



Original Research

Living Situation and Physical Activity in the COVID-19 Pandemic Among American Private University Students

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ABSTRACT

International Journal of Exercise Science 15(4): 1064-1074, 2022. Many university students experienced changes during the COVID-19 pandemic, including potential changes in physical activity (PA) levels and living situation. As PA behaviors in young adulthood help establish life-long habits and future health outcomes, the purpose of this study was to investigate overall change in PA, as well as change in PA due to living situation, among private university students during the COVID-19 pandemic. Private university students ($n = 109$) between 18 and 25 years of age completed an online survey that included the International Physical Activity Questionnaire – Short Form. T-tests examined changes in overall time spent in PA from before to during the COVID-19 pandemic, and the differences in MET-minute distributions between groups. Students performed significantly less activity during the COVID-19 pandemic than before ($t(108) = 3.51, p = .001, d = 0.493$), with 70.6% of all students meeting exercise recommendations before the pandemic and 51.4% after. Students living with vs. without a parent/guardian attained similar PA levels ($t(107) = -.114, p = .910$) before the pandemic (73.1% vs. 69.9%, respectively), but students living with a parent/guardian engaged in significantly less PA ($t(107) = 2.04, p = .044, d = 0.475$) than those living without a parent/guardian during the pandemic (37.5% vs. 57.1%, respectively). The declines in PA suggest the need for targeted interventions and education among private university students. In order to maximize the health benefits of PA, it is crucial that activity engagement return to at least pre-COVID-19 levels.

KEY WORDS: Parent, guardian, MET-minutes, physical activity guidelines, World Health Organization

INTRODUCTION

Physical activity (PA) is an integral component of good health. Existing research strongly suggests that there is a negative relationship between PA and non-communicable diseases (NCDs), including type 2 diabetes mellitus, cardiovascular diseases, cancers, and chronic respiratory diseases (2, 21). Furthermore, it is estimated that inactivity is responsible for 9% of premature deaths (15). Beyond the physical health benefits PA provides, it also produces mental

benefits. In a study of undergraduate students from 94 universities, students who met guidelines for vigorous PA were significantly less likely to declare poor mental health like anxiety or depression disorders (23). In another study of undergraduate students, those reporting regular PA were twice as likely to report a good GPA (3.0-4.0 range) than those who did not engage in regular activity (7). Official GPA records were obtained, in order to ensure objectivity. This trend suggests that reaching a threshold level of PA has a positive impact not only on physical and mental health, but also on academic achievement.

In order to minimize the risk of NCDs, the World Health Organization (WHO) has set weekly guidelines for PA. Among adults, 75-150 minutes of vigorous or 150-300 minutes of moderate activity is recommended (5). Achieving the lower limit of either guideline is the minimum recommend dose of weekly PA. Unfortunately, a substantial portion of university students were not consistently reaching these guidelines prior to the COVID-19 pandemic. One study found that only 24.5% of students met the minimum WHO guideline of 150 minutes of moderate PA per week (13). Moreover, the group of students who did not meet the WHO benchmark had a higher prevalence of poor health outcomes, including overweight/obesity and elevated blood pressure. Another study found that only 30.3% of university students accumulated 30 minutes of PA 5 days a week or 150 weekly minutes (3). In a systematic review of 10 early COVID-19 pandemic studies, 9 found a significant reduction in physical activity. Half of the studies observed decreases in vigorous physical activity, and most of them found declines in light physical activity (16). Overall, studies regarding PA during the pandemic remain limited, and research focused on students attending private institutions is not well established.

There may be numerous barriers to engaging in PA for university students. Among university students, the most commonly perceived barriers to engaging in PA include school workload (84.8%), lack of motivation (59.0%), and time spent working a job (55.0%) (14). Notably, only 7.5% of students reported that lack of a place to exercise was a barrier in 2014 (14). However, this minor barrier to PA was highlighted with the onset of the COVID-19 pandemic. In March of 2020, many states in the U.S. began issuing stay-at-home orders, which prevented all but essential travel. Public gyms were not exempt from these orders. In a study of university undergraduate and graduate students during COVID-19, lack of place to exercise (23.4%) was a top barrier to physical activity (9). Home confinement also negatively impacted PA, thus leading to more sedentary time (1). Confinement also led to drops across all activity levels: vigorous, moderate, and walking (1). Thus, the pandemic itself made it more difficult to find a place to exercise, and a barrier that was minor before the pandemic became a considerable obstacle to PA during the pandemic.

Another factor that influences PA is living situation. Prior research in university students suggests that living off campus leads to less PA participation regardless of geographical location (22). This study did not further examine whether off-campus students were living with a parent. Nevertheless, this university study shows that the living situation (e.g., on versus off a university campus) may play a more important role for physical activity than geographical living location. Notably, as university campuses transitioned to online learning, many students

experienced changes in living situation. By mid-2020, over half (52%) of 18- to 29-year-olds lived with either one or both parents, compared to 46% in January 2020 before the pandemic (12). Among 18- to 24-year-olds, the increase in at-home living was even higher. In February 2020, 63% lived at home with a parent, compared to 71% by July 2020 (12). Therefore, many young adults resided or transitioned to residing with a parent during the COVID-19 pandemic. If discrepancies in PA based on living situation existed before the COVID-19 pandemic, these discrepancies were likely accentuated during the pandemic, thus increasing cause for concern.

As shown, research illustrates changes in PA with the onset of the COVID-19 pandemic among university students, as well as with living situation. However, the impact the COVID-19 pandemic presented for the PA of undergraduate students in private institutions, as well as the specific effect of living situation on their PA, is unknown. Therefore, the purposes of this study were to compare PA before and during the COVID-19 pandemic for private-university students and to explore significant differences in PA between pandemic living situations. The authors hypothesized that private-university students would exhibit changes in PA during the COVID-19 pandemic, and that there would be significant differences in PA levels based on living situation.

METHODS

Participants

This descriptive cross-sectional study was approved by the Institutional Review Board at the primary investigator's university prior to recruitment and data collection. All aspects of this study adhere to the ethical guidelines set forth by Editorial Board (19). After approval, adults between 18 and 25 years of age, who were currently enrolled in a college or university in the greater Houston area, were recruited by university emails, social media, and chain referral sampling in November 2020. Participants provided informed consent prior to online survey access. Participants were allowed to skip questions or stop the survey at any time, and they could enter a drawing for a \$20 gift card at the end of the survey as incentive.

Protocol

Data for this project were collected as part of the larger COVID-19 Stress, Physical Activity, and Nutrition Effects on Students (C-SPANES) study, which examined the effect of the COVID-19 pandemic on PA, diet, resilience, and stress among university students in the greater Houston area. Our study used a data subset focused on PA and living situation among students attending private universities. In addition to general demographic data (e.g., age, race/ethnicity, and socioeconomic status), participants selected from three possible living arrangements: on campus, off campus with a parent/guardian, or off campus without a parent/guardian.

PA was assessed using the International Physical Activity Questionnaire - Short Form (IPAQ-SF). The IPAQ-SF is a seven-day recall tool capturing total weekly minutes spent in PA in distinct categories of vigorous activity, moderate activity, and walking. The IPAQ-SF asks participants to report the number of days they engage in PA, and the time spent in activity on

each of those days. This tool has good validity and reliability among university students (8). In a review from over 12 countries, the IPAQ-SF had a final reliability of 0.76 (17).

For this study, participants filled out the IPAQ-SF twice. The first IPAQ-SF requested participants to provide retroactive data, reflecting their activity before the COVID-19 pandemic. The second IPAQ-SF requested participants to record their current PA during the COVID-19 pandemic. PA was then calculated as both a continuous variable in MET-minutes and categorical classification, both calculated using IPAQ-SF scoring guidelines (11). The IPAQ-SF categorical classifications included low (under 600 MET-minutes per week), moderate (between 600 and 3000 MET-minutes per week), and high (at least 3000 MET-minutes per week) activity (11).

Statistical Analysis

Relevant population descriptive statistics were calculated using mean \pm standard deviation or frequency (%). A paired-samples t-test analyzed the difference in MET-minutes of PA for the entire sample of participants, comparing PA from before to PA during the COVID-19 pandemic. For additional statistical analyses, the authors dichotomized living situation into two categories: living with or without a parent/guardian. Students living on-campus and those living off campus without a parent/guardian were combined as the second category. As the WHO recommends 150 minutes of moderate activity or 75 minutes of vigorous activity per week, the authors also dichotomized participant IPAQ-SF scores as meeting or not meeting WHO guidelines to assess clinical significance (5).

Independent-samples t-tests analyzed differences in MET-minutes of activity between living situations before the pandemic and during the pandemic. To analyze PA categorically, the related-samples McNemar change test was used to explore differences in activity from before to during the COVID-19 pandemic. All statistical analyses were conducted using IBM SPSS software v.26, with an alpha significance level set to $< .05$. A faculty statistician reviewed all analyses and confirmed findings.

RESULTS

For the C-SPANES study at large, a total of 181 participants opened the survey, and of those, only 109 were included in the study (Figure 1). Relevant descriptive statistics, including population demographics, were recorded as part of the survey (Table 1).

MET-minutes were used to evaluate PA levels. Overall, there was significantly less PA performed during ($M = 2106$, $SD = 2602$), as compared to before ($M = 3631$, $SD = 3517$), the COVID-19 pandemic. This was analyzed by paired-samples t-test ($t(108) = 3.51$, $p = .001$), with a medium effect size of $d = 0.493$ (6). The decrease in activity was seen across the entire sample, regardless of living situation. Fewer students achieved a moderate or high activity level during the pandemic (Table 2).

The largest drop occurred in the high activity IPAQ-SF classification, with a 22% decrease in high PA classification during the COVID-19 pandemic. The only IPAQ-SF classification with an increase during the pandemic was the low activity group, composed of students recording less than 600 weekly MET-minutes.

Figure 1. Determination of Sample Size.

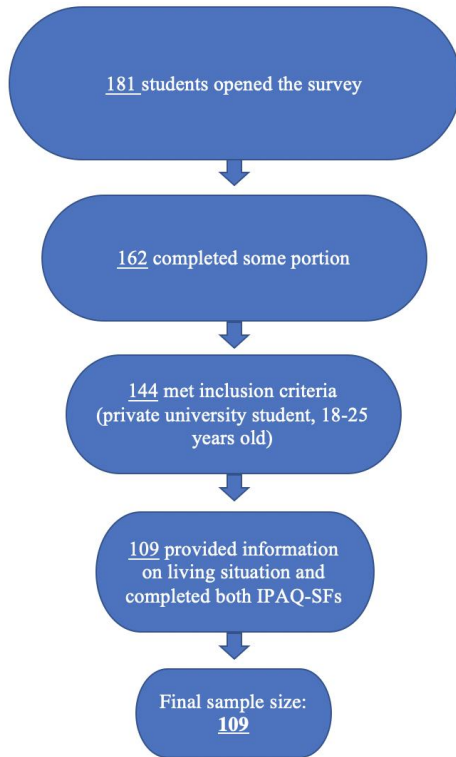


Table 1. Participant Characteristics.

Characteristic or Demographic	Frequency (n)	Mean or %	Standard Deviation (SD)
Age (years)	109	19.7	± 1.26
Gender			
Woman, Feminine, Female	82	75.2%	
Man, Masculine, Male	27	24.8%	
Race			
Asian	47	43.1%	
Black or African American	7	6.4%	
Hispanic, Latino, or Spanish	5	4.6%	
Middle Eastern or North African	3	2.8%	
White	35	32.1%	
Multi-racial	11	10.1%	
Prefer not to Answer	1	0.9%	
Socioeconomic Status (SES)			
Poor	2	1.8%	
Working Class	17	15.6%	
Middle Class	62	56.9%	
Affluent	28	25.7%	

Table 2. Participant Physical Activity Breakdown.

Physical Activity	Frequency (n)	Mean or %	Standard Error of Mean	Statistical Significance
<i>IPAQ Classification Before COVID-19</i>				
Low Activity	9	8.3%		
Moderate Activity	53	48.6%		
High Activity	47	43.1%		
<i>IPAQ Classification During COVID-19</i>				
Low Activity	36	33.0%		
Moderate Activity	50	45.9%		
High Activity	23	21.1%		
<i>Physical activity (MET-minutes)</i>				
Before COVID-19	109	3631	± 337	<i>p</i> = .001
During COVID-19	109	2106	± 249	
<i>Physical Activity Before the COVID-19 Pandemic (MET-minutes)</i>				
Living Without Parent/Guardian	83	3609	± 394	<i>p</i> = .910
Living With Parent/Guardian	26	3700	± 657	
<i>Physical Activity During COVID-19 (MET-minutes)</i>				
Living Without Parent/Guardian	77	2430	± 327	<i>p</i> = .044
Living With Parent/Guardian	32	1328	± 281	

Before the COVID-19 pandemic, there were no significant differences in MET-minutes between the two living situations. Independent samples t-test showed similar PA levels between students with ($M = 3700$, $SD = 3350$) vs. without ($M = 3609$, $SD = 3587$) their parent or guardian ($t(107) = -.114$, $p = .910$). After the pandemic, students living with a parent or guardian ($M = 1328$, $SD = 1590$) performed significantly less PA than those without a parent or guardian ($M = 2430$, $SD = 2869$). Independent samples t-test confirmed this significant difference ($t(107) = 2.04$, $p = .044$), with a medium effect size of $d = 0.475$ (6).

Analysis of WHO guidelines revealed a clinically and statistically significant difference in PA compliance for the entire sample before vs. during the COVID-19 pandemic ($p = .005$). Before the pandemic, 70.6% of students met the WHO minimum weekly exercise guidelines, while only 51.4% met recommendations during the pandemic (5). When comparing change by living situation, 69.9% of participants residing without a parent/guardian met the WHO PA recommendations prior to the pandemic. For that same group, 57.1% of students achieved this standard during the COVID-19 pandemic. In the group of students living with a parent/guardian, 73.1% complied with WHO guidelines before the pandemic. After COVID-19, only 37.5% of students living with a parent/guardian achieved the benchmark PA levels. These changes in WHO guideline compliance were then measured graphically (Figure 2).

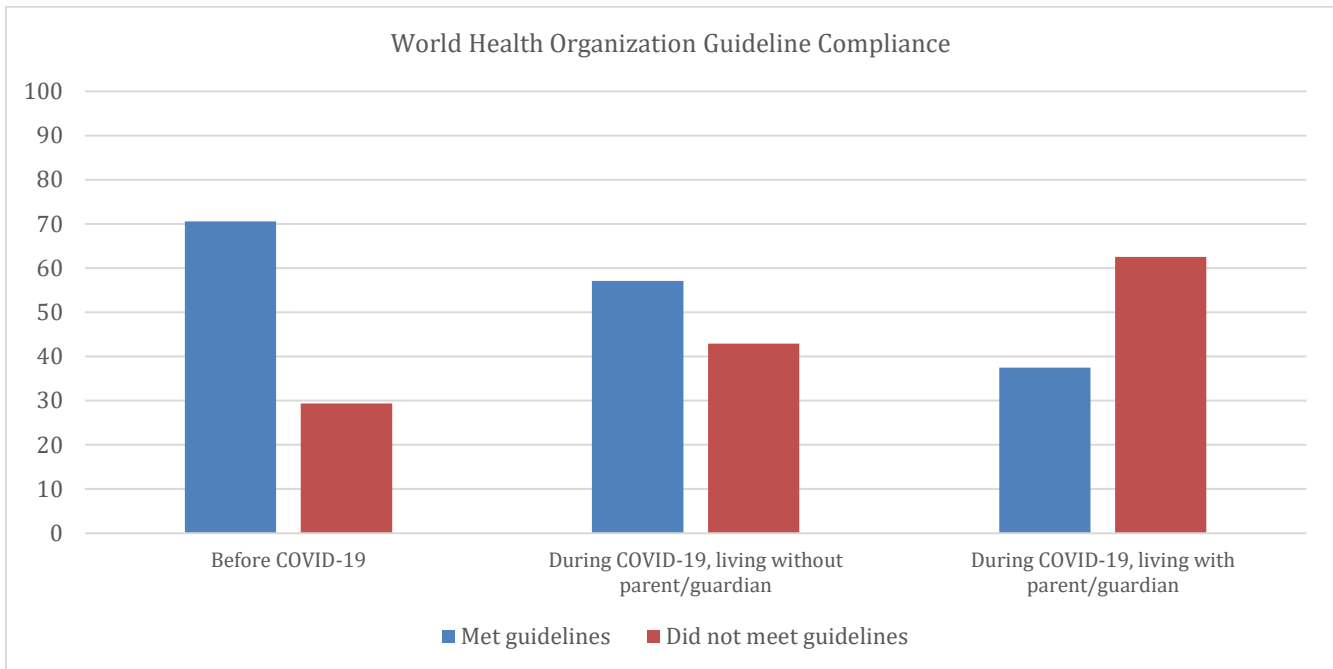


Figure 2. Physical Activity is dichotomized, showing the percent of participants who met or did not meet the World Health Organization guidelines. There was a significant difference in guideline compliance pre-COVID to during COVID-19 ($p = .005$).

DISCUSSION

During the COVID-19 pandemic, there was a significant decline in overall PA for private university students, most significantly for those living with their parent or guardian. Overall, fewer students achieved high or moderate IPAQ activity classification after the onset of the pandemic, with more students classified in the IPAQ's low-activity group. Moreover, students living with vs. without a parent/guardian did not exhibit significant differences in PA before the COVID-19 pandemic, but those who lived with their parent/guardian averaged significantly fewer weekly MET-minutes of activity during the pandemic.

The first important finding was the decrease in private university students' overall PA during the COVID-19 pandemic. This decrease in PA also reflected a change in PA classification, with fewer students achieving high or moderate activity levels. Existing research in university students agree with these findings. A study of university students during the initial COVID shutdown found both a significant drop in weekly minutes of activity and a notable increase in sedentary time (8). Other research show that these trends hold for university student athletes; a study that tracked the PA patterns of university student athletes across the pandemic found a decrease in MET-minutes after the onset of the COVID-19 pandemic (18). Additionally, fewer student athletes achieved a high activity classification after the onset of the COVID-19 pandemic (18). It is likely that regulations (e.g., stay-at-home orders, closures of community gyms and campus recreation centers) during the COVID-19 pandemic posed barriers for students' PA engagement. The PA decrease captured in the current study merits attention and action, as this

pandemic shift may negatively impact students' future physical and mental health (24). In order to restore PA to pre-pandemic levels, it is important to prepare public health campaigns and initiatives. Campaigns will make the general public aware of the ongoing PA deficit. Meanwhile, educational initiatives will provide the means for people to increase activity levels in a safe and healthy manner.

Beyond the general PA decrease, there was a significant difference in PA level between living situations during the COVID-19 pandemic. Those students living with a parent/guardian reported lower PA than peers living without a parent/guardian. To the authors' knowledge, there is currently no available COVID-19 research that examines PA compliance based on living situation among university students. However, current literature in general indicates that individuals living on their own during the pandemic performed less PA than those not living alone (10). While not focused on our subpopulation of private university students, this trend concurs with our research findings.

Specific to university students, there are potential explanations for the difference in PA based on living situation. As one possibility, university students exercised more caution about COVID-19 exposure if they lived with their parent/guardian or other older adults, as older adults have a higher risk of a severe COVID-19 infection, starting at about age 50. With this in mind, students may have taken extra care to avoid contracting COVID-19 while living with parents or guardians in a higher-risk category, than if they were on their own or living with university-aged peers. This could have included minimizing visits to public spaces (e.g. exercise facilities), therefore disrupting and decreasing the PA from their pre-pandemic levels. As an additional possibility, the interactions and social dynamics between an authority figure and their adult children may have played a role. A recent study found that most university students did not view themselves as full adults yet, and their parents concurred; they were in a transition phase (4). Additionally, parents of undergraduate students reported high levels of parental authority (20). This suggests that parents may serve a role in providing guidance for their university-aged children. If parents or guardians discouraged their adult child from going to public exercise facilities, this guidance would have a stronger influence on the decision-making of students living at home with a parent/guardian than on the decision-making of students living alone or with peers.

There are strengths to the current study, including a real-time evaluation of current PA levels when many COVID-19 restrictions and lockdowns were still in effect. Because PA data was collected in mid-2020, it reflects activity behaviors during a time period with less gym accessibility and better captures information on health behaviors during the height of the pandemic. A limitation of this research is the retroactive collection of pre-pandemic PA levels, presenting the possibility of recall errors. On a larger scale, relying on a questionnaire for PA measures remains susceptible to misreporting or misremembering of critical information. Nevertheless, the IPAQ-SF remains a valid and reliable tool in assessing university students' PA (76). Another limitation is the relatively homogenous sample, with participants largely identifying as Asian (43.1%) and white (32.1%). However, national estimates project that 77% of

students currently enrolled in U.S. universities identify as white or Asian. Therefore, while this research study includes a somewhat imbalanced racial representation, the percentages used to draw our conclusions are a reasonable reflection of national university demographics, thus increasing their generalizability among this population. A final limitation is the cross-sectional nature of this study, so temporality and causality could not be established. Future longitudinal research is needed.

Overall, PA levels of private university students dropped during the COVID-19 pandemic. Students living with a parent/guardian in the pandemic experienced the largest PA drop-off, with only 37% of these students reaching WHO-recommend weekly PA (5). These findings showcase the need for PA interventions designed to target private university students, particularly those living with a parent or guardian during the COVID-19 pandemic. Education campaigns on the importance of PA should be prepared for both students and their parents, especially if they are living together, and should highlight additional options to safely participate in PA without increasing the risk of COVID-19 exposure. Proper education and intervention can create the opportunity to increase PA during the COVID-19 pandemic among this demographic and positively impact health behaviors extending into adulthood.

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