Multilateral activity model: improving children's gross motor

Modelo de actividad multilateral: mejora de la motricidad gruesa en niños

Authors

Anggi Setia Lengkana[1]
Tatang Muhtar [2]
Tedi Supriyadi [3]
Fadilah Umar [4]
Djoko Nugroho [5]
N Siti Nuraeni Sofa [6]

[1,2,3] Universitas Pendidikan Indonesia, Bandung (Indonesia)
[4] Universitas Sebelas Maret (Indonesia)
[5] Universitas Sebelas Maret (Indonesia)
[6] Universitas Sebelas April Sumedang (Indonesia)

Corresponding author:
Anggi Setia Lengkana
asetialengkana@upi.edu

How to cite in APA

Lengkana, A. S. (2025). Multilateral activity model: improving children's gross motor. *Retos*, *67*, 289–300. https://doi.org/10.47197/retos.v67.110796

Abstract

Introduction: Gross motor development of children is very important for their physical and cognitive growth. However, many children face difficulties in this regard. Multilateral activity models involving various body movements can be effective in stimulating and improving gross motor skills in early childhood.
Objective: This study aims to determine whether multilateral activity models can improve children's gross motor skills. The instrument used is the Basic Motor Test with movement guidance to measure its impact, with a pre-experimental group pre-test-post-test research strategy and using the Gross Motor Skill test.
Results: The normality test with Kolmogorov-Smirnov showed a Sig. value of 0.00 for the pretest and posttest of multilateral activity, which means that the data is not normally distributed because the significance value is less than 0.05 (0.00 < 0.05). The Wilcoxon test showed a positive increase from pretest to posttest, with an average increase in rating of 17.00 and a total rating of 561.00 from 33 respondents. There were five respondents who had exactly the same value. The results of the Wilcoxon test showed a Sig. value of 0.00, which is less than 0.05, so the hypothesis is accepted. This evidence confirms that multilateral activity has a significant effect on increasing children's gross motor skills. In addition, the determination test showed an R-square value of 0.977, which means that 97.7% of children's gross motor skills can be explained by the influence of multilateral activity.
Conclusion: So it can be concluded that the multilateral activity outcome variable has a significant influence on the gross motor outcome variable.

Keywords

Model, multilateral activity, children's gross motor, young athletes.

Resumen

Introducción: El desarrollo motor grueso de los niños es fundamental para su crecimiento físico y cognitivo. Sin embargo, muchos niños presentan dificultades en este aspecto. Los modelos de actividad multilateral que involucran diversos movimientos corporales pueden ser eficaces para estimular y mejorar la motricidad gruesa en la primera infancia.
Objetivo: Este estudio busca determinar si los modelos de actividad multilateral pueden mejorar la motricidad gruesa de los niños. El instrumento utilizado es la Prueba Motora Básica con guía de movimiento para medir su impacto, con una estrategia de investigación grupal preexperimental pre-test-post-test y utilizando la Prueba de Motricidad Gruesa.
Resultados: La prueba de normalidad con Kolmogorov-Smirnov mostró un valor de significancia de 0,00 para el pretest y el postest de la actividad multilateral, lo que significa que los datos no se distribuyen normalmente porque el valor de significancia es menor que 0,05 (0,00 < 0,05). La prueba de Wilcoxon mostró un aumento positivo del pretest al postest, con un aumento promedio en la calificación de 17,00 y una calificación total de 561,00 de 33 participantes. Cinco encuestados obtuvieron exactamente el mismo valor. Los resultados de la prueba de Wilcoxon mostraron un valor significativo de 0,00, inferior a 0,05, por lo que se acepta la hipótesis. Esta evidencia confirma que la actividad multilateral tiene un efecto significativo en el aumento de la motricidad gruesa de los niños. Además, la prueba de determinación mostró un valor R-cuadrado de 0,977, lo que significa que el 97,7 % de la motricidad gruesa de los niños se puede explicar por la influencia de la actividad multilateral.
Conclusión: Por lo tanto, se puede concluir que la variable de resultado de la actividad multilateral tiene una influencia significativa en la variable de resultado de motricidad gruesa.

Palabras clave

Modelo, actividad multilateral, motricidad gruesa infantil, atletas jóvenes.

Introduction

Children are an investment and source of the future development of a nation. Correct management and treatment of children will increase the chances of achieving future progress for a nation and state. The physical development aspect is a dominant factor that cannot be ruled out, in fact it is a priority to be managed properly and optimally. Through school and outside school, physical activity is an activity that needs to be programmed with correct management through a child growth and development approach (Flavier et al., 2002). If adults have sports activities in the form of sports with standard facilities, then children need the implementation of physical activities with all the equipment that is unique to the characteristics and nature of the child. This condition is very necessary so that children can carry out physical activities and sports in accordance with their growth and development. This is done in an effort to develop self-management skills in an effort to develop and maintain physical fitness and a healthy lifestyle through various selected physical activities and sports (Dai et al., 2024; Mulya et al., 2021, 2023). Limited time in carrying out physical activities in physical education learning will affect children's movement experience in carrying out each activity. Because there is a need for freedom of time and activities to support children's movement experiences. For this reason, it is possible to develop physical activity outside of school hours through coaching in sports clubs for beginners, which incidentally are inhabited by children aged 6-12 years (UNICEF-ONU-UNESCO, 2009). Activities that can be carried out in the form of games but represent every basic movement in every sport, such as what is called multilateral activity.

Multilateral activity is overall physical development (Nurulfa, 2017). Through this development, children carry out natural movements and biomotor development such as speed, flexibility, agility, coordination and all aspects of fitness in general. The same thing was stated by multilateral development that it is important for children to develop various basic skills that can help children become athletes in fulfilling special sports training. The development of this multilateral movement training model is a development of a training model based on freedom of movement in children as an effort to instill broad base movements. The basic exercises developed include running/walking, jumping, throwing, catching, rolling and maintaining balance. Multilateral training is development based on children's freedom of movement as a broad basic effort to develop future performance (Lumintuarso, 2019, 2020). The importance of multilateral training has been recognized by sports scientists which is characterized by the inclusion of this multilateral training in the training system pyramid, as practiced by Bompa, Thompson, and other experts (Cataldi et al., 2019). Sports scientists have presented and suggested for designing long- term and continuous exercises through clear training stages from multilateral basic exercises, advanced training, and development exercises, leading to optimal achievement (Hidayat et al., 2022; Lengkana et al., 2024; Subarna et al., 2021). It is clear that multilateral activity programs must be planned and systematic, because the main achievement of this program is the overall development of children in the future.

Through multilateral coaching, it is hoped that children will gain a broad movement foundation, thereby enabling children to have comprehensive movement skills, which in turn will become the basis for determining the child's future potential in sports. (Capehart, 2001) has proposed and written about a multilateral development model. A multilateral development model is based on the idea that children must develop a variety of basic skills before specializing in one sport and reaching peak levels of achievement. Multilateral developments during the developmental years are the basis for subsequent training periods when specialization becomes the main focus in a learning plan. If implemented seriously, multilateral training will lead a child to the psychological development necessary to maximize his performance later in his future career history. (Bompa, .O. Tudor & Buzzichelli, 2015) emphasizes that, multilateral development during the athlete's formative years lays the groundwork for later periods of training when specialization becomes a greater focus of the training plan. If properly implemented, the multilateral training phase will allow the athlete to develop the physiological and psychological bases needed to maximize performance later in his career. This should be a reference for teachers and trainers of elementary school age children that in order to prepare human resources from an early age they must be prepared as well as possible, because not only do they grow well physically, but their psychology also develops (Guntoro et al., 2025; Setiawan et al., 2024).

Many studies have supported the idea that multilateral coaching and physical activity interventions for kids are closely linked to their growth and development. For example, (Hidyah, 2011) found that the

multilateral training model significantly differs from the conventional training model's impact on basketball players' physical condition and is superior to the latter. Then (Nurulfa, 2017) concluded that students can learn sprinting effectively by employing multilateral sprint training. (Lumintuarso, 2019) concluded that the multilateral training model is an exercise program for novices between the ages of 10 and 12 that includes a variety of fundamental sports movements that can be utilized in elementary schools, particularly in the fourth and sixth grades. Then, a meta-analysis by (Wu et al., 2023) found that children who participated in physical activity at school had better cardiovascular fitness levels. The most significant results were from programs involving moderate to high-intensity physical activity for at least 30 minutes daily. Executive functions, such as attention and control, can be improved in elementary school children with physical activity before class, according to research conducted by (Donnelly et al., 2016). (Zhao et al., 2024) explained that video games involving physical activity, or exergames, can help children become more active. Children who play extreme video games do more physical activity than regular video games. Physical activity interventions before school can improve cognitive abilities in children (García-Hermoso et al., 2020). (Andermo et al., 2020) explained that physical activity interventions in schools can improve children's mental health.

Not many studies have researched the effect of multilateral activities on improving children's gross motor skills. This is needed because the goal of motor development is mastery of skills reflected in the ability to complete specific motor tasks. Motor quality is seen from how far the child can display the given motor tasks with a high level of success in carrying out motor tasks, meaning that the motor skills he does are practical and efficient. So gross motor skills aim to improve motor skills, maintain and enhance physical fitness, instil self-confidence, work together, and behave in a disciplined, honest, and sporty manner. Therefore, this study further analyses the application of the multilateral activity model to improve children's gross motor skills.

Method

The research design used is a quantitative research design, quantitative research design involves collecting and analyzing numerical data (Sharma et al., 2023). The approach used in this research is a pre-experimental approach. Pre-experimental design is a design that includes only one group or class that is given pre- and post-tests (Asmus & Radocy, 2017). This one group pretest and posttest design was carried out on one group without a control or comparison group.

Participants

This study's population was 65 children who were members of sports clubs, which consisted of martial arts clubs, large and small ball games, and individual sports clubs. The sampling technique used is purposive sampling. Purposive sampling is a technique for determining research samples with certain considerations with the aim of making the data obtained more representative (Rai & Thapa, 2019). Some considerations include: 1) age 7-8 years. So the number of samples who took part in research activities was 38 people.

Procedure

Before the research was carried out, the author prepared the things needed for the research such as a research permit, instruments using the Gross Motor Skill Test. The author coordinates with parents to make the research process easier. Because it will definitely take up time from children's activities. Research activities are carried out during routine training hours, but there are quite a few additional hours during training sessions. This training is carried out for two months, to see how far the child has progressed in improving gross motor skills. The following is the training program for multilateral activities used in this research:

Table 1. Multilateral activity program

Explanation of Basic Physical Ability Activities
Activity Introduction to Organization, Rules, and Formation. One game that can be used to introduce organization, rules and formations is the island game in the middle of the ocean. The goals of this game are: Identify safety and practice the benefits of following rules, Identify clues, Learn start and stop signals,

Move to formation information and instructions, and
Move with limitations. Meanwhile, the equipment used is a piece of carpet per child and 5-10 small bags.
The warm-up is done before playing the game by explaining that the carpet is like an island, each child has their own island and it is very small. Each child should try to stay dry by staying within the carpet piece. After the child has done this, he is then given the command to move and position himself to stand, walk, squat, kneel, stand and hold his fingertips, jump, turn around and sit, but the child must remain on the carpet. If the child is able to do well then the child must be given praise.
The essence of this game is:
Explain formation information. If there is a command for formation information, children carry out and form groups (for example in 3, 4 or 5). After doing this several times, the children remain in formation, then sit down and explain the meaning of the information given when it is related to sports.
Explain the importance of rules and ask whether they are important, such as what happens if there are no rules, and what rules must be in physical education to be safe and.
Explain and ask to write about the rules in physical education such as keep hands still, be careful, listen and look for instructions to stop, be kind (don't fight), listen and do, and do your best.

Fitness Workout 1
Fitness training is done 2 times. Each of these exercises is:
Fitness Workout 1
Goals: a) Flexibility training, b) Running fitness training, c) Explain the importance of training and warming up before the test, d) Demonstrate the relationship between training and flexibility.
Warm up: a) Stand up straight and touch your hands to your feet with your legs straight, and b) Sleep on your stomach then bend your body and walk slowly towards your hands,
Activities carried out: a) Carrying out flexibility test exercises by sitting stiffly, straightening and bending the body as much as possible and stopping until it hurts, and b) Running training for 400 m with a track made of 7 squares. The run was carried out 4 times. Each run 100 m to the end of the track. Continue until you finally run 400 m.
Closing: a) Explain the benefits of training tests, both flexibility and running (cardio respiration).

Fitness Workout 2
Goals: a) Practice doing sit ups correctly, b) Practice doing push ups correctly, and c) Work together by watching friends do sit ups and push ups.
Activities: a) Push ups: start by sleeping on your stomach and placing your toes and hands next to your chest, straightening your arms and keeping your body straight, and doing push ups in pairs and observing each other. b) Sit ups: do sit ups slowly with your legs bent and your arms crossed against your chest. and feel the muscles working.
Closing: discuss the importance of doing push-ups and sit-ups with children and provide reinforcement about sit-ups and push-ups.

Circuit Training Exercises
Goals: 1) demonstrate fitness circuit 1, 2) explain that good exercise is done at least 3 times a week, and 3) Explain that physical fitness means having enough energy to move all day and be healthy.
Warm up: 1) Do a warm up routine which includes Stretching body standing (16 counts), rag doll (16 counts), side lunges (16 counts), knee dips (16 counts), airplane circle: Rotate forward 8 counts and rotate backwards 8 counts each done 2x8 counts 2) Explain that you will do the exercise by changing activities very slowly, then do it again with increasing speed and finally you will do it as quickly as you can.
Circuit training exercise 1 which includes: station 1: Jumping jacks, station 2: airplane circles, station 3: sit ups, station 4: crab walk, station 5: push ups, station 6: rope jump. Exercise repetitions: 1) Round 1: time for each station 15 seconds and rest time 15 seconds, 2) Round 2: time for each station 20 seconds and rest time 15 seconds, 3) Round 3: time for each station 25 seconds seconds and rest time 15 seconds, 4) Round 4: time for each station 30 seconds and rest time 15 seconds,
Circuit training exercise 2 which includes: 1) Station 1: zig-zag run, 2) Station 2: hip raise, 3) Station 3: line jump, 4) Station 4: tricep push up, 5) Station 5: agility run and 6) Station 6: crunches.

Games and Sports
In games and sports activities, planning includes skills training. The exercises are as follows:
Recognition of the child's body parts. The equipment used is a small bag filled with cotton. The warm-up is done by throwing bags using zig-zag throws in pairs. After warming up, the child is asked to hold the bag and on command, place the bag on parts of the child's body (for example head, shoulders, hands, feet, etc.) then the child names the body part. This activity is carried out on foot or on the spot.
Throwing, Catching and Throwing the bag Throwing and catching through the rope. The initial throwing and catching was done without using rules. After doing this several times, the rules for throwing with the right hand (unless left-handed) and catching with the left hand are used.
Apart from using a rope, throwing and catching can also be done using a sinpai or with a lever that you step on yourself so that the bag can float and then be caught. After the child throws and catches using a bag, then continue with using a foam ball, tennis ball and finally a tennis ball. In this way, the level of difficulty will always increase and readiness to learn the game of softball will be higher.
Locomotor skills with obstacles. In this activity, children carry out walking, running and jumping activities for 20 minutes with predetermined obstacles.

Instrument

Gross motor skills are movement abilities that involve the strength of large muscles (body muscles, arms and legs) which are used to carry out the task of a movement. These gross motor skills can be an indicator in detecting delays and disorders in a child's development. If it is not detected as early as possible, it will affect his ability to learn and socialize. Therefore, special measuring instruments are needed to detect it. The research instrument used the Gross Motor Skills Test for ages 3-10 years. The Gross Motor Skills Test is a test to measure an individual's basic motor skills, which develop from an early age. For more details, the following are the test instruments used in this research: The instrument in this study used the Gross Motor Skills Test proposed by (Suharjana, 2019).

Table 2. Gross Motor Skills Test

No	Test form	Evaluation
1.	Running speed 20 Meters	Time counts in completing the 20-meter run quickly and placing a good starting position.
2.	Arm strength by throwing a tennis ball	Add the number of balls that go into the basket from the 20 available balls, throw catch the ball on target with 3 positions, from middle, top to bottom and side.
3.	Leg strength through wide jumps	Directly to the right on the preset cone, jump as far as you can from the available cones.
4.	Balance by walking on a 4 m long beam	See the balance Step by Step that doesn't touch the airy.
5.	Balance by walking on a 4 m long beam	Leg strength through wide jumps

Data analysis

The test uses statistics to determine the significance of the research findings. Using IBM SPSS version 22 for Windows, this data analysis examines quantitative data based on the study's conclusions. The statistical testing stage was carried out after the initial and final test data were collected; the goal was to find a statistical description and then test for normality with Shapiro-Wilk. Then, because the data was not standard, the next test step was a non-parametric hypothesis test using Wilcoxon to see the effect of the model on children's gross motor skills. The next step is the Simple Linear Regression Test, which is used to know the percentage of the impact of X on Y.

Results

Data Descriptions

This research took the form of a pre-test and post-test involving various educational games to hone motor skills in 18 meetings. The following are the pre-test and post-test results:

Table 3. Description of Pre-test – Post-test Results

	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
pretest	38	40	19	59	45.39	1.889	11.645	135.597
postest	38	51	19	70	54.76	2.572	15.853	251.321
Valid N (listwise)	38							

Table 3 shows that the N value or number of samples is 38. The minimum pretest value is 19 and the posttest is 19, the maximum pretest value is 59 and the maximum posttest value is 70. The mean or average pretest value is 45.39 and the average value posttest is 54.76, the standard deviation value on the pretest is 11.645 and on the posttest is 15.853.

Normality Test

The normality test is carried out to determine whether the data distribution is normal or not using Kolmogorov-Smirnov with the help of SPSS version 21. Data is said to have a normal distribution if the significant value is more than 0.05 or Sig. (2-tailed) > 0.05 and if less than 0.05 or Sig. (2-tailed) < 0.05 then the distribution is not normal.

Table 4. Normality Test Results Data

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
pretest	.273	38	.000	.838	38	.000
postest	.314	38	.000	.770	38	.000
Lilliefors Significance Correction						

Table 4 shows the results of the normality test for the pretest and posttest multilateral activity tests, showing that Sig. (2-tailed) shows the results of Sig. 0.00 so that the variable significance value is smaller than 0.05 or 0.00 < 0.05. So from these results it can be concluded that the data is not normally distributed.

Wilcoxon test

The modified Wilcoxon test is carried out to test differences between paired data, test comparisons between observations before and after treatment and determine the effectiveness of a treatment. The Wilcoxon test was carried out as an alternative to the paired sample t test because the data is not normal.

Table 5. Wilcoxon Test Results Data

		N	Mean Rank	Sum of Ranks
postest_seluruhkelas - pretest_seluruhkelas	Negative Ranks	0[a]	.00	.00
	Positive Ranks	33[b]	17.00	561.00
	Ties	5[c]		
	Total	38		

a. postest < pretest
b. postest> pretest
c. postest= pretest

Table 5: In the results that have been searched for negative rank, 33 respondents did not experience a decrease, either in terms of mean rank (average) or sum of rank (total). Positive rank saw an increase in pretest to posttest seen from 33 respondents, the increase in mean rank was 17.00 and the sum of ranks was 561.00. For ties, there are exactly the same values, there are 5 respondents.

Table 6. Test Statistics

Test Statistics	
	Postest-pretest
Z	-5.026b
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

It can be seen from the results that have been tested that the Wilcoxon test results have a Sig value. 0.00, where the basis for decision making is a Sig value <0.05, the hypothesis is accepted. The results of the data that have been input with SPSS version 21 show that the N value or number of samples is 38. The minimum pretest value is 19 and the posttest is 19, the maximum pretest value is 59 and the maximum posttest value is 70. The mean or average pretest value 45.39 and the average posttest value is 54.76, the standard deviation value on the pretest is 11.645 and on the posttest is 15.853. Normality test results for the multilateral pretest and posttest activity tests show that Sig. (2-tailed) shows the results of Sig. 0.00 so that the variable significance value is smaller than 0.05 or 0.00<0.05. So from these results it can be concluded that the data is not normally distributed. The researcher continued with the next stage of calculation using the Wilcoxon test. The data shows that the results of the research, for the negative rank of 33 respondents, did not experience a decrease, either in terms of mean rank (average) or sum of rank (total).

For Positive rank, the increase in pretest to posttest was seen from 33 respondents, the increase in mean rank was 17.00 and the sum of ranks was 561.00. For ties, there are exactly the same values, there are 5 respondents. Meanwhile, it can be seen in the statistical test table that it can be seen from the results that have been tested that the Wilcoxon test results are with a Sig value. 0.00, where the basis for decision making is a Sig value <0.05, the hypothesis is accepted. All the results provide confirmation that there is an influence of multilateral activities improving children's gross motor skills. The test results showed a significant increase in each respondent.

Simple Linear Regression Test

Table 7. Simple Linear Regression Test

Model	Change Statistics				
	R Square Change	F Change	df1	df2	Sig. F Change
1	.977[a]	1514.517	1	36	.000

a. Predictors: (Constant), pretest_seluruhkelas

Based on table 7 of the determination test, it was found that R Square was 0.977, which means that the influence of multilateral activities on gross motor skills was 97.7%. The conclusion based on the analysis obtained is that there is a significant influence between multilateral activities on gross motor skills of 97.7%, 2.3% is influenced by other than gross motor skills.

Discussion

Children's general growth and well-being are greatly dependent on the development of their gross motor abilities. In addition to promoting physical activity, these abilities also support the growth of the brain and emotions (Greco et al., 2019; Perič & Komínková, 2021). Studies reveal that physical activity improves children's gross motor abilities, which has a good impact on their executive functions and emotional intelligence. For example, emphasize how engaging in physical activities aids in children's adaptation to shifting surroundings, enhancing their executive and gross motor abilities—two things necessary for emotional control and comprehension (Yuhua Li et al., 2023). According to (Fernandes et al., 2022; Veldman et al., 2023), there is a noteworthy correlation between gross motor abilities and executive function in preschool-aged children, indicating that motor skills lay the groundwork for cognitive development.

Furthermore, it is impossible to exaggerate the significance of promoting gross motor development in early life. underline that offering suitable physical activities is essential for preschoolers' best gross motor development (Malambo et al., 2022). This is consistent with the findings of, who contend that kindergarten physical education is crucial for fostering the development of fundamental motor skills, which are necessary for children's physical literacy and general health (Liu et al., 2022). According to (Gao & Wang, 2019), incorporating structured exercises can improve kids' motor abilities over time and increase their likelihood of participating in sports and other physical activities in the future.

Creative methods like dance and rhythmic gymnastics have been demonstrated to be a useful means of augmenting structured physical activity in the development of gross motor abilities. discovered that dancing exercises greatly improve kids' gross motor skills, encouraging creativity and self-assurance (Goodway et al., 2014; Jafar et al., 2023). It has also been stated that training in rhythmic gymnastics improves children's social acceptance and self-esteem in addition to helping them enhance their gross motor abilities (Mastrogianni et al., 2020; Pushkina, 2024). According to these results, including a variety of physical activities can accommodate children's various interests and learning preferences while also promoting their motor development. It is also crucial for educators and caregivers to support gross motor skills. underline the value of using instructional strategies that develop motor skills in early childhood settings and promote a mastery environment that motivates kids to participate actively in physical activity (Goodway et al., 2014). Moreover, research has indicated that the creation of instructional models, such circuit games, can effectively improve children's gross motor skills between the ages of four and five (Veldman et al., 2016). This emphasizes the necessity of focused treatments that are entertaining and instructive in order to maximize kids' development of motor skills.

Additionally, studies show a strong correlation between children's cognitive and social development and their gross motor skill development. For instance, research (Barnett et al., 2016, 2019) revealed that preschoolers who were more active had improved motor competence. This is important because it will enable the children to participate in physical activities when they get older (Lengkana et al., 2019; Muhtar et al., 2020, 2021; Razali et al., 2023). The findings of further corroborate this association, indicating that although gross motor development may not directly affect cognitive capabilities, it does promote the development of particular cognitive capacities, such visual-spatial memory (Dillmann et al., 2019, 2021). The development of gross motor abilities can therefore have a significant impact on children's academic and social performance.

Recent studies have shown that children's gross motor development is greatly influenced by multilateral activities combining different body movements simultaneously. Activities such as running, jumping, throwing, and moving use more complex body coordination. According to previous studies, physical exercise can help children's gross motor development, including balance, considerable muscle strength, and hand-foot coordination (Rodríguez-Negro et al., 2020). These diverse activities improve various aspects of children's motor development. This aims to increase the speed of achieving gross motor skills.

In addition, previous studies have emphasized the importance of structured physical activity in improving children's gross motor skills. However, most of these studies have concentrated on one type of physical exercise or separate exercises. This can include certain sports or specific strength training (Bukvić et al., 2021; Dapp et al., 2021; Szabo, 2021). The multilateral activity model includes Different types of movements, which aim to improve gross motor skills more comprehensively. This recent study suggests that children's motor development, including physical strength and more complex body coordination skills, can be influenced more broadly. Variations in the types of physical activities that combine different elements of movement can have a more significant impact (Plazibat et al., 2021). Therefore, this multilateral model is considered more efficient in overall gross motor development.

The two approaches have some significant similarities and differences compared to previous studies. One main similarity is that single and multilateral physical activity-based models aim to improve children's gross motor development. Both approaches also emphasize the importance of regular physical exercise to improve children's health and fitness (Melby et al., 2021). However, the main difference lies in the activities' complexity. More specific physical activities tend to provide a narrower focus on developing specific skills, while the multilateral model offers a more comprehensive approach by involving various types of movements that stimulate gross motor development in a broader and more varied aspect variatif (Fischetti & Greco, 2017). Therefore, by integrating other activity elements in the multilateral model, we can improve children's gross motor development, which is fundamental to their overall growth, cognitive development, and emotional well-being.

The diversity of movements applied is a significant strength of the research results that explore the multilateral activity model. Children who take part in multilateral activities have the opportunity to practice various gross motor skills simultaneously. This method also allows children to face different movement challenges, increasing the speed and quality of their motor development. However, a drawback of this study is that implementing the multilateral activity model may require more time, effort, and resources in planning and supervising activities. This contrasts with more straightforward and structured methods that are easier to apply in various environments. However, this approach may not affect children's gross motor development in the same broad way (Greco, 2020).

Conclusions

In conclusion, in this study, the author provides information regarding multilateral activities which have a significant influence on gross motor outcome variables. The background to the influence of varied training models affects the quality of movements of beginner athletes, because at the age of 7-8 years children do not yet have the focus in participating in sports achievements, therefore it is very important for coaches to be able to create variations of training that can motivate children to practice.

Acknowledgements

The author would like to thank the Institute for Research and Community Service of the Indonesian University of Education and various parties involved, including teachers and students who have devoted a lot of time to completing this research.

Financing

This research and publication were funded by the Annual Work Plan and Budget Fund for the Assignment of the Research and Community Service Institute, Universitas Pendidikan Indonesia, Fiscal Year 2024, with the Rector's Decree Number: 392/UN40/PT.01.02/2024.

It is an optional section, which is used to recognize all those who helped to obtain the results of the research, projects that finance the research, colleagues who review the scientific value of the articles, among other variables present.

References

Andermo, S., Hallgren, M., Nguyen, T. T. D., Jonsson, S., Petersen, S., Friberg, M., Romqvist, A., Stubbs, B., & Elinder, L. S. (2020). School-related physical activity interventions and mental health among children: a systematic review and meta-analysis. *Sports Medicine - Open*, *6*(1), 1–27. https://doi.org/10.1186/s40798-020-00254-x

Asmus, E. P., & Radocy, R. E. (2017). Quantitative analysis. In *Critical Essays in Music Education* (pp. 129–171). Routledge. https://doi.org/10.1007/978-3-658-22675-6_3

Barnett, L. M., Hnatiuk, J. A., Salmon, J., & Hesketh, K. D. (2019). Modifiable factors which predict children's gross motor competence: A prospective cohort study. *International Journal of Behavioral Nutrition and Physical Activity*, *16*(1), 1–11. https://doi.org/10.1186/s12966-019-0888-0

Barnett, L. M., Lai, S. K., Veldman, S. L. C., Hardy, L. L., Cliff, D. P., Morgan, P. J., Zask, A., Lubans, D. R., Shultz, S. P., Ridgers, N. D., Rush, E., Brown, H. L., & Okely, A. D. (2016). Correlates of Gross Motor Competence in Children and Adolescents: A Systematic Review and Meta-Analysis. *Sports Medicine*, *46*(11), 1663–1688. https://doi.org/10.1007/s40279-016-0495-z

Bompa, .O. Tudor & Buzzichelli, C. (2015). *Periodization Training for Sport.United States*. Human kinetics. https://books.google.com/books?hl=en&lr=&id=rfFsBgAAQBAJ&oi=fnd&pg=PR1&dq=sports&ots=lDEiTeYjsC&sig=n5pb2Kv267G8xoa4pxxlkv1y-Gc%0Ahttps://mdthinducollege.org/ebooks/training_methods/Periodization_Training_for_Sports.pdf

Bukvić, Z., Ćirović, D., & Nikolić, D. (2021). The importance of physical activity for the development of motor skills of younger school age children. *Medicinski Podmladak*, *72*(2), 34–39. https://doi.org/10.5937/mp72-31878

Capehart, G. M. (2001). Total Training for Young Champions. In *Pediatric Physical Therapy* (Vol. 13, Issue 1). Human Kinetics. https://doi.org/10.1097/00001577-200113010-00013

Cataldi, S., Latino, F., Greco, G., & Fischetti, F. (2019). Multilateral training improves physical fitness and fatigue perception in cancer patients. *Journal of Human Sport and Exercise*, *14*(Proc4), S916–S926. https://doi.org/10.14198/jhse.2019.14.Proc4.54

Dai, I. S., Lengkan, A. S., Dinangsit, D., & Razali, R. (2024). Athletes' Sleep Quality: Performance Study in Football Clubs Aged 13-15 Years. *International Journal of Disabilities Sports and Health Sciences*, *7*(4), 896–904. https://doi.org/10.33438/ijdshs.1486231

Dapp, L. C., Gashaj, V., & Roebers, C. M. (2021). Physical activity and motor skills in children: A differentiated approach. *Psychology of Sport and Exercise*, *54*, 101916. https://doi.org/10.1016/j.psychsport.2021.101916

Dillmann, J., Freitag, C., Lorenz, B., Holve, K., Schweinfurth, S., & Schwarzer, G. (2021). Motor and Visual-spatial Cognitive Abilities in Children Treated for Infantile Esotropia. *Perceptual and Motor Skills*, *128*(4), 1443–1463. https://doi.org/10.1177/00315125211011726

Dillmann, J., Schwarzer, G., & Peterlein, C. D. (2019). Motor and cognitive functioning in children treated for idiopathic clubfoot at the age of 3 years. *BMC Pediatrics*, *19*(1), 1–6. https://doi.org/10.1186/s12887-019-1765-3

Donnelly, J. E., Hillman, C. H., Castelli, D., Etnier, J. L., Lee, S., Tomporowski, P., Lambourne, K., & Szabo-Reed, A. N. (2016). Physical activity, fitness, cognitive function, and academic achievement in children: a systematic review. *Medicine and Science in Sports and Exercise*, *48*(6), 1197.

Fernandes, A. C., Viegas, Â. A., Lacerda, A. C. R., Nobre, J. N. P., Morais, R. L. D. S., Figueiredo, P. H. S., Costa, H. S., Camargos, A. C. R., Ferreira, F. D. O., de Freitas, P. M., Santos, T., da Silva Júnior, F. A., Bernardo-Filho, M., Taiar, R., Sartorio, A., & Mendonça, V. A. (2022). Association between executive functions and gross motor skills in overweight/obese and eutrophic preschoolers: cross-sectional study. *BMC Pediatrics*, *22*(1), 498. https://doi.org/10.1186/s12887-022-03553-2

Fischetti, F., & Greco, G. (2017). Multilateral methods in physical education improve physical capacity and motor skills performance of the youth. *Journal of Physical Education and Sport*, *17*(4), 2160–2168. https://doi.org/10.7752/jpes.2017.s4223

Flavier, E., Bertone, S., Hauw, D., & Durand, M. (2002). The meaning and organization of physical education teachers' actions during conflict with students. *Journal of Teaching in Physical Education*, *22*(1), 20–38. https://doi.org/10.1123/jtpe.22.1.20

Gao, Z., & Wang, R. (2019). Children's motor skill competence, physical activity, fitness, andhealthpromotion. *Journal of Sport and Health Science*, *8*(2), 95.

García-Hermoso, A., Hormazábal-Aguayo, I., Fernández-Vergara, O., González-Calderón, N., Russell-Guzmán, J., Vicencio-Rojas, F., Chacana-Cañas, C., & Ramírez-Vélez, R. (2020). A before-school physical activity intervention to improve cognitive parameters in children: The Active-Start study. *Scandinavian Journal of Medicine and Science in Sports*, *30*(1), 108–116. https://doi.org/10.1111/sms.13537

Goodway, J. D., Famelia, R., & Bakhtiar, S. (2014). Future directions in physical education & sport: Developing fundamental motor competence in the early years is paramount to lifelong physical activity. *Asian Social Science*, *10*(5), 44–54. https://doi.org/10.5539/ass.v10n5p44

Greco, G. (2020). Multilateral Training Using Physical Activity and Social Games Improves Motor Skills And Executive Function In Children With Autism Spectrum Disorder. *European Journal of Special Education Research*, *5*(4), 26–42. www.oapub.org/edu

Greco, G., Cataldi, S., & Fischetti, F. (2019). Effectiveness of a short after-school intervention on physical fitness in school-aged children extracurricular multilateral training improves physical fitness in children. *Ricerche Di Pedagogia e Didattica*, *14*(1), 143–164. https://doi.org/10.6092/issn.1970-2221/9217

Guntoro, T. S., Prasetyo, Y., Fariz Prima Putra, M., Agung Nanda, F., Pambudi, T., & Nurhidayah, D. (2025). Design feasibility test instrument for sports tourism domain contextual events based on local wisdom. *Retos*, *64*, 381–393. https://doi.org/10.47197/retos.v64.109450

Hidayat, C., Lengkana, A. S., Fauzi, R. A., Rohyana, A., Rosalina, M., Hermawan, D. B., & Purwanto, D. (2022). Levelling System Model: Approach to Physical Literacy. *International Journal of Learning, Teaching and Educational Research*, *21*(11), 334–356. https://doi.org/10.26803/ijlter.21.11.19

Hidyah, T. (2011). Latihan Multilateral Alternatif Untuk Meningkatkan Kondisi Fisik Pemain Bola Basket. *Jurnal Media Ilmu Keolahragaan Indonesia*, *1*(2), 104–111.

Jafar, M., Rinaldy, A., & Yunus, M. (2023). Improving Student Motor Skills through a Structured Physical Training Program. *Journal of Advances in Sports and Physical Education*, *6*(05), 82–95. https://doi.org/10.36348/jaspe.2023.v06i05.003

Lengkana, A. S., Muhtar, T., Supriyadi, T., Safari, I., Kemala, A., Ginting, A., & Raswin. (2024). The DR-GOS Model: Early Detection of the Potential of Children with Disabilities through a Sports Education Approach. *International Journal of Human Movement and Sports Sciences*, *12*(1), 50–58. https://doi.org/10.13189/saj.2024.120107

Lengkana, A. S., Tangkudung, J., & Asmawi, A. (2019). The effectiveness of thigh lift exercises using rubber on the ability of acceleration on sprint runs. *Journal of Physics: Conference Series*, *1318*(1), 12031. https://doi.org/10.1088/1742-6596/1318/1/012031

Liu, J., Li, Y., Zhou, T., Lu, Y., Sang, M., Li, L., Fang, C., Hu, W., Sun, X., Quan, M., & Liu, J. (2022). Relationship Between Gross Motor Skills and Inhibitory Control in Preschool Children: A Pilot Study. *Frontiers in Human Neuroscience*, *16*, 848230. https://doi.org/10.3389/fnhum.2022.848230

Lumintuarso, R. (2019). Multilateral Training Model in Sport Performance. *2nd International Conference on Sports Sciences and Health 2018 (2nd ICSSH 2018)*. https://doi.org/10.2991/icssh-18.2019.35

Lumintuarso, R. (2020). The analysis of implementation and implementing strategy of multilateral development in sport training sessions on young athletes in Indonesia. *International Journal of Human Movement and Sports Sciences*, *8*(6), 428–437. https://doi.org/10.13189/saj.2020.080615

Malambo, C., Nová, A., Clark, C., & Musálek, M. (2022). Associations between Fundamental Movement Skills, Physical Fitness, Motor Competency, Physical Activity, and Executive Functions in Pre-School Age Children: A Systematic Review. *Children*, *9*(7), 1059. https://doi.org/10.3390/children9071059

Mastrogianni, A., Psychountaki, M., & Donti, O. (2020). Self-perceptions and self-esteem in adolescent rhythmic gymnasts: Is training level a determinant? *Science of Gymnastics Journal*, *12*(3), 357–366. https://doi.org/10.52165/sgj.12.3.357-366

Melby, P. S., Elsborg, P., Nielsen, G., Lima, R. A., Bentsen, P., & Andersen, L. B. (2021). Exploring the importance of diversified physical activities in early childhood for later motor competence and physical activity level: a seven-year longitudinal study. *BMC Public Health*, *21*(1), 1–15. https://doi.org/10.1186/s12889-021-11343-1

Muhtar, T., Supriyadi, T., & Lengkana, A. S. (2020). Character development-based physical education learning model in primary school. *International Journal of Human Movement and Sports Sciences*, *8*(6), 337–354. https://doi.org/10.13189/saj.2020.080605

Muhtar, T., Supriyadi, T., Lengkana, A. S., & Cukarso, S. H. I. (2021). Character education in physical education learning model: A bibliometric study on 2011-2020 scopus database. *International Journal of Human Movement and Sports Sciences*, *9*(6), 1189–1203. https://doi.org/10.13189/saj.2021.090613

Mulya, G., Lengkana, A. S., & Agustryani, R. (2021). Tennbastech: A scientific approach to teach tennis. *International Journal of Human Movement and Sports Sciences*, *9*(6), 1371–1382. https://doi.org/10.13189/saj.2021.090633

Mulya, G., Lengkana, A. S., Agustryani, R., Dinangsit, D., Susilawati, D., Nurodin, D., & Rosalina, M. (2023). Brain Jogging: Cognitive Abilities of Beginner Tennis Players. *International Journal of Human Movement and Sports Sciences*, *11*(6), 1327–1336. https://doi.org/10.13189/saj.2023.110617

Nurulfa, R. (2017). Pengembangan Model Latihan Lari Cepat Berbasis Multilateral Untuk Anak Sekolah Dasar. *Gladi Jurnal Ilmu Keolahragaan*, *8*(1), 37. https://doi.org/10.21009/gjik.081.03

Perič, T., & Komínková, L. (2021). *The relationship between multilateral development and specific sport skill acquisition in middle childhood*. https://dspace.cuni.cz/handle/20.500.11956/126751

Plazibat, K., Karuc, J., & Vidranski, T. (2021). Effects of different multi-year physical exercise programs on motor skills in preschool children. *Journal of Functional Morphology and Kinesiology*, *6*(3), 74. https://doi.org/10.3390/JFMK6030074

Pushkina, N. (2024). Developing Social Skills Through Rhythmic Gymnastics in American sport. *Futurity of Social Sciences*, *2*(2), 79–102. https://doi.org/10.57125/fs.2024.06.20.05

Rai, N., & Thapa, B. (2019). A study on purposive sampling method in research. *Kathmandu:Kathmandu School of Law*, *5*(1), 1–12. http://stattrek.com/survey-research/sampling-methods.aspx?Tutorial=AP,%0Ahttp://www.academia.edu/28087388

Razali, Ahadin, Akbari, M., Valianto, B., Rahmati, Lengkana, A. S., & Suhaimi. (2023). Impact of reaction speed, eye-hand coordination, and achievement motivation on backhand drive skills of table tennis players. *Journal of Physical Education and Sport*, *23*(9), 2357–2367. https://doi.org/10.7752/jpes.2023.09271

Rodríguez-Negro, J., Pesola, J. A., & Yanci, J. (2020). Effects and retention of different physical exercise programs on children's cognitive and motor development. *Journal of Educational Research*, *113*(6), 431–437. https://doi.org/10.1080/00220671.2020.1854159

Setiawan, I., Kurniawan, W. R., & Wijayanti, D. G. S. (2024). Implementation of Online Teacher Professional Development Programs: Physical Education Teacher Perspectives. *Retos*, *57*, 445–454. https://doi.org/10.47197/retos.v57.105406

Sharma, L. R., Jha, S., Koirala, R., Aryal, U., & Bhattarai, T. (2023). Navigating the Research Landscape: A Guide to the Selection of the Right Research Design. *International Research Journal of MMC*, *4*(1), 64–78. https://doi.org/10.3126/irjmmc.v4i1.51863

Subarna, Tangkudung, J., Asmawi, M., Lengkana, A. S., Rahman, A. A., Abdulgani, R., Mulyana, D., & Badaru, B. (2021). The effect of endurance, eye-hand coordination, and confidence to volleyball referee performance in West Java. *International Journal of Human Movement and Sports Sciences*, *9*(3), 436–444. https://doi.org/10.13189/saj.2021.090307

Suharjana, P. S. (2019). Improving gross motor skills by kinaestheticandcontemporary-based physical activity in early childhood. *Cakrawala Pendidikan*, *38*(3), 540–551. https://doi.org/10.21831/cp.v38i3.25324

Szabo, D. A. (2021). The importance of motor behavior and balance training in the acquisition of physical activity/sports-related motor skills among children – review. *Health, Sports Rehabilitation Medicine*, *22*(4), 242–247. https://doi.org/10.26659/pm3.2021.22.4.242

UNICEF-ONU-UNESCO. (2009). World-wide Survey of School Physical Education. *Unesco*, 167 s. https://jykdok.linneanet.fi/vwebv/holdingsInfo?bibId=1080751

Veldman, S. L. C., Hammersley, M. L., Howard, S. J., Stanley, R. M., Okely, A. D., & Jones, R. A. (2023). Associations of gross motor skills with self-regulation and executive function in preschool-aged children. *Australasian Journal of Early Childhood*, *48*(3), 234–246.

https://doi.org/10.1177/18369391231175524

Veldman, S. L. C., Jones, R. A., & Okely, A. D. (2016). Efficacy of gross motor skill interventions in young children: An updated systematic review. *BMJ Open Sport and Exercise Medicine*, *2*(1), e000067. https://doi.org/10.1136/bmjsem-2015-000067

Wu, J., Yang, Y., Yu, H., Li, L., Chen, Y., & Sun, Y. (2023). Comparative effectiveness of school-based exercise interventions on physical fitness in children and adolescents: a systematic review and network meta-analysis. *Frontiers in Public Health*, *11*, 1194779. https://doi.org/10.3389/fpubh.2023.1194779

Yuhua Li, Satomi Izumi-Taylor, Kun Wang, Kaitlyn D. Britton, & Gerhild Ullmann. (2023). Comparisons of Gross Motor Development of American and Chinese Preschoolers Children: A Pilot Study. *US-China Education Review A*, *13*(6), 263–272. https://doi.org/10.17265/2161-623x/2023.06.001

Zhao, M., Lu, X., Zhang, Q., Zhao, R., Wu, B., Huang, S., & Li, S. (2024). Effects of exergames on student physical education learning in the context of the artificial intelligence era: a meta-analysis. *Scientific Reports*, *14*(1), 7115. https://doi.org/10.1038/s41598-024-57357-8

Authors' and translators' details:

Anggi Setia Lengkana	asetialengkana@upi.edu	Author/Translator
Tatang Muhtar	tatangmuhtar@upi.edu	Author
Tedi Supriyadi	tedisupriyadi@upi.edu	Author
Fadilah Umar	faddilahumar@staff.uns.ac.id	Author
Djoko Nugroho	djokonugroho@staff.uns.ac.id	Author
N Siti Nuraeni Sofa	nuraeni_sofa@unsap.ac.id	Author