COMPETITOR:
JURNAL PENDIDIKAN KEPELATIHAN OLAHRAGA
e-ISSN: 2657-0734 & p-ISSN: 2085-5389 ‖ Volume 17, Number 1, 2025 ‖ P.381-390
DOI: 10.26858/cjpko.v17i1.71914

The Relationship Between Physical Activity and Learning Outcomes For Upper Elementary School Students

Akmal Muhamad[1A-E], Dinar Dinangsit[2B-D], Aam Ali Rahman[3B-D*]

[1,2,3]Physical Education of Elementary Teacher Program, Universitas Pendidikan Indonesia, Bandung, West Java, Indonesia

akmal060702@upi.edu[1], dinardinangsit@upi.edu[2], alirahman@upi.edu[3]

ABSTRACT

This study aims to determine the relationship between physical activity and learning outcomes of upper-grade elementary school students. Physical activity is defined as body movements that require energy expenditure and is categorized into light, moderate and heavy activities. This study used a quantitative approach with a correlational design. The research sample amounted to 205 students in grades IV to VI who were selected by purposive sampling technique from several elementary schools. The instrument used to measure physical activity was the PAQ-C (Physical Activity Questionnaire for Children) questionnaire while learning outcomes were obtained from students' report cards. Significant between physical activity and learning outcomes with a correlation value of -0.181 and a significance of 0.009. This means that the higher the students' physical activity level, the lower their learning outcomes. This result contradicts some theories that physical activity improves cognitive function and academic achievement. However, this finding can be explained through time management factors and the high intensity of physical activity, which can cause fatigue and reduce study time. This study provides important implications for schools and parents to help students optimally balance physical activity and study time.

ARTICLE HISTORY
Received: 2025/02/21
Accepted: 2025/02/25
Published: 2025/02/28

KEYWORDS
Physical Activity;
Learning Outcomes;
Primary School Students.

AUTHORS' CONTRIBUTION
A. Conception and design of the study;
B. Acquisition of data;
C. Analysis and interpretation of data;
D. Manuscript preparation;
E. Obtaining funding

Cites this Article : Muhamad, Akmal; Dinangsit, Dinar; Rahman, Aam Ali. (2025). The Relationship Between Physical Activity and Learning Outcomes For Upper Elementary School Students. **Competitor: Jurnal Pendidikan Kepelatihan Olahraga**. 17 (1), p.381-390

INTRODUCTION

One measure of educational achievement that can be seen from student academic achievement is student learning outcomes. Learning outcomes are one indicator of the achievement of an education Yandi et al. (2023). Learning outcomes are changes that occur in individuals as a result of interaction with their environment. Changes in children's abilities, such as cognitive, affective, and psychomotor aspects, are known as learning outcomes in early childhood Aminingtyas & Dwi Wardhani, (2023). Learning outcomes can also be influenced by several internal and external factors. Internal factors include interest, talent, health, and lifestyle. As for external factors, such as family environment and social environment Nabillah & Abadi, (2019).

Especially in health points, of course, physical activity is one of the options for improving the quality of health. In a study Chaeroni et al (2021) suggest that doing physical activity of moderate or high intensity can improve physical fitness, besides that he suggests that in addition to improving physical fitness, physical activity can also have an impact on mental health performance. Based on the aforementioned statements, physical education can be defined as an educational process that uses physical activity to enhance a person's overall quality of life, particularly in terms of students' academic performance by promoting improvements in their physical, mental, social, and emotional well-being Sukamti, (2001). Several studies have shown that physical activity can have a positive impact on brain function and academic performance, especially in primary school-aged children who are at an important stage of physical and mental development Riyanto & Mudian, (2019). The World Health Organization (WHO) recommends that children aged 10 to 12 years should be physically active at moderate or high intensity for at least 60 minutes every day (WHO, 2021) But in reality, many children do not reach the specified time limit, starting from the PJOK lesson hours at school which only meet once a week coupled with a lack of scope that does not support physical activity. For example, the lack of playing fields and lack of facilities is certainly a factor in the tendency to spend more time in front of the screen, whether to play games, watch videos, or interact on social media Jeki & Isnaini, (2022). This condition raises concerns about the long-term impact on students' physical development and learning outcomes, which should be met. Writing, punching, jumping, and similar physical activities are more closely associated with the psychomotor domain (Hildan et al., 2022). Therefore, it is assumed that physical activity has a relationship with learning outcomes. Sport may be the best word to describe physical exercise in the context of education, as well as its vital function in treatment and a healthy lifestyle. Rijsdorp further contended that Sport is the foundation of all education, based on the idea that cultivating the soil is the foundation of culture Saunders & Lutan (2020). the decline in physical activity (PA) due to the absence of the "carry-over effect" of physical education programs from elementary school through college Kane et al. (2016)

During elementary school, children experience rapid motor and cognitive development (Alfriana, 2024). At that age, children are more active, but in reality, children are often distracted by media devices, many children spend their time playing games and watching television. The research Alawiyah & Ernawati (2021), in his research he got results that showed that children aged 10-12 years used gadgets for an average of 3 hours a day, while the ideal use of time in using media gadgets at that age was 2 hours per day Thomas (2021), with the results above, it is assumed that many children are addicted to gadgets so that they rarely do physical activities that are useful for maintaining physical fitness and mental health. Physical activity not only keeps the body healthy, but can also increase blood flow to the brain, encourage the growth of brain cells, and improve brain functions related to concentration, memory, and problem-solving abilities Umiyati (2021). Therefore, physical activity is considered to have a role in helping to improve learning outcomes.

In Indonesia, physical education is already part of the primary school curriculum, but often its implementation is limited and less connected to academic goals, one of the

obstacles is inappropriate learning and not using learning media Trunojoyo et al. (2019). Even some schools do not have sports teachers in their schools, which makes physical education lessons not well channelled, then some schools often focus on academic lessons compared to sports lessons, with the above statement, getting a temporary assumption that physical education learning in schools does not always go well so that physical activity is not fulfilled, so that physical fitness and mental health do not occur as in research Kamaruddin et al (2023) he suggests that lack of physical activity can reduce the ability to think critically which is part of the cognitive domain. This raises the question, to what extent can students' physical activity affect their learning outcomes? Furthermore, the research of Suwandaru & Hidayat (2021) which examines the relationship between physical activity and learning achievement at SMK Negeri 1 Surabaya, with a sample of 35 class X students, shows that physical activity does not have a significant relationship with learning achievement. In this case, the author refers to this study, because there are several differences between the above studies such as, differences in samples, the above study used a sample of vocational high school students while this study used a sample of upper-grade elementary school students. Then the next difference is the location of the research, if the above research was conducted research in Surabaya, this research was conducted in the Paseh sub-district so it can be said that there are differences between this research and previous research. Based on the above statement, this study aims to explore more deeply the relationship between physical activity and the learning outcomes of elementary school students. The results of this study are expected to provide new insights for schools and parents to create a more balanced education program between sports and academics, so that children can develop optimally, both physically and cognitively.

Research by Erickson et al. (2019) examines the intensity of physical activity on student cognition, from low to high physical activity and the results show that moderate to high-intensity physical activity has a relationship with improvements in cognition, including performance on academic achievement tests and neuropsychological tests that measure processing speed, memory, and executive function. Research by Sulistia et al. (2019) which examines the results of the calculation of the correlation between sleep quality and cognitive learning achievement shows a significant positive relationship, while the relationship between physical activity and cognitive learning outcomes shows a significant negative correlation. So it can be concluded that physical activity has a relationship with physical activity.

As for research Haverkamp et al. (2020), this study high-intensity physical activity may be a promising way to improve some cognitive outcomes and language skills in adolescents and young adults, this study shows that physical activity has a relationship with children's cognition, which is related to learning outcomes. Furthermore, regarding physical activity, if added to the curriculum in schools Norris et al. (2020) in their research state physical activity if added to the curriculum, then it has a positive impact on educational outcomes. This is in line with Lengkana et al. (2020) research on Physical education taught at school has an important role in providing opportunities for students

Akmal Muhamad[1A-E], Dinar Dinangsit[2B-D], Aam Ali Rahman[3B-D]
alirahman@upi.edu[3*]

to engage directly in a variety of learning experiences through systematic physical activity, sport and health. Physical activity during school hours can occur during physical education, breaks, and classroom instruction Fauzi et al. (2023).

Responding to the research above, it is important to further examine the relationship between physical activity and student learning outcomes, because, in the research above, not all studies show results that show physical activity correlates with learning outcomes. Especially in elementary school students. This research certainly provides new knowledge about physical activity with learning outcomes at the elementary school level, because this research focuses on the elementary school level.

This study aims to understand how active elementary school students are in doing physical activity, both at school and outside of school, so that an overview of their daily activity patterns can be obtained. In addition, this study also wants to analyze whether there is a relationship between physical activity and students' learning outcomes at school. This study also illustrates how physical activity can affect students' cognitive abilities, such as concentration, memory, and problem-solving skills. This study is expected to provide recommendations for teachers and schools on the importance of balance between sports and academic activities, so that students can develop optimally, both physically and mentally.

Based on the research objectives above, the hypothesis in this study uses the decision-making criteria in this study if H0 is accepted, then there is no relationship between physical activity and student learning outcomes.

METHODS

The method used in this study is a quantitative research approach with a correlational design that aims to determine whether there is a relationship between physical activity and student learning outcomes in one of the elementary schools. Using correlational methods to predict learning outcomes based on physical activity. The population in this study is elementary schools in the Paseh District, with sample selection using purposive sampling.

Choosing a sample with upper-grade criteria, because the age of 9-11 years, age is a stage to build a foundation for the whole, especially in the education stage, Agus Mulyadi & Lestari dkk. (2024). Furthermore, the criteria in this study are that the sample has or is close to facilities for physical activity. Coupled with the lack of facilities, children are distracted by media devices such as playing games and watching movies in the house, so their physical activity is low (Indriani et al., 2020). Furthermore, the sample studied must have the latest learning outcomes data to make it easier for researchers to immediately process research data. Of all elementary schools in the Paseh sub-district, 3 elementary schools have these criteria. Data were collected through surveys, using The Physical Activity for Children (PAQ-C) Questionnaire (Kowalski et al., 2004), which has been translated into Indonesian, with the validity of PAQ-C items being between 0.140- 0.730. Inter-item correlations ranged from 0.000) - 0.616, as a measurement tool. Each question

is rated on a scale of 1 to 5, except for item 10. In the first item, never doing an activity gets 1 point, while doing seven or more activities per week gets 5 points. Items 2 to 8 cover various periods (such as study time, break time, lunch, after-school activities, evenings, and weekends) and aim to describe the child's activities. a) Answers range from the lowest to the highest activity. b) Each item is scored based on the selected response (1 for lowest activity, 5 for highest activity). Item 9 averages the activities throughout the week (1 for "none", 5 for "very often") to produce a composite score. Item 10 was only used to identify unusual activities in the previous week and was not used in the calculation of the final PAQ-C score, and also the average report card score as a learning outcome instrument. Analyzing data using linear regression through the pre-requisite test stage using the normality test and the linearity test. After conducting the pre-requisite test, the researcher conducted a correlation test using SPSS 26 software.

RESULTS AND DISCUSSION

Result

The importance of the normality test in a study can be seen from several previous references, The normality test is useful for seeing whether the research data is normally distributed or not.

Table. 1
Tests of Normality

	Kolmogorov-Smirnov[a]		
	Statistic	**df**	**Sig.**
Learning Outcomes	0,046	205	0,200*
Physical Activity	0,052	205	0,200*

Based on Table 1 of the normality test that has been carried out. Then the researcher uses the Kolmogorov-Smirnov normality test because the number of samples is more than 50, after which it can be concluded that the data that has been taken through the physical activity questionnaire shows a result of 0.200> 0.05 while the learning outcome variable measured by the average report card score shows a result of 0.200> 0.05. From these results, it can be concluded that both variables, namely physical activity and learning outcomes, are normally distributed. With the results above, next to the Pearson correlation test

Table. 2
Test of Linearity

			Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Learning Outcomes* Physical activity	Between Groups	(Combined)	2908,821	137	21,232	,911	,680
		Linearity	147,021	1	147,021	6,310	,014
		Deviation from Linearity	2761,800	136	20,307	,872	,751
	Within Groups		1561,177	67	23,301		
	Total		**4469,998**	**204**			

Akmal Muhamad[1A-E], Dinar Dinangsit[2B-D], Aam Ali Rahman[3B-D]
alirahman@upi.edu[3*]

The table above shows the results of the linearity test to see if there is a consistent relationship between physical activity and the learning achievement of primary school students. As a result, the significance value for linearity of 0.018 indicates that the relationship between these two variables tends to follow a clear and regular pattern. Meanwhile, the significance value for deviation from linearity was 0.751. In other words, physical activity and learning outcomes have a predictable relationship without any deviant variations in the relationship.

Before discussing the results of hypothesis testing in Table 4, it is necessary to understand that correlation analysis was conducted to determine the relationship between two variables, namely physical activity and student learning outcomes. The Pearson correlation test was used because the data was declared normally distributed based on the results of the previous prerequisite test. This analysis aims to identify how strong and the direction of the relationship occurs between variables. By looking at the correlation value and its significance, we can determine whether physical activity has a statistically meaningful relationship to learning outcomes. Furthermore, the following are the results of the Pearson correlation test displayed in Table 4.

Table 4.
Pearson Correlation

		Learning outcomes	Physical activity
Learning outcomes	Pearson Correlation	1	-,181**
	Sig. (2-tailed)		,009
	N	205	205
Physical activity	Pearson Correlation	-,181**	1
	Sig. (2-tailed)	,009	
	N	205	205

The Pearson correlation test results in the table show that there is a relationship between the two variables of physical activity and learning outcomes with a sample size of 205. The correlation value of -0.181 indicates a weak negative relationship, meaning that when one variable increases, the other tends to decrease, but the effect is not too large. In addition, the significance value is 0.009 > 0.05, which means that this relationship is statistically strong and does not occur by chance.

Discussion

The results showed a significant negative relationship between physical activity and learning outcomes of upper-grade elementary school students. The Pearson correlation value of -0.181 with a significance of 0.009 indicates that the higher the students' physical activity, the lower their academic scores. The relationship was linear (sig. 0.018) and the data was normally distributed (sig. 0.200), making the analysis valid. This finding appears to contradict several theories that physical activity can increase blood flow to the brain, improving cognitive function, concentration, and academic performance (Badu et al., 2021; Haverkamp et al., 2020; Rahmawati et al., 2021).

The explanation for this finding can be attributed to time management factors and the intensity of physical activity. When students spend too much time on physical or

extracurricular activities that demand high energy, their study time is reduced (Habsyi, 2020; Sulistia et al., 2019). Heavy physical activity also risks causing physical and mental fatigue, which in turn can reduce students' concentration and understanding of the subject matter (Kamaruddin et al., 2023; Rohani, 2023). Unbalanced physical activity also has the potential to increase mental fatigue, which has implications for decreased working memory and focusing ability, as found by Phan et al. (2018) and Xu et al. (2018)

Thus, schools, teachers and parents need to help students balance physical activity with adequate study time. Physical activity still provides health benefits, but it needs to be regulated in an appropriate duration and intensity so as not to interfere with academic achievement (Cristanto et al., 2021; Kusumo, 2020). It is recommended that students be guided in organizing study time effectively and structure, and pay attention to adequate rest duration. To gain a deeper understanding, further research can be conducted by considering the type of physical activity, level of fatigue, and time management strategies applied by students.

CONCLUSION

Based on the results of statistical analysis of 205 students from three elementary schools in the Paseh sub-district, this study concluded that there is a significant relationship between physical activity and learning outcomes of upper-grade students. The Pearson correlation test results show a significance value of 0.009, which means that statistically there is a real relationship between the two variables. Although the direction of the correlation is negative and the strength is weak (r = -0.181), this finding still has significance. This negative correlation indicates that the higher the student's level of physical activity, the lower their average academic learning outcomes. It should be noted that students' engagement in physical activity must be balanced with effective study time management. In addition, the frequency analysis showed that the majority of students had moderate levels of physical activity (42%), yet their learning outcomes were still mostly in the “good” category (68%). This shows that although physical activity is important for physical and mental health, its implementation needs to be regulated proportionally so as not to interfere with the academic learning process. Therefore, it can be concluded that physical activity does have a relationship with learning outcomes, but its presence does not necessarily improve academic achievement without proper management of time and intensity. The findings also open up room for further research into the quality, duration and type of physical activity that best supports improved learning outcomes, as well as emphasizing the importance of a holistic approach to education that does not just focus on academic or physical aspects in isolation.

REFERENCES

Alawiyah, N., & Ernawati, R. (2021). Hubungan Penggunaan Gadget dengan Interaksi Sosial Anak Usia Sekolah Dasar di SD Muhammadiyah 5 Samarinda. *Borneo Student Research*, *3*(1), 300–309. https://journals.umkt.ac.id/index.php/bsr/article/download/2461/1013

Alfriana, D. (2024). *International Journal of Education, Social Studies and Counselling (IJEDUCA) Vol.2, No.1, 2024*. *2*(1), 1–8.

Aminingtyas, M., & Dwi Wardhani, J. (2023). Hubungan Minat dan Motivasi Belajar Berbasis Portal Rumah Belajar terhadap Hasil Belajar Kognitif Anak. *Murhum : Jurnal Pendidikan Anak Usia Dini*, *4*(1), 590–601. https://doi.org/10.37985/murhum.v4i1.268

Badu, K. M., Sugiharto, S., & Hariyanto, E. (2021). Literatur Review: Aktivitas Fisik Dalam Pembelajaran Pendidikan Jasmani sebagai Stimulus Fungsi Kognitif Siswa. *Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan*, *6*(12), 1953. https://doi.org/10.17977/jptpp.v6i12.15180

Chaeroni, A., Kusmaedi, N., Ma'mun, A., & Budiana, D. (2021). Aktivitas Fisik : Apakah Memberikan Dampak Bagi Kebugaran Jasmani dan Kesehatan Mental? *Jurnal Sporta Saintika*, *6*(1), 54–62.

Cristanto, M., Saptiningsih, M., & Indriarini, M. Y. (2021). Hubungan Aktivitas Fisik Dengan Pencegahan Hipertensi Pada Usia Dewasa Muda: Literature Review. *Jurnal Sahabat Keperawatan*, *3*(01), 53–65. https://doi.org/10.32938/jsk.v3i01.937

Erickson, K. I., Hillman, C., Stillman, C. M., Ballard, R. M., Bloodgood, B., Conroy, D. E., Macko, R., Marquez, D. X., Petruzzello, S. J., & Powell, K. E. (2019). Physical Activity, Cognition, and Brain Outcomes: A Review of the 2018 Physical Activity Guidelines. *Medicine and Science in Sports and Exercise*, *51*(6), 1242–1251. https://doi.org/10.1249/MSS.0000000000001936

Fauzi, R. A., Suherman, A., Saptani, E., Dinangsit, D., & Rahman, A. A. (2023). The Impact of Traditional Games on Fundamental Motor Skills and Participation in Elementary School Students. *International Journal of Human Movement and Sports Sciences*, *11*(6), 1368–1375. https://doi.org/10.13189/saj.2023.110622

Gaya Hidup Sehat Sejak Dini Melalui Pendidikan Jasmani, M., Kesehatan Agus Mulyana, D., Lestari, D., Pratiwi, D., Mufidah Rohmah, N., Tri, N., Nisa Audina Agustina, N., & Hefty, S. (2024). Menumbuhkan Gaya Hidup Sehat Sejak Dini Melalui Pendidikan Jasmani, Olahraga, Dan Kesehatan. *Jurnal Bintang Pendidikan Indonesia*, *2*(2), 321–333. https://ejurnal.stie-trianandra.ac.id/index.php/JUBPI/article/view/2998

Habsyi, F. Y. (2020). Pengaruh fasilitas belajar terhadap prestasi belajar siswa SMA Nusantara Tauro. *Jurnal Pendidikan Dan Ekonomi*, *2*(1), 13–22.

Haverkamp, B. F., Wiersma, R., Vertessen, K., van Ewijk, H., Oosterlaan, J., & Hartman, E. (2020). Effects of physical activity interventions on cognitive outcomes and academic performance in adolescents and young adults: A meta-analysis. *Journal of Sports Sciences*, *38*(23), 2637–2660. https://doi.org/10.1080/02640414.2020.1794763

Hildan, N. M., Susilawati, D., & Dinangsit, D. (2022). Physical Education Lecture Evaluation Studies in Cognitive, Affective, and Psychomotor in Students. *JUARA : Jurnal Olahraga*, *7*(3), 589–604. https://doi.org/10.33222/juara.v7i3.2278

Indriani, Loebaloe, N. P., & Wardhani, R. R. (2020). Pola Aktifitas Fisik dan Hubungannya dengan Perubahan IMT Terhadap Anak Sekolah Dasar di Yogyakarta. *The 11th University Research Colloquium 2020: Universitas 'Aisyiyah Yogyakarta*, 261–268.

Jeki, A. G., & Isnaini, I. F. (2022). Aktivitas Fisik Pada Remaja Dengan Kegemukan;

Sistematik Review. *Ikesma*, *18*(2), 117. https://doi.org/10.19184/ikesma.v18i1.24902

Kamaruddin, I., Leuwol, F. S., Putra, R. P., Aina, M., Suwarma, D. M., & Zulfikhar, R. (2023). Dampak Penggunaan Gadget pada Kesehatan Mental dan Motivasi Belajar Siswa di Sekolah. *Journal on Education*, *6*(1), 307–316. https://www.jonedu.org/index.php/joe/article/view/2944

Kane, S. N., Mishra, A., & Dutta, A. K. (2016). Preface: International Conference on Recent Trends in Physics (ICRTP 2016). *Journal of Physics: Conference Series*, *755*(1). https://doi.org/10.1088/1742-6596/755/1/011001

Kowalski, K. C., Crocker, P. R. E., Columbia, B., & Donen, R. M. (2004). *The Physical Activity Questionnaire for Older Children (PAQ-C) and Adolescents (PAQ-A) Manual*. *August*.

Kusumo, M. P. (2020). Buku Pemantauan Aktivitas Fisik Mahendro Prasetyo Kusumo. In *Yogyakarta: The Journal Publishing*. http://repository.umy.ac.id/bitstream/handle/123456789/35896/Bukupemantauan aktivitas fisik.pdf?sequence=1

Lengkana, A. S., Rahman, A. A., Alif, M. N., Mulya, G., Priana, A., & Hermawan, D. B. (2020). Static and dynamic balance learning in primary school students. *International Journal of Human Movement and Sports Sciences*, *8*(6), 469–476. https://doi.org/10.13189/saj.2020.080620

Nabillah, T., & Abadi, A. P. (2019). *Faktor penyebab rendahnya hasil belajar siswa*. 659–663.

Norris, E., Van Steen, T., Direito, A., & Stamatakis, E. (2020). Physically active lessons in schools and their impact on physical activity, educational, health and cognition outcomes: A systematic review and meta-analysis. *British Journal of Sports Medicine*, *54*(14), 826–838. https://doi.org/10.1136/bjsports-2018-100502

Phan, D. Van, Chan, C. L., Pan, R. H., Yang, N. P., Hsu, H. C., Ting, H. W., & Lai, K. R. (2018). A study of the effects of daily physical activity on memory and attention capacities in college students. *Journal of Healthcare Engineering*, *2018*. https://doi.org/10.1155/2018/2942930

Rahmawati, S., Masni Erika Firmiana, & Hadiansyah, A. (2021). Manajemen stress dan menjaga kesehatan mental di masa pandemi COVID 19. *Journal of Chemical Information and Modeling*, *53*(9), 1–8.

Riyanto, P., & Mudian, D. (2019). Pengaruh Aktivitas Fisik Terhadap Peningkatan Kecerdasan Emosi Siswa. *Journal Sport Area*, *4*(2), 339–347. https://doi.org/10.25299/sportarea.2019.vol4(2).3801

Rohani, D. (2023). Hubungan Pengetahuan Gizi , Tingkat Kecukupan Zat Gizi , Dan. *Student Research Journal*, *1*(1), 01–14.

Saunders, J., & Lutan, R. (2020). Sport, science and politics in Indonesia: Challenges in epistemology within an evolving global context. *International Sports Studies*, *42*(e), 4–14. https://doi.org/10.30819/iss.42-e.02

Sukamti, E. R. (2001). Jurnal Pendidikan Kepelatihan Olahraga -S1. *Jurnal Pendidikan Kepelatihan Olahraga -S1*, *1*(1), 190–209. http://journal.student.uny.ac.id/jurnal/artikel

Sulistia, T., Djamahar, R., & Rahayu, S. (2019). Hubungan kualitas tidur dan aktivitas fisik

dengan hasil belajar kognitif sistem koordinasi manusia. *Jurnal Penelitian Pendidikan Biologi*, *2*(2), 113–120. http://jurnal.um-palembang.ac.id/index.php/dikbio

Suwandaru, C., & Hidayat, T. (2021). *SURABAYA Cahyo Suwandaru *, Taufiq Hidayat*. *09*, 113–119.

Thomas, G. (2021). *Understanding screen use in children and adolescents*.

Trunojoyo, U., Telang, M., Bangkalan, K., & Timur, J. (2019). *Edy Prasetyo 1* , Agung Setyawan 2* , Tyasmiarni Citrawati 3* 1*. *1*, 76–82.

Umiyati. (2021). *Hubungan Olahraga dan Motivasi Belajar Dengan Konsentrasi Belajar Pada Mahasiswa Fakultas K*. *4*(1), 6.

WHO. (2021). Рекомендации Воз По Вопросам Физической Активности И Малоподвижного Образа Жизни. In *https://apps.who.int/iris/bitstream/handle/10665/336656/9789240032170-rus.pdf?sequence=34&isAllowed=y*.

Xu, R., Zhang, C., He, F., Zhao, X., Qi, H., Zhou, P., Zhang, L., & Ming, D. (2018). How Physical Activities Affect Mental Fatigue Based on EEG Energy, Connectivity, and Complexity. *Frontiers in Neurology*, *9*(October), 1–13. https://doi.org/10.3389/fneur.2018.00915

Yandi, A., Nathania Kani Putri, A., & Syaza Kani Putri, Y. (2023). Faktor-Faktor Yang Mempengarui Hasil Belajar Peserta Didik (Literature Review). *Jurnal Pendidikan Siber Nusantara*, *1*(1), 13–24. https://doi.org/10.38035/jpsn.v1i1.14