

RESEARCH COMMUNICATION

Student characteristics associated with the level of physical activity in undergraduate students: An observational study

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ABSTRACT

Background: Levels of physical activity are thought to decline from childhood to early adulthood. Understanding the level of physical activity and its associated factors among undergraduate students is critical to promote health benefits and reduce their risk for certain diseases.

Objectives: This study aimed to identify the factors that are associated with the level of physical activity among undergraduate students.

Methodology: In this cross-sectional, observational study, the physical activity of 489 undergraduate students enrolled in the University of the Philippines Manila was measured. Physical activity was measured using the Global Physical Activity Questionnaire Version 2. Multiple linear regression was done to analyze the association between physical activity and variables including age, sex, belonging to degree-granting units that do clinical placements, year level, current enrolment in physical education course, and membership in sports-related organization.

Results: Students were, on average, physically active 112 minutes per day and sedentary 536 minutes per day. Enrolment in a physical education course (B 79, 95% CI 44 to 115), membership in sports-related organization (B 105, 95% CI 54 to 157), and sedentary time (B -0.13, 95% CI -0.19 to -0.07) were associated with the level of physical activity. These three variables explained 10% of the variance in physical activity.

Conclusion: Undergraduate students were physically active but spent most of their day sedentary. Physical activity was associated with enrolment in a physical education course, membership in a sports-related organization, and sedentary time. Results of this study could inform decisions on strategies to facilitate active lifestyles for students to carry over healthy physical activity habits into adulthood.

Keywords: *physical activity, sedentary, students*

Introduction

Physical activity is vital as it lowers the risk of developing chronic diseases such as cardiovascular diseases and diabetes mellitus [1], prevents obesity, and improves psychological health. Specific global and national recommendations have been developed to ensure that the youth is sufficiently engaging in at least an average of 60 minutes per day of moderate to vigorous levels of physical activity [2,3], and the adult population is intentionally engaging in at least an average of 75–150 minutes of vigorous-level or at least 150–300 minutes of moderate-level of physical activity weekly [3] to remain healthy.

Yet physical inactivity is identified as one of the leading risk factors for global mortality [3] and causes about 6% of the global

burden of disease from noncommunicable diseases [4]. Despite the documented benefits of daily physical activity and specific global and national recommendations on the level of physical activity required for the population to remain healthy [3-5], 81% of adolescents and 28% of adults in developed and developing countries remained physically inactive between 2001-2016 contributed by country-specific and community-specific factors [6]. When combined with high sitting time, low levels of physical activity increase the risk for all-cause mortality by 58% which is similar to the harmful effects of smoking and obesity [7].

Physical activity level is insufficient in developing and developed countries due to daily occupations and transportation

modes that encourage prolonged sitting time but is found to be less prevalent in economically emerging nations [6]. Inadequate physical activity level is higher in women than men globally [6]. In the east and southeast Asia region, the Philippines has the highest prevalence of inadequate physical activity at 40% [6] despite the Philippine National Guidelines on Physical Activity created by the DOH in 2010 [2]. According to the Lancet Physical Activity 2016: Progress and Challenges Series, the increase in risk for all-cause mortality brought by high sitting time can be counteracted by engaging in 60–75 minutes of moderate level of physical activity daily and even eliminated by doing higher levels of daily physical activity [7]. The insignificant progress in increasing levels of physical activity in majority of populations remains a major public health concern that should be addressed through effective, coordinated, and sustainable efforts by multiple sectors worldwide [8].

The levels of physical activity are found to decline from childhood to early adulthood [9]. Among adolescent students residing in developing Southeast Asian countries, insufficient levels of physical activity are contributed by lack of engagement in active modes of transportation, non-attendance in physical education courses, poor vegetable diet intake, and lack of peer and family support [10]. For undergraduate university students, the decline is attributed to physical activity becoming more a voluntary than a required curricular activity [11]. On the other hand, personal characteristics such as age, gender, and involvement in sports [12], enrolment in a physical education course [13,14] and year level [15] have been shown to be associated with high level of physical activity in this population. Further data on the level of physical activity and sedentary time, and its predictors in undergraduate students in developing countries are needed to further understand this health concern [3,16]. Such data are critical if the intention is to eventually devise strategies to enforce active lifestyles for this group to carry over into adulthood [17]. Therefore, the research questions of this study were:

1. What is the level of physical activity in undergraduate students in a developing country?
2. Do they spend more time sedentary than doing physical activity in a day?
3. Which student characteristics are associated with the level of physical activity?

Methodology

Design

A cross-sectional survey was done to assess the level of physical activity of undergraduate students of a university in

the capital city of the Philippines. The survey was administered in online and paper formats. Students were recruited from different degree-granting units of the university through advertisements posted on noticeboards, social media, and electronic mailing list of student organizations. These advertisements indicated the web link for the online survey. To ensure wide distribution, copies of the survey were handed out to interested students of different degree-granting units. The paper-based surveys included a statement about the option of completing the survey online. Students answered the survey in the format they preferred. Students who elected the paper format returned the completed survey at designated collection points in their units. Students who elected the online format accessed the survey on their own. To prevent multiple responses to the online survey from the same student, the survey was limited to one response per computer. Both formats of the survey were available for 6 weeks.

The Ethical Review Committee of the University of the Philippines College of Allied Medical Professions approved this study and participants gave informed consent before data collection began.

Participants

Undergraduate students enrolled in the Doctor of Dental Medicine, BS Physical Therapy, BS Occupational Therapy, BS Speech Pathology, BS Nursing, BS Pharmacy, BS Industrial Pharmacy, BS Public Health, BS Biology, BS Biochemistry, BA Behavioral Sciences, BS Computer Science, BA Political Science, BA Social Sciences, BA Organizational Communications, BA Developmental Studies, and BA Philippine Arts at the time of data collection were invited to participate in this study. There were no exclusion criteria. Characteristics of the students such as age, sex, degree-granting unit they belonged to, current enrolment in physical education course, and membership in sports-related organization were collected.

Outcome measures

Factors considered for association were age, sex, belonging to degree-granting units that do clinical placements, year level, current enrolment in physical education course, and membership in sports-related organization.

The outcome of interest was the level of physical activity measured using the Global Physical Activity Questionnaire Version 2 (GPAQ) and reported in minutes per day active and sedentary. Time spent doing physical activity was determined according to the domain (work, travel to and from places, or recreational activities) and intensity (moderate or vigorous).

(Permission to use GPAQ, version 2, granted by Regina Guthold, gutholdr@who.int; email; February 2, 2011). The GPAQ, developed by WHO for physical activity surveillance in developed and developing countries, comprises 16 questions and collects information on physical activity in the three domains and sedentary behavior. These domains are further divided into six sub-domains, namely, vigorous work, moderate work, travel, vigorous recreational, moderate recreational, and sitting or reclining. The GPAQ is accomplished by indicating the types of work-related, travel-related, and recreation-related physical activities, as well as the number of days and duration of time spent in activities and in sitting in a typical week. The GPAQ showed moderate to strong concurrent validity with the International Physical Activity Questionnaire for moderate and vigorous-intensity physical activity and sedentary behavior questions ($r = 0.45$, $r = 0.57$ and $r = 0.65$, respectively), fair criterion validity versus pedometer data for total physical activity ($r = 0.31$), poor to fair criterion validity for sedentary behavior questions (0.06-0.35), and substantial test-retest reliability for vigorous-intensity activity and sedentary questions ($r = 0.67$ and 0.76 , respectively) [18].

Data analysis

We targeted collecting data from 180 students in order to have sufficient power to enter six factors since according to Wilson VanVoorhis & Morgan [19], having 30 participants per factor in the regression model is desirable for better power.

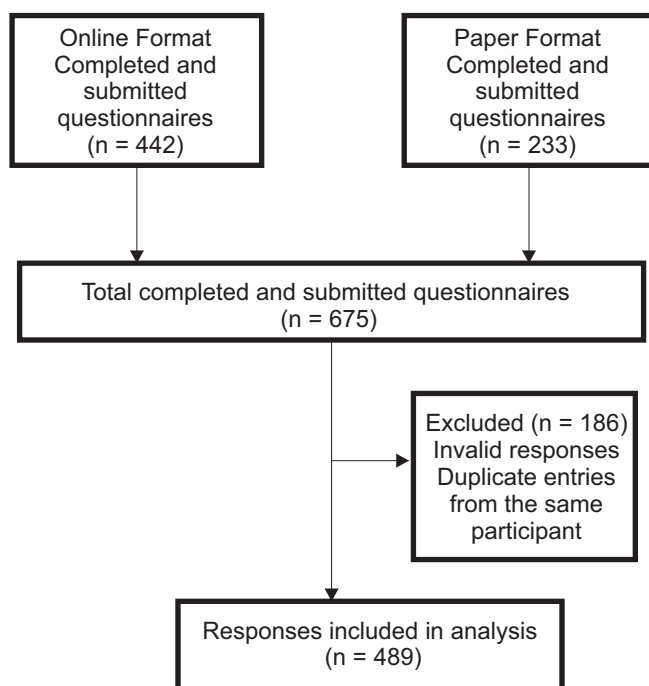


Figure 1. Design and flow of students through the study.

Univariate analysis was undertaken using Pearson's Correlation between factors and time spent physically active (minutes per day) was conducted to identify predictors. Regression coefficients (95% CI) were determined for each factor using univariate analysis. Significant predictors were entered into the multiple linear regression ($p < 0.05$). An equation to predict time spent physically active was developed from the coefficients (B) of the significant factors from the multiple regression analysis ($p < 0.05$). Descriptive statistical analysis was also performed to determine the characteristics of the participants.

Results

Flow of Participants through the Study

Six hundred seventy-five students consented and completed the survey. Of these, 489 responses were included in data analysis as detailed in Figure 1. Table 1 presents the characteristics of the students as to age, sex, degree-granting unit, year level, enrolment in physical education course, and membership in sports-related organization. Most students were enrolled in physical education courses and not members of any sports-related organization.

Level of Physical Activity in Undergraduate Students in a Developing Country

Data on physical activity are presented in Table 2. On average, students were physically active 112 (134) minutes per day. Of this total time spent on physical activity, 48 (77) minutes per day were spent on work-related physical activities and 35 (87) minutes per day were spent doing vigorous activities.

Table 1. Characteristics of Participants.

Characteristic	(n = 489)
Age (yr), mean (SD)	19 (2)
Sex, n male (%)	145 (30)
Degree-granting unit, n with clinical placements (%)	293 (60)
Year, n (%)	
1	75 (15)
2	86 (18)
3	127 (26)
4 to 6	201 (41)
Enrolled in physical education courses, n (%)	149 (30)
Members of sports-related organizations, n (%)	59 (12)

Active Time Compared to Sedentary Time

Participants were sedentary 536 (284) minutes per day, which was more than four times longer than their active time.

Factors Associated with the Level of Physical Activity

Univariate regression analysis showed that sex, enrolment in physical education course, membership in sports-related organization, and sedentary time were correlated with the level of physical activity ($r = 0.11 - 0.20, p < 0.05$) (Table 2).

When the significant factors were entered into multiple linear regression, the level of physical activity was associated with enrolment in physical education course, membership in sports-related organization, and sedentary time. Box 1 presents the regression coefficients of the predictors in the model, the prediction equation, and the accuracy of the prediction of the level of physical activity. The prediction

Table 2. Mean (SD) Level of Physical Activity (min/day) According to Active and Sedentary Time.

Physical Activity (min/day)	(n = 489)
Active time	112 (134)
Domain	
Work	48 (77)
Transport	37 (69)
Recreation	27 (49)
Intensity	
Vigorous	35 (87)
Moderate	77 (134)
Sedentary time	536 (284)

Box 1. Mean (95% CI) regression coefficients of predictors and prediction equation from the multivariate analysis and accuracy of prediction of physical activity (n = 489).

Regression coefficients of predictors
Constant = 225 (186 to 264) Current enrolment in physical education course = 79 (44 to 115) Membership in sports-related organization = 105 (54 to 157) Sedentary time = -0.13 (-0.19 to -0.07)
Prediction equation
Physical activity (min/day) = 225 + 79 enrolment in physical education course + 105 membership in sports-related organization - 0.13 sedentary time (minutes/day)
Accuracy of prediction equation
R ² = 0.10

equation explained 10% of the variance in the level of physical activity.

Discussion

Undergraduate students in a developing country were physically active, spending, on average, 112 minutes per day doing mostly work-related physical activities of moderate intensity. This level of physical activity meets the WHO global recommendations on physical activity of at least 150 minutes of moderate-intensity activity per week [3]. However, the time that students were sedentary was higher than their active time. The level of physical activity may be predicted by student characteristics. Enrolment in physical education course, membership in sports-related organization, and sedentary time explained 10% of the variance in the level of physical activity.

The level of physical activity of the respondents is within values reported for college students in Newcastle, England, most of whom reported being active for a total of at least 1 hour per day on 3 to 7 days per week [14]. The composition of total physical activity of the students is consistent with earlier reports of transport and work, more than leisure, making up most of the physical activities in low and middle-income countries [16] and the reported need to improve participation in physical activity in this domain among adults. On the other hand, the results of this study did not bear out results from other developing countries that showed transport-related physical activities comprising majority of the total physical activity [16,20]. This difference in results could be accounted for by other predictors of physical activity such as self-efficacy [21,22], health mindsets [23], fruit and vegetable intake [24], perceived body weight [24], social support [21], and number of health education-related courses per week [25] that were not investigated in this research.

While the level of physical activity of the students complies with the global recommendations for health, their sedentary behavior requires intervention. Undergraduate students spent an average of 9 hours sitting or reclining, which meets the recommended maximum of 2 to 3 hours [26]. While the respondents are generally physically active, their sedentary behavior must be modified as high sedentary time also contributes to health risks. This is particularly important because students sit to listen to lectures, study, do homework, answer written examinations, and the like. Outside the hours spent sitting in student activities, more hours could also be spent sitting during discretionary time due to technological advancement and urbanization such as

when playing video games, using tablets or computer, and watching television and movies [27]. This predisposition to sedentary behavior has been reported in 48% of Filipino youth who watch television for greater than or equal to two hours per day [28].

Factors associated with physical activity revealed in this study support previous reports on involvement in a sports-related organization and physical education courses [12,29,30]. These factors may be understood to reflect curricular demands (for enrolment in physical education course and sedentary time) and intrinsic motivation (for membership in sports-related organization).

Results of this study must be taken with caution because of the inherent subjective judgment and recall involved in using self-reported questionnaires that could otherwise be avoided by using objective measures of physical activity. Self-report could have over- or under-estimated the data. Moreover, because of the data collection methods, probing of answers was not possible, which could have decreased the occurrence of data errors.

Despite these limitations, results point to a number of opportunities for further understanding the nature of physical activity in undergraduate students. This understanding has become even more critical because of the changed behaviors of students while learning remotely and minimizing health risks during the pandemic. Other personal, socio-cultural, and environmental predictors of physical activity may be investigated in subsequent longitudinal studies. Results also inform strategies to ensure that undergraduate students spend adequate time being physically active while keeping their sedentary time within acceptable limits. University-based wellness programs that would further increase the level of physical activity and decrease sedentary behaviors among undergraduate students should be designed and implemented. Programs may be devised to encourage undergraduate students to spend their discretionary time doing even light physical activities instead of sitting.

In conclusion, undergraduate students are physically active but spend most of their day sedentary. Physical activity was associated with enrolment in physical education course, membership in sports-related organization, and sedentary time.

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