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Physical activity patterns of university students during the COVID-19 pandemic: The impact of state anxiety

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Abstract:

BACKGROUND: Coronavirus disease (COVID-19) and resulting restrictions have impacted populations' lifestyles and posed a challenge regarding their behaviors, including physical activity (PA). This study aimed to evaluate PA patterns of university students during the COVID-19 outbreak. We also analyzed the association of participants' characteristics, including their level of anxiety, under the pandemic conditions, with adherence to the world health organization (WHO) recommendations for PA.

MATERIALS AND METHODS: This cross-sectional study comprised 717 Moroccan university students recruited during the COVID-19 pandemic. The Global Physical Activity Questionnaire (GPAQ V.2) was used to evaluate PA. Data on sociodemographic characteristics and anxiety levels were also collected. Anxiety was assessed using State-Trait Anxiety Inventory (STAI). Descriptive and inferential statistical analysis was carried out. The association between participants' characteristics and PA was studied using regression models.

RESULTS: Of all participants, 33.2% did not achieve the recommended levels of PA. The daily median (25th–75th percentile) time spent in PA was 34.3 min (12.7–98.6), whereas the median time of sedentariness was 10 h per day (6–14). Multivariate analysis showed that female sex (OR = 0.63; 95% CI: 0.44–0.90; $P < 0.05$) and high level of state anxiety (OR = 0.43; 95% CI: 0.20–0.92; $P < 0.05$) were negatively associated with the achievement of the WHO recommended PA.

CONCLUSION: The reported PA patterns of university students during the current outbreak should be taken into account and evoke the necessity of encouraging this population to adhere to the recommended PA levels. Targeting state anxiety related to the conditions we are facing may have a promising effect on the promotion of PA.

Keywords:

Anxiety, COVID-19, physical activity

Introduction

The health benefits of physical activity (PA) are well established in the literature, including its association with lower risks of cardiovascular disease, diabetes mellitus, obesity, and some cancers such as breast and colon cancer.^[1,2] Furthermore, PA has positive effects on mental health, including reduced anxiety, stress, and depression.^[1] In recognition of these benefits, PA is considered as one of

the targets of the prevention and treatment of non-communicable disease.^[2]

The World Health Organization (WHO) recommends at least 150 min of moderate-intensity PA or 75 min of vigorous-intensity PA daily for people aged 18–64 years.^[3] However, globally, 1 in 4 individuals do not meet these guidelines.^[4] Moreover, PA levels are lower in university student populations worldwide. It was estimated that the prevalence of physical inactivity among university students is 41%.^[5] In a meta-analytic study of

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undergraduate students' PA habits, 40%–50% did not achieve the WHO recommendations for PA.^[3]

Nevertheless, in the course of the current coronavirus disease pandemic, meeting the WHO-recommended PA levels became more challenging.^[6] The coronavirus disease is caused by a severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and has rapidly spread worldwide and developed into a pandemic.^[7] To minimize the spread of the virus, public health recommendations and governmental restrictions have adopted different forms of measures, including social isolation, physical distancing, closure of schools and universities, and transition to online courses, in addition to the closure of PA places (i.e., gyms and outdoor recreation facilities) and home confinement. These measures vary according to each country in terms of strategies used and time period covered but all aimed to prevent human-to-human virus transmission and thereby limiting the virus spread. Expectedly, COVID-19 and related restrictions may have negative effects on populations life behaviors, including PA.^[6] Indeed, important proportions of population worldwide have reported negative changes (reduction) in their levels of PA.^[8,9] According to studies' results of PA among university students, the number of active students decreased significantly in comparison to before the COVID-19 pandemic.^[10] Deteriorations in mental health were also reported. The fear of COVID-19 infection along with the protective measures have resulted in enhanced levels of anxiety and depression.^[11] In this context, several guidelines have been issued and aimed to improve individuals' PA, and some of these considered home-based exercise programs relevant to cope with the physical and psychological deleterious effects of physical inactivity.^[12]

Monitoring PA levels of populations during the COVID-19 pandemic is important for public health. This may help in planning for effective guidelines to improve PA and prevent physical and mental health disorders. This study aimed to investigate patterns of PA among university students during the COVID-19 pandemic and to explore whether there was an impact of mental health, particularly anxiety, on the observed PA levels.

Materials and Methods

Study design and settings

This was a cross-sectional study targeting students from Moroccan universities belonging to the 12 country's regions. Data were collected using a questionnaire distributed using institutional emails within an overall collection period between September 10 and January 30, 2020. During this period, the Moroccan government started easing lockdown measures, but a state of emergency requiring physical distancing, travel restrictions, and night curfew was still in place.

Study participants and sampling

The questionnaire was completed by 768 participants. While 51 respondents provided implausible responses to the questions and were excluded from the final dataset, the final sample for analysis consisted of 717 Moroccan university students.

Data collection tools and technique

Each participant was asked to complete a self-administered questionnaire consisting of three sections:

Sociodemographic characteristics

The first section of the questionnaire included questions regarding socio-demographic and academic characteristics including, age, sex, weight, height, university affiliation, and academic discipline.

Physical activity

The second section assessed participants' PA level by using the French validated version 2 of the Global Physical Activity Questionnaire (GPAQ v. 2). GPAQ was developed by the World Health Organization and has been shown to be reliable for the measurement of PA.^[13] This questionnaire comprises 15 questions providing information about the frequency and duration of PA in three domains (at work, travel to and from places, and recreational PA) in a typical week and the 16th question provides time of sedentariness during a typical day. The different settings of the questionnaire allow calculation of the time spent on PA in each of the domains as well as the total amount of PA reported in minutes per week or in metabolic equivalent of task (MET). One MET is equivalent to the consumption of 1 kcal/kg/h, reflecting the energy cost of sitting quietly. Data collected through the GPAQ allows classifying respondents as active if they accumulated a total of ≥ 600 MET-min per week and inactive if they failed to meet the recommended total PA (total PA < 600 MET-min per week).^[14] Cleaning of GPAQ data and calculation of PA variables and sedentary time was performed based on the GPAQ analysis guidelines.^[14]

Anxiety

The third section of the questionnaire evaluated participants' anxiety by using the French version of State-Trait Anxiety Inventory (STAI). This questionnaire was developed by Spielberger in 1970 to assess individuals' levels of anxiety symptoms.^[15] There are two subscales within this measure. First, the State Anxiety Scale (S-Anxiety) evaluates the current state of anxiety defined as a feeling of anxiety in response to an external stressor or stressful event. Second, the Trait Anxiety (T-Anxiety) evaluates how respondents feel "in general."^[16]

The STAI has 40 items, 20 items allocated to each of the subscales. The score range for each of the state and trait anxiety scales is 20–80 points, and a higher score represents more severe symptoms of anxiety. According to STAI scores, anxiety symptoms were defined as low (<33), medium (33–49), and high (>49).^[17] The collected data were analyzed using the Statistical Package for the Social Sciences (SPSS) software version 21.0 (SPSS, Chicago, IL, USA). Descriptive and inferential statistical analyses were carried out in this study. The results on continuous measurements were presented in median (interquartile range) and the results on categorical data were presented in frequency (%).

Univariate and multivariate binary logistic regression analyses were used to estimate the association between participants' characteristics and PA. The 95% confidence intervals (CIs) were provided. Statistical significance was set at 0.05.

Results

The sociodemographic, academic, PA, and anxiety characteristics of the study sample are presented in Tables 1 and 2. In total, 717 participants were enrolled in the study. The median age of participants was 21 years with an interquartile range of 3 years, and 65.4% were women. Among all participants, 32.6% had a BMI outside the normal range: 8.6% were underweight and 24% were overweight or obese.

Based on overall PA, 33.2% of respondents did not achieve the WHO recommendations for PA (defined by participants not accumulating a total of at least 600 MET-min per week). The daily median (25th–75th percentile) time spent in PA was 34.3 min (12.7–98.6), a median time of 6.5 min/day (0–25.7) was spent in vigorous PA, and 23.6 (8.6–60.4) in moderate PA. Overall, 51.6% of participants had a high level of state anxiety, while 40.6% had a high trait anxiety level.

Table 1: Socio-demographic characteristics of the study participants (n=717)

Characteristics	n (%)	95% CIs
Sex		
Male	248 (34.6)	30.8-37.9
Female	469 (65.4)	62.1-69.2
Body mass index (kg/m ²)		
<24.9	62 (8.6)	6.6-10.7
25.0-29.9	483 (67.4)	63.9-70.9
30.0-34.9	136 (19.0)	16-21.9
≥35	36 (5.0)	3.5-6.6
Discipline		
Fundamental sciences	180 (25.1)	21.9-28.8
Health sciences	267 (37.2)	34-40.9
Engineering	129 (18.0)	15.1-20.8
Social sciences	141 (19.7)	16.7-22.7

95% CIs: 95% confidence intervals for proportions

Unadjusted and adjusted analyses of the association between participants' characteristics and the achievement of the WHO-recommended levels for PA are presented in Table 3. Adjusted regression analysis showed that female sex (OR = 0.63; 95% CI: 0.44–0.90; $P < 0.05$) and high level of state anxiety (OR = 0.43; 95% CI: 0.20–0.92; $P < 0.05$) are negatively associated with the achievement of recommended level of PA. No significant association was found between age, BMI, discipline, and trait anxiety and achieving the WHO PA recommendations.

Discussion

Monitoring the levels and patterns of PA is essential to track progress toward the promotion of PA as a global target for physical and mental health. It also allows the identification of populations at risk of insufficient PA and to assess the effectiveness of PA guidelines, and guide future health planning guidelines and policies.^[2] This monitoring is of further importance under long-lasting pandemics' conditions such as the current COVID-19 outbreak.

The prevalence of insufficient PA (that is, the overall PA was below the WHO-recommended PA level) reported in our study is lower than those found in prior studies,^[6,18,19] notably in a sample of Moroccan university students, of whom 70% of students had a low level of PA.^[18] The timing of the survey may account for this difference; these studies were conducted during the initial COVID-19 lockdown (population was home-quarantined, and all non-essential movements were prohibited), which may explain the lower levels of observed PA compared to our findings. Despite the increased information on PA benefits and recommendations encouraging PA and suggesting how individuals could remain active under the pandemic conditions,^[4,12] results showed that there still has been insufficient adherence to PA among university students. It is possible that the non-accessibility to PA facilities (e.g., gyms and parks) is related to the observed PA levels, and home-based PA may not be possible and preferred by all individuals. Being unable to perform the preferred PA was reported to be one of the reasons why PA is low during the COVID-19 pandemic.^[20]

In terms of time spent in PA and in sedentary behavior, a daily median time of 34.3 min (25th–75th percentiles: 12.7–98.6) was spent in PA and 10 h (6–14) in sitting. In comparison to international studies on university students, averages of total PA were 54.7 ± 62.7 , 38.6 ± 54.3 , and 37.7 ± 30.7 min/day in Spain, Italy, and the US, respectively.^[6,21,22] The survey on US students further reported 7.8 h/day as the average of time spent in sitting.^[22] The transition to online learning may

Table 2: Characteristics of participants regarding physical activity and anxiety (n=717)

Characteristics	n (%)	Median (IQR)
Physical activity		
Achieving WHO recommendations for PA		
Yes	478 (66.8)	
No	239 (33.2)	
Time of total PA (min/day)		34.3 (12.7-98.6)
Time spent in vigorous PA (min/day)		6.5 (0-25.7)
Time spent in Moderate PA (min/day)		23.6 (8.6-60.4)
Sedentary time (h/day)		10 (6-14)
Anxiety		
State anxiety score		50 (40-59)
State anxiety levels		
Low	80 (11.2)	
Moderate	267 (37.2)	
High	370 (51.6)	
Trait anxiety score		46 (36-57)
Trait anxiety levels		
Low	106 (14.8)	
Moderate	320 (44.6)	
High	291 (40.6)	

PA: Physical activity; IQR: Interquartile range

Table 3: Logistic regression analysis for the association between participants' characteristics and PA (Achieving vs. not achieving WHO recommendations for PA)

Variable	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Age	1.07 (1.02-1.12)	1.04 (0.98-1.10)
Sex		
Male	1	1
Female	0.56 (0.39-0.78)	0.63 (0.44-0.90)
Body mass index (kg/m ²)		
<24.9	1	1
25.0-29.9	1.11 (0.63-1.93)	0.97 (0.54-1.73)
30.0-34.9	0.93 (0.50-1.77)	0.73 (0.38-1.43)
≥35	0.64 (0.28-1.49)	0.58 (0.24-1.41)
Academic discipline		
Health sciences	1	1
Fundamental sciences	1.71 (1.13-2.57)	1.5 (0.96-2.36)
Engineering	1.53 (0.97-2.40)	1.38 (0.85-2.34)
Social sciences and humanities	1.28 (0.83-1.96)	1.18 (0.75-1.85)
State anxiety		
Low	1	1
Moderate	0.81 (0.44-1.47)	0.80 (0.40-1.59)
High	0.38 (0.21-0.67)	0.43 (0.20-0.92)
Trait anxiety		
Low	1	1
Moderate	0.77 (0.46-1.27)	1.05 (0.57-1.94)
High	0.43 (0.26-0.72)	0.91 (0.45-1.82)

Bold values indicate statistical significance at P<0.05

be associated with the increased time of sitting and decreased PA.

This study also assessed the anxiety levels of university students. The proportion of participants reporting a high level of state anxiety, which is related to stressful events (COVID-19 pandemic), exceeded 50% of overall respondents. These findings are consistent with other

research results showing an increased anxiety level during the current pandemic.^[23] In fact, studies have underlined a correlation between epidemics and mental illnesses such as anxiety, stress, and depression.^[24] In addition, stress related to limited social and physical contact with others due to the pandemic may be a cause of mental disorders.^[15] The new mode of online classes was also expected to increase levels of anxiety.^[19]

The analysis of the association between participants' characteristics with the achievement of adequate levels of PA showed that females were less likely to adhere to the recommended levels of PA. This finding is in line with other studies' findings across undergraduate and adult samples before^[25,26] and during the pandemic.^[27] Sex differences in PA levels have been suggested to be attributed to differences in psychosocial factors including motivation, self-efficacy, and social support.^[28]

Various studies during the COVID-19 pandemic were focused on the study of the association between physical inactivity and mental health outcomes and suggest PA as a tool to mitigate the negative impact of COVID-19 on mental health.^[29] In this study, we expected that anxiety may be a factor discouraging engagement in PA. Indeed, our findings showed that respondents experiencing higher levels of state anxiety were less likely to achieve PA recommendations. The limited studies examining mental health effects on PA participation have stated stress as a reason for reducing adherence to positive health behaviors.^[30] The results of a previous study examining individuals' perceived barriers and motivators to being physically active during the pandemic showed that the majority of participants were not motivated to participate in PA because they were anxious and lacked social support.^[31] Moreover, daily hassles (i.e., stressors) have shown a negative predictive effect on PA.^[20] In addition, it has been reported that exposure to anxiety and depression symptoms, once or more times, is associated with the likelihood of not achieving the recommended PA levels.^[32] Research is needed to explore the effect of anxiety and other mental health indicators on PA and to understand the psychological processes that fuel engagement and disengagement in PA.

Limitation and recommendation

This study has some limitations. First, self-reporting of data on PA by using questionnaires may not be as accurate as using accelerometers instruments. Second, we reported data on PA during the COVID-19 pandemic; available pre-COVID-19 data would be useful for comparison purposes. Notwithstanding these limitations, this study provides information on PA status among university students during the COVID-19 pandemic. Our findings also indicate that state anxiety related to the context of the pandemic has a negative effect on the achievement of adequate levels of PA. These findings highlight concerns regarding the long-term effects of physical inactivity, such as the increase of the risk of chronic disease, predominantly in this population, if the pandemic lasts longer. This information can guide the planning of public health interventions for PA and health promotion.

Conclusion

Considering the COVID-19 pandemic conditions, populations' behavior is of utmost importance to be studied. According to our results, the level of PA was not adequate for a great portion of our sample of university students, and their level of anxiety was high. We found that female sex and state anxiety were negatively associated with adherence to PA, pointing to the importance of adopting specific measures considering differences between genders. Health professionals should also consider mental health indicators, such as state anxiety related to the situation we are living, to help maintain and promote PA during pandemics.

Acknowledgments and ethical-moral code

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Conflicts of interest

There are no conflicts of interest.

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