JSSF (10) (1) (2024)

Journal of Sport Sciences and Fitness

http://journal.unnes.ac.id/sju/index.php/jssf

The Influence of Taekwondo Movement Activities on The Cognitive Function Of Early Childhood At The Fundamental Stage

Nawang Wulan Febriani[1]✉, Dede Rohmat Nurjaya[2], Widi Kusumah[3], Mulyana[4]

Program Studi Pendidikan Kepelatihan Olahraga, Fakultas Pendidikan Olahraga dan Kesehatan, Universitas Pendidikan Indonesia, Bandung, Indonesia[1,2,3,4]

nawangwulanfebriani2100099@upi.edu[1],dede-rohmat-n@upi.edu[2],widikusumah@upi.edu[3], , mulyanafpok@upi.edu[4]

Article's Info

Article's History:
Received October 2024
Accepted December 2024
Published December 2024

Keywords:
Young Children, Cognitive Funcition, Stroop Color Word Test, Taekwondo, Fundamental

Abstract

Children's cognitive development is a crucial part of their growth process, particularly in the areas of comprehension and memory. However, many children struggle to improve this ability. Exercise activities such as taekwondo are thought to be able to enhance cognitive development, although there have been few studies specifically looking at their benefits for Indonesian children. The purpose of this study is to evaluate the effects of taekwondo-related activities on cognitive functions, particularly concentration, in children aged 6 to 9 years in the elementary stage. This study uses an experimental approach with 20 children from Sukabumi Academy Taekwondo Dojang, consisting of 10 children and 10 adults. Taekwondo exercises are performed three times a month for 21 minutes at moderate intensity (between 50-80%). The Stroop Colour Word Test (SCWT) is an instrument for assessing a person's ability to understand words, colours and word combinations. The paired T-test is used to analyse the differences between the results before and after the test. The results show a significant increase in the following three variables: Word-Colour Combination ($t(19) = 10.491$, $p<0.001$), Word-Colour Recognition ($t(19) = 7.973$, $p<0.001$) and Colour-Colour Recognition ($t(19) = 8.063$, $p<0.001$). The average score after the test was better than before the test, indicating an increase in concentration after the Taekwondo intervention. Taekwondo exercises significantly improve cognitive functions, especially concentration, in children aged 6 to 9 years. This study highlights the importance of incorporating sports such as taekwondo into early childhood education and development programmes.

Correspondence E-mail✉: nawangwulanfebriani2100099@upi.edu

Universitas Pendidikan Indonesia, Jalan Setiabudi No. 229, Bandung

ISSN 2252-6528

INTRODUCTION

Humans naturally experience various stages of growth and development, one of which is early childhood. This phase is one of the important stages in the human growth process (Nugraha, 2015). During this period, children experience significant changes both physically andmentally, each child shows unique needs according to their stage of development. The early childhood stage is very crucial in shaping psychological development, cognitive skills such as focus, attention, and problem solving, as well as social skillsthat will affect their education process (Wahyuningrum, 2022). In this phase, cognitive growth is very important because children begin to master basic motor skills and begin to understand simple concepts such as game rules and teamwork, all of which play a role in strengthening memory, concentration, and decision making abilities. As explained by jean piaget (marinda, 2020), children's cognitive development occurs through four main stages based on age, from the sensorimotor stage to formal operational, and each activity or stimulus must be adjusted to their developmental needs.

Understanding child developmental psychology is an important basis for providing appropriate support during this period, because early childhood has different needs than adolescents or adults (syaodih, 2021). If this development process does not go well, there will be negative impacts such as concentration disorders that can affect all aspects of a child's life (Wahyuningrum, 2022).Movement plays an important role in early childhood development and includes gross motor skills such as running and jumping as well as fine motor skills such as writing and organizing objects (Pacifico, 2011). This activity not only plays a role in supporting children's Physical health is not only beneficial for cognitive and social development. (Yuniarti et al., 2023). Children who are physically active tend to have better learning abilities, high concentration, and more optimal mental well being. Therefore, understanding the various types of movement activities that are appropriate to the child's age and developmental stages is very important for parents and educators to ensure that children grow and develop optimall.

The ltad (long term athlete development) model emphasizes the importance of a structured approach in helping children improve basic motor skills, sports skills, and maintain their health during growth, thus creating a strong foundation for achieving peak performance in adulthood
(Styasih et al., 2023). In the context of long term athlete development (ltad), early childhood is not yet categorized as an athlete, but the focus is on the development of basic motor skills with a structured and fun approach (Grandmaster Kee Ha, 2008). One of the movement activities that can increase cognitive benefits is martial arts, especially in increasing concentration, martial arts movement activities are often overlooked, without realizing the benefi ts of these movement activities go beyond academic activities (Sollerhed et al., 2021).

Various international studies have examined martial arts from different perspectives, revealing that martial arts can improve physical fitness, emotional health, motor skills, and cognitive development (Ciaccioni et al., 2024). One of the martial arts that is the focus is taekwondo, a discipline originating from korea that has experienced significant global expansion, including in

indonesia (Linhares et al, 2022). This martial art not only improves aerobic and anaerobic abilities, but also cognitive functions. At the very least, it helps to slow down cognitive decline. (Chen, 2022). Taekwondo became a modern sport in the 1950s and is practiced worldwide. Its growth has been impressive; in 2005, there were 165 member countries, which increased to 206 countries in 2016, spanning five continents. The rapid development of taekwondo is also seen in the city of semarang. In 2009, there were 106 dojangs, and in 2016 the number jumped to 148 dojangs (Hidayat H, 2019).

Movement activities in taekwondo have a positive effect on physical fitness, as well as on the development of concentration in children. Doing taekwondo movement activities is very effective in childhood to promote their overall growth (Cho et al., 2017). In addition, taekwondo is also closely related to a more positive self-image and body perception, as well as increased confidence in its positive impact on physical health. Research shows that taekwondo involves psychological elements in addition to just motivation (Febrianty et al., 2021). Difficulties resulting from inadequate development at the elementary level include weak memory, problems distinguishing letters, problems learning new information related to memory, inability to fully complete tasks, impulsive or reckless behavior, and problems in solving simple problems or making decisions (Kadri et al., 2019).

The studies described above often focus on the general benefits of physical activity, but do not specifically examine how martial arts activities such as taekwondo affect other people. Most previous research has also focused on physical and emotional benefits, but less research has been conducted on specific benefits for cognitive functions such as concentration, particularly in children aged six to nine. In Indonesia, not much research has been conducted on the potential of taekwondo to improve young children's cognitive abilities. Most of the research has been conducted in developing countries with different socio-cultural conditions. Consequently, the results of this study help us to better understand how taekwondo training affects children's concentration in Indonesia, especially in local settings. By providing empirical data on the benefits of taekwondo for children aged six to nine years, this study fills a gap in the literature. This study emphasises the relationship between physical activity and cognitive development, particularly concentration, which is often overlooked in previous research. In contrast, this study includes cognitive aspects that are rarely researched. Quantitative experimental methods were used in this research. This study used the Stroop Colour Word Test (SCWT), which provides strong scientific evidence of how effectively Taekwondo improves concentration. Previously, similar studies used observational or qualitative methods, which were limited in objectively measuring cognitive changes. Researchers want to conduct scientific research that examines the cognitive characteristics of children, with a particular focus on the level of concentration when participating in basic phases of taekwondo training between the ages of six and nine. The researchers stated that there is no clear research in this area, particularly in Indonesia. In order to support children and provide appropriate interventions, parents, educators and coaches need to rely on the

results of this cognitive analysis (Lochbaum et al., 2022). This study focussed on taekwondo athletes aged six to nine years to gain insight into their cognitive needs. The researchers hope that the results of this study will serve as a guide for educators, educators and parents. They also want to emphasise how important psychological and cognitive aspects are in early childhood development, especially at crucial stages.

METHOD

The research method is a scientific approach used to collect data for specific purposes and benefits. According to (Sugiyono, 2019), the research method can be defined as a scientific procedure for obtaining data with particular objectives. Based on the previous problem formulation, the method used in this study is the experimental method. The purpose is to gather data on the results of the treatment of independent variables on the dependent variable (Hastjarjo, 2019). explained that experimental research aims to identify a causal relationship between two factors through the manipulation of one factor by the researcher, while controlling for interference from other factors. Experiments are always conducted to observe the effects of a treatment (Linhares et al., 2022). In this study, the independent variable is taekwondo movement activity, while the dependent variable is the cognitive function ability of early childhood at the fundamental stage. During the experimental process, the researcher provided taekwondo training with moderate intensity and a volume of 50% - 80%, consisting of basic movement exercises, poomsae, and taekwondo kicks. The participants in this study were early childhood children aged 6 untill 9 years, in accordance with the LTAD guidelines. The participants were from the Sukabumi Taekwondo Academy dojang and included 20 children, 10 girls and 10 boys. The participants were required to meet specific criteria: they had to be able to read, be between the ages of 6-9 years, be physically and mentally healthy, and not be colorblind.

The sampling technique used in this study was purposive sampling, which is a technique for selecting samples based on specific criteria (Sugiyono, 2019). The instrument used in this study was the Stroop Color Word Test (SCWT), which was developed in 1935 by psychologist John Ridley Stroop. According to (Periáñez et al., 2021), the Stroop Color Word Test is widely used by researchers to measure cognitive function. As cited in (Wahyudi et al., 2019), SCWT is a test used to measure cognitive function, particularly concentration and attention functions. The test consists of 30 columns of words in different colors that the subject must complete. Each word is presented in a different color, and the subject is instructed to identify the ink color rather than the word. The examiner records the time taken and accuracy of the responses. There is no standard version of the Stroop test in terms of materials, administration, or scoring, and many researchers have adapted the test without altering the core theory of the Stroop effect. In this study, the test will be administered in Indonesian, making it easy for children to understand. The researchers chose the Stroop

Color Word Test because it is simple to administer, cost-effective, and time-efficient. The quicker the participant completes the test, the better their performance. Data analysis used Kolmogorov Smirnov and Shapiro Wilk normality tests and paired t-tests to compare pre-test and post-test scores, ensuring the validity and reliability of the results.

RESULT AND DISCUSSION

Table 1. Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Pre test	W	.116	20	.200*	.977	20	.897
	C	.105	20	.200*	.944	20	.283
	CW	.102	20	.200*	.957	20	.489
Post Test	W	.100	20	.200*	.969	20	.738
	C	.087	20	.200*	.973	20	.815
	CW	.123	20	.200*	.953	20	.412

Based on table 1, the normality tests using Kolmogorov-Smirnov and Shapiro-Wilk indicate that both pre-test and post-test data from all three groups (Word, Color, Color Word) are normally distributed. All p-values from both tests are greater than 0.05, showing no significant deviation from normality. Therefore, the data meet the assumptions required for further parametric statistical analysis.

Table 2. Paired Samples Test

	Mean	Std. Deviation	Std. Error Mean	t	df	Sig.
Pretest W – Postest W	9.350	5.244	1.173	7.973	19	.000
Pretest C – Postest C	11.200	6.212	1.389	8.063	19	.000
Pretest CW – Postest CW	12.650	5.393	1.206	10.491	19	.000

Based on table 2, the t-test results for the word variable show a significant difference between pretest and posttest scores in word recognition ability ($t(19) = 7.973$, $p < 0.001$). This indicates a significant improvement in participants' abilities after the intervention. For the color recognition variable, the t-test also revealed a significant difference between pretest and posttest scores ($t(19) = 8.063$, $p < 0.001$). The analysis of word color recognition ability also demonstrated a significant change ($t(19) = 10.491$, $p < 0.001$). This indicates a significant effect of the intervention on participants' ability to recognize the combination of words and colors. Based on the paired t-test results, it can be concluded that there is a significant difference between pretest and posttest scores across all three measured variables. The increase in scores from pretest to posttest suggests that the intervention led to an improvement in participants' abilities in word recognition, color recognition, and the combination of both. This indicates that the approach or method used in

the intervention should be further evaluated to enhance its effectiveness.

In this study, the Stroop color word test was used to assess the cognitive function of early childhood children aged between 6 and 9 years. There were significant changes after 21 weeks of raining, three times a week. According to Jean Piaget's theory, reviewed in the journal (Marinda, 2020), there are four different stages of children's cognitive development, and every activity and encouragement should be in accordance with the age stage of the child. There are four categories: sensori-motor stage 0-2 years; preoperative (2-7 years); concrete operational (7-11 years); and formal operational (11until 13 years). According to (Bae & Roh, 2021), regular participation in taekwondo can positively affect different areas of children's development, including enhancing their self-confidence in social interactions. A 16 week taekwondo program resulted in improvements in mood, social abilities, and cognitive functions in children aged 7 to 12 from multicultural families in Korea. Similarly, research by demonstrated that taekwondo training over eight weeks helped university students enhance their cognitive skills, with the experimental group performing significantly better than the control group in cognitive assessments.

The core philosophy of taekwondo focuses on important values like self-discipline, respect, honesty, perseverance, setting goals, and concentration. Taekwondo combines physical and cognitive activities as part of its training regimen. One example of the cognitive complexity in taekwondo is Poomsae, a sequence of choreographed movements performed with precise technique.

Taekwondo training benefits not only physical development but also cognitive growth (Cho et al., 2017). Another study by found that although practicing taekwondo once a week for 16 weeks did not have a significant impact on Stroop word color test scores, it did contribute to better physical health and mental well-being. Furthermore, research by showed that, compared to other modern martial arts, six months of taekwondo training significantly improved psychosocial health. This is attributed to the emphasis taekwondo places on values such as respect, humility, responsibility, perseverance, and honor, which are central to the training process.

CONCLUSION

The study found that taekwondo movement activities significantly improve cognitive functions, particularly in concentration, among children aged 6 until 9 years. This was confirmed by significant differences between pre-test and post test scores across all variables (word recognition, color recognition, and word color recognition). The findings suggest that structured taekwondo training can be an effective method to enhance cognitive development in early childhood, highlighting the importance of integrating physical activities like martial arts into educational and developmental programs for children.

REFERENCES

Bae, J.-Y., & Roh, H.-T. (2021). Regular taekwondo training affects mood state and sociality but not cognitive function among international students in South Korea. *Healthcare (Switzerland)*, *9*(7). https://doi.org/10.3390/healthcare9070820

Chen, B. (2022). Characteristics of Sports Injuries in Taekwondo Athletes in Physical Training. *Revista Brasileira de Medicina Do Esporte*, *28*(1), 43–45. https://doi.org/10.1590/1517-

8692202228012021_0463

Cho, S. Y., Kim, Y. Il, & Roh, H. T. (2017). Effects of taekwondo intervention on cognitive function and academic self-efficacy in children. *Journal of Physical Therapy Science*, *29*(4), 713–715. https://doi.org/10.1589/jpts.29.713

Ciaccioni, S., Castro, O., Bahrami, F., Tomporowski, P. D., Capranica, L., Biddle, S. J. H., Vergeer, I., & Pesce, C. (2024). Martial arts, combat sports, and mental health in adults: A systematic review. *Psychology of Sport and Exercise*, *70*(January 2023), 102556. https://doi.org/10.1016/j.psychsport.2023.102556

Febrianty, M. F., Purnamasari, I., & Novian, G. (2021). Analysis of Psychological Aspects of Taekwondo Athletes in Training Phase. *Journal of Physical Education, Sport, Health and Recreation*, *10*(3), 2021. http://journal.unnes.ac.id/sju/index.php/peshr

Grandmaster Kee Ha, P. (2008). *Life for Long-Term Athlete Development National Coaching Certification Program*. 1–108.

Hastjarjo, T. D. (2019). Rancangan Eksperimen-Kuasi. *Buletin Psikologi*, *27*(2), 187. https://doi.org/10.22146/buletinpsikologi.38619

Hidayat H, S. I. (2019). *Analisis Butir Tes Fisik Atlet Taekwondo Puslatda Jawa Timur*.

Kadri, A., Slimani, M., Bragazzi, N. L., Tod, D., & Azaiez, F. (2019). Effect of taekwondo practice on cognitive function in adolescents with attention deficit hyperactivity disorder. *International Journal of Environmental Research and Public Health*, *16*(2), 1–10. https://doi.org/10.3390/ijerph16020204

Linhares, G., Diego Dos Santos, Andressa Oliveira Barros Santos, D., Lima, L. C., Souza, L. de, de Castro, J. B. P., & Vale, R. G. de S. (2022). The effects of taekwondo practice on physical and cognitive variables in children and adolescents: a systematic review. *European Journal of Human Movement*, *49*. https://doi.org/10.21134/eurjhm.2022.49.2

Mandolesi, L., Polverino, A., Montuori, S., Foti, F., Ferraioli, G., Sorrentino, P., & Sorrentino, G. (2018). Effects of physical exercise on cognitive functioning and wellbeing: Biological and psychological benefits. *Frontiers in Psychology*, *9*(APR), 1–11. https://doi.org/10.3389/fpsyg.2018.00509

Marinda, L. (2020). Teori Perkembangan Kognitif Jean Piaget Dan Problematikanya Pada Anak Usia Sekolah Dasar. *An-Nisa': Jurnal Kajian Perempuan Dan Keislaman*, *13*(1), 116–152. https://doi.org/10.35719/annisa.v13i1.26

Muslima, T. F., & Himam, F. (2018). Peran Pelatih dalam Pembinaan Prestasi Atlet pada Organisasi Taekwondo Profesional. *Gadjah Mada Journal of Professional Psychology (GamaJPP)*, *2*(3), 186. https://doi.org/10.22146/gamajpp.41769

Nugraha, B. (2015). Pendidikan Jasmani Olahraga Usia Dini. *Jurnal Pendidikan Anak*, *4*(1), 557–564. https://doi.org/10.21831/jpa.v4i1.12344

Pacifico, L. & A. (2011). citation-51120275. *Management of Metabolic Syndrome in Children and Adolescents. Nutrition, Metabolism, and Cardiovascular Diseases*. https://www.researchgate.net/publication/51120275_Management_of_metabolic_syndrome_in_children_and_adolescents/citation/download?_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InB1YmxpY2F0aW9uIiwicGFnZSI6InB1YmxpY2F0aW9uIn19

Periáñez, J. A., Lubrini, G., García-Gutiérrez, A., & Ríos-Lago, M. (2021). Construct validity of the stroop color-word test: Influence of speed of visual search, verbal fluency, working memory, cognitive flexibility, and conflict monitoring. *Archives of Clinical Neuropsychology*, *36*(1), 99–111. https://doi.org/10.1093/arclin/acaa034

Sollerhed, A. C., Olesen, L. G., Froberg, K., Soini, A., Sääkslahti, A., Kristjánsdóttir, G., Vilhjálmsson, R., Fjørtoft, I., Larsen, R., & Ekberg, J. E. (2021). Movement and physical activity in early childhood education and care policies of five nordic countries. *International Journal of Environmental Research and Public Health*, *18*(24). https://doi.org/10.3390/ijerph182413226

Sook, B. K. (2021). Training needs analysis of Korean nurses' neurological assessment competency. *Pubmed*.

Styasih, N., Liskustyawati, H., & Riyadi, S. (2023). *7th International Conference on Learning Innovation and Quality Education (ICLIQE 2023) SHEs: Conference Series 6 (2) (2023) 330-336 LTAD Concept Learning To Train Stage of Taekwondo Sport: Narrative Study 7th International Conference on Learning Innovati*. *6*(Icliqe), 330–336. https://jurnal.uns.ac.id/shes

Sugiyono. (2019). prof. dr. sugiyono, metode penelitian kuantitatif kualitatif dan r&d. intro (PDFDrive).pdf. In *Bandung Alf*.

Syaodih, E. W. (2021). *PSIKOLOGI PERKEMBANGAN ANAK*. 1–14. http://file.upi.edu/Direktori/FIP/JUR._PGTK/196510011998022-ERNAWULAN_SYAODIH/PSIKOLOGI_PERK_ANAK.pdf

Wahyudi, A. H., Dinata, M. K., & Primayanti, D. A. I. D. (2019). Pengaruh Kebisingan Terhadap Fungsi Kognitif Pada Mahasiswa Program Studi Pendidikan Dokter Fakultas Kedokteran Universitas Udayana. *E-Journal Medika*, *8*(4), 1–12.

Wahyuningrum, E. AL. (2022). Impact of Learning From Home: Cognitive Development of Early Childhood Education Student in Pandemic Covid – 19. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *6*(5), 5271–5279. https://doi.org/10.31004/obsesi.v6i5.2825

Yuniarti, Larasati, T., & Diana. (2023). Peningkatan Konsentrasi Belajar Pada Anak. *Jurnal Warna : Jurnal Pendidikan Dan Pembelajaran Anak Usia Dini.*, *08*(01), 41–51. https://doi.org/10.24903/jw.v