

Comparison of Self-Reported Measured Physical Activity Among Youth in Central Java, Indonesia

Fajar Ari Widiyatmoko¹, Maftukin Hudah¹, Galih Dwi Pradipta¹, Osa Maliki¹

¹Physical Education, Health and Recreation Department University PGRI of Semarang,
Indonesia

Corresponding author: fajariwidiyatmoko@upgris.ac.id

Abstract: Physical activity in adolescents is influenced by various environmental factors. However, the COVID-19 pandemic and ensuing lockdowns have limited many aspects of the environment. The objective of this study was to assess the physical activity and sedentary behaviour of students following the COVID-19 pandemic. An observational, cross-sectional study was conducted, and a total of 802 teenagers participated. Physical activity was measured using the International Physical Activity Questionnaire—Short Form (IPAQ-SF). The results show vigorous PA was highest Junior High Schools 578.22 ± 851.37 (mean \pm SD), moderate PA highest is Elementary school (922.59 ± 1553.68). Online game players and non-game players have PA that are not that different. Girls have a higher PA than boys. Our findings show that PA in adolescents is generally quite high.

Keywords: physical activity, youth, central java

INTRODUCTION

Physical activity has a very important role for anyone, both men and women, young and old alike. Engaging in consistent physical activity offers several advantages such as sustaining physical fitness and diminishing the probability of physical ailments by 20-30% (Warburton and Bredin 2016), these illnesses include but are not restricted to cardiovascular disease, diabetes, cancer, hypertension, obesity, depression, osteoporosis, and untimely death. (Sikorska-Siudek, Olędzka-Oręziak, and Parzuchowska 2006). Numerous studies have demonstrated with compelling evidence (involving millions of individuals) that frequent physical activity is linked to a lowered risk of all-cause mortality and multiple chronic medical conditions (Warburton & Bredin, 2017; Warburton and Bredin 2016; Sikorska-Siudek et al. 2006).

Inversely, physical inactivity and sedentary behavior are independent risk factor or chronic diseases such as cardiovascular disease (CVD) dan obesity (Kohl et al. 2012; Bell et al. 2014; Scholes et al. 2016). Physical inactivity is the fourth leading cause of death worldwide (Kohl et al. 2012), so this is like pandemic, and should be a public health priority. Especially during pandemic Covid-19, physical inactivity may lead dead-lier 'second wave' of ill health and wellbeing long-term (Ghozy et al. 2021; Ali and Kunugi 2020; Damiot et al. 2020). To promote

physical activity on a global scale, it is imperative to expand on the existing groundwork by adopting a systemic approach that emphasizes populations and their intricate interrelated factors instead of solely relying on a behavioural science approach centered on individuals. This approach will help address the complex interactions among the correlates of physical inactivity, thereby paving the way for increased physical activity worldwide.

Many things that influence a person to do regular and programmed physical activity in order to maintain health. Encouragement for exercise benefits and social support can motivate individuals to overcome internal obstacles such as fatigue, lack of time, cost, and age (Koh et al. 2022). Although extrinsic and intrinsic motivation correlates inversely with energy expenditure for some people (Giakoni-Ramírez, Merellano-Navarro, and Duclos-Bastías 2022).

Indeed, there are not enough research results on levels of physical activity, especially after the Covid-19 pandemic. Some research results on the level of physical activity, fitness and health of adolescents report that in general adolescents in several regions of Indonesia are quite good (Widiyatmoko and Hadi 2018; Apriantono et al. 2020; Darni et al. 2021). Each region with another in the territory of Indonesia experiences different levels of physical activity. This really depends on environmental factors where adolescents live and playmates (Romero-Blanco et al. 2020). From Riskesdas data in the last decade, there is an interesting fact, namely that there has been a decreasing trend of physical activity in Indonesia (Ministry of Health 2014; Health 2018). Especially during a pandemic, with the form home study policy in place, the economy slowed down and so on, physical activity decreased (Salmi and Markuri 2022; Darni et al. 2021; Suryoadji and Nugraha 2021; Dewi 2022; Kusdalinah, Mutia, and Jumiyati 2022)

Therefore it is quite important to know data on physical activity after the Covid-19 pandemic so that it can be used as a guide in making policies, especially in the education environment, and related policy makers in general.

METHOD

This research is a cross sectional survey conducted on adolescents in Central Java. The participants were adolescents aged 10-20 years from elementary school to tertiary level, as well as those who were not in school. The sample was determined by accident, and we got a participant of 1558 people, but after selecting the valid data, only 802 were teenagers. The assessment of physical activity involved the use of the International Physical Activity Questionnaire—Short Form (IPAQ-SF), comprising seven questions (Rodriguez-Munoz et al.

2017). The questionnaire was employed to gather information on the total minutes of physical activity per week and sitting time per day. Descriptive statistical analysis was conducted on the data, utilizing absolute and relative frequencies for categorical variables and mean with standard deviation (SD) for quantitative variables. All computations were carried out using the software program SPSS v24.0 (IBM Corp).

RESULT

In accordance with the flow of research methods that have been made, this research begins with a survey regarding the level of physical activity of students in the population in Central Java province. The survey was assisted by a team of students using the accidental sampling method, and managed to get more than 1558 participants, but after checking the validity based on the calculation of the IPAQ-SF Final MET-Minutes and Categorical Scores, it was obtained 802 teenage students whose data was valid, with an age range of 12 – 20 years. To determine the level of physical activity, the validated IPAQ (International Physical Activity Questionnaire) instrument from the World Health Organization (WHO) was utilized (Rodriguez et al. 2019). The questionnaire consists of 7 (seven) questions regarding physical activity during the last 7 days.

Tabel 1.Deskripsi Karakteristik Partisipan

	% (n)	Mean (SD)
Age		17.77 (2.61)
Gender		
Male	57 (459)	
Female	43 (346)	
Educational level		
SD	2.1 (17)	12 (1.14)
SMP	13.4 (108)	14 (1.37)
SMA	37.2 (299)	17 (1.60)
PT	39.7 (319)	19 (1.09)
Umum	7.6 (61)	20 (2.99)
Play Game online		
Yes	49.75 (399)	
No	50,25 (403)	

A total of 802 teenagers who participated in this study. The mean age was 17.77 years (SD = 2.61). Participants consisted of 459 young men (57%) and 346 young women (48%). Demographic research participant data can be seen in the table. 1.

Tabel 2. International Physical Activity Questionnaire (IPAQ) by group

	SD		SMP		SMA		PT		UMUM	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Days of vigorous PA	1.20	1.58	1.23	1.48	1.23	1.32	1.26	1.31	1.20	1.58
Days of moderate PA	1.86	1.62	1.98	1.96	2.01	2.01	1.65	1.82	1.86	1.62
Minutes of vigorous PA	26.00	30.19	36.78	48.23	44.33	54.04	44.92	48.93	36.52	46.08
Minutes of moderate PA	51.94	54.31	57.27	57.03	50.19	51.18	51.25	53.97	46.58	49.66
Total minutes of weekly PA	103.18	73.76	159.78	131.51	173.07	165.94	151.21	163.90	167.59	158.96
Daily sitting time	100.88	98.21	243.66	467.09	221.37	162.81	263.66	184.06	244.73	150.72

Table 3. Physical activity: Total Minutes Per Week by Group

	Vigorous (Mean ± SD)	Moderate (Mean ± SD)	Walk (Mean ± SD)	Total (Mean ± SD)
Gender				
Male	608.49 ± 774.84	421.55 ± 567.87	528.48 ± 841.92	1558.52 ± 1466.72
Female	668.67 ± 939.07	613.93 ± 910.59	758.22 ± 1102.44	2040.82 ± 1956.25
Jenjang Pendidikan				
Elementary School	394.82 ± 391.33	922.59 ± 1553.68	407.65 ± 517.67	1725.06 ± 1803.03
Junior High School	578.22 ± 851.37	533.11 ± 746.14	734.89 ± 1011.72	1846.23 ± 1729.11
Senior High School	658.57 ± 882.35	637.82 ± 932.19	732.66 ± 1064.17	2029.04 ± 2000.32
College	670.97 ± 895.08	425.13 ± 584.38	561.56 ± 924.45	1657.66 ± 1592.63
Other/general	602.03 ± 825.97	454.24 ± 561.46	759.22 ± 1150.43	1815.49 ± 1512.03
Play Game online				
Yes	636.57 ± 795.01	521.60 ± 774.43	724.29 ± 1065.52	1882.47 ± 1769.99
No	649.23 ± 944.08	541.59 ± 801.80	596.27 ± 938.63	1787.10 ± 1787.92

Furthermore, presented in table 2. The results of the level of physical activity from the IPAQ questionnaire were analyzed based on: days, minutes, time of sitting or physical inactivity from various levels of participant education. There are quite interesting data differences from the level of physical activity at each age level. At high levels of physical activity (vigorous PA) the SMA and PT ages are higher compared to other ages; SD = 26.00, SMP = 36.78, SMA = 44.33, PT = 44.92, General = 36.52. Meanwhile, moderate physical activity (moderate PA) has more or less the same results.

In total minutes of weekly PA or level of physical activity in one week, in general the higher the age the higher the level of physical activity, (SD = 103.18, SMP = 159.78, SMA = 173.07, PT = 151.21, GENERAL = 167.59) although the highest is high school age, while the daily sitting time or time of inactivity is almost the same, that is, the higher the age the higher the daily sitting time, (SD = 100.88, SMP = 243.66, SMA = 221.37, PT = 263.66, GENERAL = 244.73).

The level of physical activity in minutes on average in one week is different between men and women, between ages at each level of education, all of which can be seen in table 3. In general, the total average physical activity level of female adolescents (2040.82 MET/ week) was higher than boys (1558.52 MET/week). When viewed from the age at the educational level, high school age (2029.04 MET/week) has the highest total physical activity compared to ages at other levels. At high levels of physical activity (vigorous PA), junior high school age = 578.22 MET/week, followed by PT = 670.97 MET/week, SMA = 658.57 MET/week, GENERAL = 602.03 MET/week and SD = 394.82 MET/week. Whereas at the moderate level of activity (moderate PA) elementary school age had the highest activity level, namely 922.59 MET/week, followed sequentially by SMA (637.82 MET/week), Middle School (533.11 MET/week), General (454.24 MET/week) and PT (425.13 MET/week).

The most interesting thing from table 3 is that teenagers who play online games and those who don't play online games, that is, teenagers who like to play online games have higher physical activity, namely 1882.47 MET/week and those who do not play online games have a physical activity level of 1787.10 METs/week.

DISCUSSION

The aim of study was to analyze youth's PA after pandemic covid-19. The result confirmed the hypothesis that PA returns to normal for all levels of educational age. Based on the analysis of the self-reported results, girls were more active than boys, inversely to previous research, which stated that boys tend to be more active than girls (Halliday, Kern, and Turnbull 2019; Castañeda-Babarro et al. 2020; Herbert et al. 2022).

Vigorous PA in general almost have the same score, except in elementary school level, has the lowest score. Inversely on moderate PA, elementary school level have highest score 922.59 ± 1553.68 MET/week. It is because younger children are much more active with their free play, especially children over 10 years of age (Burchartz et al. 2021). Encouraging individuals by providing social support, highlighting the costs and benefits, and increasing awareness of existing infrastructure can help enhance physical activity levels. Additionally, workplace interventions that educate individuals on sedentary behaviour and diminish the amount of time spent sitting can reduce sedentary behaviour (Koh et al. 2022).

The main results highlight that youth playing esports have high and/or moderate levels of physical activity, total 1882.47 ± 1769.99 MET/week. These results are similar to the study

Giakoni-Ramírez et al. (2022), that report 92.7% of professional esports players have moderate and high levels of physical activity, the sample includes professional players from America and Europe, totaling 260 people. This is because professional esports players have an orientation toward intrinsic and extrinsic motivation rather than amotivation, which is stronger in the group of performers who self-report low levels of physical activity (Giakoni-Ramírez et al. 2022; Rudolf et al. 2020).

Overall we found that the level of physical activity of youth and adolescents is classified as high and moderate. This is because after the pandemic ended, life activities returned to normal as before. Our study has several limitations that require consideration. Firstly, being an observational study, all participants volunteered to take part in the questionnaire, which may have resulted in selection bias. Secondly, the use of self-administered questionnaires to assess physical activity and sedentary behaviour may not be as reliable as using accelerometers or other tools to perform a precise physical activity evaluation. This could potentially be a future area of research.

CONCLUSION

In this study, we observed the physical activity level youth and adolescents, starting from elementary school age to late adolescence. Participant spent more time doing physical activity. The average physical activity belongs to the moderate to high category. The environmental situation that returns to normal is the main factor for good physical activity.

Acknowledgment

Thanks to all participating students involved in this research. Thanks to LPPM Universitas PGRI Semarang for providing funding, permits and support.

REFERENCES

- Ali, Amira Mohammed, and Hiroshi Kunugi. 2020. "COVID-19: A Pandemic That Threatens Physical and Mental Health by Promoting Physical Inactivity." *Sports Medicine and Health Science* 2(4):221–23. doi: 10.1016/j.smhs.2020.11.006.
- Apriantono, Tommy, Indria Herman, Muhamad Fahmi Hasan, Agung Dwi Juniarsyah, Sri Indah Ihsani, and Iwa Ikhwan Hidayat. 2020. "Physical Activity Level Mapping of Senior High School Students in West Java." *Jurnal Pendidikan Jasmani Dan Olahraga* 5(1):17–21. doi: 10.17509/jpjo.v5i1.20673.
- Bell, Joshua A., Mark Hamer, G. David Batty, Archana Singh-Manoux, Séverine Sabia, and Mika Kivimaki. 2014. "Combined Effect of Physical Activity and Leisure Time Sitting on Long-Term Risk of Incident Obesity and Metabolic Risk Factor Clustering." *Diabetologia*

- 57(10):2048–56. doi: 10.1007/s00125-014-3323-8.
- Burchartz, Alexander, Doris Oriwol, Simon Kolb, Steffen C. E. Schmidt, Kathrin Wunsch, Kristin Manz, Claudia Niessner, and Alexander Woll. 2021. "Comparison of Self-Reported & Device-Based, Measured Physical Activity among Children in Germany." *BMC Public Health* 21(1):1–10. doi: 10.1186/s12889-021-11114-y.
- Castañeda-Babarro, Arkaitz, Ane Arbillaga-Etxarri, Borja Gutiérrez-Santamaría, and Aitor Coca. 2020. "Physical Activity Change during COVID-19 Confinement." *International Journal of Environmental Research and Public Health* 17(18).
- Damiot, Anthony, Ana Jéssica Pinto, James E. Turner, and Bruno Gualano. 2020. "Immunological Implications of Physical Inactivity among Older Adults during the COVID-19 Pandemic." *Gerontology* 66(5):431–38. doi: 10.1159/000509216.
- Darni, Joyeti, Retno Wahyuningsih, Lalu Khairul Abdi, and Irianto Irianto. 2021. "Aktivitas Fisik Remaja Pada Masa Pandemi Covid-19." *Jurnal Gizi Prima (Prime Nutrition Journal)* 6(2):91–96.
- Dewi, Kadek Wiwien Pradnyaswari. 2022. "Tingkat Aktivitas Fisik Pada Mahasiswa Sarjana Keperawatan Di Masa Pandemi Covid-19." *Jurnal Medika Usada* 5(2):27–33.
- Ghozy, Sherief, Abdelaziz Abdelaal, Jaffer Shah, Kate Elizabeth Parker, and Sheikh Mohammed Shariful Islam. 2021. "COVID-19 and Physical Inactivity: Teetering on the Edge of a Deadlier Pandemic?" *Journal of Global Health* 11:10–12. doi: 10.7189/jogh.11.03031.
- Giakoni-Ramírez, Frano, Eugenio Merellano-Navarro, and Daniel Duclos-Bastías. 2022. "Professional Esports Players: Motivation and Physical Activity Levels." *International Journal of Environmental Research and Public Health* 19(4). doi: 10.3390/ijerph19042256.
- Halliday, Amber J., Margaret L. Kern, and Deborah A. Turnbull. 2019. "Can Physical Activity Help Explain the Gender Gap in Adolescent Mental Health? A Cross-Sectional Exploration." *Mental Health and Physical Activity* 16:8–18. doi: <https://doi.org/10.1016/j.mhpa.2019.02.003>.
- Health, Ministry of. 2014. "National Report on Basic Health Research, RISKESDAS 2013."
- Health, Ministry of. 2018. "National Report on Basic Health Research-RISKESDAS 2018."
- Herbert, Jarosław, Piotr Matłoz, Alejandro Martínez-Rodríguez, Krzysztof Przednowek, Muhammad Asif, and Justyna Wszyńska. 2022. "Weekday and Weekend Physical Activity of Preschool Children in Relation to Selected Socioeconomic Indicators." *International Journal of Environmental Research and Public Health* 19(9). doi: 10.3390/ijerph19094999.
- Koh, Yen Sin, P. V. Asharani, Fiona Devi, Kumarasan Roystonn, Peizhi Wang, Janhavi Ajit Vaingankar, Edimansyah Abidin, Chee Fang Sum, Eng Sing Lee, Falk Müller-Riemenschneider, Siow Ann Chong, and Mythily Subramaniam. 2022. "A Cross-Sectional Study on the Perceived Barriers to Physical Activity and Their Associations with Domain-Specific Physical Activity and Sedentary Behaviour." *BMC Public Health* 22(1):1–11. doi: 10.1186/s12889-022-13431-2.
- Kohl, Harold W., Cora Lynn Craig, Estelle Victoria Lambert, Shigeru Inoue, Jasem Ramadan Alkandari, Grit Leetongin, Sonja Kahlmeier, Lars Bo Andersen, Adrian E. Bauman, Steven N. Blair, Ross C. Brownson, Fiona C. Bull, Ulf Ekelund, Shifalika Goenka, Regina Guthold, Pedro C. Hallal, William L. Haskell, Gregory W. Heath, Peter T. Katzmarzyk, I. Min Lee, Felipe Lobelo, Ruth J. F. Loos, Bess Marcus, Brian W. Martin, Neville Owen, Diana C. Parra, Michael Pratt, Pekka Puska, David Ogilvie, Rodrigo S. Reis, James F. Sallis, Olga Lucia Sarmiento, and Jonathan C. Wells. 2012. "The Pandemic of Physical Inactivity: Global Action for Public Health." *The Lancet* 380(9838):294–305. doi: 10.1016/S0140-6736(12)60898-8.
- Kusdalinah, Kusdalinah, Ashifa Mutia, and Jumiyati Jumiyati. 2022. "Pola Makan Dan Aktivitas

- Fisik Terhadap Kejadian Obesitas Remaja Pada Masa Pandemi Covid-19.” *Journal of Nutrition College* 11(1):26–34.
- Rodriguez-Munoz, Sheila, Cristina Corella, Alberto Abarca-Sos, and Javier Zaragoza. 2017. “Validation of Three Short Physical Activity Questionnaires with Accelerometers among University Students in Spain.” *The Journal of Sports Medicine and Physical Fitness* 57(12):1660–68.
- Rodriguez, María, Ayllon Cristina, Cadenas Sánchez, Fernando Estévez, and Nicolas E. Muñoz. 2019. “Role of Physical Activity and Sedentary Behavior in the Mental Health of Preschoolers , Children and Adolescents : A Systematic Review and Meta - Analysis.” *Sports Medicine* (0123456789). doi: 10.1007/s40279-019-01099-5.
- Romero-Blanco, Cristina, Julián Rodríguez-Almagro, María Dolores Onieva-Zafra, María Laura Parra-Fernández, María Del Carmen Prado-Laguna, and Antonio Hernández-Martínez. 2020. “Physical Activity and Sedentary Lifestyle in University Students: Changes during Confinement Due to the Covid-19 Pandemic.” *International Journal of Environmental Research and Public Health* 17(18):1–13. doi: 10.3390/ijerph17186567.
- Rudolf, Kevin, Peter Bickmann, Ingo Froböse, Chuck Tholl, Konstantin Wechsler, and Christopher Grieben. 2020. “Demographics and Health Behavior of Video Game and ESports Players in Germany: The ESports Study 2019.” *International Journal of Environmental Research and Public Health* 17(6).
- Salmi, and Thesa Dwi Markuri. 2022. “Faktor Sosioekonomi Dan Tingkat Aktivitas Fisik Remaja Pada Masa Pandemi COVID-19: Studi Pada Siswa SMK.” *Jurnal Ilmu Keolahragaan Undiksha* 10(2 SE-Articles):194–200. doi: 10.23887/jiku.v10i2.44958.
- Scholes, Shaun, Sally Bridges, Linda Ng Fat, and Jennifer S. Mindell. 2016. “Comparison of the Physical Activity and Sedentary Behaviour Assessment Questionnaire and the Short-Form International Physical Activity Questionnaire: An Analysis of Health Survey for England Data.” *PLoS ONE* 11(3):1–30. doi: 10.1371/journal.pone.0151647.
- Sikorska-Siudek, Katarzyna, Małgorzata Olędzka-Oręziak, and Beata Parzuchowska. 2006. “Choroba Wieńcowa Wśród Kobiet - Czy Istnieje Problem Płci?” *Family Medicine and Primary Care Review* 8(3):1110–15.
- Suryoadji, Kemal Akbar, and Darrin Ananda Nugraha. 2021. “Aktivitas Fisik Pada Anak Dan Remaja Selama Pandemi COVID-19: A Systematic Review.” *Jurnal Mahasiswa* 13(1):1–6.
- Warburton, Darren E. R., and Shannon S. D. Bredin. 2016. “Reflections on Physical Activity and Health: What Should We Recommend?” *Canadian Journal of Cardiology* 32(4):495–504. doi: 10.1016/j.cjca.2016.01.024.
- Warburton, Darren E. R., and Shannon S. D. Bredin. 2017. “Health Benefits of Physical Activity: A Systematic Review of Current Systematic Reviews.” *Current Opinion in Cardiology* 32(5):541–56. doi: 10.1097/HCO.0000000000000437.
- Widiyatmoko, Fajar, and Husnul Hadi. 2018. “Tingkat Aktivitas Fisik Siswa Di Kota Semarang.” *Journal Sport Area* 3(2):140. doi: 10.25299/sportarea.2018.vol3(2).2245.