ORIGINAL ARTICLE

Comparison of Student Athlete's Physical Activity and Sedentary Behaviour by Gender

Adang Sudrazat[1], Jajat[2], Kuston Sultoni[2]

[1] Department of Elementary Physical Education, Universitas Pendidikan Indonesia, Sumedang 45322, West Java, Indonesia
[2] Sport Science Program, Faculty of Sport and Health Education, Universitas Pendidikan Indonesia, Bandung 40154, West Java, Indonesia

ABSTRACT

Introduction: There is no objective measurement of physical activity and sedentary behaviour for high school students, especially student-athletes who registered in sport specific class in Indonesia. The purpose of the study was to investigate physical activity and sedentary behaviour using objective measures with ActivPal. **Methods:** A total of 36 high school students (17 Male; 19 Females) participated in the study. Participants wore an ActivPAL™ on the right tight for seven days to determine light and moderate to vigorous physical activity stepping and the total sedentary time (lying and sitting). **Results:** : The high school students who took a sports specific class spend the average time for moderate to vigorous physical activity 2,08 hours, sitting time 9,33 hours, primary lying 8,5 hours, and secondary lying 1,24 hours every day. There is no difference in the time used for physical activity and secondary lying between males and females ($p > 0.05$). Meanwhile, male, and female students' sitting, and primary lying times were significantly different ($p < 0.05$). **Conclusion:** Male students spend more sitting time, and females spend more primary lying time. Almost half of the day, high school students in special sports classes are paid for sedentary activities, and their daily physical activities still do not meet WHO recommendations.

Keywords: Accelerometer, Objective measurement, Physical activity, Student-athletes, Sedentary behaviour

Corresponding Author:
Jajat, S.Si., M.Pd.
Email: jajat_kurdul@upi.edu
Tel: +6285218393933

INTRODUCTION

Physical activity that is carried out regularly will improve physical fitness and motor skills (1), academic performance (2), and quality of life (3). On the other hand, physical inactivity or sedentary behaviour is closely related to cardiovascular disease (4) and is a contributing factor to other health problems (5). In this regard, the world health organization recommends that children and adolescents aged 6-17 years of age do moderate to vigorous physical activity for at least 60 minutes per day (6). However, most adolescents did not meet the moderate to vigorous physical activity as recommended (7), and with increasing age, physical activity tends to decrease while sedentary behaviours increases (8,9).

The study has been reported that boys are more physically active than girls (9,10). Girls spend more time on sedentary activities than boys (11). Boys were more involved in moderate to vigorous physical activity than girls (12). Some of these studies were carried out during learning and outside physical education learning in regular classes. Meanwhile, research on student-athletes who registered at sport specific class is relatively rare.
It is essential that student athletes can maintain both academic and sport achievements. One of the programs carried out by several schools in Indonesia is a sport specific class for student-athletes in various sports. Student-athletes classes have different learning schedules than regular classes because of their training routine. They are put in one course during the learning process and placed in a dormitory.

Several studies on student-athletes have been conducted, but most studies have focused on social aspects (13), psychological (13–18), physiological (19), and academic performance (18). However, far too little attention has

been paid to their movement behaviour. Meanwhile, most adolescents did not meet the moderate to vigorous physical activity as recommended (7,11). Although an athlete, it is not a guarantee that their movement behavior is following the recommendations. It takes an objective measurement of their daily movement behavior. Will they automatically meet WHO physical activity recommendations?

Therefore, it is necessary to measure physical activity and sedentary behaviour objectively in this sport specific class. This objective measurement is essential to determine the appropriate intervention strategy according to population characteristics (21). Although objectively measuring physical activity using accelerometers such as ActivPAL and Actigraph has been carried out in many countries, the same measurement in Indonesia is relatively rare. Even to the author's knowledge, there is no objective measurement of physical activity and sedentary behaviour using the ActivPal accelerometer for high school students, especially student-athletes. Therefore, this research aims to measure movement behaviour objectively using the ActivPAL accelerometer.

MATERIALS AND METHODS

Ethical Clearance

This comparative study was conducted according to the ethical clearance guaranteed by the ethics committee for research of the Centre of Research and Community Service, Universitas Pendidikan Indonesia. No. B-1074/UN40.LP/PJ.00.00/2021

Participants

Participants in this study were 36 high school student-athletes (boys n=17, girls n=19) aged 17+6 years old who registered in sport specific class in public high school in Ciamis, West Java, Indonesia. The majority of these athletes' train and compete in various of sports at regional and national levels. All participants have expressed their willingness to do a monitoring of their daily activities using an accelerometer for seven consecutive days. Initially, there were 47 participants, but based on the complete data recording results, only 36 participants were recorded.

Measuring sedentary behavior and physical activity

As the research objective is to measure sedentary behaviour and physical activity objectively, this study uses the ActivPal™ PAL 4 accelerometer. In several previous studies, ActivPal™ PAL 4 has been widely used to measure physical activity patterns objectively in various age groups, including adolescents. This instrument can measure the number of steps, and other physical activities such as cycling converted into moderate to vigorous physical activity. In addition, it can also record sedentary behaviours such as sitting time, sleeping time, and lying down. Validity and reliability of the ActivPal™ PAL 4 accelerometer have been measured in previous studies with concurrent validity R=0.96 (21).

Participants were asked to wear ActivPal™ PAL 4 accelerometer on the participant's right upper thigh using Tegaderm adhesive for seven consecutive days without being released. Data collection was carried out in January to March 2019. The recording was done on ActivPAL for seven days was then downloaded and used PALanalysis, then the incomplete data was reduced. Preliminary data, those less than seven days later, were excluded and not analysed.

Data Analysis

Physical activity and sedentary behaviour descriptive data (mean, standard deviation, standard error) were analysed using SPSS IBM software. Meanwhile, to see differences in physical activity and sedentary behaviour based on gender in sports specific class high school student athletes, the data was tested using an independent sample t-test in SPSS IBM software.

RESULT

Values are expressed as the mean ± SD, n = 6. *: The results of the study as in Table I show that high school students who are members of the sports class spend more than 2 hours per day doing physical activity on average, more than 9 hours per day sitting, 8.5 hours per day sleeping, and more than 1 hour per day for lying down. Table II, shows that male students spend more time on physical activities than girls. Male students spend more time sitting, and on the other hand, female students spend more time sleeping than girls.

Table I. Descriptives statistics

Variable	N	Mean	SD
PA	36	2.08	0.64
Siting	36	9.33	1.2
Sleeping	36	8.51	1.23
Lying	36	1.24	0.88

Table II. Descriptives Statistics by Gender

Variable	Gender	N	Mean	SD	Std. Error
PA	Male	17	2.25	0.69	0.17
	Female	19	1.94	0.55	0.13
Sitting	Male	17	9.77	1.55	0.38
	Female	19	8.94	0.59	0.14
Sleeping	Male	17	7.88	1.23	0.03
	Female	19	9.07	0.95	0.27
Lying down	Male	17	1.36	1.09	0.26
	Female	19	1.13	0.63	0.15

Table III shows statistical analysis results regarding differences in physical activity and sedentary behaviour consisting of times for sitting, sleeping, and lying. The recorded data in minutes was converted into hours before statistical analysis was carried out. The analysis results show no significant difference in the average PA of high school students for sports special classes based on gender (t = 1.45, p = 0.146, MD = 0.31). As for SB both time of sitting (t = 2.17, p = 0.037, MD = 0.83) and sleeping (t = 3.27, p = 0.002, MD = 1.19) between male and female are significant different, while for lying is not (t = 0.8, p = 0.430, MD = 0.23).

Table III. PA & SB Giffernces by Gender

Variable	t	*p*	MD
PA	1.45	0.15	0.31
Sitting	2.17	0.04	0.83
Sleep	3.27	0.00	1.19
Lying	0.8	0.43	0.23

DISCUSSION

This study examines movement behaviour among student-athletes. The first question in this study sought to determine whether a student-physical activity meets WHO recommendations. The second question in this research was to compare movement behaviour among male and female student-athletes.

The results of this study indicate that student-athletes are meet physical activity WHO recommendations. The average student-athletes spend two hours a day doing moderate to vigorous physical activity. It is more than the WHO recommendation should accumulate 60 minutes of moderate to vigorous-intensity physical activity daily. This finding is contrary to previous studies where most regular students did not meet the moderate to vigorous physical activity as recommended (7,11,22,23). For example, Person et al. (7) examined health-related behaviours (physical activity and diet recommendation) among adolescents in the United Kingdom. The result showed only 6% of adolescents meet the health-related behaviour recommendations. In addition, Allafi A et al. (11) conducted a cross-sectional study to measure physical activity, sedentary behaviors, and dietary habits among adolescents in Kuwait. The result shows that Kuwaiti adolescents do not meet physical activity recommendations and spend more time in sedentary behaviors. This somewhat contradictory result may be due to the differences in the learning program. Student-athletes programs give more attention to both academics and movement behaviour.

The second finding was that is no differences in physical activity between male and female student-athletes. In contrast to earlier findings, male adolescents' physical activity is different from that of adolescent girls. Male adolescents were more active in physical activity than girls (24–26). A study by Butt J et al. (24) analysed adolescents' physical activity and sedentary behaviour. The study results show that males are more interested in physical activity than females, and females decrease physical activity. Another study by Wu, Rose, and Bancroft (25) investigated gender differences in health risk and physical activity. The investigation found that males were more to participate in physical activity, whereas females were doing unhealthy practices to lose weight.

The third findings of sedentary behaviours included sitting time, sleeping time, and lying downtime. Student-athlete spent 9,33 hours/day on average for sitting time. Other than that, this study shows that sitting time is different between males and female student athletes. Male student-athletes spend more sitting-time than females. Meanwhile, previous research reports that adolescents aged 12-19 years spent 7,5 hours/day sitting, where females were seated more than males (27). A study by Jago et al. (9) notes that sedentary time is significantly different between boys and girls, with boys more active than girls. Another study report that in seven countries, males have to trend sedentary time than males, otherwise in six countries, females have more trend sedentary than males (28).

Regarding sleeping time, student-athletes spend an average of 8,5 hours/night, where females spent more time than males. This finding is consistent with that Olds et al. were girls sleeping 11 min/night more than boys (9). Meanwhile, another study reports that sleep duration among adolescents is decreased with age, between 8,5 hours/night at 13 age to 7,3 hours/night at age 18 (29). The last finding is that lying downtime among student-athletes spent an average of 1,24 hours/day. It is no difference in lying rest between male and female student-athletes. Gender does not impact lying downtime when adolescents in when in the same intervention (30).

These findings suggest that sports specific classes can be one way to promote physical activity among students. The involvement in sports specific classes may have the same impact on males' and females' physical activity levels. Movement behaviour among males and females who participated in sports teams should be relatively equal (31). This condition is made possible by the influence of the environment, where sports specific class make females also have the same physical activity behaviour as males. One of the closely related factors to physical activity behaviour is the environment (20,32,33). Apart from the environment, involvement in the physical activity program community is also associated with gender differences in physical activity (34). However, these results need to be interpreted with caution. Future studies are required with a large sample and take other variables into account that influenced student movement behaviours.

CONCLUSION

The present research aimed to examine movement behaviour among student-athletes who are involved in sports specific classes. This study has shown that student-athletes are meet WHO physical activity recommendations. The second significant finding was that there are no differences in physical activity between males and female student-athletes. The other essential result of this study is that student-athlete males spent more time sitting, and student-athlete males spent more time sleeping. Meanwhile, they spend the same amount of time lying down.

ACKNOWLEDGMENTS

???????

REFERENCES

1. Jurak G, Cooper A, Lesko ek B, Kovač M. Long-term effects of 4-year longitudinal school-based physical activity intervention on the physical fitness of children and youth during 7-year follow-up assessment. Cent Eur J Public Health. 2013;21(4):190–5.
2. von Hippel PT, Bradbury WK. The effects of school physical education grants on obesity, fitness, and academic achievement. Prev Med (Baltim) [Internet]. 2015;78:44–51. Available from: http://dx.doi.org/10.1016/j.ypmed.2015.06.011
3. Balboa-Castillo T, Leyn-Mucoz LM, Graciani A, Rodrнguez-Artalejo F, Guallar-Castillyn P. Longitudinal association of physical activity and sedentary behavior during leisure time with health-related quality of life in community-dwelling older adults. Heal Qual Life Outcomes. 2011;9(47):1–10.
4. Stamatakis E, Rezende LFM De, Rey-lo JP. Sedentary Behaviour and Cardiovascular Disease. Springer Ser Epidemiol Public Heal. 2018;(Springer Ser. Epidemiol. Public Heal.):215–43.
5. Copeland JL, Ashe MC, Biddle SJ, Brown WJ, Buman MP, Chastin S, et al. Sedentary time in older adults: A critical review of measurement, associations with health, and interventions. Br J Sports Med. 2017;51(21):1–8.
6. World Health Organization. Global Recommendations on Physical Activity for Health. Geneva, Switzerland: WHO Press; 2010. 1–59 p.
7. Pearson N, Atkin AJ, Biddle SJH, Gorely T, Edwardson C. Patterns of adolescent physical activity and dietary behaviours. Int J Behav Nutr Phys Act. 2009;6(45):1–7.
8. Kandola A, Lewis G, Osborn DPJ, Stubbs B, Hayes JF. Depressive symptoms and objectively measured physical activity and sedentary behaviour throughout adolescence: a prospective cohort study. The Lancet Psychiatry [Internet]. 2020;7(3):262–71. Available from: http://dx.doi.org/10.1016/S2215-0366(20)30034-1
9. Jago R, Anderson CB, Baranowski T, Watson K. Adolescent patterns of physical activity: Differences by gender, day, and time of day. Am J Prev Med. 2005;28(5):447–52.
10. Trost SG, Pate RR, Sallis JF, Freedson PS, Taylor WC, Dowda M, et al. Age and gender differences in objectively measured physical activity in youth. Med Sci Sports Exerc. 2002;34(2):350–5.
11. Allafi A, Al-Haifi AR, Al-Fayez MA, Al-Athari BI, Al-Ajmi FA, Al-Hazzaa HM, et al. Physical activity, sedentary behaviours and dietary habits among Kuwaiti adolescents: Gender differences. Public Health Nutr. 2014;17(9):2045–52.
12. Smith NJ, Lounsbery MAF, McKenzie TL. Physical activity in high school physical education: Impact of lesson context and class gender composition. J Phys Act Heal. 2014;11(1):127–35.
13. Fraina M, Pastore D, Anderson-Butcher D, Newman T. Examination of Social Influence Toward Need Satisfaction of High School Student-Athletes. Phys Educ. 2020;77(4):708–30.
14. Wilson G, Pritchard M. Comparing Sources of Stress in College Student Athletes and Non-Athletes. Athl Insight. 2005;7(1):1–8.
15. Ryska TA, Vestal S. Effects of Sport Motivation on Academic Strategies and Attitudes Among High School Student-Athletes. N Am J Psychol. 2004;6(1).
16. Todd SY, Kent A. Student athletes' perceptions of self. Adolescence. 2003;38(152):659–67.
17. Kroshus E, Chrisman SPD, Coppel D, Herring S. Coach support of high school student-athletes struggling with anxiety or depression. J Clin Sport Psychol. 2019;13(3):390–404.
18. Grace M, Garcia G, Subia GS. High school athletes: Their motivation, study habits, self-discipline and academic performance. 86 ~ Int J Phys Educ Sport Heal [Internet]. 2019;6(1):86–90. Available from: www.kheljournal.com
19. Hirschhorn RM, Kerr ZY, Wasserman EB, Kay MC, Clifton DR, Dompier TP, et al. Epidemiology of injuries requiring emergency transport among collegiate and high school student-athletes. J Athl Train. 2018;53(9):906–14.
20. Ishii K, Shibata A, Adachi M, Nonoue K, Oka K. Gender and grade differences in objectively measured physical activity and sedentary behavior patterns among Japanese children and adolescents: A cross-sectional study. BMC Public Health [Internet]. 2015;15(1):1–9. Available from: http://dx.doi.org/10.1186/s12889-015-2607-3
21. Dowd KP, Harrington DM, Donnelly AE. Criterion and Concurrent Validity of the activPALTM Professional Physical Activity Monitor in Adolescent Females. PLoS One. 2012;7(10).
22. Ranasinghe CD, Ranasinghe P, Jayawardena R,

Misra A. Physical activity patterns among South-Asian adults : a systematic review. Int J Behav Nutr Phys Act. 2013;10(116).
23. BashiriMoosavi F, Farmanbar R, Taghdisi M, AtrkarRoshan Z. Level of Physical Activity among Girl High School Students In Tarom County and Relevant Factors. Iran J Heal Educ Promot. 2015;3(2):133–40.
24. Butt J, Weinberg RS, Breckon JD, Claytor RP. Adolescent physical activity participation and motivational determinants across gender, age, and race. J Phys Act Heal. 2011;8(8):1074–83.
25. Wu TY, Rose SE, Bancroft JM. Gender differences in health risk behaviors and physical activity among middle school students. J Sch Nurs. 2006;22(1):25–31.
26. Lauderdale ME, Yli-Piipari S, Irwin CC, Layne TE. Gender Differences Regarding Motivation for Physical Activity Among College Students: A Self-Determination Approach. Phys Educ. 2015;72:153–72.
27. Carson V, Staiano AE, Katzmarzyk PT. Physical Activity, Screen Time, and Sitting among US Adolescents. Pediatr Exerc Sci. 2015;27(1):151–9.
28. Khan A, Uddin R, Lee EY, Tremblay MS. Sitting time among adolescents across 26 Asia–Pacific countries: a population-based study. Int J Public Health [Internet]. 2019;64(8):1129–38. Available from: https://doi.org/10.1007/s00038-019-01282-5
29. Maslowsky J, Ozer EJ. Developmental trends in sleep duration in adolescence and young adulthood: Evidence from a national United States sample. J Adolesc Heal [Internet]. 2014;54(6):691–7. Available from: http://dx.doi.org/10.1016/j.jadohealth.2013.10.201
30. Huus K, Ludvigsson JF, Enskαr K, Ludvigsson J. Risk factors in childhood obesity - Findings from the All Babies in Southeast Sweden (ABIS) cohort. Acta Paediatr Int J Paediatr. 2007;96(9):1321–5.
31. Robbins LB, Sikorskii A, Hamel LM, Wu TY, Wilbur JE. Gender comparisons of perceived benefits of and barriers to physical activity in middle school youth. Res Nurs Heal. 2009;32(2):163–76.
32. Ding D, Sallis JF, Kerr J, Lee S, Rosenberg DE. Neighborhood environment and physical activity among youth: A review. Am J Prev Med [Internet]. 2011;41(4):442–55. Available from: http://dx.doi.org/10.1016/j.amepre.2011.06.036
33. Wilbur JE, Chandler P, Dancy B, Choi JW, Plonczynski D. Environmental, policy, and cultural factors related to physical activity in urban, African American women. Women Heal. 2002;36(2):17–28.
34. Trost SG, Pate RR, Dowda M, Saunders R, Ward DS, Felton G. Gender Differences in Physical Activity and Determinants of Physical Activity in Rural Fifth Grade Children. J Sch Health. 1996;66(4):145–50.