

## Physical Activity with Play and Game Model to Improve the Cognitive of Elementary School Students

Humaid Ali Hasan<sup>1\*</sup>, Sapto Adi<sup>2</sup>, Eko Hariyanto<sup>3</sup>, Arus Kongrungchok<sup>4</sup> , Herlina Ike Oktaviani<sup>5</sup>, Otto Fajarianto<sup>6</sup>

<sup>1,2,3,5,6</sup>Universitas Negeri Malang, Jl. Semarang 5 Malang, Indonesia, 65145

<sup>4</sup>Rajamangala University of Technology Krungthep, Thung Maha Mek, Sathon, Bangkok, Thailand, 10120

Author\*: [humaid4hasan@gmail.com](mailto:humaid4hasan@gmail.com)

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### Abstrak

Usia sekolah dasar merupakan masa pertumbuhan dan gerak fisik yang memegang peranan penting dalam pembentukan individu yang berkualitas. Melalui gerak fisik berupa permainan yang terus memberikan perkembangan optimal pada anak, baik kematangan kognitif maupun perkembangan motorik. Olahraga dengan sistem play and game dapat meningkatkan pertumbuhan neuron di otak dan merangsang pertumbuhan neuron baru di hippocampus. Sementara itu, pembelajaran pendidikan jasmani di sekolah dasar masih berpusat pada guru dan masih kurangnya variasi model pembelajaran. Berdasarkan permasalahan di atas, model play and game dapat digunakan sebagai solusi pembelajaran yang monoton dan kurang menarik. Pembelajaran ini efektif dan inovatif karena dapat memberikan pengalaman belajar yang baik dari aspek kognitif, motorik, dan afektif. Terlibat dalam aktivitas fisik akan berdampak positif pada semua sistem: sistem kardiovaskular, pernapasan, hormonal, imunologi, dan saraf. Selain itu, perkembangan lobus frontal dan temporal utama pada anak usia 7-12 tahun. Otak akan berkembang lebih cepat, membuat peningkatan kognitif lebih cepat. Dengan model Play and Game dapat meningkatkan prestasi akademik baik dalam memori maupun pembelajaran.

**Kata kunci:** Aktivitas Fisik, Model Play and Game, Kognitif

### Abstract

Elementary school age is a period of physical growth and movement that plays an important role in the formation of quality individuals. Through physical movement in the form of games that continue to provide optimal development in children, both cognitive maturity and motor development. Sports with a play-and-game system can increase the growth of neurons in the brain and stimulate the growth of new neurons in the hippocampus. Meanwhile, physical education learning in elementary schools is still centered on the teacher and there is still a lack of variations in learning models. Based on the above problems, the play-and-game model can be used as a monotonous and less interesting learning solution. This learning is effective and innovative because it can provide a good learning experience from cognitive, motoric, and affective aspects. Engaging in physical activity will positively affect all

	<p><i>systems: cardiovascular, respiratory, hormonal, immunological, and nervous systems. In addition, major frontal and temporal lobes development in children aged 7-12 years. The brain will develop more rapidly, making faster cognitive improvement. With the Play and Game model, it can improve academic performance both in memory and learning.</i></p> <p><i>Keywords: Physical Activity, Play and Game Model, Cognitive</i></p>
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## INTRODUCTION

Physical activity greatly affects the development of elementary school children. Memory, study, and mood influence a student's academic ability. In everyday life, children do physical activity through games both at school and at home. The potential for cognitive and health effects is often discussed in scientific public forums and discussions. Evidence that exercise affects students' cognitive and academic well-trains gives reason to promote game-based physical activity for students. In elementary schools, there is a need for quality and planned physical education design, so that the goals of student improvement and cognitive are achieved. In elementary school according to [Mattson](#) (2004: 23), physical activity presents physiological stress on the brain when balanced with recovery. With physical improvement, brain growth, and brain function will be maintained.

Physical activity is made to influence the potential that exists in students in physical education learning at school starting from the level of early childhood education to secondary education. Through physical education, the hope is that students will get experiences that are closely related to a pleasant person, creative innovation, the ability to move, physical freshness, and a healthy lifestyle. Physical education learning is learning movement skills where human movements are manipulated in the form of physical activities such as: through games and sports that use music or not, which contain positive values, attitudes, and behaviors ([Rosdiani](#), 2015: 3).

Learning physical education, sports, and health is needed at all levels of education, especially elementary school because during elementary school age, the growth and development of children are said to be the golden age. Elementary school age is a period of physical growth and movement that plays an important role in the formation of quality individuals. The primary school physical education curriculum has skill characteristics from several sports. Basic sports technique skills will not be mastered if you have not mastered basic movement skills ([Sugiharto](#), 2017). Basic motion skills can be divided into several types, including basic locomotor, non-locomotor, and manipulation movements. According to [BSNP](#) (2006: 208) that one of the objectives of implementing physical education, sports, and health in elementary schools is to be able to improve basic movement abilities and skills.

## LITERATURE REVIEW

Cognitive function is a conscious mental activity such as thinking, remembering, learning, and using language. Cognitive processes include changes in individual thinking, intelligence, and language ([Santrock](#), 2007: 56). Cognitive development at the age of 5-6 years can draw 6 body parts, draw complete people, draw quadrangles, understand the meaning of opponents, answer questions about what objects are made of and their uses, recognize numbers, colors, follow sympathy, follow the rules of the game, develop reading skills well ([Soetjningsih](#), 2012: 78). Then the third stage is the concrete operational stage (7-11 years),

where the child begins to think logically about concrete events, the thought process becomes rational, mature, like an adult. 7-year-olds usually have cognitive stages such as speaking better than 6-year-olds, understanding the law of cause and effect, being able to express their feelings, being able to absorb and classify information better, showing improvement in speaking vocabulary, writing faster, and being more independent in activities. While children aged 6 years have stages of cognitive development such as receiving new vocabulary usually using image media, understanding speech more than expressing opinions, communicating well in small groups, require adult guidance in doing commands.

[Brown et al.](#), (2018: 61) explain that cognitive development in elementary school is the ability to think logically about the here and now. Cognitive abilities in elementary school children not only increase their perception but also their ability to understand the world at large. [De-Oliveira](#) (2019: 43) states that at the age of elementary school children can already react to intellectual stimuli, and can perform learning tasks that require cognitive abilities such as reading, writing, and arithmetic. According to [Haskel-Ittah](#) (2018: 36) the period of elementary school children is characterized by three abilities, namely compiling, connecting or calculating numbers, and classifying. [Stallard](#) (2019: 22) states that children's thought processes must be cogkrit yet able to think abstractly. Thus elementary school-age children in solving problems using concrete logic, or physical in nature. Then in this stage begin to be able to arrange categories based on hierarchy. The cognitive development of children aged 6-10 years is directed at the development of Auditory, Visual, Tactile, and Kinestic. Arithmetic, Geometry, and Science. [Cameron](#) (2018: 59) that at the age stage of 6-10 years can perform concrete tasks. Children develop three kinds of thought processes, namely identification (recognizing something), nagasi (denying something), and looking for reciprocal relationships between how many things. According to [Sudarsana](#) (2018: 174), Play is an activity that affects the growth and development of children. Playing must be by the ability of children and children willing to do it so that the learning process will experience a good improvement. [Nijhof et al.](#), (2018:145) state that children learn through play. A great gaming experience continues will provide optimal development in children both cognitive maturity and motor development.

According to [Fullerton](#) (2018:3), the game is an activity that is limited by complete rules and efforts between players to produce the expected results. While [Ritblatt et al.](#), (2019: 78) explains that playing is an activity carried out by a person or group to get pleasure without paying attention to the final result. According to [Jefferies et al.](#), (2018: 102) state that games have a positive impact on long-term levels, due to the stimulation of pleasure hormones (Endorphins) that increases, so it is good for stimulating changes in one's behavior in the short term and directly. While [Vorkapić et al.](#), (2018: 135) states that games are made to increase individual participation, in building togetherness in solving a problem, increase self-confidence, psychological, physical, and mental conditions, and increase solidarity and responsibility of each individual and group. According to [Sugiyanto](#) (2010: 5) judging from the characteristics of the development of elementary school children, teachers must carry out play activities with the rest of the game method for lower grades. In Teaching, elementary school teachers are expected to learn elements of play so that children do not get bored when learning a certain subject. [Burhaein](#) (2017: 3) stated that educators are required to understand child development, and provide physical activity with play models. Learning materials are made in the form of games, especially in lower-grade elementary students (grades 1 to 3) who are still quite thick with the play zone. So that the design of the learning model has a fun play concept, but still pays attention to the achievement of teaching material.

The research of [Cassilhas et al.](#), (2016: 75) stated that physical activity with a play system in elementary schools will improve learning and memory. While in [Rockwood et al.](#), (2007: 12) mentioned exercise will delay and prevent cognitive decline in old age. Then Hilman (2008: 34) also found that exercise with a play-and-game system can increase the growth of neurons in the brain and stimulate the growth of new neurons in the hippocampus. For this reason, physical activity also greatly determines cognitive abilities as well as for elementary school students. This is very interesting to be studied more deeply as a reference in learning variations.

## RESULT

According to [Morgan et al.](#), (2015: 4) learning basic movements with a gebug skirt game approach can be used as an alternative to applying. These games can provide direct learning experiences to students through play and the development of skills and good scientific attitudes for students. Can be used as an alternative to overcome facilities and infrastructure that are less supportive in schools so that it is applied as a variation of learning. According to [Roopnarine et al.](#), (2019: 7) locomotor and manipulative basic motion learning will increase when there is a modification of learning with a game approach, there are five game models without tools to develop basic movement skills of lower-grade students. The games to develop basic locomotor movement skills are as follows: watch out for mines, be ready, whomever he gets, dragon snakes. [Lin et al.](#), (2019: 4) stated that the physical education teacher program in Australia called (PATCH) provides an environment for children to develop and practice social skills and play awareness, this program introduces activities that promote play. This PATCH aims to build a child's confidence, and independence, and provide social skills through play, providing cognitive abilities, and brain activity. At the age of 6-8 years, a basic movement activity program carried out with various learning media will improve students' motor skills, academic abilities, and cooperation behavior and responsibility. [Kusumawati et al.](#), (2019: 46) stated that motor skill training activities for elementary school children specifically experience health and motor problems, which are carried out regularly and continuously will improve their health level and cognitive abilities.

According to [Sulton et al.](#), (2019: 16), Game-based basic motion learning carried out by children aged 6-12 years will improve the quality of academic and cognitive achievement of students. Meanwhile, [Hardika et al.](#), (2020: 54) stated that physical education learning, especially basic locomotor, non-locomotor, and manipulative movement activities based on games, will increase student learning activity. Motor skill training with a play and game system consists of a combination of speed, strength, space orientation, memory of action, and balance. [Niederer et al.](#), (2011: 31) revealed that motor skill training includes obstacle courses in the form of walking on balance beams. Motor skill training is a sensory input from the initial stimuli of the environment then processed from the cortex before being sent to the hippocampus along the efferent pathway. This exercise increases blood flow to the brain, after which there is an increase in BDNF (brain-derived neurotrophic factor). According to [Binder and Scrafman](#) (2004: 10), this protein maintains the health of the young brain and encourages it to produce new neurons. BDNF also improves performance on a variety of learning tasks and long-term memory in the hippocampus. [Berchtold et al.](#), (2005: 30) revealed that physical activity in motion learning in children carried out every day of the week will increase BDNF and improve the cognitive system in the frontal lobe. Based on the many studies above, it can be concluded that motor training skills training with a play and game model can be used to increase BDNF to stimulate growth in memory and cognitive in children. According to [Ferris et](#)

al., (2007: 12), circuit-shaped obstacle activity will affect BDNF function to improve cognitive function. Physical activity for children can increase synaptogenesis and dendrites as well as branches of axons to have a positive effect on memory and cognition. A lot happens with play and physical activity affecting a child's healthy development. According to Lin et al., (2019: 16) Fun learning will affect the memory, concentration, and performance of the student's academic system. While physical activity presents physiological stress on the brain, when balanced with recovery, increases adaptation and growth, maintains brain function, and allows the brain to respond to the front mass. Mavilidi et al., (2019: 233) stated that physical activity is proven to improve learning and memory. Based on many of the studies above, it can be concluded that physical activity in children related to cognitive-ness will increase concentration, academic system performance, memory, and learning.

Studies show that exercise benefits memory, learning, and cognitive abilities in many ways. Hill et al., (2019: 47) showed that physical activity in the form of Play and games for children will cause gross structural and vascular plasticity, increase brain activity and modulate important neurotransmitter systems. Aerobic activity also stimulates neuron growth (the local that helps neurons survive and thrive), promotes synaptic plasticity and long-term potentiation, (dynamic modification of connections between neurons), and stimulates the growth of new neurons in the hippocampus (a region of the brain involved in learning and memory). With physical activity based on the play and game model, it will stimulate growth in neurons in the hippocampus which is a place of learning and memory

According to Jabar et al., (2015: 740) Physical education in elementary schools mostly takes a game-based learning approach. Plass et al., (2015: 258) stated the purpose of game-based learning is to connect learners and their skills both physical and cognitive with the demands of play. This game approach also asks learners to interact with individuals from both physical, cognitive, environmental, and rules placed on them. Tomporowski et al., (2011: 52) stated also that physical education with a game approach also provides students with improving their physiological and cognitive functions.

## DISCUSSION

Donelly (2016: 534) states that physical education with the concept of Play will improve performance in both physical and cognitive function, especially in the Prefrontal cortex and sections cerebellum. Basic movement development and refinement are important for children. The brain consists of the right and left hemispheres that control various brain functions such as thinking, abstraction, and language. The hippocampus is an important part of the formation and storage of memory and plays a role in emotions. The body movement system is under the control of the motor system. Motor neurons of the alpha type invert the skeletal muscles, as a result of which the muscles contract and movement occurs. Bluma and Lipowska (2018: 2) also show that sports in the mass of children affect cognitive and emotional positively. The cognitive function allows the child to engage in a given planning situation. Leisman et al., (2014: 6) stated that efficient physical activity will stimulate activity in neurons in the frontal lobe, especially in the dorsolateral prefrontal cortex, anterior cingulate cortex, parietal cortex, and subcortical structures such as the thalamus, putamen, caudate nucleus, and cerebellum.

According to Silverman et al., (2014: 7) physical exercise will improve circulation, which leads to oxygen supply to the brain, as well as providing the brain with nutrients. Engaging in physical activity will positively affect all systems: cardiovascular, respiratory, hormonal, immunological, and nervous systems. While Morgan et al., (2015: 8) said physical activity is

determined based on an increase in a person's hormones (produced by hypothalamic neurons and transported by blood), increasing the effect on the ability of the nervous system. According to Broce et al., (2019: 88), there is a major development in the frontal and temporal lobes at the age of children 7-12 years. The brain will become more rapidly developed so that it will make faster cognitive improvement. According to Johnson (2010: 8), children's cognitive improvement occurs along with a decrease in gray matter density, which is caused by loss of synapses and other reinforcement. Gray matter density peaks and decreases about halfway through age 11 in girls and about age 14 in boys. According to Kandemir et al., (2018: 34), the basic movements modified in the form of games can increase children's sensory, emotional, and cognitive activities if done with intensity three times a week for at least one month. Based on this, variations in learning related to student cognitive improvement can be supported by physical activity activities in the form of games.

## CONCLUSION

Physical Education Learning in Elementary School is a milestone to make performance in children improve both cognitive, affective, and psychomotor aspects. Along with the development of the industrial era 4.0, physical education teachers must develop the ability to plan, create and facilitate physical education learning. For this reason, from the various descriptions above, physical activity developed with the Play and game model can improve academic performance both in memory, memory, and learning. Learning physical activity in the form of basic movements aims to: describe and develop innovative physical education learning models, obtain an overview of student learning outcomes in the form of products and processes, and measure the effectiveness of model products developed as physical education teaching materials in elementary schools.

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