION AND RECOMMENDATIONS

Low physical activity is prevalent among university students. Despite the emphasis placed by the government on physical activity as an important aspect

of enhancing the nation's health and quality of life, efforts are needed to raise awareness about the magnitude of the problem with a specific focus on the needs, barriers, and facilitators to physical activity among university students.

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CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

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