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The Effectiveness of Coordinated Locomotor Movement Training to The Balance and Agility of Intellectual Impairment: Sixteenth Times Locomotor Exercise Improved Balance and Agility of Intellectual Impairment

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Abstract. Children with intellectual impairment have a lack of locomotor movement than non-intellectual impairment. Motoric activity like walking and running of intellectual impairment showed decreased balance and agility. The study investigated the locomotor exercise effect on increasing balance and agility the children with intellectual impairment. Quasi-experiment with one group pre-test and post-test design was used in the study. Sampling technique using Purposive Sampling and Ten children with Intellectual Impairment at Roemah Disabled Semarang who have Movement Balance and Agility Barriers became the research sample. While the technique of data collection by observing the movement of balance and agility on the subject. They followed the intervention 16 times, each time for 40 minutes, each exercise 3-5 repetitions and 3-5 sets, and minutes for rest. The intervention exercise was locomotor coordination, like walking, running, and jumping. The balance and agility were tested before and after the intervention. The data were analyzed using the Wilcoxon test. The result of the study showed that static balance significantly increased from (50 ±17.91) to (90.10 ± 15.94), p = 0.007, after 16 times locomotor exercises. The agility improved significantly before (46.60 ± 17.55) and after (86.80±17.04), p = 0.007 the intervention. The study concluded that locomotor coordination exercise intervention 16 times improved dynamic balance and agility of intellectual impairment.

Key words: intellectual impairment; fundamental; motoric exercises

Abstract in Indonesia. *Intellectual impairment* memiliki keterbatasan gerak lokomotor dibandingkan anak non intelektual. Aktivitas motorik seperti berjalan dan berlari pada gangguan intelektual menunjukkan penurunan keseimbangan dan kelincahan. Tujuan Penelitian ini yaitu ingin mengetahui pengaruh latihan koordinasi gerak lokomotor terhadap peningkatan keseimbangan dan kelincahan *intellectual impairment.* Metode yang digunakan dalam penelitian yaitu Quasi-experiment dengan desain one group pre-test dan post-test. Teknik Sampling dengan menggunakan Purposive Sampling Serta Sepuluh anak *intellectual impairment* di Roemah Difabel Semarang yang memiliki Hambatan Gerak Keseimbangan dan Kelincahan menjadi sampel penelitian. Sedangkan teknik pengumpulan data dengan observasi pengamatan gerak keseimbangan dan kelincahan pada subyek. Mereka mengikuti perlakuan sebanyak 16 kali, setiap kali selama 40 menit, setiap latihan 3-5 repetisi dan 3-5 set. Latihan yang dilakukan adalah koordinasi lokomotor, seperti berjalan, berlari, dan melompat. Keseimbangan dan kelincahan diuji sebelum dan sesudah diberikan perlakuan. Data dianalisis menggunakan uji Wilcoxon. Hasil penelitian ini menunjukkan bahwa terjadi peningkatan pada 10 subyek setelah diberikan latihan gerak lokomotor. Rata rata perkembangan keseimbangan Pre-Test(50±17,91) Posttest (90,10± 15,94) p=0,007 dan kelincahan pada pretest(46,60 ±17,55) dan posttest sebesar (86,80±17.04), p=0,007, Berdasarkan tes statistik, Diketahui Asymp. Sig (2-talled) bernilai 0,007. Atau p<0,05. Hasil penelitian menyimpulkan bahwa latihan koordinasi lokomotor 16 kali meningkatkan keseimbangan Dinamis dan kelincahan pada anak gangguan intelektual.

Kata Kunci: intellectual impairment; fundamental; Latihan motorik

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INTRODUCTION

Children with Intellectual impairment are children who are categorized as having below-average intelligence barriers when compared to normal children in general (Febrisma, 2013). Intellectual impaired children are children who have significantly below average intelligence and are accompanied by an inability to adapt behaviors that arise during their development period (Widiastuti & Winaya, 2019) (Yosiani, 2014)The cause of intellectual impairment are internal factors such as genetics, prenatal

problems, and natal, post-natal. The problem of pre-natal conditions is regarding the development of the fetus and the mother's body, namely offspring, the age of the mother during pregnancy, the intensity of the mother's pregnancy checks, and the health status of the mother affected or not by the disease during pregnancy (Setyarini & Salmah, 2015) (Ulfatusholiat, 2010) Children with intellectual impairment are children with special needs so that have problems or obstacles in motor, sensory, emotional and social (Simahate & Munip, 2020) (Putri, 2021). Based on the capability capabilities that can be referred to as the basis for potential development, intellectual impairment children can be classified into: (1) Intellectual impairment children can be educated with an IQ range of 50-75, (2) Intellectual impairment children can be trained with an IQ range of 25-50, (3) Intellectual impairment children can be treated with an IQ range of 25- and below (Rukmana & Wahyudi, 2013).

Gross motor is one of the physical activities that require balance and coordination between the limbs (Mas'udah & Sujarwnto, 2013) (Ardiyanto & Sukoco, 2014), the gross motor is a body movement that utilizes large muscles and parts of the body are to the whole body which will affect the maturity of the child it self (Rozana, 2019) (Hakim et al., 2013) gross motor physical development is a skill that uses large muscles in the human body (Dewantoro et al., 2021) (Yosinta et al., 2016).

The gross motor consists of locomotor, non-locomotor and manipulative (Ananditha, 2017) Locomotor is a movement that is carried out to move places for example walking, running and jumping (Arifin & Oenfiati, 2006) (Muslihin, 2020). Non-locomotor is a movement that does not move because only a part of the body is used but does not make a movement that moves (Fitria & Rohita, 2019)examples of non-locomotor motion are bending the arms, squatting and standing. While manipulative is something that is moved, for example, by throwing, catching, hitting and other movements related to throwing and catching (Firmansyah, 2011).

One way or method that can be used to train the gross motor development of Intellectual impairment children is to train their locomotor motion (Amirzan, 2017). This locomotor movement exercise is very much needed by human beings who move individuals in one space or space or other places (Dewantoro et al., 2021) (Beninger, 1983) (Apriliani et al., 2020), Locomotor motion carried out in this study, one of the goals is to improve children's gross motor skills, especially in balance and agility.

Agility is the ability of a limb or part of the body to be able to perform or change the direction of movement suddenly and in a state of high speed (Nur, 2016) (Fatahillah, 2018). Examples such as by running fast, winding (zig-zag), turning, back and forth, dodging or dodging with a fixed position standing in place and so on.

Balance is a person's ability to maintain our neuromuscular system in static conditions, or control the neuromuscular system in an efficient position or attitude while we are moving (Puspitasari, 2019) (Permana, 2013). Balance is needed because it is useful for maintaining position and stability when we move from one position to a different position (Sumiati & Wijaya, 2018) (Armade & Manurizal, 2019) there are two types namely static balance and dynamic balance. Static balance maintains a position that does not move or change (Kurniawati, 2017) while what is meant by dynamic balance is a balance that involves body control because the body moves in space (Habut et al., 2016).

Purpose of the Study the study purpose was (1) as a method to improve agility in Intellectual impairment children; (2) as a method to improve balance in Intellectual impairment children; (3) to determine the effectiveness of locomotor movement exercises to improve balance and agility in Intellectual impairment children.

METHODS

Participants

In this study, it will be determined that at least 10 children with special needs participate in learning. In this case, our research sample consisted of 10 (6 boys, 4 girls) students aged 20-44 years, with moderate and mild intellectual disabilities who experienced movement barriers, especially agility and balance. All participants were informed by the researcher about the possible risks and details of the study. A Voluntary Consent Form was obtained from their Carer. This study was approved by the Health Research Ethics Committee (HREC) Number: 383/KEPK/EC/2022 Faculty of Sports Science, State University of Semarang, Institute of Ethics Committee. The research was conducted in accordance with the HREC.

Research Design

Anthropometric measurements and test batteries were performed on volunteers who participated in this study. In this context, the participant's height, weight, Leg Length, and Sitting Height were determined. Balance Test with Instruments Jumping from Point A to Point B and walking on a straight line along with Agility Test With zigzag running and running back and forth.

The participants were given information about the test, the research instrument was also prepared in advance by the researcher, and the motivation used required is given during the test. Information about students' health has also previously been coordinated with their caregivers at Roemah Difabel. Before starting the test participants were given an experiment to understand the test. To evaluate the test, at the initial stage all samples will be measured initial data, then 16 times of training treatment will be carried out and added with final data collection to measure the development of their balance and agility after being given treatment.

Table 1. Locomotor Training Program

Treatment	Activity	Repetition	Set	Rest (Minute)
1	a. Warm-up b. Agility shuttle run. c. Cool down	3	3	1
2	a. Warm-up b. Balance jump from point A to B c. Cool down	3	3	1
3	a. Warm-up b. Agility Zig-Zag run c. Cool down	3	3	1
4	a. Warm-up b. Balance run in a straight line c. Cool down	3	3	1
5	a. Warm-up b. Agility shuttle run c. Cool down	3	5	1
6	a. Warm-up b. Balance jump from point A to B c. Cool down	3	5	1
7	a. Warm-up b. Agility zig-zag run c. Cool down	3	5	1
8	a. Warm-up b. Balance run in a straight line c. Cool down	3	5	1
9	a. Warm-up b. movement combination jump from point A to B and shuttle run c. Cool down	5	3	1
10	a. Warm-up b. movement combination jump from point A to B and zig-zag run c. Cool down	5	3	1
11	a. Warm-up b. Movement combination run in a straight line and zig-zag run c. Cool down	5	3	1
12	a. Warm-up b. Movement combination run in a straight line and zig-zag run c. Cool down	5	3	1
13	a. Warm-up b. Movement combination jump from point A to B and shuttle run c. Cool down	3	5	1
14	a. Warm-up b. Movement combination jump from point A to B and zig-zag run c. Cool down	3	5	1
15	a. Warm-up b. Movement combination run in a straight line and zig-zag run c. Cool down	3	5	1
16	a. Warm-up b. Movement combination run in a straight line and shuttle run c. Cool down	3	5	1

Table 2. The criteria used in the assessment improve students' balance and agility subject

Value		Criteria	Assessment Aspects
86 – 100	A	Very good	Good Balance and agility
76 – 85	B	Good	Less Balanced and Less Agile
66-75	C	Enough	Less Balanced and Less Agile
55-65	D	Not Enough	Not Balance and agile
<54	Not Pass	Kurang	Unbalanced and Not yet agile

Statistical Analysis

The method used in this study is quasi-experimental in the form of a pre-post test design, namely the research method by collecting data from the dependent variable (test of gross motor skills balance and agility of Intellectual impairment) and independent variables (repetition of locomotor movement coordination). The population in this study were Roemah Difabel Students in Semarang City. The sample in this study was Intellectual impairment children to be examined, which amounted to 10 children. The instrument used in this study was a gross motor test, namely walking, running, jumping, and walking tests. Each aspect of the test is assessed with a score of 3 for balanced and agility, 2 for less balanced and agility, and 1 for unbalanced and agility. The data analysis technique used in this study is the Wilcoxon test statistic. After that, the data were tested for normality to find out how normal the data was and continued with hypothesis testing to find out the comparison of the average test before and after being given treatment.

SPSS 26 program was used for statistical analysis in this study. The average (X) and standard deviation (sd) of all test instruments were calculated. In the analysis of normality between groups calculated along with homogeneity tests were carried out to find out whether the data set under study had the same characteristics or not. This study found that the data had an abnormal distribution because the balance value $P = 0.000 < 0.05$ and agility $P = 0.000 < 0.05$, it can be said that the Shapiro-Wilk normality test was used because the sample in this study was less than 30 and for this study, the variables were not normally distributed. To compare the group 'Wilcoxon test, one of the nonparametric tests, the basis for decision-making, is the Asymp. Sig value <0.05 then the hypothesis is accepted if the Asymp. Sig value> 0.05 then the hypothesis is rejected. This study established a significance level of $p < 0.05$

RESULTS AND DISCUSSION

Results and Discussion

Table 1. Age of Subject

No	Age	F	%
1	0-20 Years	1	10
2	21-40 Years	8	80
3	41-60 Years	1	10
4	61-80 Years	0	0
5	81-100 Years	0	0
SUM		10	100

Table 2. Gender Subject

No	Gender	F	%
1	Male	6	60
2	female	4	40
SUM		10	100

Table 3. Anthropometry Subject

Variable	Mean ±Sd.Deviation (N=10)	Mean ±Sd.Deviation (N=10)	Δ
	Pre-Test	**Post-Test**	
Height (cm)	148,24 ± 15,48	148,61± 15,37	-0,37
Weight (Kg)	66,07 ± 12,001	65,66±11,76	0,41
Mid upper arm circumference (Cm)	26,9 ± 2,91	26,15 ± 3,16	0,75
Leg length (Cm)	79,9 ± 10,08	79,57 ± 9,89	0,33
Sitting height (Cm)	68,9 ± 6,37	68,75 ± 6,28	0,15

Table 4. Data Comparison of Pretest and Posttest Balance Results

No	Name Of Subject/ Age	Pretest	Posttest	Increase Value Results
1	Subject 1 M / 25 Years	33	100	67
2	Subject 2 A/ 23 Years	33	67	34
3	Subject 3 Y/ 23 Years	33	100	67
4	Subject 4 L/ 23 Years	67	100	33
5	Subject 5 Si/ 20 Years	67	100	33
6	Subject 6 V/ 22 Years	67	67	0
7	Subject 7 W/ 24 Years	33	100	67
8	Subject 8 Ai/ 23 Years	67	100	33
9	Subject 9 Y/ 44 Years	33	67	34
10	Subject 10 AL/ 24 \ Years	67	100	33

Table 5. Data Comparison of Pretest and Posttest Agility Results

No	Name Of Subject/ Age	Nilai Pretest	Nilai Posttest	Increase Value Results
1	Subject 1 M / 25 Years	33	67	34
2	Subject 2 A/ 23 Years	33	100	67
3	Subject 3 Y/ 23 Years	33	100	67
4	Subject 4 L/ 23 Years	67	67	0
5	Subject 5 Si/ 20 Years	67	100	33
6	Subject 6 V/ 22 Years	67	100	33
7	Subject 7 W/ 24 Years	67	100	33
8	Subject 8 Ai/ 23 Years	33	67	34
9	Subject 9 Y/ 44 Years	33	67	34
10	Subject 10 AL/ 24 Years	33	100	67

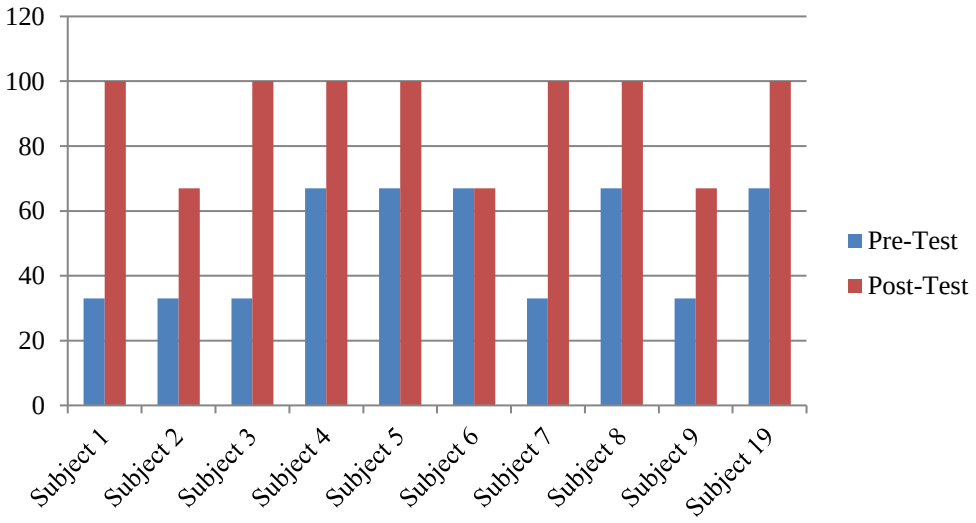

Figure 1. Graph of Subject Balance Pre-Test and Post-Test Results

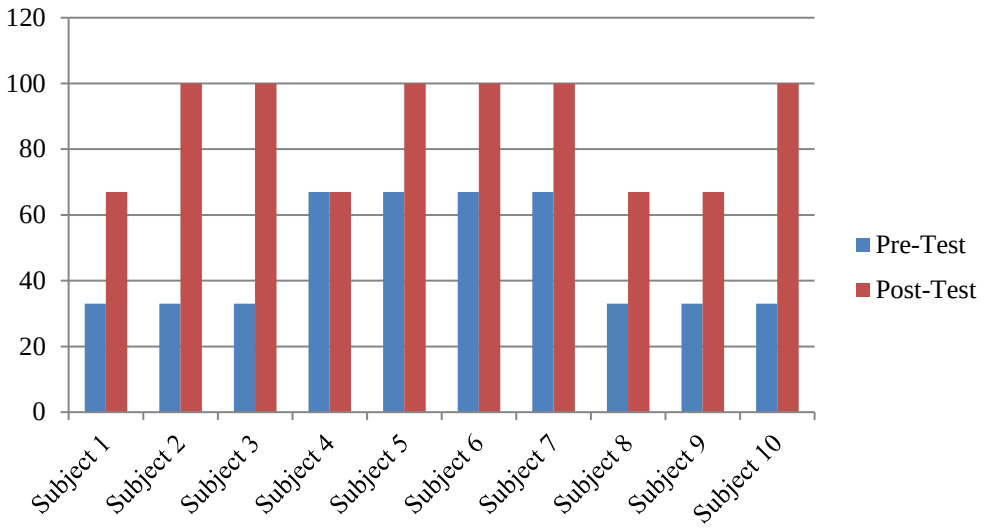

Figure 2. Graph of Subject Agility Pre-Test and Post-Test Results

Figures 1 and 2 show an increase in gross motor skills between the pretest and posttest of 10 samples of Intellectual impairment children in Roemah Difabel Semarang City with the method to improve gross motor skills in Intellectual impairment children, especially in balance and agility.

Table 8. Subjects' Agility and Balance Improvement

Variable	Mean ±Sd.Deviation(N=10)	Mean ±Sd.Deviation(N=10)	Δ	P
	Pre-Test	Post-Test		
Balance	50 ± 17.91	90,10 ± 15,94	-40,1	0,007
Agility	46,60±17,55	86,80±17,04	-40,2	0,007

Table 8 shows the average value of Pretest balance Motion of 50 ± 17.91 and post-test of 90.10 ± 15.94 and p-value = 0.007 increase in the balance of 40.10 and average agility pretest 46.60 ± 17.55 and posttest 86.80 ± 17.04 p-value = 0.007 The average value of the difference in agility improvement is 40.2. The results of the analysis obtained p value = 0.007 Wilcoxon Test Decision Making Basis If the Asymp. Sig Value <0.05 then the hypothesis is accepted if the Asymp. Sig value> 0.05 then the hypothesis is rejected decision making. Based on the Statistics Test, it is known that Asymp.sig.(2-talled) is worth 0.007. Because the value of 0.007 is smaller than <0.05, it can be concluded that "The Hypothesis is Accepted". This means that there is a difference between the gross motor movements of Intellectual impairment children for the pretest and post-test, so it can be concluded that "the effectiveness of locomotor coordination exercises on improving gross motor skills in students with disabilities in Semarang City".

Based on the results of the study using the locomotor movement training method, showed that the 10 subjects studied got better posttest scores than the results from the pretest. Gross motor skills require coordination between body parts such as coordination between hands and feet, feet and eyes, or eyes with hands, students with disabilities in Semarang City have difficulty coordinating their body parts, especially in their gross motor skills.

Learning by using the locomotor movement coordination exercise method aims to improve The children's gross motor skills have been determined regarding aspects of agility and balance. The results of the study also showed that there were 10 subjects doing locomotive activities for 16 treatments in the form of walking, jumping, and running. Locomotor motion is defined as a movement that moves places such as walking, running, and jumping. These three skills are defined as basic locomotor skills because they are skills that develop with development and are more functional. The locomotor movement training method is also considered to be able to give students more active walking, running, and jumping in increasing gross motor strength.

Research conducted by (Kurniawati, 2017)Gross motor development developed through locomotor movement exercises is carried out with three indicators obtained from the Standards for Child Development Achievement Levels (STPPA) which can perform coordinated body movements to train balance, and agility; able to coordinate eye-foot-hand-head movements in imitating dance or gymnastics; skillfully using the right and left hands.

Research conducted by (Muhammad Aris, 2014)can be seen that locomotor movement activities jumping hoops, tiptoe walking in a straight line, zig-zag running, and running back and forth can improve gross motor skills, especially aspects of balance, strength, and agility Group B children of Kindergarten ABA Gondang.

This research is related to research conducted by researchers in disabled homes in Semarang City which shows the importance of locomotor movement coordination to improve balance and agility movements in Intellectual impairment. Where in this study the researchers made coordination movement instruments such as walking in a straight line and jumping as balance and running zig-zag and running back and forth as agility are locomotor movement training instruments that are easy to do to train motor skills. k rough children with special needs, because in previous research the test instrument used sports equipment or traditional games.

Based on the discussion above, the results of data analysis show that the hypothesis is accepted because the post-test value is higher than the pre-test, which means that there is an effect of Locomotor Coordination Exercises on increasing student balance and agility in Roemah with disabilities, Semarang city.

CONCLUSION

The study concluded that 16 times of locomotor exercise improved the balance and agility of children with intellectual impairment. Based on the discussion above, the results of the data analysis show that the hypothesis is accepted because the post-test value is higher than the pre-test. It can be concluded that there is an effect of Locomotor Movement Coordination Exercises on increasing student balance and agility in Roemah with disabilities in Semarang City.

CONFLICT OF INTEREST

The authors claim that there is no conflict.

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