

Impact of brain breaks to supporting the physical activity during the Covid-19 Pandemic in elementary school

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Abstract:

Changes in learning patterns during the Covid-19 certainly have a negative and positive impact, especially on students' physical activity development. The brain breaks program is a new program in Indonesia. This program is designed to develop physical activity in children to improve learning, motor skills, fitness, and cultural culture. This research provided students' perceptions of the use of the brain breaks program increasing physical activity, especially during the Covid-19. The research design used is descriptive quantitative research with survey techniques. Researchers conducted a survey of the entire population, which described the population's unique attitudes, behaviours, and characteristics. Students did a brain break for a week, then fill out a questionnaire to measure their opinions and attitudes towards the brain break program. This research uses purposive sampling. This study involved 194 elementary school students (4-6) in six areas of DKI Jakarta. This research used a questionnaire instrument of Attitudes toward Physical Activity Scale (APAS). The percentage and descriptive analysis techniques were used to analyze the data in this study. Result: According to the findings, students' perceptions of the brain breaks program were excellent, where the average score is 81.40%. The brain break program is beneficial from the aspect of physical activity and can contribute to the overall educational process, especially during the Covid-19. This positive impact must be supported by the competence of physical education teachers in the use of technology both in operation and in variations in the development of brain break movements adjusted to local wisdom based on Indonesian culture. The next step from the results of this research needs to be further developed research on brain breaks programs, especially in Indonesia, to increase physical activity in students at other educational levels and improve the quality of education.

Key Words: Brain breaks, physical activity, covid-19, elementary school

Introduction

The Covid-19 pandemic has resulted in significant changes to Indonesia's physical education learning process worldwide. During the pandemic, education in Indonesia implemented Distance Learning (DL), which changed physical education learning patterns that initially took place offline turned online (Fatkhur Rozi et al., 2021). Changes in learning patterns during the pandemic require teachers to adjust to the right conditions in overcoming challenges (Jauhari et al., 2020).

Changes in learning patterns during the Covid-19 pandemic certainly had negative and positive impacts, especially for learning physical education. The negative impact includes the stress level of Physical Education students in the heavy category of 34% (Jauhari et al., 2020). The results of other studies show that in physical education lessons using online learning are 41% said they were less understood, and 52.2% were not fun (Indriyani, 2021). Physical education's teaching and learning process during the Covid-19 pandemic were low, according to 79.59% (Septian Raibowo & Yahya Eko Nopiyanto, 2020). The negative impact that occurs indeed affects the development of students' physical activity. (Widiyatmoko & Hadi, 2018) in their research, students' physical activity is still low, so there must be efforts to improve health and an active lifestyle among students.

The positive impact of changes in learning patterns during the pandemic is that education about information technology has increased significantly. It becomes a new opportunity for academics to develop physical education and sports learning methods through distance learning models (Widiyatmoko & Hadi, 2018). Technology has a significant role in implementing Physical Education learning both as a facilitator in the delivery of learning material and as a medium for interaction between educators and students, especially during the Covid-19, which was not done face-to-face (Hanifah Salsabila et al., 2020). The use of video tutorials during the coronavirus pandemic can complement online learning tools used by educators as discussion material and

practical material and increase students' understanding of the material presented (Batubara & Batubara, 2020). Research studies show that providing virtual health content (physical activity, physical education, and nutrition education) is a viable way to sustain school and family investment in comprehensive adolescent health in times of a pandemic. In addition, virtual programming has become an effective mechanism for extending outreach by leveraging multiple deployment strategies (Whalen et al., 2021).

Physical education learning has the potential to be developed amid the Covid-19 through a DL model with a collaborative approach (Herlina & Suherman, 2020). Online learning methods that can be used in the physical education learning process related to psychomotor aspects (motion), which are seminars, have a video application (Jayul & Irwanto, 2020). Physical education programs in particular (manipulation of modifications to the school environment both physically and psychologically) are able to increase student's physical activity. Changes in the level of physical activity that occur due to treatment in two different elements, psychological (for example, attitudes, competence in Physical Education classes) and the physical environment (for example, facilities, structures, and methods) (Gråstén, 2016).

Physical education learning is essential to carry out during the Covid-19 pandemic. The prevention and transmission of the Covid-19 Virus are affected by physical education through the fulfilment of good physical fitness (Fatkhur Rozi et al., 2021). Physical fitness is obtained through movement activities and sports during Physical Education activities. A good level of fitness increases the body's immunity (Amalia et al., 2020). Through physical education, it encourages students to continue doing physical activity. According to Bailey et al. (2009), the assumption that the Physical Education and School Sports program can encourage adolescents to engage in physical activity has been proven. Through various physical activities, it will increase students' physical activity both in the Physical Education class and outside the Physical Education class. Therefore, physical education is essential in increasing physical activity during a pandemic.

Several studies explain that during COVID-19, there was a decrease in physical activity in students. 94% of 97 South Korean parents reported in a survey that during COVID-19, there was a decrease in children's involvement in sports and play (Hongyan Guan et al., 2020). Since the beginning of COVID-19, data examining the physical activity of children and adolescents has occurred.

There was a drastic decrease in the level of physical activity (Moore et al., 2020). Croatian teenagers (mean age 16.5 ± 2.1 years) did not complete prescribed physical activities owing to activity limitations, according to research conducted before (October 2019 - March 2020) and after (April 2020) the beginning of COVID-19. During covid-19, Croatian adolescents living in urban areas experienced a more significant decrease in physical activity than in rural areas (Zenic et al., nd). Social limitations imposed after COVID-19 to prevent the virus's transmission have disrupted 24-hour a day activities, including physical activity, sedentary behaviour and sleep in children aged 5-12 years and adolescents aged 17 years. There is a considerable decline in physical activity, an increase in sedentary behaviour, sleep pattern, and quality problems (Bates et al., 2020).

One way to develop effective and efficient physical activity during the Covid-19 period is by utilizing internet-based technology. Internet-based physical activity is more interesting to trigger children's interest (Hall & Bierman, 2016). One of the media used by children for physical activity at home is the Brain Breaks program. Research shows that brain break technology can support children to trigger physical activity levels at home while maintaining social distance from peers (Cline et al., 2021). "Brain Breaks" is very effective in triggering physical activity in elementary school children during learning (Bobe et al., 2014)

Brain Break is a web-based organized physical exercise video to improve student health and academic performance (Rizal et al., 2019a). Brain Break is a cost-effective, safe and fun program everywhere because every child has the opportunity to be active, from any level of motor, cognitive, and affective skills (Bonnema et al., 2020). The brain break program aims to introduce physical activity to children in specific movements from each country given in each video so that teachers have video references about physical activity (Kuan et al., 2019). The brain break program is a program that has never been developed in Indonesia. The first step in developing a brain break in Indonesia is to describe students' perceptions of the program. This research aims to provide an overview of students' perceptions of using the brain break program in increasing physical activity, especially during the Covid-19 period.

Material & Methods

Study Design Participants

The research design used is descriptive quantitative research with survey techniques. Researchers conducted a survey of the entire population, which described the unique attitudes, behaviours, and characteristics of the population (Creswell, 2012). Students do a brain break for a week, then fill out a questionnaire. Questionnaire to measure their opinions and attitudes towards the brain break program. This research uses purposive sampling (Kerlinger, 2014). Sampling criteria are based on students, teachers, and schools' readiness to participate in the brain break program. The sample represents each school in the DKI Jakarta area (South Jakarta, East Jakarta, Central Jakarta, North Jakarta and Kepulauan Seribu). The questionnaire was filled out by 194 elementary school students (4-6).

Measurement

This study used a questionnaire instrument, “Attitudes to Physical Activity Scale (APAS)”, which was developed by (Mok et al., 2015). Researchers redeveloped questionnaire items to adjust reliability according to the Indonesian culture. The APAS questionnaire contains seven indicators designed to measure students’ attitudes towards physical activity. The following are the results of testing the APAS instrument which the researcher redeveloped:

Table 1. Testing Results of the “Attitudes toward Physical Activity Scale (APAS)”

No	Indicator	Reliability Score	Category
1	Benefits	0.755	High
2	Importance	0.881	Very High
3	Learning	0.672	High
4	Self-efficacy	0.627	High
5	Fun	0.814	Very High
6	Fitness	0.920	Very High
7	Personal best	0.623	High

Researchers used seven indicators using a Likert scale of 5 (five). Each positive statement Strongly Disagree score 1, Disagree score 2, Neutral score 3, Agree score 4 and Strongly Agree score 5. Each negative statement Strongly Disagree score 5, disagree score 4, neutral score 3, agree score 2, and strongly agree score 1.

Statistical analysis

The data analysis technique in this research was carried out by using percentage and descriptive analysis. The data obtained are grouped based on indicators then presented in the form of data that is easy to read, analyzed and concluded with the percentage technique. The method of calculating data analysis looks for the relative frequency of the percentage, with the formula (Sugiyono, 2011) as follows:

$$P = \frac{F}{N} \times 100\%$$

Results

This research was conducted to determine students’ perceptions of using the brain breaks program in increasing physical activity, especially during the Covid-19 pandemic. After trying the brain breaks the program for a week, students’ perceptions were reviewed from the questionnaire that the students filled out. The results of students’ perceptions of the brain breaks program obtained look like the percentages below:

Table 2. Results of Research on the Effect of Brain Breaks during the Covid-19 Pandemic in Support of Primary School Students’ Physical Activity:

No	Indicator	Percentage (%)
1	Benefits	86.96
2	Importance	89.81
3	Learning	70.88
4	Self-efficacy	68.20
5	Fun	90.63
6	Fitness	88.08
7	Personal best	75.26
Average		81.40

Based on the research results above, it can be concluded that the brain break program has a positive impact on supporting students’ physical activity during the Covid-19 period. The positive impact felt by students who have scores above the average are benefits, fun, and fitness. Positive impacts that have values below the average are learning, self-efficiency, personal best

Discussion

Brain Break in Indonesia is a new program. The brain rest program in Indonesia during the Covid-19 period has proven to impact students at the elementary school level positively. The results of this study are in accordance with the results of previous studies that the perceptions that arise about the experience of students’ physical activity through brain breaks are very positive, and their perceptions reveal that (1) the experience is meaningful; (2) variety of physical activity with brain break is the key (3) interesting for all (Stapp & Prior, 2018). This brain rest effectively triggers daily physical activity and helps maintain positive behaviour, improve concentration, and better focus in children (Mitkovska & Popeska, 2019). The positive effect of brain rest is related to children’s perceptions, attitudes, and knowledge about physical activity (Kuan et al., 2021). This study provides evidence that brain rest is beneficial in terms of learning experiences, attitudes toward physical activity, and personal motivation. (Mo et al., 2020). Brain rest is effective in helping to maintain physical activity over time, especially when done with peers and can help trigger healthy competition (Rizal et al., 2019b).

Based on the study results, the perception felt by students after trying the brain break program was to get pleasure. The study results (Kuan et al., 2021) support the positive effect of brain break video treatment in class on children's interests and pleasure. Brain Break treatment program contributes to the physical health of elementary school children (Tumynait et al., 2014). Although it did not significantly impact aspects of self-efficacy, brain break programs did contribute to learning activities for elementary school children (Glapa et al., 2018). Therefore, in the Covid-19 era and the digital era, it is very important to develop a brain break program, especially in Indonesia. This is because digital facilities have proven to create a cognitive framework to improve health (Emeljanovas et al., 2018). Exercise videos are recommended as a technology-based interactive physical activity option that is simple to implement in schools (Mo et al., 2020). Other studies have found that classroom-based and technology-supported physical activity treatments like brain breaks improve holistic health and children's attitudes toward physical activity, as evidenced by a significant increase in their understanding of the importance of regular physical activity and exercise, training, motivation, enjoyment, and efforts to imitate (Kuan et al., 2021). Countries in Asia have developed brain break programs to support learning activities in schools. Given the benefits of brain rest programs and supporting physical activity, it can support other educational activities. Several studies stated that teachers and students well received the brain break program. Brain break programs can increase concentration while providing beneficial physical activity (Perera et al., 2015). Daily school routines serve as a tool for developing inter-subject linkages, integration, learning, and holistic development in addition to active rest and incentive for physical exercise (Popeska et al., 2018). Brain rest is a holistic approach to improving cognitive and physical health in the school environment (Rizal et al., 2019a). Brain rest focuses on the physical activity itself and the underlying factors of physical activity (motivation to exercise, knowledge, self-confidence), elementary school curriculum, and general knowledge (Emeljanovas et al., 2018). Teachers spend less time directing students because students are more excited, focused, concentrated, and able to follow every direction. So that efficient and effective learning occurs (Dlouhy, 2020).

Based on the research above, the brain break program can positively impact the development of students, especially their attitude towards physical activity. The results of other studies also explain that the brain break program is beneficial from the aspect of physical activity and can contribute to the overall educational process. Therefore, a more in-depth research is needed on the brain break program, especially for the world of education in Indonesia.

Conclusions

The results of other studies also explain that the Brain Break program has a positive impact on supporting students' physical activity during the Covid-19 period. The positive impact felt by students who have scores above the average are benefits, fun, and fitness. Exercise videos are recommended as a technology-based interactive physical activity option that is simple to implement in schools. Other studies have found that classroom-based and technology-supported physical activity treatments like brain breaks improve holistic health and children's attitudes toward physical activity, as evidenced by a significant increase in their understanding of the importance of regular physical activity and exercise, training, motivation, enjoyment, and efforts to imitate. Positive impacts that have values below the average are learning, self-efficiency, personal best the brain break program is not only beneficial from physical activity. However, it can contribute to the overall educational process, especially during the Covid-19 pandemic. This positive impact must be supported by the competence of physical education teachers in the use of technology both in operation and in variations in the development of brain break movements adjusted to local wisdom based on Indonesian culture. The next step from the results of this research needs to be further developed research on brain breaks programs, especially in Indonesia, to increase physical activity in students at other educational levels and improve the quality of education.

References

- Amalia, L., Irwan, & Hiola, F. (2020). Analysis of Clinical Symptoms and Immune Improvement to Prevent Covid-19 Disease. *Jambura Journal of Health Sciences and Research*, 2(2), 71–76. [In Indonesian]
- Bailey, R., Armour, K., Kirk, D., & Jess, M. (2009). The educational benefits claimed for physical education and school sport: an academic review. *Research Papers in Education*, 24(1), 37–41. <https://doi.org/10.1080/02671520701809817>
- Batubara, H. H., & Batubara, D. S. (2020). Use of Video Tutorials to Support Online Learning During the Corona Virus Pandemic. *Jurnal Madrasah Ibtidayah*, 29, 74–84. [In Indonesian]
- Bobe, G., Ms, M. P. H., Ms, T. P., Ma, S. F. M. P. H., & Frei, B. (2014). P86 Brain Breaks: Physical Activity in the Classroom for Elementary School Children. *Journal of Nutrition Education and Behavior*, 46(4), S141-142. <https://doi.org/10.1016/j.jneb.2014.04.116>
- Bonnema, J., Coetzee, D., & Lennox, A. (2020). Original Article Effect of a three-month HOPSports Brain Breaks® intervention programme on the attitudes of Grade 6 learners towards physical activities and fitness in South Africa. *Journal of Physical Education and Sport*. 20(1), 196–205. doi:10.7752/jpes.2020.01026

- Bates, L. C., Zie, G., Stanford, K., Moore, J. B., Kerr, Z. Y., Hanson, E. D., Gibbs, B. B., Kline, C. E., & Stoner, L. (2020). COVID-19 Impact on Behaviors across the 24-Hour Day in Children and Adolescents: Physical Activity, Sedentary Behavior, and Sleep. *Children*, 7(9), 138. <https://doi.org/10.3390/children7090138>
- Cline, A., Knox, G., Silva, L. D. M., & Draper, S. (2021). A Process Evaluation of A UK Classroom-Based Physical Activity Intervention — ‘Busy Brain Breaks’. *Children*, 8(2), 63. doi: 10.3390/children8020063.
- Creswell, J. W. (2012). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* 3th Ed (3th ed.). Sage Pub.
- Dlouhy, S. (2020). Investigating the Effect of Brain Breaks in the Classroom on Teaching Practice. *Scholarly Commons*, 1-2.
- Emeljanovas, A., Mieziene, B., Chingmok, M. M., Chin, M. K., Cesnaitiene, V. J., Fatkulina, N., Trinkuniene, L., Sánchez, G. F. L., & Suárez, A. D. (2018). The effect of an interactive program during school breaks on attitudes toward physical activity in primary school children. *Anales de Psicología*, 34(3), 580–586. <https://doi.org/10.6018/analesps.34.3.326801>
- Fatkhur Rozi, Setiorini Rahma Safitri, Ibdaul Latifah, D. W. (2021). Three Aspects of Physical Education Learning. *Jurnal Kependidikan*, 7(1), 239–246. [In Indonesian]
- Glapa, A., Grzesiak, J., Laudanska-Krzeminska, I., Chin, M. K., Edginton, C. R., Mok, M. M. C., & Bronikowski, M. (2018). The impact of brain breaks classroom-based physical activities on attitudes toward physical activity in polish school children in third to fifth grade. *International Journal of Environmental Research and Public Health*, 15(2). <https://doi.org/10.3390/ijerph15020368>
- Gråstén, A. (2016). Children’s expectancy beliefs and subjective task values through two years of school-based program and associated links to physical education enjoyment and physical activity. *Journal of Sport and Health Science*, 5(4), 500–508. <https://doi.org/10.1016/j.jshs.2015.12.005>
- Hall, C. M., & Bierman, K. L. (2016). Technology-assisted Interventions for Parents of Young Children: Emerging Practices, Current Research, and Future Directions. *Early Child Res Q*, 33, 21–32. doi: 10.1016/j.ecresq.2015.05.003
- Hanifah Salsabila, U., Irna Sari, L., Haibati Lathif, K., Puji Lestari, A., & Ayuning, A. (2020). The Role of Technology in Learning During the Covid-19 Pandemic. *Al-Mutharahah: Jurnal Penelitian Dan Kajian Sosial Keagamaan*, 17(2), 188–198. <https://doi.org/10.46781/al-mutharahah.v17i2.138> [In Indonesian]
- Herlina, & Suherman, M. (2020). Potential for Learning Physical Education in Sports and Health during the Corona Virus Disease (Covid) -19 Pandemic in Elementary School. *Tudolako Journal Sport Sciences and Pysical Education*, 8(1), 1–7. [In Indonesian]
- Hongyan Guan, Anthony D Okely, Nicolas Aguilar-Farias, Borja del Pozo Cruz, Catherine E Draper, Asmaa El Hamdouchi, Alex A Florindo, Alejandra Jáuregui, Peter T Katzmarzyk, Anna Kontsevaya, Marie Löf, Woonsoon Park, John J Reilly, Deepika Sharma, Mark S Tr, S. L. C. V. (2020). Promoting healthy movement behaviours among children during the COVID-19 pandemic. 4(June), 416–418. [https://doi.org/10.1016/S2352-4642\(20\)30131-0](https://doi.org/10.1016/S2352-4642(20)30131-0)
- Indriyani, E. (2021). Analysis of the Effectiveness of the Implementation of Online Learning During the Covid-19 Pandemic in Class X High School Students in Mranggen Sub-District Subjects 2(April), 1–11. [In Indonesian]
- Jauhari, M. N., Sambira, & Zakiah, Z. (2020). The Impact of the Covid-19 Pandemic on the Implementation of Adaptive Physical Education Learning in Special Schools. *STAND: Journal Sports Teaching and Development*, 1(1), 63-70. <https://doi.org/10.36456/j-stand.v1i1.2594> [In Indonesian]
- Jayul, A., & Irwanto, E. (2020). Online Learning Model as an Alternative for Physical Education Learning Activities in the Middle of the Covid-19 Pandemic. 6(2), 190–199. [In Indonesian]
- Kerlinger, F. N. (2014). *Foundations of behavioural research*. Gadjah Mada University Press.
- Kuan, G., Rizal, H., Hajar, M. S., Chin, M. K., & Mok, M. M. C. (2019). Bright sports, physical activity investments that work: Implementing brain breaks in Malaysian primary schools. *British Journal of Sports Medicine*, 53(14), 905–906. <https://doi.org/10.1136/bjsports-2018-100146>
- Kuan, G., Zhou, K., He, S., Zhou, Y., Popeska, B., Kuan, G., Chen, L., Chin, M., Mo, M., Mok, C., Edginton, C. R., Culpan, I., & Durstine, J. L. (2021). Implementation of Brain Breaks® in the Classroom and Its Effects on Attitudes towards Physical Activity in a Chinese School Setting. *Int. J. Environ. Res. Public Health* 2021, 18, 272. <https://doi.org/10.3390/ijerph18010272>
- Mitkovska, Snezana Jovanova., & Popeska, Biljana. (2019). Brain Breaks Active Break in Macedonian Schools – Qualitative Study. *Activities in Physical Education and Sport*, 9(1), 34–37.
- Mo, M., Mok, C., Chin, M., Korcz, A., Popeska, B., Edginton, C. R., Uzunož, F. S., Podnar, H., & Coetzee, D. (2020). Brain Breaks® Physical Activity Solutions in the Classroom and on Attitudes Toward Physical Activity: A Randomized Controlled Trial among Primary Students from Eight Countries. *Int J Environ Res Public Health*, 17(5), 1666. doi: 10.3390/ijerph17051666
- Mok MM, Chin MK, Chen S, Emeljanovas A, Mieziene B, Bronikowski M, Laudanska-Krzeminska I, Milanovic I, Pasic M, Balasekaran G, Phua KW, M. D. (2015). Psychometric Properties of the Attitudes toward Physical Activity Scale: A Rasch Analysis Based on Data From Five Locations. *J Appl Meas.*,

16(4), 379–400.

- Moore, S. A., Faulkner, G., Rhodes, R. E., Brussoni, M., Chulak-Bozzer, T., Ferguson, L. J., Mitra, R., O'Reilly, N., Spence, J. C., Vanderloo, L. M., & Tremblay, M. S. (2020). Impact of the COVID-19 virus outbreak on movement and play behaviours of Canadian children and youth: A national survey. *International Journal of Behavioral Nutrition and Physical Activity*, 17(1), 1–11. <https://doi.org/10.1186/s12966-020-00987-8>
- Perera, T., Frei, S., Frei, B., & Bobe, G. (2015). Promoting Physical Activity in Elementary Schools: Needs Assessment and a Pilot Study of Brain Breaks. *Journal of Education and Practice*, 6(15), 55–64.
- Popeska, B., Jovanova-Mitkovska, S., Chin, M. K., Edginton, C. R., Mok, M. M. C., & Gontarev, S. (2018). Implementation of brain breaks ® in the classroom and effects on attitudes toward physical activity in a macedonian school setting. *International Journal of Environmental Research and Public Health*, 15(6). <https://doi.org/10.3390/ijerph15061127>
- Putri, R. S., Purwanto, A., Pramono, R., Asbari, M., Wijayanti, L. M., & Hyun, C. C. (2020). Impact of the COVID-19 pandemic on online home learning: An explorative study of primary schools in Indonesia. *International Journal of Advanced Science and Technology*, 29(5), 4809–4818. [In Indonesian]
- Rizal, H., Hajar, M. S., Muhamad, A. S., Kueh, Y. C., & Kuan, G. (2019). The effect of brain breaks on physical activity behaviour among primary school children: A transtheoretical perspective. *International Journal of Environmental Research and Public Health*, 16(21), 1–13. <https://doi.org/10.3390/ijerph16214283> [In Indonesian]
- Septian Raibowo, & Yahya Eko Nopiyanto. (2020). Physical Education Teaching and Learning Process During the Covid-19 Pandemic. *STAND: Journal Sports Teaching and Development*, 1(2), 112–119. <https://doi.org/10.36456/j-stand.v1i2.2774> [In Indonesian]
- Stapp, A. C., & Prior, L. F. (2018). The Impact of Physically Active Brain Breaks on College Students' Activity Levels and Perceptions. *Journal of Physical Activity Research*, 3(1), 60-67. DOI: 10.12691/jpar-3-1-10
- Sugiyono. (2011). Quantitative, Qualitative and Research and Development Research Methods. Alfabeta. [In Indonesian]
- Tumynaitė, L., Miežienė, B., Mo, M., Mok, C., & Chin, M. (2014). Effects of Intervention “Hopsport Brain Breaks” Program On Physical Fitness and Sedentary Behaviour in Primary School. *Education, Physical Training, Sport*, 3(94), 57–66.
- Whalen, L., Barcelona, J., Centeio, E., & McCaughy, N. (2021). Healthy Kids Quarantined: Supporting Schools and Families with Virtual Physical Activity, Physical Education, and Nutrition Education During the Coronavirus Pandemic, 1–5. *Journal of Teaching in Physical Education*, 1–5. <https://doi.org/10.1123/jtpe.2020-0299>
- Widiyatmoko, F. A., & Hadi, H. (2018). Level of Student Physical Activity in Semarang City. 3(2), 140–147.
- Zenic, N., Taiar, R., Gilic, B., Blazevic, M., Maric, D., Pojskic, H., & Sekulic, D. (n.d.). Levels and Changes of Physical Activity in Adolescents during the COVID-19 Pandemic: Contextualizing Urban vs. Rural Living Environment. *Applied Sciences*, 10(11), 3997. <https://doi.org/10.3390/app10113997>