DOI: 10.4025/jphyseduc.v30i1.3076

Original Article

PHYSICAL ACTIVITY AND PHYSICAL FITNESS AMONG FILIPINO UNIVERSITY STUDENTS

ATIVIDADE FÍSICA E APTIDÃO FÍSICA ENTRE ESTUDANTES UNIVERSITÁRIOS FILIPINOS

Chessa Sanchez Pituk[1] and **Jonathan Yap Cagas**[2]

[1]University of the Philippines Manila. Manila, Philippines.
[2]University of the Philippines Diliman. Quezon City, Philippines.

ABSTRACT
The purpose of this study is to examine the physical activity and physical fitness of university students. Four hundred seventy-four apparently healthy university students (167 males; 307 females) answered a physical activity questionnaire and underwent anthropometric and physical fitness assessments. Results indicated that male university students were more physically active (p=0.012) and physically fitter than females. Specifically, male students outperformed female students in the following tests: vertical jump (p=.000), curl-ups (p=0.000), and aerobic output (p=0.000). No significant gender difference was found in upper body flexibility. However, females displayed greater lower body flexibility compared to males (p=0.000). Females also had greater body fat than males (p=0.000). Additionally, higher physical activity was associated with higher aerobic output, leg power, muscular endurance, and lower body fat. Increasing physical activity among university students is important not only to promote physical fitness but also to help students manage the demands of university student life. Strategies to promote increased physical activity among university students should give special attention to female students as they are more likely to be less active than their male counterparts.
Keywords: Physical activity. Fitness. University students.

ABSTRACT
O objetivo deste estudo foi examinar a atividade física e a aptidão física de estudantes universitários. Quatrocentos e setenta e quatro estudantes universitários aparentemente saudáveis (167 homens; 307 mulheres) responderam a um questionário de atividade física e foram submetidos a avaliações antropométricas e de aptidão física. Os resultados indicaram que os estudantes universitários do sexo masculino eram mais ativos fisicamente e fisicamente mais aptos do que as mulheres. Especificamente, os alunos do sexo masculino superaram os estudantes do sexo feminino nos seguintes testes: salto vertical, enrolamentos e produção aeróbica. Nenhuma diferença significativa entre os sexos foi encontrada na flexibilidade da parte superior do corpo. No entanto, as fêmeas apresentaram maior flexibilidade corporal menor em comparação aos machos. Eles também tinham maior gordura corporal que os machos. Além disso, maior atividade física foi associada com maior produção aeróbia, força da perna, resistência muscular e menor gordura corporal. O aumento da atividade física entre estudantes universitários é importante não apenas para promover a aptidão física, mas também para ajudar os alunos a administrar as demandas da vida universitária. Estratégias para promover o aumento da atividade física entre os estudantes universitários devem dar atenção especial aos estudantes do sexo feminino, pois eles são mais propensos a ser menos ativos do que seus colegas do sexo masculino
Keywords: Atividade física. Aptidão. Estudantes universitários.

Introduction

Increased physical activity plays an essential role in risk reduction for heart disease, stroke, and cancer[1]. For university students, engagement in physical activity can lead to better mental health[2] and it can help them cope better with the stress and demands of university life[3]. Despite the importance of physical activity, there seems to be a high prevalence of sedentary lifestyle among university students[4]. The occurrence of leisure-time physical inactivity has been evident among a large number of university students[5].

University students have a busy and demanding schedules in both their academic and extracurricular activities. They are more susceptible to adopt unhealthy coping behaviours such as high caloric food intake and alcohol consumption[6]. Also, university students have been found to exhibit decreased level of physical activity and inadequate sleep[7]. Unhealthy

lifestyle of university students may lead to various diseases in their adulthood years. It is vital for them to adopt a healthy lifestyle throughout their university life.[8]

A recent report on worldwide trends in insufficient physical activity has shown that almost 40% of Filipinos are inadequately active. Guthold et al.[9] found that 30% of Filipino males and 50% of Filipino females were insufficiently active. These numbers are alarming given that physical inactivity is a known risk factor of many chronic diseases[9]. Promoting physical activity among university students may be an important strategy to ensure that they develop regular physical activity habits which they can continue throughout their adult life.

Physical activity is seen to influence the improvement of fitness parameters among university students. It has been found that the Metabolic Equivalent (MET) and body fat percentage were negatively correlated among university students[10]. Researchers also pointed out that increased physical activity led to positive effects on vertical jump performance among college men[11]. Collegiate students engaging in recreational sports demonstrated higher muscular endurance as compared to those who are sedentary[12]. In the study by Mesquita et al.[13], men scored higher in cardiorespiratory fitness. Women were anticipated to have lesser cardiorespiratory fitness due to lower cardiac output and oxygen transport capacity. It has been speculated that women having lower levels of physical activity than men caused these physiological differences[13].

There have been several publications on the comparison of the fitness levels of males and females. Male physical education students were reported to have higher physical fitness levels as compared to female students in terms of anthropometric and performance indices[13]. Furthermore, the gender differences in the adherence of physical activity in the study by Zaccagni et al.[14] showed that Italian female university students were three times as sedentary as their male counterparts[14].

In the Philippines, there are limited studies about physical activity levels and physical fitness among university students in Metro Manila. Thus, this study will try to establish evidence of whether male students in the local setting are more physically active than female students.

Determining the prevalence of physical activity in university settings may help conceptualize, plan, and implement programs towards improving students' health. As a result, the purpose of this study is to compare the physical activity and fitness levels of males versus females. The current study also aims to examine the relationship between physical activity and fitness indices of Filipino university students. We hypothesize that males are more active than women and that physical active individuals have greater physical fitness levels compared to those who are sedentary.

Methods

Participants

Convenience sampling of Physical Education (PE) classes of Academic Year (AY) 2018-2019 was included. All available students in each class were invited to be screened for eligibility to participate in research. Exclusion criteria were contraindications for physical activity and lack of approval for participation in the research. A total of four hundred seventy-four (474) consented to participate. Data on eighty-two (82) participants were excluded from the analysis because of missing data on the demographic information or physical fitness domains.

Three hundred ninety-two (n = 392) apparently healthy university students participated in this study. Specifically, there were 167 male (M_{age} = 18.4, SD = 0.74 years) and 225 female (M_{age} = 18.4, SD = 1.00 years) students who volunteered to participate. During the time of the testing, the students were enrolled in a physical activity course that

meets once a week for 2 hours. A written consent form was signed by the students before further experimentation. Also, Physical Activity Readiness- Questionnaire[15] was used to screen the participants. This study was approved by the institutional research ethics board.

Measurement and Procedures

Data collection was conducted for two sessions separated by seven days. In the first session, test procedures were explained to the students. It was followed by answering the PAR-Q. During the second session, the participants were asked to complete the International Physical Activity Questionnaire (IPAQ) long form to determine their physical activity levels. Aside from answering the survey, students underwent health and fitness assessment such as (1) height, (2) weight, (3) body fat percentage, and physical fitness tests namely: (1) 20-meter shuttle run test, (2) modified sit and reach test, (3) zipper test, (4) 1-minute partial curl-up test, and (5) vertical jump test.

Measures

*Physical Activity***.** Self-reported physical activity levels for the past seven days was assessed using the self-administered long version of the International Physical Activity Questionnaire (IPAQ). This questionnaire measures physical activity undertaken across a comprehensive set of domains such as (a) leisure time physical activity; (b) domestic and gardening (yard) activities; (c) work-related physical activity and; (d) transport-related physical activity. IPAQ items provide details about the frequency (number of times in a week) and duration (number of minutes in a day) of their day-to-day activities from moderate to high-intensity efforts. Classification of physical activity levels was based on the IPAQ guidelines on data processing. Students were classified into having high physical activity if they reported having engaged in vigorous-intensity activities on at least three days and had spent at least 1500 MET-minutes/week. High physical activity levels were also assigned to those who reported having spent seven or more days doing combinations of walking, moderate-intensity or vigorous-intensity activities achieving to at least 3000 MET-minutes/week. Assignment of moderate physical activity was done to those who reported having engaged in at least three days of vigorous-intensity activities which they did for at least 20 minutes per day. Those who reported doing moderate-intensity activities for at least five days for at least 30 minutes per day were also classified as having moderate physical activity. Those who did not meet the criteria for having high or moderate physical activity levels were classified as having low physical activity levels[16]. In the study Craig et al.[17], the measurement properties of IPAQ demonstrated acceptable reliability (report the ICC number that the study presented) and validity when the instrument was used in both developed and developing countries[17].

Body fat percentage (body fat %). Body composition was measured using a two-point Bioelectrical Impedance Analysis (BIA) (Inner Scan 541 N, Tanita, Tokyo, Japan). It is designed to provide information about the major health indicators to monitor the effects of lifestyle modification. It was devised for adults aged 18-99 years old.

Lower body flexibility. Hamstring and lower back flexibility were assessed using the modified sit and reach test. To administer this test, the participant was asked to be barefoot and to sit on the floor with the buttocks, shoulders, and head in contact with the wall. A yardstick was positioned in between the fully extended legs, with the zero mark facing the body. The heels were 25.4-30.48 cm apart and aligned on the 38.1 cm mark of the yardstick. Subjects were instructed to reach as far as possible without bending their knees with one hand placed on top of the other while keeping their hands parallel to each other. If a participant demonstrated bouncing motions and flexed knees, the score was not considered. Three trials were given with the highest score recorded for analysis[18].

Upper body flexibility. Right shoulder and left shoulder flexibility were measured using the Zipper Test. In this test, the participant attempts to touch the middle finger on a specified elbow position placed over the thoracic region. Three trials were given with the closest distance recorded for analysis[19]

Lower body power. Assessment of local body muscular power was derived from the Sargent Jump Test[20] that measures the difference between the subject's standing reach and the maximum height at the peak of the jump. This test is commonly utilized in numerous studies that assessed the effectiveness of an exercise or training program in developing explosive power. It is also used to predict future success in different sports disciplines that require execution of explosive leg power, including basketball and weight lifting[21]. The participant's standing reach height was recorded first with either hand by asking the subject to put a mark on the wall while maintaining their feet flat on the floor. The jump is then initiated with knees bent at around 90 degrees. The subject may also opt to start in a standing position followed by a rapid knee flexion before jumping. The subject attempts to jump vertically as high as possible using arms and legs to project the body upwards. This test protocol allows swinging of arms when performing the jump. However, subjects were prohibited from executing preparatory steps before jumping. The fingertips marked the wall using a 2.54 cm chalk during the peak of the jump. Difference between the measures of standing reach and the peak jump height was recorded in centimetres and was used for statistical analyses[22].

Muscular endurance. The abdominal muscular endurance was evaluated using the 1-minute curl up test. In this test, the participant lays down on their back with knees bent at 90 degrees. Arms were placed at the side of their body. The upper body was curled forward by lifting the head and shoulder as the fingertips slid forward by 7.62 cm after which they returned to the starting position. The total number of correct curl-ups for 1 minute was recorded[18].

Cardiovascular endurance. The cardiovascular endurance was measured using the 23-level continuous sub-maximal test known as 20m shuttle run test or beep test. In this test, the runs were synchronized using a pre-recorded audio that provided a distinct sound called "beep" at set intervals. The initial speed starts at 8.5 km/hr and increases by 0.5 km/hr increment each minute after that. The subject attempts to perform continuous shuttle runs and reach the other end of the line before the next beep sounds. As the test progressed, the interval between each beep decreased. The subject who does not reach the line before the beep sounds will be given a warning of one failed attempt and must proceed to run towards the line and catch up with the pace. If the participant reached the line before the succeeding beep, their failed attempt was reset. However, the subject will be asked to withdraw from the test after performing two consecutive failed attempts. After withdrawal from the test, the last level covered was recorded[23].

Statistical Analysis

Data are displayed as mean ± standard deviation. Median and interquartile range (IQR) were used to describe the physical activity scores due to its skewed distribution. Independent *t*-test was utilized to identify any significant difference. Wilcoxon rank sum test was used to assess the significant difference in the data on physical activity. The effect size was calculated using Cohen's *d*. Spearman rank correlation (r_s) was used to establish the relationship of physical activity with body fat and performance markers. Results of statistical tests were deemed significant at 5% level of significance. Adjustment for Type I error was done using Bonferroni correction for the multiple comparison tests done. Statistical analysis was performed using a commercial statistical package[24].

Results

Overall Physical Activity Level

The total physical activity of the 50%of the university students was at least 2001.0 MET-minute/week, which revealed moderate levels of physical activity. 37% of the university students have high levels of physical activity and 15% have low levels of physical activity. Table 1 shows the physical activity levels of Filipino University students.

Table 1. Physical activity levels of Filipino university students (n=392)

Total physical activity *(MET-min/week*	Median: 2001.0 IQR: 988.5 – 3823.5
Physical activity level	No (%)
Low	60 (15.31)
Moderate	188 (47.96)
High	144 (36.73)

Source: The authors

Males demonstrated greater physical activity than females z = 2.51, p = 0.012. However, the difference in the distribution of physical activity levels between males and females is not significant. Among the Filipino university students examined females have a low physical activity level that equals to lower than 600 MET physical activities. In the high physical activity category, males and females did at least 1500 MET/week physical activity (Table 2).

Table 2. Physical activity levels of Filipino university students by sex (n=392)

Physical activity levels	Male (*n*=167)	Female (*n*=225)	Total (*n*=392)
	No. (%)	No. (%)	No. (%)
Low	22 (13.17)	38 (16.89)	60 (15.31)
Moderate	70 (41.92)	118 (52.44)	188 (47.96)
High	75 (44.91)	69 (30.67)	144 (36.73)

Notes: Chi-square = 8.37, p = 0.015
Source: The authors

Domain Specific Physical Activity Level

Results suggested that Filipino university students have no engagement in a job-related activity. No significant differences were found in the domains except in leisure (p=0.0006). Most males were more active during their leisure time as compared to females (Table 3).

Table 3. Physical activity (MET-min/week) of Filipino university students by domain and sex

Physical activity domains	Male (*n*=167)		Female (*n*=225)		Total (*n*=392)	
	Median	IQR	Median	IQR	Median	IQR
Work	0		0		0	
Active Transportation	693.0	330.0–1188.0	594.0	264.0–1039.5	660.0	297.0–1171.5
Domestic and Garden work	270.0	0–870.0	202.5	0–660.0	210.0	0–720.0
Leisure	443.0	1122.0–4812.0	1789.0	0–693.0	235.5	0–972.0
Total	2226.0	1122.0–4812.0	1789.0	814.0–3090.0	2001.0	988.5–3823.5

Notes: No IQR for work domain because its range is from 0 to 0. Type I error adjustment using Bonferroni correction was done (α^{*}= 0.013). Wilcoxon rank-sum test was done to compare median physical activity levels PER domain. All were non-significant EXCEPT for leisure (p = 0.0006)
Source: The authors

Independent *t*-Test revealed a significant difference in height between males and females, $t(390) = 2.78$, $p = .000$, $d = 1.96$. Males were also seen to be heavier compared to females at $t(390) = 12.7$, $p = .000$, $d = 1.25$. Females posted greater body fat than males $t(390) = -14.7$, $p = .000$, $d = 1.48$ (Table 4).

For performance measures, no significant difference was seen in right shoulder flexibility, t (390) = .777, p = .390. Left shoulder flexibility was also non-significant between groups, t (390) = .605, p = .545. Females showed greater sit and reach than males, $t(390) = -5.55$, $p = .000$, $d = 0.56$. Males posted higher vertical jump than females, t (390) = 28.3, $p = .000$, $d = 2.83$. There was a significant difference in curl-up performance between both groups, $t(390) = 5.64$, $p = .000$, $d = 0.56$. Males scored higher aerobic output than females, $t(390) = 12.2$, p = .000, $d = 1.20$ (Table 4).

Table 4. Anthropometrics, physical activity, and performance scores of males and females

Variables	Males (n = 167)	Females (n = 225)
Height (cm)[§]	168 ± 6.77	156 ± 5.39*
Mass (kg)[§]	67.3 ± 14.6	52.3 ± 8.75*
% Body fat[§]	18.8 ± 6.68	28.2 ± 6.03*
Physical Activity	Median: 2226 IQR: 1112 – 4812	Median: 1789 IQR: 814 – 3090
Sit and Reach[§]	15.7 ± 4.53	18.3 ± 4.70*
Zipper Test - Right[§]	4.07 ± 2.19	3.91 ± 1.79
Zipper Test - Left[§]	3.15 ± 1.99	3.04 ± 1.55
Vertical Jump[§]	104 ± 5.14	91.2 ± 3.81*
Curl-up[§]	47.7 ± 19.4	38.1 ± 14.5*
20-meter shuttle run test[§]	27.2 ± 4.57	22.6 ± 2.92*

Note: [§]Type I error adjustment using Bonferroni correction was done ($\alpha^* = 0.006$). * $p < 0.0001$
Source: The authors

Spearman Rank Correlation showed a negative relationship between physical activity and body fat, $r_s = -0.099$. There was a positive relationship between physical activity and vertical jump, $r_s = 0.183$. Similarly, curl-up was positively related to physical activity $r_s = 0.219$. A positive correlation between physical activity and 20 m shuttle run test performance existed, $r_s = 0.254$ (Table 5).

Table 5. Relationship between the physical activity of body fat and fitness indices

Fitness Indices	Physical Activity (r_s)
Body fat%	-0.099*
Sit and Reach	0.127*
Zipper Test - Right	0.042
Zipper Test - Left	0.064
Vertical Jump	0.183**
Curl-up	0.219**
20m shuttle run	0.254**

Note: ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).
Source: The authors

Discussion

The purpose of the study is to compare the physical activity levels between male and female university students. Results of the current study indicated that a high percentage of students has moderate to high levels of physical activity. According to the Office of Disease Prevention and Health Promotion (ODPHP), the range of physical activity levels per week of 500-1000 MET- minutes will result in significant health benefits[25]. Thus, most of the

university students were reported to have more than the recommended levels of physical activity. As expected, males were found to be more physically active than female students. This result is consistent with previous studies reporting that males were more physically active than females[26].

Another aim of this study is to compare the physical performance indices of males and females. The results of the present study revealed that males outperformed females in their physical fitness performance with the exception in the modified sit and reach test. These findings were in agreement with the study of Jourkesh and colleagues[27].

Results from this study confirmed that female subjects had significantly higher body fat percentage as compared with male subjects. It has been shown in women that 18 to 20% of the total body weight is composed of body fat, while men comprise 10 to 15%. The reason behind the morphological difference in women may be attributed to the needed energy reserve in the form of fat in expectation of pregnancies in the future[28].

In terms of flexibility assessment using the zipper test, men scored higher than women, although it was not statistically significant. This result may be unique delineating to the common findings that women are more flexible than men. The result is somewhat related to the report of Kim et al.[29] that shoulder flexibility was found to have no significant difference between genders. In the evaluation of flexibility using the modified sit and reach test, females outperformed males. Such finding is consistent with the result of previous studies that reported women having a broader range of motion[30]. Also, research indicated that women demonstrated greater flexibility than men[31]. Men, in general, have higher muscle volume, which negatively affects flexibility[28], and they have lesser hamstring elasticity[32].

In the current study, males demonstrated superior leg power as compared to their counterparts. They have naturally greater vertical jump, lower extremity strength, and force and power than females[33]. Another research revealed that females scored lower in the vertical jump as compared to males[34].

For muscular fitness tests, results revealed that men surpassed the ratings of women. This result coincides with the findings of Sidney and Jette[35], which stated that males performed better than females in terms of average scores in partial curl-ups. Also in the present study, males scored higher in terms of cardiovascular fitness as compared to females. Such a result is consistent with the low levels of cardiovascular fitness that have been observed among African-American female college students in the study by Kelley et al.[36]. Lower levels of cardiovascular fitness could also be attributed to a higher percentage of body fat as presented in the study by Meckel et al.[37]. Moreover, increased physical activity level could also affect the cardiovascular fitness of the individual. This notion is evident in the study of Jourkesh et al.[27] among college students in Iran.

Another purpose of the study is to examine the relationship between fitness levels with physical activity levels. The study revealed that performances indices in health-related fitness tests were positively correlated with physical activity levels except for flexibility and body fat percentage. Regular physical activities and exercise regimen lead to significant changes in men and women, specifically in the enhancement of physical fitness[38]. In addition, college students who participate in regular exercise develop a high level of physical fitness as compared to those who do not exercise regularly[39].

Similar to the findings of Ruchan[10], the result of the current study confirms that body fat percentage is negatively correlated with physical activity levels. This result is supported by Hoffman and colleagues that weight gain and fat mass increase occur in freshman year of college due to reduced physical activity. Furthermore, physical activity was associated with a higher percentage of fat-free mass[40,41].

The positive relationship between physical activity and muscular endurance was suggested in the current investigation. The same correlation was observed with the study

conducted by Parikh and Arora[12] that college students participating in recreational sports exhibited greater muscular endurance as compared to those who are sedentary. Furthermore, it was revealed in the study by Milanović et al.[11] that vertical jump performance was positively correlated with increased physical activity. Also, the current result corresponds with the report of Irēna, Anna and Anda[32] that the performance in 20 m shuttle run test was positively correlated with physical activity levels. Magutah[42] assessed the cardiorespiratory fitness markers using the 20m shuttle run tests among university students. It was revealed that subjects who were regularly exercising obtained lowest diastolic blood pressure at exhaustion compared to subjects who were exercising irregularly or not exercising.

Physical Education teachers should empower female university students to become more physically active. More activities should specifically address the students' needs and preferences to enhance their health-related fitness levels and their physical activity levels not only during their class but during their leisure or recreational time as well. More reliable iPhone and Android applications can be recommended as well as pedometer watches or gadgets and fitness trackers in assessing the physical activity level. Aside from the required physical activity courses, different universities should organize the preferred and comprehensive fitness, recreational and sports programs for male and female students to compensate for the insufficient time given in class. Availability of appropriate facilities is vital in increasing students' levels of physical activity[43]. It is important to maintain an active lifestyle to maintain higher fitness levels and prevent the risk of developing chronic non-communicable diseases[13]. Additional successful interventions should be conducted to promote physical activity[44].

Conclusion

This is the first comprehensive study performed in the Philippines that investigates the physical activity and physical fitness levels among university students as far as the authors know. The current study provides local data for the educational institutions to become more aware on the need to implement programs to promote physical activity and physical fitness among university students. The results show that Filipino university students have similar physical activity levels compared to the rest of the world. This study is in accordance with the literature that male university students were more physically active and fitter than females. Although this study found that a high percentage of university students had moderate to high levels of physical activity, future research needs to examine the strategies on how to increase physical activity among university students, especially among females, to help ensure that they remain active throughout their university life.

References

1. Kyu HH, Bachman VF, Alexander LT, Mumford JE, Afshin A, Estep K, et al. Physical activity and risk of breast cancer, colon cancer, diabetes, ischemic heart disease, and ischemic stroke events: Systematic review and dose-response meta-analysis for the Global Burden of Disease Study 2013. BMJ 2016;354:i3857. Doi: 10.1136/bmj.i3857.
2. Tyson P, Wilson K, Crone D, Brailsford R, Laws K. Physical activity and mental health in a student population. J Ment Health 2010;19(6):492-9. Doi: 10.3109/09638230902968308
3. Nguyen-Michel ST, Unger JB, Hamilton J, Spruijt Metz D. Associations between physical activity and perceived stress/hassles in college students. Stress Health 2006;22(3):179-88. Doi: 10.1002/smi.1094
4. Luna Filho EB, Silva FT, Cruz Santos A, Nascimento LS, Rabay AN, Dantas FF, et al. Level of physical activity in college students. Man Ther Posturology Rehabil J 2015;13(256):1-6. Doi:10.17784/mtprehabjournal.2015.13.256

5. Haase A, Steptoe A, Sallis JF, Wardle J. Leisure-time physical activity in university students from 23 countries: associations with health beliefs, risk awareness, and national economic development. Preventive med 2004;39(1):182-90. Doi: 10.1016/j.ypmed.2004.01.028
6. Carter AC, Brandon KO, Goldman MS. The college and noncollege experience: a review of the factors that influence drinking behavior in young adulthood. J Stud Alcohol Drugs 2010;71(5):742-50. Doi: 10.15288/jsad.2010.71.742
7. Buboltz Jr WC, Brown F, Soper B. Sleep habits and patterns of college students: a preliminary study. J Am Coll Health 2001;50(3):131-5. Doi: 10.1080/07448480109596017
8. Acampanado, E, Valenzuela, M. Physical activity and dietary habits of Filipino college students: a cross-sectional study. Kinesiology 2019;50(1): 57-67.
9. Guthold R, Stevens GA, Riley LM, Bull FC. Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys with 1.9 million participants. Lancet Glob Health 2018;6(10):e1077-86. Doi: 10.1016/S2214-109X(18)30357-7
10. Ruchan IR. An evaluation of the physical activity levels and body compositions of university students. Anthropologist 2015;20(3):430-6. Doi: 10.1080/09720073.2015.11891746
11. Milanović Z, Pantelić S, Sporiš G, Mohr M, Krustrup P. Health-related physical fitness in healthy untrained men: effects on VO2max, jump performance and flexibility of soccer and moderate-intensity continuous running. PloS One 2015;10(8):e0135319. Doi: 10.1371/journal.pone.0135319
12. Parikh CM, Arora M. Muscular endurance comparison between Indian collegiate students playing recreational sports & those who are sedentary: An observational study. Int J Rehabil Res 2017;6(2):211. Doi: 10.5455/ijtrr.000000267
13. Mesquita CA, Turi-Lynch BC, Bergoc RD, Maia RL, Amaral SL, Monteiro HL. Health-related physical fitness among undergraduate students in physical education. J Phys Educ 2018;29. Doi: 10.4025/jphyseduc.v29i1.2908
14. Zaccagni L, Barbieri D, Gualdi-Russo E. Body composition and physical activity in Italian university students. J Trans Med 2014;12(1):120. Doi: 10.1186/1479-5876-12-120
15. PAR-Q Collaboration [Internet]. The physical activity readiness questionnaire for everyone. The New PAR-Q and ePARmed-X : OFFICIAL WEBSITE. 2017 [cited Jan 29 2018]. Available from: http://eparmedx.com/
16. IPAQ Research Committee [Internet]. Guidelines for data processing and analysis of the International Physical Activity Questionnaire (IPAQ)-short and long forms [cited Jan 29 2018]. Available from: http://www. ipaq. ki. se/scoring. pdf. 2005.
17. Craig CL, Marshall AL, Sjorstrom M, Bauman AE, Booth ML, Ainsworth BE, Pratt M, Ekelund UL, Yngve A, Sallis JF, Oja P. International physical activity questionnaire: 12-country reliability and validity. Med and Sci Sport Exer 2003;35(8):1381-95. Doi: 10.1249/01.MSS.0000078924.61453.FB
18. Acevedo EO, Starks MA. Exercise testing and prescription lab manual. 2nd ed. Champaign: Human Kinetics; 2011.
19. Greenberg JS, Dintiman GB, Oakes BM. Physical fitness and wellness: Changing the way you look, feel, and perform. Champaign: Human Kinetics; 2004.
20. Sargent DA. The physical test of a man. Am Phys Educ Rev 1921;26(4):188-94. Doi: 10.1080/23267224.1921.10650486
21. Klavora P. Vertical-jump tests: A critical review. J Strength Cond Res J 2000;22(5):70-5.
22. Miller DK. Measurement by the physical educator. New York: McGraw-Hill; 2014.
23. Walker O [Internet]. Multistage fitness (beep) test. Science for Sport: Official Website. 2016 [cited Jan 29 2018]. Available from: https://www.scienceforsport.com/multistage-fitness-beep-test/#av_section_2
24. Statistical Package for the Social Sciences for Windows. Version 21.0. Armonk: IBM; 2012.
25. Office of Disease Prevention and Health Promotion [cited 2018 Jan 29]. Translating scientific evidence about total amount and intensity of physical activity into guidelines. Office of disease prevention and health promotion: Official Website [cited Jan 29 2018]. Available from: https://health.gov/paguidelines/2008/appendix1.aspx
26. Troiano RP, Berrigan D, Dodd KW, Masse LC, Tilert T, McDowell M. Physical activity in the United States measured by accelerometer. Med Sci Sports Exerc 2008;40(1):181-8. Doi: 10.1249/mss.0b013e31815a51b3
27. Jourkesh M, Sadri I, Ojagi A, Sharanavard A. Determination of fitness level in male and female college aged students. Arch Appl Sci Res 2011;3(2):326-33.
28. Delavier F, Gundeill M. Delavier's women's strength training anatomy workouts. Champaign: Human Kinetics; 2014.
29. Kim M, Bercades L, Pieter WI, Cruz A. Performance characteristics of Filipino collegiate athletes. Asia Life Sci 2014;23(1):187-94.
30. Marta CC, Marinho DA, Barbosa TM, Izquierdo M, Marques MC. Physical fitness differences between prepubescent boys and girls. J Strength Cond Res 2012;26(7):1756-66. Doi: 10.1519/JSC.0b013e31825bb4aa

31. Shaffer L, Barton A, Moxley J, Vigo A, James-Hassan M. Gender differences in health-related physical fitness among college students. Int J Exerc Sci 2016;9(4):92.
32. Irena K, Anna M, Anda B. Physical activity and its relation to health-related physical fitness in students. Ovidius University Annals, Series Physical Education and Sport/Science, Movement and Health 2012;12(2):256-64.
33. Jack A [Internet]. The comparison of vertical jump height between gender and body fat percentage [cited Jan 29 2018]. Available from: http://hdl.handle.net/10106/24194
34. Fallahi AA, Abdollahi MH. Comparison effect of different aspects of weight on some factors related to physical fitness among female and male college students in Bushehr. Iran J Health Educ Health Promot 2016;4(3):226-35.
35. Sidney K, Jetté M. The partial curlup to assess abdominal endurance: Age and sex standards. Res Sports Med 1990;2(1):47-56. Doi: 10.1080/15438629009511897
36. Kelley GA, Lowing L, Kelley K. Gender differences in the aerobic fitness levels of young African-American adults. J Natl Med Assoc 1999;91(7):384.
37. Meckel Y, Galily Y, Nemet D, Eliakim A. Changes in weight indexes and aerobic fitness of physical education students over three years of college. J Hum Sport Exerc 2011;6(1):112-121.
38. Olubayo-Fatiregun MA, Ayodele RB, Olorunisola HK. Health, fitness and physical activity: A key to enhancing wellness for all ages in building a vibrant nation. AJHSS 2014;2(1):77-87.
39. Cheng JS, Yang MC, Ting PH, Chen WL, Huang YY. Leisure, lifestyle, and health-related physical fitness for college students. Soc Behav Personal 2011;39(3):321-32. Doi: 10.2224/sbp.2011.39.3.321
40. Hoffman DJ, Policastro P, Quick V, Lee SK. Changes in body weight and fat mass of men and women in the first year of college: A study of the" freshman 15". J Am Coll Health 2006;55(1):41-6. Doi: 10.3200/JACH.55.1.41-46
41. Stachoń A, Pietraszewska J. Body composition in male physical education university students in view of their physical activity level. Hum Mov 2013;14(3):205-9.
42. Magutah K. Cardio-respiratory fitness markers among Kenyan university students using a 20m shuttle run test (SRT). Afr Health Sci 2013;13(1):10-6. Doi: 10.4314/ahs.v13i1.2.
43. Young SJ, Sturts JR, Ross CM. Physical activity among community college students. Physical Educator 2015;72(4):640.
44. Judge L, Bellar D, Lee D, Petersen J, Wanless E, Surber K, et al. An exploratory study of physical activity patterns of college students at a Midwest State University in the United States. Sport Journal 2012;15.

Acknowledgments: The authors would like to thank all the volunteers who agreed to participate in this study.

Author's **ORCID:**
Chessa Sanchez Pituk: 0000-0002-2042-4586
Jonathan Yap Cagas: 0000-0003-0233-4023

Received Jan, 31, 2019.
Reviewed May, 22, 2019.
Accepted Jun, 23, 2019.

Author address: Chessa Sanchez Pituk. University of the Philippines Manila, Pedro Gil Street, Ermita, Manila, 1000 Metro Manila. E-mail: cspituk@up.edu.ph