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ORIGINAL SCIENTIFIC ARTICLE

REGULAR PHYSICAL ACTIVITY HELPS IMPROVE THE PHYSICAL FITNESS LEVEL OF ELEMENTARY SCHOOL STUDENTS DURING THE COVID-19 PANDEMIC

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Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

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Abstract

The purpose of this study was to prove the effect of regular physical activity in helping to increase the physical fitness level of elementary school students during the coronavirus disease 2019 (COVID-19) pandemic.

Materials and methods. This research is true experimental with the randomized pretest-posttest control group design. A total of 48 students from the Kabuh District Public Elementary School, Jombang Regency, East Java, Indonesia, aged 10-11 years participated in the study. The students were divided into two groups, namely the control group (G1; n = 21) and the experimental group (G2; n = 27). Measurement of physical fitness level using a) body mass index (BMI); (b) sit-and-reach test; (c) lie down for 30 seconds; (d) pull-up modification; and (e) the 20-meter multistage shuttle run test was performed before and after treatment. The data analysis technique used the Statistical Package for Social Sciences (SPSS) software version 21.

Results. The results showed that there was a significant difference in the average level of physical fitness between the pretest and posttest in the experimental group (G2) ($p \leq 0.001$), while the control group (G1) did not show a significant difference ($p \geq 0.05$).

Conclusions. Based on the results of the study it was concluded that providing regular physical activity had a positive impact on increasing the level of physical fitness in elementary school students during the COVID-19 pandemic.

Keywords: physical activity, level of physical fitness, elementary school students, COVID-19.

Introduction

The coronavirus disease 2019 (COVID-19) pandemic has had an impact on all sectors of society, particularly as a result of restrictions on physical activities that are only permitted to be carried out at home (Ammar et al., 2020; Chtourou et al., 2020; Xiao et al., 2020). This is because COVID-19 can spread through direct means (droplet transmission and human-to-human) and indirect contact (contaminated objects and airborne transmission) (Lotfi et al., 2020). Google's COVID-19 Community Mobility Report shows that compared to pre-COVID-19 baselines (median values over the five weeks from 3 January 2020 to 6 February 2020), mobility trends during COVID-19 (as of 9 March 2021) show a decline in some Most locations including retail and recreation (-14%), transit stations (-34%), grocery stores and pharmacies (-5%), as well as workplaces (-31%), recent increases seen in parks (+9%) and residential place (+9%) (Park et al., 2022). Restricting physical activity due to a pandemic has the risk of causing a decrease in fitness levels (Ammar et al., 2020). Social distancing and self-isolation are characterized by movement restrictions and a reduced number of human-to-human interactions (Chtourou et al., 2020). Hawryluck et al. (2004) noted that there are emotional and psychological problems associated with this period of quarantine. Likewise, Reynolds et al. (2008) observed that quarantined individuals experience increased levels of anxiety and nervousness. This condition risks causing various health problems (Jurak et al., 2020).

Physical activity is known to provide important health benefits for school-age children (Pate et al., 2019). Increased physical activity during school hours is associated with

better physical, psychological and social health and well-being (Smedegaard et al., 2016). Limited physical activity, or often no engaged in at all, causes a variety of health problems, including posture problems (such as idiopathic scoliosis), somatic conditions, overweight and obesity, circulation problems and even premature death (Rejeki et al., 2022; Hillman et al., 2008; Kohl et al., 2012; Lipowski et al., 2009). Results by Chung et al. (2021) demonstrated that physical distancing policies and population compliance can slow the transmission of COVID-19. However, the impact of decreased physical activity is also a problem that requires special handling (Chaabna et al., 2022).

Physical activity is a drug commonly prescribed for people with conditions such as obesity and diabetes who are also at high risk of being hospitalized or seriously ill from COVID-19 (Park et al., 2022). Physical activity provides some health benefits, both physical and psychological (Cragg & Cameron, 2006; Warburton et al., 2006). The physical activity program serves to provide an overview of physical activity and learning habits for healthy living (Sibley & Etnier, 2003). High levels of sedentary behavior and insufficient levels of physical activity increase obesity among children and adolescents (Ahmad Bahat et al., 2021). The findings by Fernández et al., (2017) show a correlation between being overweight or obese and having poorer physical fitness. The school environment is the context in which young people spend most of their time learning about various topics, including Health (Stabelini Neto et al., 2022). Most importantly, the level of physical fitness in childhood and youth has been considered a strong predictor of health later in life and an adequate level of PA is essential for the development and maintenance of health-related fitness (Stabelini Neto et al., 2022; Ortega et al., 2008). We hypothesize that regular physical activity interventions can help improve physical fitness levels in elementary school students during the coronavirus disease 2019 (COVID-19) pandemic.

Materials and Methods

Study design

This research is true experimental with the randomized pretest-posttest control group design. A total of 48 students from the Kabuh District Public Elementary School, Jombang Regency, East Java, Indonesia, male and female, aged 9-12 years participated in the study. Students were randomly divided into two groups, namely the control group (G1; n = 21), and the experimental group (G2; n = 27). Students obtain information both orally and in writing about the research before participating. All students filled out their willingness to participate in the research and were approved by the school, parents, and students by signing the informed consent.

Physical activity protocol

Physical activity is implemented and supervised by professional officers from the Postgraduate Program, at Surabaya State University. The physical activity intervention was carried out for 60 minutes/session with a frequency of 3x/week for 4 weeks. Details of physical activity can be seen in Table 1.

Measurement of physical fitness level

Measurement of the level of physical fitness was carried out between the pretest and posttest using tests (a) body mass index (BMI); (b) sit-and-reach tests; (c) lying down for 30 seconds; (d) modification of pull-ups; and (e) the 20-meter multistage shuttle run test.

Statistic analysis

The data analysis technique used the SPSS software version 21. The Shapiro-Wilk test was used to analyze the normality test with a significant level ($p \geq 0.05$). To find out the difference in the level of physical fitness between the pretest vs. the posttest in each group was carried out by the Paired Sample t-Test, while to find out differences in the level of physical fitness between groups an Independent Samples t-Test was carried out. Overall data is shown with mean±SD. All statistical analyzes used the 5% level of significance.

Results

The results of the analysis of the characteristics of the study subjects including age, height, weight, and body mass

Table 1. Physical activity program

No	Saturday	Time	Monday	Time	Wednesday	Time
1	Movement jump on one leg 5x repetitions	60 minutes	Movement jump in place 5x repetitions	60 minutes	Movement jump by swinging arms sideways 5x repetitions	60 minutes
2	Jump with a zig-zag 5x repetitions		Movement jump forward with hands over 5x repetitions		Jump forward with the position of the hands holding the shoulders 5x repetitions	
3	Jumping movement by arranging box objects 5 x repetitions		Movement jump by touching the wall 5x repetition		jump by swinging your arms up 5 x repetitions	
4	The movement jumps past boxed objects 5 x repetitions		Movement jump with the position of the hands on the waist 5x repetition		Jump by touching the feet with both hands 5 x repetitions	
5	The movement jumps and then rotates 5x repetitions		Moves move places by jumping quickly 5x repetitions		Jump forward with your hands above your head for 5 repetitions	

index showed that there were no significant differences between the two groups which can be seen in Table 1. The results of the physical fitness of students can be seen in Figure 1-2.

Table 2. Characteristics of research subjects

Parameters	G1 (n = 21)	G2 (n = 27)	p-value
Age (yrs)	10.33±0.66	10.11±0.97	0.352
Height (m)	1.35±0.06	1.34±0.08	0.980
Weight (kg)	38.52±5.39	40.15±7.63	0.393
BMI (kg/m2)	21.24±1.70	22.03±2.48	0.197

BMI: Body mass index. Data is presented with Mean ± SD. p-value obtained by testing the Independent Samples t Test.

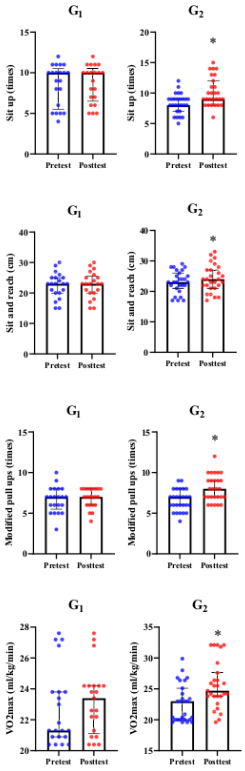

Fig. 1. The average level of physical fitness of students between the pretest vs. posttest in each group. (*)Significant with pretest ($p \leq 0.001$). The p-value is obtained by using the Paired Samples t-Test

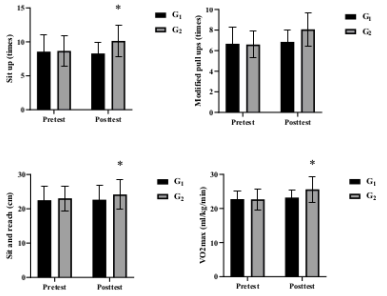

Fig. 2. The average level of physical fitness of students between the control group (G1) vs. experimental group (G2). (*)Significant with the control group (G1) ($p \leq 0.05$). p-value obtained by testing the Independent Samples t-Test

Discussion

The purpose of this study was to prove the effect of regular physical activity in helping to increase physical fitness level of elementary school students during the coronavirus disease 2019 (COVID-19) pandemic. The main finding of the study was that there was a significant difference in the level of physical fitness between pretest vs. posttest in the experimental group, while the control group did not show any significant difference (Figure 1). This proves that regular physical activity has proven effective in increasing the physical fitness level of elementary school students during the COVID-19 pandemic. These results are in line with research by Kapoor et al. (2022) showed that the health benefits of physical activity are not limited to improvements in cardiorespiratory and muscle fitness, bone and cardiometabolic health, and positive effects on body weight status, but also improve mental health and social health. This is reinforced by the results of Kljajević et al. (2021) which state that subjects with satisfactory levels of physical activity have good physical fitness. Physical fitness is the physical ability to carry out daily activities without experiencing significant fatigue and having good physical and physiological conditions (Chen et al., 2002; Clark & Ferguson, 2010). Kapoor et al. (2022) explained that the level of physical fitness is the ability to carry out daily functional activities with optimal performance, endurance, and strength to overcome illness, fatigue, and stress, and reduce sedentary behavior.

Physical exercise is considered a miracle drug in the primary prevention of at least 35 chronic diseases, including obesity, insulin resistance, and type 2 diabetes (Susanto et al., 2022; Rejeki et al., 2021; Türkel et al., 2022). Exercise has benefits related to health-related quality of life, motivation for physical activity, and levels of depression in subjects with metabolic syndrome (Zupkauskiene et al., 2022). Glucose absorption into skeletal muscle increases during and in recovery from exercise, with exercise being effective in controlling glucose homeostasis in individuals with type 2 diabetes (Stocks & Zierath 2022). Marcocin et al. (2022)

stated that higher physical activity was associated with higher well-being, lower quality of life, and symptoms of depression, anxiety, and stress, regardless of age. Physical activity increases peripheral BDNF levels (Shobeiri et al., 2022). Evidence suggests that brain-derived neurotrophic factor (BDNF) plays a protective role in the brain (Pranoto et al., 2020; Soloey-Nilsen et al., 2022). Lower serum BDNF levels have been seen in patients with major depressive disorder, bipolar disorder, schizophrenia, eating disorders, obsessive-compulsive disorder, and alcohol dependence (Soloey-Nilsen et al., 2022; Nomoto et al., 2015). Participation in regular physical activity is associated with many health benefits, including improvements in cardiorespiratory fitness, body composition, cardiometabolic profile, and mental health (Stabelini Neto et al., 2022). The quality of health is an important symbol of progress and social civilization and contains the meaning of health from psychology, physiology, and society (Wu, 2022). Rather, what is more, worrying is the fact that periods of increasing physical inactivity are silently and aggressively taking over modern human life – at school, at work, at home, and even at leisure (Pišot, 2021). It has been shown that several components of the metabolic syndrome, including obesity, insulin resistance, and arterial hypertension, are associated with poorer health-related quality of life (Zupkauskiene et al., 2022; Schlotz et al., 2007; Søltoft et al., 2009; Zygmuntowicz et al., 2012). Results by Yin et al. (2022), stated that higher sedentary behavior time is associated with a higher risk of metabolic syndrome among children aged 6-14 years in Beijing. The Asian population shows excessive sedentary behavior and has a high susceptibility to metabolic syndrome (Kinoshita et al., 2022). These findings confirm that providing regular physical activity is effective in increasing the physical fitness level of elementary school students during the COVID-19 pandemic. Physical activity is beneficial for health because individuals who are healthy and fit both physically and mentally can participate in the learning process optimally. Based on the results of the study, it can be suggested that further research can use subjects with the age range of adolescents, adolescents are in a vulnerable phase of experiencing physical and emotional changes.

Conclusion

Based on the results of the study, it was concluded that providing physical activity for 60 minutes/session with a frequency of 3x/week for 4 weeks had a positive impact on increasing the physical fitness level of elementary school students during the coronavirus disease 2019 (COVID-19) pandemic.

Conflict of Interest

The authors declare that there is no conflict of interest.

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РЕГУЛЯРНА ФІЗИЧНА АКТИВНІСТЬ ДОПОМАГАЄ ПІДВИЩИТИ РІВЕНЬ ФІЗИЧНОЇ ПІДГОТОВЛЕНОСТІ УЧНІВ ПОЧАТКОВИХ КЛАСІВ ПІД ЧАС ПАНДЕМІЇ COVID-19

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Авторський вклад: A – дизайн дослідження; B – збір даних; C – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 7 с., 2 табл., 2 рис., 45 джерел.

Метою цього дослідження було довести вплив регулярної фізичної активності на підвищення рівня фізичної підготовленості учнів початкових класів під час пандемії коронавірусної хвороби 2019 року (COVID-19).

Матеріали та методи. Це дослідження є істинним експериментом із рандомізованим планом попереднього та підсумкового тестування з використанням контрольної групи. У дослідженні брали участь загалом 48 учнів державної початкової школи в окрузі Кабух, регентство Джобанг, провінція Східна Ява, Індонезія, віком 10–11 років. Учнів розділили на дві групи: контрольну (G1; n = 21) та експериментальну (G2; n = 27). Вимірювання рівня фізичної підготовленості з використанням a) індексу маси тіла (IMT); (b) тесту «нахили тулуба вперед із положення сидячи»; (c) вправи «прилягти на 30 секунд»; (d) вправи «модифіковані підтягування»; та (e) багатоетапного тесту «човниковий біг на 20 метрів» проводили до та після експериментальних процедур. У методиці аналізу даних використовували програмне забезпечення Statistical Package for Social Sciences (SPSS) версії 21.

Результати. Результати показали наявність статистично значущої різниці в середньому рівні фізичної підготовленості між результатами попереднього та підсумкового тестування в експериментальній групі (G2) ($p \leq 0{,}001$), тоді як у контрольній групі (G1) статистично значущої різниці не виявлено ($p \geq 0{,}05$).

Висновки. На підставі результатів дослідження було зроблено висновок, що забезпечення регулярної фізичної активності позитивно впливає на підвищення рівня фізичної підготовленості учнів початкових класів під час пандемії COVID-19.

Ключові слова: фізична активність, рівень фізичної підготовленості, учні початкових класів, COVID-19.

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