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Brain Gym Optimizing Concentration on Elementary Students

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ABSTRACT

Concentration is one aspect which play important role in supporting childrens's learning ability. Exercise may optimize concentration especially on this pandemic situation which makes children have less physical activity due to learning method alteration. This research aims to find out the effect of Brain Gym on elementary student's concentration. There was one group on this pra-experimental research, which measured the pre-test and post-test concentrations. 30 samples in this research were selected by purposive sampling technique from level 5 and 6 elementary students. These 30 students were set to do Brain Gym 3 times per week for 4 weeks. We find out from this research that group concentration's pre test mean result was= 13.633 and for post-test was= 21.00. Wilcoxon signed rank test shows $p=0,000$. Those means that Brain Gym give significant effect on increasing students concentration. We can conclude that students can be increased concentration of learning by practicing Brain Gym regularly. Students may practicing this Brain Gym exercise at least 3 times per week at home in this pandemic condition, or before starting face to face learning when the pandemic is over.

Keywords: Concentration, Brain Gym, Elementary Students

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BACKGROUND

Concentration is the development of competence in the executive function of the brain. Concentration is also defined as a person's ability to be able to pay full attention by putting aside of other distractions. Children need good concentration skills in order to complete any given task (Grose, 2009).

The Covid-19 pandemic experienced throughout the world, including Indonesia, resulted in changes in learning methods due to closed schools for classroom learning and replaced by online learning with students individual learn from home by using the internet network (Harnani, 2020). A Pediatrician, dr. Johny Lambert Rompis, said that the impact of the prolonged pandemic has resulted in limited physical activity of children and increased high sugar's food consumption (Alamsyah, 2020). Consumption of foods that are high in sugar, especially refined sugar and sucrose can reduce cognitive abilities and impaired brain function (Chong et al, 2019). Physical activity is also an important aspect in supporting the ability to concentrate, which is part of one's cognitive aspects. Previous research with elderly subjects found that participants who followed aerobic exercise for 24 weeks showed increased concentration (Alghadir et al, 2016). A Systematic Review research by Bidzan-Bluma & Lipowska (2016) conclude that exercise as a physical activity has a positive impact on children cognitive function (Bidzan-Bluma & Lipowska, 2016).

Previous research about brain gym exercise is mostly carried out on the elderly, or on children subjects but is related to academic ability. Brain Gym exercise intervention on this research was held on pandemic situation has its own challenges and at the same time it can directly provide benefits for children and also parents. Based on the researcher's preliminary data, parents convey that since the pandemic and learning methods have changed to online, children have become less active in sports and are also more likely to play gadgets. The results of this study are expected to convince that exercise can have a positive impact on children's concentration. Those will give parents motivation that exercise is important to do even if children learning from home in order to optimize children's concentration.

METHODS

This study is pre-experimental research with one group participant which took place at NU Islamic Elementary School Pare. From 136 students from 5th and 6th class which 11-12 years old, live with their parents, not an athlete, and have no physical disability, there are 30 students who participated in this research. The 30 students were considered able to follow this research by online methods by considering gadget device and network connectivity availability. Participants' general data were collected by google form questionnaire, while specific data that is student concentration was measure by the concentration grid online test. Concentration grid test was develop by Harris and Harris (1984) which consist of 10x10 numbered squares from 00 to 99 which placed randomized (Greenlees et al, 2006). Participants sorted the numbered squares ascendingly in 60 seconds. More they got sorted the number correctly then much more score they got

Participant do the Concentration Grid test online and the result is their concentration pre-tests score. Participants start to do the Brain Gym exercise on the next day for 4 weeks and 3 times exercise each week. Parents help their kids to follow the exercise movement at home. Parents were given a preparation by online coordination previously. Those coordination informed parents about Brain Gym, about the movement and practicing Brain

Gyms movement. Parents and childrens were given Brain Gyms instructional video to make it easier for participants to follow Brain Gyms movement and for parents, it makes them easier to supervise their kids. After 4 weeks Brain Gym Exercises intervention, participants do the Concentration Grid test again for their post-test score on the first day of the 5th week. Participants concentration score then analyzed by wilcoxon signed rank test. Wilcoxon was chosen based on the normality data test with saphiro-wilk test showed the result was $<0,05$, it means the data was unnormal distribution.

This research didn't give any negative side effect or risk for covid-19 transmission for the participant because they do the exercise at home. This research has got its ethical clearance No: 754/PP2M-KE/VIII/2020 from Institut Ilmu Kesehatan Bhakti Wiyata Kediri Ethic Research Commission.

RESULT

The results of this study found that most of the respondents were female (70%). Data related to physical activity found that 60% of the sample exercised regularly before the pandemic, and 57% of the sample did not exercise regularly after the pandemic. To fulfill the need for sleep rest, it is found that most respondents sleep at least 9 hours per day (80%). This study also obtained data that most of the samples liked to consume foods high in sugar (83.33%) such as candy, sweet pastries and packaged snacks.

Table 1. Research subjects gender characteristics

Gender	Frequency	Percentage
Male	9	30%
Female	21	70%
Total	30	100%

Table 2. Research subjects nutritional status characteristics

Nutritional status	Frequency	Percentage
(Thinness)	0	0%
(Normal)	30	100%
(Overweight)	0	0
(Obese)	0	0
Total	30	100%

Table 3. Research subjects physical activity characteristics

Category	Frequency (percentage)	
	Before the Pandemic	After the pandemic
Exercise regularly	18 (60%)	13 (43%)
Irregular exercise	12 (40%)	17 (57%)
Total	30 (100%)	30 (100%)

Table 4. Research subjects sleep rest characteristics

Category	Frequency	Percentage
≥ 9 hours/day	24	80%
<9 hours/day	6	20%
Total	30	100%

Table 5. Research subjects residential environment characteristics

Category	Frequency	Percentage
Noisy	2	7%
Not noisy	28	93%
Total	30	100%

Specific data, that is participants concentration, obtained the pre-test sample average value of 13.633 while the average post-test value was 21. This shows that the average pre-test sample value is less than the standard concentration grid value, which is said to be good if the concentration is reached a minimum value of 30. The post-test average score of the sample also showed less than 30 results, but there was an increase in the average pre-test score. Wilcoxon test results in the sample obtained a value of $\rho = 0.000$ where $\alpha = 0.05$ so it can be concluded that the participants showed a significant increase after 4 weeks Brain Gym intervention (see table 6. below).

Table 6. Research subjects statistic analysis

Variable	Mean±SD	P-Value
Pre-test	13,63±6,46	0,000
Pos-test	21±6,78	

DISCUSSION

The results of the pre-test and post-test participants show that the average concentration value is still below the standard concentration using a good concentration grid, which should be a minimum score of 30. This can be influenced by several factors, such as nutrition aspect, sports activities, fulfillment of sleep needs, and residential environment condition.

All participants in this study had nutritional good/ normal nutritional status category according to the Ministry of Health (Kementerian Kesehatan RI, 2018), but the results of the general data obtained showed that the participants tended to like consuming sweet foods that were high in glucose, especially snacks compared to rice. Consumption of foods that tend to be high in glucose can reduce cognitive function and are also at risk of causing brain function disorders in adults (Chong et al, 2019). Beilharz et al (2016) also stated that high blood sugar concentrations can trigger inflammation in the hippocampus and cortex, which are part of the limbic system that plays a role in memory and learning functions (Beilharz et al, 2016). According to Michael Grose (2009), reducing sugar intake and increasing protein intake can stimulate dopamine levels which have an impact on making it easier for children to concentrate (Grose, 2009). However, basically glucose is also a nutrient needed by the brain primarily because the brain cannot get energy intake apart from glucose (Mergenthaler et al, 2013). So that keeping glucose intake in children is still sufficient and not excessive is important to help improve concentration in children.

Sports activities in 60% of study participants before the pandemic had carried out sports activities such as playing ball or cycling. When the pandemic hit, this sport activity has decreased. Students who regularly exercised after the pandemic fell to 43%. Information from parents was obtained that after the pandemic and learning at home were carried out, children became less physically active, especially sports. They tend to play games and watch television more often. This decrease in physical activity may also have an impact on student concentration. The systematic review article written by Jirout et al (2019) states that various journals have found that physical exercise provides benefits to children's cognitive and

academic functions. The article also mentions that several studies have found that aerobic fitness is closely related to improving cognitive and learning abilities in children (Jirout et al, 2019). (A parenting educator in Australia also stated that learning breaks filled with exercise or exercise can increase concentration in children (Grose,2009). Brysch and Dickinson (1996) in a study by Apriana et al (2016) stated that physical exercise helps students to be able to concentrate in class and also helps train memory by encoding learning through the body's neuro-musculatory mechanism (Apriana et al, 2016). Another article stated that routine coordinated-bilateral physical activities for four weeks were able to improve the concentration and attention of 5th grade students. Some of the literature used in the journal states that bilateral coordinated physical activity can facilitate the exchange of information between the cerebellum and the prefrontal cortex of the brain by practicing the ability to focus on the given movement changes (Harris et al, 2018).

Another factor that can affect the concentration of students is the fulfillment of the sleep needs and the environment in which they live. Most of the participants have had their sleep needs fulfilled for at least 9 hours per day, and their home environment is in an area that is not noisy or tends to be quiet. Grose stated that most children will get the best concentration after they sleep 9 hours each day (Grose,2009). Apriana et al found similar results, which sleep time was significantly associated with student learning ability. Students who lack sleep time will tend to fall asleep while learning in class (Apriana et al, 2016). In addition, Banks (2001) in Apriana's research stated that when the quality and sleep cycle is disturbed, problems will arise due to high levels of melatonin when children learn. This melatonin production will cause the body and brain to work slower, so that the child will have difficulty accepting the material given (Apriana et al, 2016). Diekelmann et al (2008) found that samples who experienced lack of sleep had decreased memory abilities. According to him, this is because lack of sleep can cause a person's motivation to do activities and also a sense of not being fulfilled their basic needs (Diekelmann et al, 2008). Lack of sleep in the long term can cause a person to stay awake longer which has a negative impact on cognitive function, namely disruption of the ability to focus (attention) and a decrease in memory skills if this sleep disorder persists (Alhola & Polo-Kantola, 2007). A systematic review study also states that meeting the need for sleep at least 8 hours a day has an effect on improving cognitive abilities and memory (Scullin & Bliwise, 2015).

The environment also plays a role in student learning concentration, as in Faizal's research which conducted research on the effect of the school environment on student learning concentration, finding that the environment had a significant influence on the learning concentration of MTs students (Faizal, 2018). According to Muhibin Syah in his book entitled Learning Psychology, the environment is a non-social external factor that affects student concentration (Faizal, 2018). Grose stated that children's concentration can be optimized by modifying the environment, namely eliminating environmental factors that can affect concentration such as noise and lighting in the learning area (Grose, 2009). Research by Ismah and Wibiastuti (2015) found that the point is, the location of the school which is near the highway, train tracks or tends to be noisy will reduce the concentration of students in learning (Ismah, 2015). This study found the same thing that there were 3 students who experienced a decrease in the concentration test scores and 2 students including the location of their house on the side of the road which tended to be noisy vehicles.

The results of this study indicate that there is an increase in the value of concentration in the average post-test score even though the average value of the student's concentration test post is still less than 30 which is the standard value of concentration that is said to be good using the concentration grid measuring instrument. This shows that the student's

concentration actually improved after the brain exercise intervention for 4 weeks. The increase in the concentration test post was supported by the Wilcoxon test which showed that there was a significant difference between the pre-test and the post-test. This means that brain exercise can have a positive impact on student concentration. This is in accordance with the initial concept that physical exercise helps improve students' learning concentration.

Several systematic review studies state that physical activity affects a person's cognitive abilities, including children (Donnelly et al, 2016), (Erickson et al, 2019), (Di Liegro, 2017). Donnelly et al. (2016) concluded from various journals analyzed that physical activity has a positive relationship with fitness, cognitive and academic achievement, although these studies need to be investigated again regarding the type of exercise used, as well as the dose of physical activity (Donnelly et al, 2016). The same thing was concluded in the literature study conducted by Gunnell et al. This study also concluded that physical exercise that is done chronically (long term) will have a significant effect when compared to acute physical exercise. Acute physical exercise tends not to show changes in cognitive aspects (Gunnell et al, 2019). The positive effect produced by physical activities on cognitive function is possible because of the effect of physical exercise on brain structure. This can be seen in a literature study conducted by (Valkenborghs et al, 2019), who concluded that physical exercise modifies the integrity of the white matter area and activates parts of the brain that are key to cognitive function, such as an increase in the volume of the hippocampus followed by an improvement in memory function if physical exercise is carried out routinely (chronically). Another thing that has been investigated is the improvement of blood flow to the brain and nerve function in patients with Alzheimer's disease who carry out routine physical activity for 12 months (Thomas et al, 2020). These studies have proven that physical activity has a positive impact on the brain which in turn has a positive effect on a person's cognitive abilities, including children.

The results of this study are in line with the research of Yanti, et al. (2018) that brain exercise provides a large category effect size which means that brain exercise has a positive impact on student concentration (Yanti et al, 2018). In addition, these results are also in line with research by Komarudin & Mulyana (2017) which examined matters related to brain jogging. The study also found that the brain can maximize its concentration ability by doing brain jogging (Komarudin, 2017).

Brain exercise contains simple movements using the whole brain which pioneered by Paul E. Dennison and his wife Gail E. Dennison. Brain Gym can draw out hidden potentials through body movements. The movements in the Brain Gym can balance the functions of the right and left brain simultaneously (Elisa, 2010). According to Dennison (2008), Brain Gym can train the dimensions of concentration for the limbic system and cerebral cortex. Both parts play an important role in learning abilities and emotional control. Brain Gym optimizes the right hemisphere, which controls the left side of the body and plays a role in intuitive functions, music, dancing, and creativity. The left hemisphere of the brain is in charge of regulating the right side of the body as well as regulating logical thinking, rational thinking, analyzing, writing and reading, speaking, time-oriented and detailed matters, and numeracy (Yusuf et al, 2010). Brain exercise also trains children to perform movements in a sequence so that it trains their concentration. This is supported by Castle & Buckler's opinion which states that concentration can be increased by doing activities that train concentration, one of which is moving in the sequence that must be done. When someone does a movement that has a sequence, they will focus on the movement so that it will be more difficult to be distracted and this trains one's concentration (Castle & Buckler, 2009).

CONCLUSION

This study concluded that Brain Gym is able to have a positive impact on student concentration. Brain exercise that is carried out regularly can be one solution to solve the problem of learning concentration in children.

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