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How to Improve Special Needs Children's Motor Skills by Modifying Circuit Exercises

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Abstract Children with special needs are distinctive and need specialized attention in a variety of activities. They also need specific help during athletic events, one of which is to improve motor abilities. Motor skills determine a person's ability to move all of their limbs; if performed by the ordinary individual, it is naturally simple to complete; on the other hand, if performed by a young child with privileges, it is significantly more challenging. The purpose of this study is to outline and assess techniques for improving the motor abilities of children with special needs through circuit training. The study's population and samples were the 30 special needs kids at SLBN Sukoharjo. The sampling technique uses purposeful sampling, but only for SLBN Sukoharjo students and children with exceptional needs. A sprint over 30 meters, a tennis ball throw, standing on one foot for 10 seconds, and a long jump without a prefix are among the exercises used to collect data on modified motor abilities. Additionally, a shuttle run, in which five tennis balls must be moved over a distance of 10 meters before being placed in a plastic basket is also included. The Independent Sample T-test and the Paired Sample T-test are both used concurrently in the bivariate analysis. The results of this study imply that circuit training can aid in the motor skill development of children who are experiencing particular problems. However, more research into all of their physical traits, technological features, and psychological profiles is necessary to determine their impact on physical fitness in terms of body mass indices, including gender characteristics.

Keywords Circuit Training, Motor Abilities, Modification

1. Introduction

Children with special needs (CSN) have developmental anomalies that influence their mental, physical, or intellectual capacities in all aspects of development, according to Ika Febriani Kristina [1]. Children with special needs are similar to other kids in that they have advantages over their shortcomings in addition to being seen as having deficits. Children with special needs have the same rights as children in general, including the right to an accessible education. The term "Persons with Disabilities" is defined in Article 1 of Indonesian Republic Law number 18 of 2016 as "any person who experiences physical, intellectual, mental, and sensory limitations for a long time and who in interacting with the environment may experience obstacles and difficulties to participate fully and effectively with other citizens based on the similarity of right" [2]. As a result, there is no distinction between children with special needs and ordinary kids because they both have opportunities. Children in general reach their

potential.

Blindness, mental illness, speech impairment, deafness, autism, hyperactivity or attention deficit hyperactivity disorder (ADHD), and vision impairment are all CSN arachnids. Only children with mental disabilities were considered for this investigation. Based on these types of CSN, children with disabilities (CWD) are one of the CSN groups that other crew members experience the most frequently. The prevalence of those who are mentally impaired fluctuates with age and is typically around 1%, according to Armour. A serious mental disability affects 6: 1000 people simultaneously [3]. Atmaja asserts that there are three times as many women as men who have mental disabilities [4]. Zakaria 1-8% of the world's population consists of CWDs [5]. According to Wati, it is estimated that 6.6 million people in Indonesia, or 1-3% of the total population, are currently living with CWD. According to figures from the Special Education Center of the Central Java Education Office (BP-DIKSUS) in 2016 [7], mentally impaired or mentally retarded is a condition, in which the development of intelligence encounters barriers so that it does not reach an optimal stage of development, along with some general characteristics of mental impairment, such as limited intelligence, social limitations, and limitations of other mental functions [8]. Children who have mental retardation or hurdles to mental retardation may display hyperactivity, according to Ramadhan [9]. According to Ramadhan, children with mental retardation or mental retardation obstacles may exhibit hyperactivity [10]. However, according to [11], hyperactivity is merely a symptom brought on by various reasons, including mental impairment [12].

According to World Health Organization (WHO) research, 4-5% of the world's population still relies on others [13]. Children (very young people), significantly older adults, sick people, and persons with impairments are among the groups who frequently struggle with dependence on self-care [14]. According to the World Health Organization (WHO), one of the significant health issues in the world is the inability to perform daily tasks, including eating, maintaining personal cleanliness, and being alert to hazards. 52.4% of children aged 6 to 9 who are enrolled in school and have a handicap are unable to do daily tasks independently, according to data from the Household Survey conducted by the United Nations International Children's Emergency Fund (UNICEF) [13].

Special needs students can receive inclusive education [15]. Further, Hornby inclusive education attempts to offer visions and recommendations for laws, rules, and instructional methods that make it easier to deliver quality education to all students with special needs and disabilities [15]. ADHD performed coaching, the provision of structures, academic accommodations, and workplace accommodations, according to different studies [16]. This study's recommendations and interventions span the psychosocial, behavioral, and educational spectrum [17].

Children with special needs have been the subject of several prior studies, including those by Abdullah on understanding their characteristics [18], Khairun Nisa on the needs and characteristics of children with special needs [19], Sijabat on how lifestyle impacts children with special needs health [20], and on the right to education for children with special needs in the political dimensions of educational law [21]. However, from some of these studies, there is still no research on methods of improving the motor skills of children with special needs using circuit training, namely that motor movement is a movement controlled by the brain and supported by the function of organs such as large muscles (gross motor) or small muscles (fine motor). Games are one alternative that helps to improve motor skills in children because it is through fun motion tasks [22]. Learning Problems for Children with Special Needs During the Covid-19 Pandemic in Schools are 1) lack of teacher and parent readiness in this distance learning, 2) lack of parental skills in accessing the internet, 3) boredom that arises in children that makes children lazy to do distance learning [23]; Freedom of Learning for Children with Special Needs; the action of Children with special needs in the Era of Education 4.0. Since all children are the nation's successors, all children have equal rights regardless of physical or mental limitations [24]; Analysis of Distance Learning Needs and Problems in Children with Special Needs, as well as collaboration between teachers and parents for the application of distance learning at home [13]. From some of these studies, no studies have studied strategies related to improving the motor skills of children with special needs through circuit training. A circuit toy is a training model consisting of several stations arranged in a circle so that muscle groups work sequentially from station to station. By developing circuit games and knowing students' motor skills, this game can be used as another innovation for teachers to provide new motion tasks that can be applied to improve motor skills in students.

According to Putri, motor ability is the capacity of an individual to demonstrate motion abilities associated with applying and demonstrating a more general movement skill [25]. Gross motor and fine motor skills are said to make up motor skills. According to Susanto, both motor skills may be learned from a young age and are excellent for boosting children's growth [26].

In circuit games, different stations are positioned in a circle so that different muscle groups or individuals can work at each station [27]. A motion game called a circuit is set up from one post to another to get the muscles to respond sequentially and continuously, from easy to challenging. According to Indahwati & Krisniawan, the circuit game has gross motor motions that are excellent for children's growth [28].

Researchers offer remedies in the form of alternatives based on this phenomenon in the form of facts, one of which is through scientific studies on methods to enhance the motor skills of kids with special needs through modifying circuit workouts. Therefore, the primary goal

of this study was to examine methods for enhancing adolescents with special needs motor skills through the modification of circuit exercises

2. Materials and Methods

2.1. Research Area and Duration

This study aims to describe and evaluate several methods for adapting circuit training in this regard, including five post-modified circuit training components to aid the development of motor skills of children with special needs. Furthermore, each child's post carries out different game activities. The implementation of circuit learning is: 1) running zigzag. This activity at this post moves five tennis balls at a distance of 10 meters before putting them in a plastic basket. In this activity, children run zigzags through bottles arranged in a row, each with a distance of 100 cm. This activity aims to train children's agility in avoiding collapses or obstacles during earthquakes; 2) students do standing activities on one leg for 10 seconds. That is the footrest in this game; the child steps the foot according to the pattern affixed to the floor, training the child to walk balanced. In this post, the child performs walking activities on a footing by adjusting the right foot and left foot with a slight jump. Material for the manufacture of cardboard media coated with color paper; 3) Throwing tennis balls, in this post, this post that must be done is training the ability of non-locomotor manipulative movements because it uses media to train eye and hand coordination skills. The activity carried out is throwing the ball at a wall target with a distance of 1.5 meters; this game aims to improve hand-eye coordination; 4) Short distance running 30 meters. In this form of the game, children with special needs do running at a distance of 30 meters and 5) a long jump without a prefix; in this post, students do footrests; in this game, children step their feet according to the pattern that has been affixed to the floor, to train children to walk balanced. In this post, children do jump activities on a footing with a little jump—material for manufacturing cardboard media coated with colored paper. The stages of circuit training in children with special needs are modified, namely: 1) preparation, where the teacher prepares the circuit game field and prepares tools that will be used in circuit games, such as cardboard and mineral water containers; 2) implementation, namely introducing equipment/game media that children will use. The teacher explains the rules of the game and gives examples in advance of how to play the game to be played, provided that the three-month research session in 2022 runs from August 1 to November 8. However, the researchers worked on the calculations while the subject's received treatment. The research location of the project is SLB Negeri Sukoharjo in Sukoharjo District, Central Java Province.

2.2. Research Design

This study used a quasi-experimental approach with one pretest and one posttest control group. In this study, the control class or experimental class was randomly selected. Therefore, the design in this study was a None-equivalent (*pretest and posttest*) control group design. There were two groups in quasi-experimental research; one was given treatment as a control group that received treatment using the circuit training method that the teacher gave. In comparison, the other group became a control group that was not given or subjected to treatment (treatment). The control group serves as a comparison to find out the differences that may appear between the experimental group and the control group. The initial test result is known before the subject receives therapy, while the post-test result is known after treatment. This approach was chosen because it allows comparison between pretest findings regarding motor skills and post-test findings after the provision of circuit training.

2.3. Participants

Thirty respondents were children with special needs from SLBN Sukoharjo in Central Java Province, Indonesia. Respondents were selected by *purposive sampling*, namely students who had special needs of the male sex, then divided into two research groups with the provision of 15 respondents for the experimental group and 15 respondents for the control group.

2.4. Instrument

The five different types of tests that were used in this study were modified motor skills, which involved running back and forth while having to move five tennis balls 10 meters before putting them into a plastic basket, short distance running of more than 30 meters, tennis ball throwing, standing on one leg for 10 seconds, and long jump without a start.

2.5. Procedure

Subjects attended a series of circuit training sessions three times a week for eight weeks. Then the intensity of circuit training in this study was around 60% -90%, and the time used was 30-60 minutes. Then the researchers used 5 (five) modified motor skills, including running back and forth, running 30 meters, throwing a tennis ball, standing on one leg for 10 seconds, and a long jump without a start.

2.6. Statistical Analysis

The data analysis used in this study used a t-test through 95% confidence intervals and p <0.05. In the prerequisite test's t-test, the data used must be declared normal after going through the normality test using the Shapiro-Wilk method, provided that the data is usually distributed if P < α 0.05 and not generally distributed if P > α 0.05. Then t-test was used to test the difference in influence between groups before and after treatment and ascertained using a two-group pretest-post-test design, namely comparing the mean between group 1 and group 2. If the value of t-count is less than t-table, Ha is rejected; if t-count is greater than t-table, Ha is accepted. The data are presented as average values and standard deviations (SD) for descriptive analysis. Data calculations were carried out with the help of the Statistical Package for the Social Sciences (SPSS) version 25 program.

3. Result

The data below show the responders' anthropometric, physiological, physiological health, dietary, and psychological characteristics.

Table 1. Age, BMI, Resting Heart Rate Characteristics

Variables	n	Experiment (15)	Control (15)
		Mean±SD	Mean±SD
Age (years)	30	15.23±1.19	15.31±1.02
BMI (kg/m^2)	30	21.12±1.56	21.78±1.25
Resting Heart Rate (pulse/minute)	30	65.74±8.2	68.1±6.4

According to the study's findings, the participants who were in good physical and mental health (15.27-1,105 years old), had an average body mass index (21.45-1.404 kg/m2), and their heart rates (66.92-7.3 bpm) did not indicate exhaustion. Simultaneously, quantitative measurements were also conducted to determine the distinguishing features of the modified motor ability test consisting of a shuttle run in which participants had to move five tennis balls into a plastic basket over a distance of 10 meters, a sprint over 30 meters, a tennis ball throw, and a 10-second one-foot stand, and a long jump without a prefix. They were getting from each variable's measuring test results. The table below shows a descriptive analysis of the anticipated variables.

Table 2. Profile motor abilities.

Variables	Groups	Number (n)	Mean±SD
Shuttle run (seconds)	Eks Pretest	15	18.88±1.29
	Eks Posttest		17.59±1.29
	Cont. Pretest	15	4.60±1.55
	Cont. Posttest		5.60±1.55
Throw a tennis ball	Eks Pretest	15	9.22±7.23
	Eks Posttest		10.45±7.23
	Cont. Pretest	15	14.81±0.87
	Cont. Posttest		2:46±0:87
Stand with 1 foot/ 10 seconds	Eks Pretest	15	58.60±14.87
	Eks Posttest		59.79±14.82
	Cont. Pretest	15	18.78±1.12
	Cont. Posttest		17.49±1.12
30-meter run (seconds)	Eks Pretest	15	3.33±1.29
	Eks Posttest		4.33±1.29
	Cont. Pretest	15	8.59±5.03
	Cont. Posttest		9.82±5.03
Long jump without prefix (cm)	Eks Pretest	15	15.07±0.84
	Eks Posttest		14.72±0.84
	Cont. Pretest	15	84.73±10.10
	Cont. Posttest		86.06±10.10

The findings demonstrated the significant disparity between the research variable's mean value and standard deviation. The experimental group's average shuttle run difference between the pretest and posttest is (r=1.291.29), while the control group's average shuttle run difference between the pretest and posttest is (r=1.291.29), indicating that the difference in shuttle run value between the two groups on the pretest is distributed at the same level. The Eks in the tennis ball throwing variable. The group displays the average value (r=1.001.55), whereas the cont's average value. Group. is (r=1.00±1.55). As indicated at the same value, this suggests no contrast between the average values for the two groups. In the Eks, the equilibrium variable. The group displays the average value (r=1.231.55), whereas the cont's average value. Group. is (r=1.23±7.23). As indicated at the same value, this suggests no contrast between the average values for the two groups.

The Eks was used in the 30-meter running variable. The group displayed the average value (r=0.350.87), whereas the cont exhibited the average value. Group. is (r=0.35±0.87). As indicated at the same value, this suggests no contrast between the average values for the two groups. In contrast, the Eks in the long jump variable is without a prefix. The group displays the average value (r=1.1914.87), unlike the contents. Group. is (r=1.19±14.87). As indicated at the same value, this suggests no contrast between the average values for the two groups. This demonstrated no appreciable average differences between the two groups' motor ability scores on the pretest and posttest. Preliminary calculations were also performed in this investigation to ascertain whether the data were distributed properly. According to the Kolmogorov-Smirnov Z (KS-Z) test with a significance level of 0.05, the findings of the computation of Normality for hypothesis testing are as follows.

Table 3. The Normality of motor abilities of Children with special needs

Variables	Groups	Number (n)	Significance (p>0.05)
Shuttle run (seconds)	Eks Pretest	15	0.200*
	Eks Posttest		0.200*
	Cont. Pretest	15	0.200*
	Cont. Posttest		0.200*
Throw a tennis ball	Eks Pretest	15	0.132
	Eks Posttest		0.132
	Cont. Pretest	15	0.200*
	Cont. Posttest		0.200*
Stand with 1 foot/ 10 seconds	Eks Pretest	15	0.200*
	Eks Posttest		0.200*
	Cont. Pretest	15	0.129
	Cont. Posttest		0.129
30-meter run (seconds)	Eks Pretest	15	0.101
	Eks Posttest		0.101
	Cont. Pretest	15	0.153
	Cont. Posttest		0.153
Long jump without prefix (cm)	Eks Pretest	15	0.200*
	Eks Posttest		0.200*
	Cont. Pretest	15	0.200*
	Cont. Posttest		0.200*

*Significance (p >0.05)

Based on the results of the normality test using the Kolmogorov–Smirnov Z (KS-Z) test, it can be concluded that the variables that include the modified motor ability test consist of data collection techniques through tests and modified motor ability measurements consisting of (i) shuttle run by moving five tennis balls to be included in a plastic basket with a distance of 10 meters / second, (ii) sprint 30 meters / second, (iii) throw a tennis ball/times, (iv) stand one foot/second; and (v) long jumps without a normally distributed prefix (cm) indicated with values greater than 0.05 (p > 0.05). Thus, the samples and variables in this study are indicated as customarily distributed populations.

Statistical Analysis.

The Paired Sample T-test was used to investigate the differences in values between the two research groups and to determine the variable's different values in the groups before and after manipulation. The following table shows the outcome.

Table 4. Paired T-Test

Variables	Groups	Significance (p<0.05)
Shuttle run (seconds)	Exp. Pretest	0.000
	Exp. Posttest	0.000
	Pretest Control	0.000
	Posttest Control	0.000
Throw a tennis ball	Exp. Pretest	0.000
	Exp. Posttest	0.000
	Pretest Control	0.000
	Posttest Control	0.000
Stand with 1 foot/ 10 seconds	Exp. Pretest	0.000
	Exp. Posttest	0.000
	Pretest Control	0.000
	Posttest Control	0.000
30-meter run (seconds)	Exp. Pretest	0.000
	Exp. Posttest	0.000
	Pretest Control	0.000
	Posttest Control	0.000
Long jump without prefix (cm)	Exp. Pretest	0.000
	Exp. Posttest	0.000
	Pretest Control	0.000
	Posttest Control	0.000

*Significance (p<0.05)

The motor ability significant values for the experimental and control groups employing circuit exercises are shown in Table 4. It is clear that the overall pretest and posttest significance values for (i) the shuttle run, which involved moving five tennis balls at a speed of ten meters per second to be placed in a plastic basket; (ii) the sprint at thirty meters per second; (iii) the tennis ball throw at one foot per second, and (iv) the long jump without a prefix (cm) significantly showed a value smaller than 0.05 (p 0.05). Using distributed circuit exercises, it is possible to conclude that there exist discoveries of scientific evidence regarding disparities in motor ability. Furthermore, the findings of the studies can be extrapolated or applied to different sample groups in various populations.

4. Discussion

The study's findings support a previous claim that circuit exercises significantly improve the motor skills of children with special needs. This claim is further supported by the findings of descriptive and inferential analyses performed at SLBN Sukoharjo. Children with special needs benefit most from circuit training if their motor skills are considered a key component. Research Broad body parts need to be involved in motion activities for children to develop basic motor skills [29]. While motor difficulties are common in children with special needs, they are not always evident from birth [30]. Kids with unique challenges generally develop motor skills within a reasonable time frame [31]. The corpus callosum is connected to motor performance, significantly dependent on overall nerve myelination [32]. Equilibrium stability is one of the several skills that make up motor abilities [31].

However, it is essential to compare the motor skills of children with special needs to other related study findings, including [33] understanding that fundamental motor competence is a functional capacity. It can be sustained over the long term and improves with the situation's particular motor demands [34]. According to Ayan, assessing children's motor skills has become more crucial in recent years due to theories that link poor motor skills to emotional, social, cognitive, and linguistic challenges [35].

According to research on growth and development, intelligence is one sign of the psychological components that enhance motor skills [36]. However, education that offers parity or equal opportunity for kids with disabilities, also known as CSNs (Children with Special Needs), to obtain learning in the same place as other students are necessary [37]. Researchers, educators, and decision-makers in the field of education can utilize this data to analyze the month of birth in terms of its usefulness and the implications of physical fitness testing [38].

Based on the findings of the study mentioned above, basic motion models based on classic games for young children (5–6 years old), as well as efficient basic motion models, can be used to increase activities, abilities, and skills involving movement, particularly those involving fundamental locomotor motion techniques, non-locomotor motion, and manipulative motion [39]. People with

intellectual disabilities (ID) are those whose IQs are lower than the average for youngsters their age (IQ 70) [40]. The analyses' results point to the possibility of some improvement in children's performance of fundamental motor skills using motor intervention programs. However, more research is required to identify the best motor intervention. Due to this study's limitations, the results should be understood and used cautiously [41].

Exercises supported by necessary elements, such as the type of exercise method or exercise strategy used and the individual's mobility without ignoring other supporting aspects, are required for the motor ability exercise process to be successful. Therefore, the practice technique should be distinct from the sequence of educational processes or the exercise process carried out in the form of specific exercises that achieve particular objectives that must be accomplished. Understanding what is being learned, opportunities for response, feedback, and reinforcement all play a role in developing motion learning of motor skills. Therefore, it is required to have a fundamental understanding of how specific skills might be developed or learned, as well as what factors encourage the mastery of such skills to obtain the degree of motor abilities described above. Fundamentally, motor skills, particularly in children with special needs, can only be learned or trained with specific prerequisites, such as practicing these abilities must be done constantly for a specific amount of time. This indicates that developing motor skills while acquiring a sports education takes time in the gym and must be done consistently and methodically. One of this study's novelties and distinctive features is the need for a correlation between circuit workouts and motor skills, despite the explanation provided by other studies that motor skills determine success in identifying fit persons. Further study with larger samples and variables is required to ascertain the association between these characteristics and the motor skills of children with exceptional needs.

5. Conclusions

According to the study's findings, there are disparities in the influence of motor skills before and after receiving circuit training therapy. However, to determine the success of studying sports education according to gender characteristics, further analysis of the quality of physical circumstances and student psychology is required.

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REFERENCES

[1] Ika Febrian Kristiana C. G. W., *Buku ajar psikologi anak berkebutuhan khusus*, Cetakan 1: Semarang: Semarang: UNDIP Pres, 2016.

[2] Republik. Indonesia, "Undang-Undang Republik Indonesia No. 8 Tahun 2016 Tentang Penyandang Disabilitas," no. June 2016.

[3] C. Armour, J. Mullerová, and J. D. Elhai, "A systematic literature review of PTSD's latent structure in the Diagnostic and Statistical Manual of Mental Disorders: DSM-IV to DSM-5," *Clin. Psychol. Rev.*, vol. 44, pp. 60–74, 2016, doi: 10.1016/j.cpr.2015.12.003.

[4] J. Thompson, *Memahami Anak Berkebutuhan Khusus*. 2017.

[5] Zakarya, Y. N.,. Dewi, E. I and T. Susanto, "Pengaruh Pelatihan Cuci Tangan Bersih dengan Metode Bermain Puzzle terhadap Kemampuan Melakukan Cuci Tangan Anak Tunagrahita di SDLB-C TPA Kabupaten Jember (The Effect of Hands Washing Training with Puzzle Method to Ability to Wash Hands of Children with," *Pustaka Kesehat.*, vol. 4, no. 3, pp. 563–567, 2016, [Online]. Available: https://jurnal.unej.ac.id/index.php/JPK/article/view/6164

[6] Wati, G. M. "Outbound Management Training Untuk Meningkatkan Kemampuan Penyesuaian Diri Anak Tunagrahita," *Educ. Psychol. J.*, vol. 1, no. 1, pp. 68–74, 2012.

[7] Sunusi, H. C.C., Soetjiningsih, H., and Kristijanto, A. I. "Picture Exchange Communication System (PECS) dan Communication Apprehension (CA) pada Remaja Tunagrahita Jenjang SD di SLBN Salatiga," *J. Psikol.*, vol. 45, no. 2, p. 132, 2018, doi: 10.22146/jpsi.33607.

[8] Astuti, P. "Dukungan Orang Tua Dalam Meningkatkan Kemandirian Anak Tunagrahita Sedang," *Psikoborneo J. Ilm. Psikol.*, vol. 6, no. 1, pp. 124–131, 2018, doi: 10.30872/psikoborneo.v6i1.4536.

[9] Akib, I.A. Husniati, Kusumah, F. Kristiawati, K .and Fayanto, S. "Thinking Processes of Mentally retarded: Students Disabled at Junior High School in Solving Fractions Problems," *AL-ISHLAH J. Pendidik.*, vol. 14, no. 2, pp. 2185–2196, 2022, doi: 10.35445/alishlah.v14i2.1773.

[10] Ramadhan, D. A. "The limitation of voting rights for people with permanent mental disabilities in Indonesia: a debate between reasonable and unreasonable rights," *Cogent Soc. Sci.*, vol. 7, no. 1, 2021, doi: 10.1080/23311886.2021.1932032.

[11] Gapin, J. I., Labban, J. D., Bohall, S. C., Wooten, J. S., and Chang, Y. K. "Acute exercise is associated with specific executive functions in college students with ADHD: A preliminary study," *J. Sport Heal. Sci.*, 2015, doi

10.1016/j.jshs.2014.11.003.

[12] Camelia, I. A., "Eco-Connectivity Of Arts Learning For Mentally Disabled Children at SLB Gedangan Sidoarjo East Java," *J. PAJAR (Pendidik. dan Pengajaran)*, vol. 5, no. 2, pp. 41–430, 2021.

[13] Supriyadi, W., Dian Atnantomi, "Analisis Kebutuhan dan Masalah Pembelajaran Jarak Jauh Pada Anak Berkebutuhan Khusus di Masa Pandemi Covid-19," *J. basic*, vol. 5, no. 6, p. 6349-6356, 2021.

[14] Silvana, I. E., Handayani, P. A., and Hartati, E., "Literatur Review Dukungan Keluarga pada Anak Retardasi Mental," *Indones. J. Nurs. Res.*, vol. 3, no. 2, pp. 42–51, 2020, [Online]. Available: http://jurnal.unw.ac.id/index.php/ijnr/article/view/1194

[15] Hornby, G., "Inclusive special education: Development of a new theory for the education of children with special educational needs and disabilities," *Br. J. Spec. Educ.*, 2015, doi: 10.1111/1467-8578.12101.

[16] Bokor G., and Anderson, P. D., "Attention-deficit/hyperactivity disorder," *J. Pharm. Pract.*, 2014, doi: 10.1177/0897190014543628.

[17] Curatolo, P., D'Agati, E., and Moavero, R., "The neurobiological basis of ADHD," *Italian Journal of Pediatrics*. 2010. doi 10.1186/1824-7288-36-79.

[18] Abdullah, N. "Mengenal Anak Berkebutuhan Khusus," *Magistra*, vol. 25, no. 86, pp. 1–10, 2013.

[19] Khairun Nisa, S. Mambela, and L. I. Badiah, "Karakteristik Dan Kebutuhan Anak Berkebutuhan Khusus," *J. Abadimas Adi Buana*, vol. 2, no. 1, pp. 33–40, 2018, doi: 10.36456/abadimas.v2.i1.a1632.

[20] Sijabat, R. "Gaya Hidup Yang Memengaruhi Kesehatan Anak Berkebutuhan Khusus di SLB Negeri Salatiga," *J. Keperawatan Muhammadiyah*, vol. 2, no. 2, 2018, doi: 10.30651/jkm.v2i2.1069.

[21] Husna, F., Yunus, N. R., and Gunawan, A., "Hak Mendapatkan Pendidikan Bagi Anak Berkebutuhan Khusus Dalam Dimensi Politik Hukum Pendidikan," *SALAM J. Sos. dan Budaya Syar-i*, vol. 6, no. 2, pp. 207–222, 2019, doi: 10.15408/sjsbs.v6i1.10454.

[22] Dewi, N. P., "Problematika Pembelajaran Untuk Anak Berkebutuhan Khusus Pada Masa Pandemi Covid-19 Di Sekolah," *JPI (Jurnal Pendidik. Inklusi)*, vol. 4, no. 1, p. 1, 2020, doi: 10.26740/inklusi.v4n1.p1-10.

[23] A. Asfiati and N. I. Mahdi, "Merdeka Belajar bagi Anak Kebutuhan Khusus di SLB Kumala Indah Padangsidimpuan," *KINDERGARTEN J. Islam. Early Child. Educ.*, vol. 3, no. 1, p. 59, 2020, doi: 10.24014/piece.v3i1.9620.

[24] Rumia, M., Simorangkir, R., and Lumbantoruan, J. H., "Aksesibilitas Anak Berkebutuhan Khusus Di Era Pendidikan 4.0," *J. Din. Pendidik.*, vol. 14, no. 1, pp. 204–213, 2021, doi: 10.33541/jdp.v12i3.1295.

[25] Putri, Y. L. "Peningkatan Keterampilan Motorik Kasar Pada Anak Disabilitas Rungu Melalui Permainan Sirkuit," *J. Pendidik. Olahraga dan Kesehat.*, pp. 207–210, 2019, [Online]. Available: https://ejournal.unesa.ac.id/index.php/jurnal-pendidikan-jasmani/article/view/27389%0Ahttps://ejournal.unesa.ac.id/index.php/jurnal-pendidikan-jasmani/article/view/27389/25055

[26] Susanto S. I., and Wijaya, F. J. M., "Analisis Perkembangan Motorik Anak Berkebutuhan Khusus Setelah Latihan Gymnastics," *J. Prestasi Olahraga*, pp. 107–113, 2021, [Online]. Available: https://ejournal.unesa.ac.id/index.php/jurnal-prestasi-olahraga/article/view/39593

[27] Komarisa P., and Ardianingsih, F., "Permainan sirkuit sebagai strategi untuk meningkatkan keterampilan motorik kasar anak dengan autisme," *J. Pendidik. khusus*, 2020.

[28] Indahwati N., and Krisniawan, F. A., "Peningkatan Kemampuan Motorik Siswa Autis Melalui Permainan Sirkuit," *J. Pendidik. Olahraga dan Kesehat.*, vol. 8, no. 2, pp. 7–10, 2020, [Online]. Available: https://ejournal.unesa.ac.id/index.php/jurnal-pendidikan-jasmani/issue/archive7

[29] Hardasari R., and Diana, D., "Early Childhood Education Papers The Application of Taiso Radio Gymnastic in Improving Gross Motor Ability of Children Aged 5-6 Years," *Early Child. Educ. Pap.*, vol. 9, no. 1, pp. 34–39, 2020.

[30] Al-near, A., and Abdelazeim, F., "Applied Neuropsychology : Child Relationship of cognitive functions and gross motor abilities in Children with spastic diplegic cerebral palsy," *Appl. Neuropsychol. Child*, vol. 0, no. 0, pp. 1–9, 2017, doi: 10.1080/21622965.2017.1312402.

[31] Wilczyńska, D., Radomska, A. Ł., Głowacka, M. P., Krasowska, K., and Perzanowska, E., "Effect of workshops for coaches on the motor ability of balance in children practicing sports in late childhood," *BMC Sports Sci. Med. Rehabil.*, vol. 9, pp. 1–9, 2021, doi: 10.1186/s13102-021-00388-9.

[32] López-Vicente M., *et al.*, "NeuroImage White matter microstructure correlates of age, sex, handedness, and motor ability in a population-based sample of 3031 school-age children," *Neuroimage*, vol. 227, no. June 2020, 2021, doi: 10.1016/j.neuroimage.2020.117643.

[33] Herrmann, C., Heim, C., and Seelig, H., "Construct and correlates of basic motor competencies in primary," *J. Sport Heal. Sci.*, no. April 2017, doi: 10.1016/j.jshs.2017.04.002.

[34] Sena L., *et al.*, "Fine motor ability and psychiatric disorders in youth," *Eur. Child Adolesc. Psychiatry*, vol. 27, no. 5, pp. 605–613, 2018, doi: 10.1007/s00787-017-1091-y.

[35] Ayan, C., Varela, S., Sanchez-lastra, M. A., and De, Ó. M., "Reliability and validity of the basic motor ability test in preschool children," *J. Phys. Educ. Sport ®*, vol. 19, no. 3, pp. 987–991, 2019, doi: 10.7752/jpes.2019.s3142.

[36] Hanafi, S. "Efektifitas Latihan Beban dan Latihan Pliometrik Dalam Meningkatkan Kekuatan Otot Tungkai dan Kecepatan Reaksi," *J. Il.*, vol. 1, no. 2, pp. 32–35, 2015.

[37] Surgent, O. J., Walczak, M., Zarzycki, O., Ausderau, K., and Travers, B. G., "IQ and Sensory Symptom Severity Best Predict Motor Ability in Children With and Without Autism Spectrum Disorder," *J. Autism Dev. Disord.*, vol. 51, no. 1, pp. 243–254, 2021, doi: 10.1007/s10803-020-04536-x.

[38] Mat-rapid S. M. *et al.*, "The Relative Age Effect on

Physical Fitness of," *Int. J. Hum. Mon. Sport. Sci.*, vol. 10, no. 5, pp. 1098–1106, 2022, doi: 10.13189/saj.2022.100528.

[39] Siregar, N. M., Fitri, E., Sari, N., and Budiningsih, M., "The Basic Learning Model of Traditional Motion Based Games for Early Childhood (5-6) Years," *Int. J. Hum. Mon. Sport. Sci.*, vol. 9, no. 1, pp. 81–88, 2021, doi: 10.13189/saj.2021.090111.

[40] Kesumawati, S. A., and Fahritsani, H., "Learning Model of Fundamental Movement Skills (FMS) for Children with Mild Intellectual Disability," *Int. J. Hum. Mon. Sport. Sci.*, vol. 9, no. 1, pp. 71–80, 2021, doi: 10.13189/saj.2021.090110.

[41] Su, H., Yang, G., Yang, M., and Chang, J., "Fundamental Motor Skills Intervention for School-age Children : A Systematic Review and Meta-Analysis," *Int. J. Hum. Mon. Sport. Sci.*, vol. 10, no. 4, pp. 644–653, 2022, doi: 10.13189/saj.2022.100403.