Jurnal Pendidikan Jasmani Indonesia
Volume 21, Issue 2, 2025, 163-173
Available online: https://journal.uny.ac.id/index.php/jpji

Impact of gymnastics to improve motion balance in kindergarten students

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Received: 13 Juni 2025; Revised: 12 November 2025; Accepted: 28 November 2025

Abstrak: Pembelajaran senam merupakan program latihan yang dirancang secara terstruktur untuk meningkatkan keterampilan gerak keseimbangan pada anak usia dini. Penelitian ini bertujuan untuk mengetahui pengaruh pembelajaran senam terhadap kemampuan keseimbangan siswa taman kanak-kanak. Sejumlah tiga puluh siswa terindentifikasi memiliki kesulitan dalam menjaga keseimbangan dipilih sebagai peserta pada kelompok ekspreimen. Peserta diberikan perlakuan melalui program pelatihan senam sebanyak 12 sesi, masing-masing berdurasi 30 menit. Tes awal (Pretest) dilakkan menggunakan tes keseimbangan satu kaki dari instrument Fundamnetal Movement Skills (FMS) selama 40 detik, dan diikuti dengan tes akhir (Posttest) setelah perlakuan. Hasil pretest dan posttest dianalisis menggunakan paired sample t-test dengan Tingkat signifikansi lebih dari 0.05. temuan penelitian menunjukkan adanya peningkatan yang signifikan dalam kemampuan keseimbangan, dengan rata-rata nilai meningkat dari 72.59 pada pretest menjadi 89.65 pada posttest. Hasil ini membuktikan bahwa programm senam selama 12 sesi efektif dalam meningkatkan kemampuan gerak keseimbangan siswa taman kanak-kanak. Latihan senam yang dilakukan secara berulang dan sistematis melalui kegiatan pembelajaran terbbukti memberikan kontribusi positif terhadap perkembangan kemampuan keseimbangan anak.
Keywords: Senam, Keseimbangan, Anak usia dini

Abstract: *Gymnastics learning is a structured exercise program designed to improve balance movement skills in early childhood. The purpose of this study was to determine how learning gymnastics affects kindergarten pupils' ability to balance and move. For the experimental group, thirty students with unbalanced movement were tested. Twelve sessions of 30-minute gym training were administered to the sample. A 40-second one-foot balance test indication was used to examine the treatment sample before a basic movement skill test (FMS). T-Paired was used to test pre-test and post-test results with significance > 0.05. The experimental group's ability to balance improved. The post-test score is 89.65, while the pre-test score is 72.59. It has been demonstrated that the 12-time gymnastics program helps children learn how to balance their movements. Learning gymnastics has an effect on kindergarten children' ability to improve their balance and movement skills. Repeated gymnastics exercises are helpful in helping kindergarten students improve their balance and movement skills.*
Keywords: *Gymnastics, Balance, Early childhood*

How to Cite: Pradipta, G. D., Rachmawati, U., Maliki, O., & Sutono, A. (2025). Impact of gymnastics to improve motion balance in kindergarten students. *Jurnal Pendidikan Jasmani Indonesia*, *21*(2), 163-173. https://doi.org/10.21831/jpji.v21i2.86818

INTRODUCTION

Early childhood balance movement skills are fundamental movement components that young children need to learn. According to Reyes et al. (2019), learning difficulties can arise from early childhood balance deficiencies. Shella & Iyakrus (2023) stated children between the ages of 4 and 6 will have difficulty learning if they are unable to balance their movements perfectly. According to Wilke et al. (2013), the effects of poor balance in early childhood can result in the following: 1) having trouble learning gross motor skills, for example: children will struggle to execute coordinated, whole-body motions like sprinting in zigzags, standing on one leg, jumping using both feet, or climbing stairs without holding on can be hard, 2) regular falls: when moving around, children seem stiff, clumsy, or uncoordinated, making them more likely to trip, fall, and get injured, 3) difficulty in active play: kids

https://doi.org/10.21831/jpji.v21i2.86818

might struggle to take part in playground activities that need balance, like swinging, climbing, or walking on paths, 4) poor posture: children find it tough to keep their backs straight and steady, whether sitting to study or standing, which makes them feel tired during tasks that need concentration.

Children can learn a variety of motions and activities by using balance as a tool (Ilieva, 2015). Having a healthy balance has several advantages, for instance: 1) gross motor skill mastery: assisting kids in learning how to run, jump with one leg, walk on a board, or ride a bicycle, 2) improved body coordination: balance teaches the brain and muscles to cooperate, making a child's motions more accurate, flexible, and less stiff or clunky, 3) injury prevention: when a child trips or loses their footing, their body reacts quickly, can quickly stabilize or fall in a way that lessens the chance of suffering a major injury, 4) good posture: balance strengthens the back and abdominal muscles that support the body. In addition to preventing tiredness during activity, strong core muscles help maintain an upright posture when sitting or standing. According to Yılmaz & Sicim-Sevim (2020), balancing ability must be optimized from a young age. The advantages of balance ability for early childhood are crucial for children to have good mobility skills that will help their learning later in life. It is crucial that early childhood education be planned to enhance children's capacity for balance.

Kindergarten is a learning program for children between the ages of four and six. It helps kids grow physically and emotionally, and prepares them for future schooling. It offers learning opportunities that support their development. Bujang & Darmawan (2019), Calderón, et al. (2020), Masters & Grogan (2018), and Pradipta et al. (2023) stated that a child's "golden age" is when they start to respond to different things and learning experiences around them, whether they are looking for them or not. Veldman et al. (2019), Jürimäe et al. (2018), and Jones et al. (2015) explained that a child's early characteristics can greatly affect their future by shaping whether they grow into a healthy, well-rounded person. Kindergarten helps kids develop skills in language, thinking, and movement. Kadi et al. (2018), Katagiri et al. (2021), Lau & Grieshaber (2018) mentioned that teaching methods in kindergarten should be balanced to make sure that physical activities and movement are included, as they are closely connected to learning and thinking skills. A new and useful way is needed to understand how children should learn.

Building a child's fundamental motor skills is a key part of their kindergarten learning. Research from Bjørgen (2016), Kennedy et al. (2019), Kulinna et al. (2018), Hsieh et al. (2017) showed that kids between the ages of three and five should play physically with their parents. Many studies, including those by Altavilla et al. (2021), Trajković et al. (2016), Durden-Myers et al. (2018), Hoeboer et al. (2016), highlighted that gymnastics is a great activity for helping children of all ages build basic motor skills and boost their overall physical health. Gymnastics teaching can significantly improve a child's overall development (Krüger, 2018, Temple et al., 2016). The movement is easy to adapt to kindergarteners' needs. The movement can be organized around a story thread to motivate children to follow the plot (Pradipta et al., 2023). Kindergarten gymnastics instructors reported dealing with a variety of problems. The children struggle to follow the teacher's directions on balance because of their restricted range of motion. Students lack confidence when they are reluctant to try moving during class. It doesn't appear, and they don't learn how to change their motions to develop balancing movement skills. Students find learning dull as a result.

Gymnastics is the study of simple movements that young children in kindergarten do, like balance and agility, to help them improve their motor skills. Examples of balance include both standing still and moving, such as rolling, stopping, landing, bending, stretching, twisting, spinning, swinging, and climbing. To help kindergarteners better control their bodies, they can be taught to roll forward, climb, walk on a line or beam, and balance on one leg. Šalaj et al.(2019) stated that gymnastics is a type of controlled movement that kids enjoy because it helps them learn about space and balance. Pot et al. (2018) mentioned that certain gymnastics activities can help improve balance by requiring both symmetrical and asymmetrical movements. Eriani & Dimyati (2020) and Leo et al. (2020) explained that gymnastics allows children to move freely based on their imagination, helping them explore, discover, and learn in their own way. Gymnastic learning is the process of learning basic movement skills by improving non-locomotor, manipulative, and locomotor movements. When a child does gymnastics, they can express themselves through movement, which helps develop their fundamental motor skills.

ISSN 0216-1699 (print) | 2581-2300 (online)

Students have trouble following basic movement lessons in kindergarten because they struggled with fundamental movement skills earlier. Their lack of confidence in their own abilities makes them hesitant to try new movements. If kids feel down or stressed from home, they are less likely to participate in school activities. Also, when parents cannot leave them, children tend to be more reserved. According to Van Aart et al. (2017) teachers in kindergarten have more flexibility in how they teach, which makes learning more enjoyable for young children. High school students still have access to gym-based movement education if they want to learn about movement principles.

Using exercises that focus on movement helps teachers improve basic movement skills in kindergarten students (Quin, 2016, Bulca et al., 2020, Ahmad et al., 2016, Lau & Grieshaber, 2018). For example, teachers can teach balance by pretending to be flying planes. This kind of imitation helps students learn how to balance. This method adds excitement and innovation to how basic motor skills are taught. It also introduces a new way to teach gymnastics in kindergartens and helps teachers create simple, easy-to-follow gymnastics routines that help kids meet learning goals for improving basic motor skills. According to the research, using a gymnasium-based learning model can help schools better support children's growth when they start school by developing their basic movement skills.

METHODS

This study was a quasi-experimental design with one group pre-test and post-test. This design was selected to meet the goal of the study which is to measure the causality relationship between the variables.

The research population was students of Asy Syaffa 2 Kindergarten in the Magelang City. We employed the purposive sampling technique and selected the experimental group based on certain criteria that was previously determined and considered relevant to the research purpose. The research sample was kindergarten students aged 4-6 years, the number of the experimental group was 30 students of Asy Syaffa 2 Kindergarten in Magelang City.

The instrument used in this study was the fundamental movement skill (FMS) test. According to Education Department of Western Australia (2013) , the FMS test is designed to evaluate the student's balance ability. In this assessment, the students are required to stand using one leg alternately for at least 40 seconds. Furthermore, the treatment was a gymnastics training program to test the impact on students' balance. The procedure for administering the balance test through pre-and post-tests and the details of the gymnastics training program are presented in Table 1 and Table 2.

Table 1. FMS Balance Test (Education Department of Western Australia, 2013)

No	Test Conditions	Picture
1	The child was first asked to stand on the child's favourite leg for as long as possible or until the researcher told him to stop. Favourite feet are used to determine the preferred feet.	
2	The child should stand in a clean place away from furniture and walls. Hands are placed on the hips and the weight is on the legs option ready for ready, lift instructions.	
3	The non-supporting leg is kept away from the balancing leg and the hand is placed on the hip before the leg is lifted.	
4	Time stopped if: 1. Non-support legs touch the floor to restore balance. 2. The child moves (jumps or slides) with a supportive leg to maintain balance. 3. The support leg rests on the other leg to maintain balance.	
5	No practice is given before the assessment. Two experiments can be given for each leg. The second attempt is given only if the child's score is less than 40 seconds on the first attempt. Record the time for all balance attempts on the scoresheet, the best time for each leg, the maximum score is the one used.	

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Gymnastics is arranged based on rules so that in arranging gymnastics movements there are no injuries. The rules in arranging gymnastics are very helpful for teachers in determining the movements to be arranged in gymnastics. The preparation of gymnastics programs is also based on the kindergarten thematic curriculum, so that the selection of songs or stories in compiling gymnastics follows the thematic each week that has been determined in the kindergarten curriculum. The gymnastics program is carried out 12 times, changes in songs or the shape of the story are carried out by adjusting the theme each week, while the content of the gymnastics is the same, while the preparation of gymnastics is explained in Table 2.

Table 2. Gymnastic Training Program

No	Day	Duration	Exercise
1.	Monday	30 minutes	Gymnastic: Warming up (5 minutes), Core exercises (20 minutes) including: a. immersion exercises, b. relaxation exercises, c. strengthening exercises, d. release exercises. 2) balance exercises, 3) strength and agility training, 4) walk and run, 5) Hop and jump, Cooling down (5 minutes)
2.	Wednesday	30 minutes	Gymnastic: Warming up (5 minutes), Core exercises (20 minutes) including: a. immersion exercises, b. relaxation exercises, c. strengthening exercises, d. release exercises. 2) balance exercises, 3) strength and agility training, 4) walk and run, 5) Hop and jump, Cooling down (5 minutes)
3.	Friday	30 minutes	Gymnastic: Warming up (5 minutes), Core exercises (20 minutes) including: a. immersion exercises, b. relaxation exercises, c. strengthening exercises, d. release exercises. 2) balance exercises, 3) strength and agility training, 4) walk and run, 5) Hop and jump, Cooling down (5 minutes)
4.	Monday	30 minutes	Gymnastic: Warming up (5 minutes), Core exercises (20 minutes) including: a. immersion exercises, b. relaxation exercises, c. strengthening exercises, d. release exercises. 2) balance exercises, 3) strength and agility training, 4) walk and run, 5) Hop and jump, Cooling down (5 minutes)
5.	Wednesday	30 minutes	Gymnastic: Warming up (5 minutes), Core exercises (20 minutes) including: a. immersion exercises, b. relaxation exercises, c. strengthening exercises, d. release exercises. 2) balance exercises, 3) strength and agility training, 4) walk and run, 5) Hop and jump, Cooling down (5 minutes)
6.	Friday	30 minutes	Gymnastic: Warming up (5 minutes), Core exercises (20 minutes) including: a. immersion exercises, b. relaxation exercises, c. strengthening exercises, d. release exercises. 2) balance exercises, 3) strength and agility training, 4) walk and run, 5) Hop and jump, Cooling down (5 minutes)
7.	Monday	30 minutes	Gymnastic: Warming up (5 minutes), Core exercises (20 minutes) including: a. immersion exercises, b. relaxation exercises, c. strengthening exercises, d. release exercises. 2) balance exercises, 3) strength and agility training, 4) walk and run, 5) Hop and jump, Cooling down (5 minutes)
8.	Wednesday	30 minutes	Gymnastic: Warming up (5 minutes), Core exercises (20 minutes) including: a. immersion exercises, b. relaxation exercises, c. strengthening exercises, d. release exercises. 2) balance exercises, 3) strength and agility training, 4) walk and run, 5) Hop and jump, Cooling down (5 minutes)
9.	Friday	30 minutes	Gymnastic: Warming up (5 minutes), Core exercises (20 minutes) including: a. immersion exercises, b. relaxation exercises, c. strengthening exercises, d. release exercises. 2) balance exercises, 3) strength and agility training, 4) walk and run, 5) Hop and jump, Cooling down (5 minutes)
10.	Monday	30 minutes	Gymnastic: Warming up (5 minutes), Core exercises (20 minutes) including: a. immersion exercises, b. relaxation exercises, c.

ISSN 0216-1699 (print) | 2581-2300 (online)

No	Day	Duration	Exercise
			strengthening exercises, d. release exercises. 2) balance exercises, 3) strength and agility training, 4) walk and run, 5) Hop and jump, Cooling down (5 minutes)
11.	Wednesday	30 minutes	Gymnastic: Warming up (5 minutes), Core exercises (20 minutes) including: a. immersion exercises, b. relaxation exercises, c. strengthening exercises, d. release exercises. 2) balance exercises, 3) strength and agility training, 4) walk and run, 5) Hop and jump, Cooling down (5 minutes)
12.	Friday	30 minutes	Gymnastic: Warming up (5 minutes), Core exercises (20 minutes) including: a. immersion exercises, b. relaxation exercises, c. strengthening exercises, d. release exercises. 2) balance exercises, 3) strength and agility training, 4) walk and run, 5) Hop and jump, Cooling down (5 minutes)

According to Robert (2014), the paired t-test is the method used to see what the results of the experiment show. This test helps find out if there is a difference between the results before and after the therapy. According to Yuldashevich & Lecturer (2024), the dataset must first meet the assumption of normality by passing a normality test with a significance level higher than 0.05 before moving on to the paired t-test. If the normality value is over 0.05, the data is considered normally distributed and suitable for the paired t-test. The pattern of the data on the Q-Plot diagram gives a visual confirmation of the normality test results. The results of this normality check were shown in the Shapiro Wilk column of the test output. Robert (2014) stated that the Shapiro-Wilk test is the right way to check for normality when there are 50 or fewer subjects or data points. Also, the Q-plot charts for the pre-test and post-test can show the results of the normality test. If the points on the Q-plot spread from the bottom left to the top right along the line, then the distribution is considered normal.

RESULT AND DISCUSSION

Result

Table 3 summarizes the initial data and shows the validity of the dataset depends on the total number of participants in the research. The data is considered normally distributed and ready for the paired t-test if the points on the Q-Plot follow the line from the bottom left to the top right. The effectiveness of the gymnastics treatment given to the experimental group was used to evaluate the study results. The effectiveness of the treatment was determined through statistical analysis using the paired t-test, after completing the normality test and analysing the Q-Plot diagrams for pretest and post-test data, as shown in Table 3.

Table 3. Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Pretest	30	100.0%	0	0.0%	30	100.0%
Post-test	30	100.0%	0	0.0%	30	100.0%

Thirty respondents were the total number of study subjects (n) included in this analysis, according to the Case Processing Summary (Table 3). After being confirmed as legitimate, all 30 cases (100.0%) were utilized in the statistical computation procedure. This indicates that the analysis has no missing cases, allowing for the complete processing of the response data.

ISSN 0216-1699 (print) | 2581-2300 (online)

Table 4. Descriptives Data

			Statistic
Pretest	Mean		62.6489
	95% Confidence Interval for Mean	Lower Bound	58.3135
		Upper Bound	66.9843
	5% Trimmed Mean		62.7838
	Median		64.0800
	Variance		76.006
	Std. Deviation		8.71814
	Minimum		47.44
	Maximum		75.43
	Range		27.99
	Interquartile Range		15.60
	Skewness		-.378
	Kurtosis		-1.039
Postest	Mean		63.0467
	95% Confidence Interval for Mean	Lower Bound	58.5943
		Upper Bound	67.4991
	5% Trimmed Mean		63.0124
	Median		62.6450
	Variance		80.162
	Std. Deviation		8.95335
	Minimum		48.45
	Maximum		78.26
	Range		29.81
	Interquartile Range		15.20
	Skewness		.155
	Kurtosis		-1.034

According to Table 4, the pretest score for balance ability has a minimum value of 47.44, a maximum value of 75.43, and a mean value of 62.64. The balance ability score on the post-test increased, as evidenced by the minimum score of 48.45, the maximum score of 78.26, and the mean score of 63.04.

Table 5. Normality Test of Balance

Result	**Shapiro Wilk**		
	Statistic	df	Sig
Pretest	0.927	30	0.171
Posttest	0.964	30	0.677

According to Table 5 the results of the pretest and post-test of the balance skills of the class showed a level of significance of 0.171 > 0.05 and 0.677 > 0.05. If the result of the normality test exceed 0,05, the data are normally distributed. It can be resumed in the paired T test. The normality test can also be seen from the point spread on the Q-plot diagram for pretests and post-tests in Figure 1.

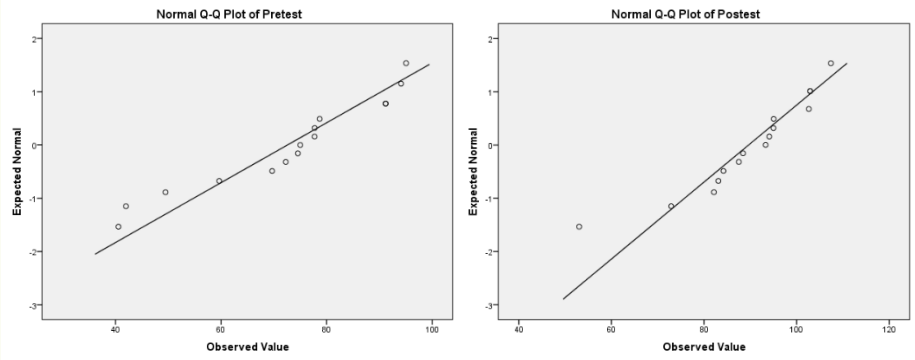

Figure 1. Diagram Q-plot pretest and post-test balance test

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The data is considered normal and can be analysed using the T paired test to check the difference between the pre-test and post-test. This is shown through the Q-plot diagram for both the pre-test and post-test, which indicates a normal distribution because the points on the diagram rise upward. Table 6 shows the results of the T paired test for balance skills.

Table 6. T-Paired Test of Balance

Result	Mean	N	Std. Deviation	Std. Error Mean
Pretest	72. 59	30	17.79	4.59
Post-test	89.65	30	13.85	3.58

Table 6 presents the data differential results in the columns representing the mean pretest results (72.59) and post-test results (89.65). The pretest and post-test findings indicate a difference in the data. The post-test mean scores are higher than the pretest indicating that the kindergarten children' treatment improved their ability to balance.

Discussion

Active engagement in sports has been shown to improve balance in certain studies (Šalaj et al., 2019, Zhang et al., 2024, Susiono et al., 2024. However, studies by Jones et al. (2015) and Hsieh et al. (2017) discovered that raising children's age also improves their capacity to learn balance. The study is consistent with previous research. The study's findings, which show that gymnastics improves kindergarteners' ability to balance and move more skilfully demonstrate this. With a pretest score of 72.59 and a post-test score of 89.65, the paired t test of the average balance movements demonstrated improvement.

The evidence shows how gymnastics helps kindergarteners develop better balance and movement skills. Many studies have found that gymnastics greatly improves children's motor skills, physical health, and overall well-being (Trajković et al., 2016, Jung & Choi, 2016, Salwiah et al., 2020, Chandel & Rathore, 2018, Rudd et al., 2017, Field & Temple, 2017). In kindergarten, gymnastics is often used as a way to teach movement through play, helping kids learn important physical skills and basic movement ideas. Students participate in rhythmic movement, react to musical cues, and execute coordinated actions that combine storytelling and physical expression through controlled activities in the gym. Results from the paired sample T tests showed that students' balancing skills were significantly enhanced by taking gymnastics classes. The findings imply that continuous and repetitive exercise in a gymnastics training program helps kindergarteners improve their balance control. According to Dwi Pradipta et al. (2022) gymnastics offers kindergarteners a safe, structured, and repetitive training environment to strengthen their physical foundation (core muscles) and train their sensory systems (vestibular and proprioceptive), which eventually makes their movements more stable, coordinated, and balanced. As a result, gymnastics programs are very effective in improving kindergarten students' balance.

De Meyer et al. (2016) and Palmer, et al. (2020) stated that training a child basic movement skills and getting them active can have a unique influence on boosting their energy, speed, and agility, which will ultimately accelerate their growth stage. One of the many benefits of learning movement through gymnastics, according to the notion, is that it stimulates kindergarten pupils' physical ability. Learning activities can be guided by a child's high playability. Gymnastics-based movement teaching is very beneficial to kindergarteners, and it can also help them improve their balance and movement skills.

Gymnastics does more than just teach kids how to move; it also helps them grow mentally, socially, and physically. Based on cognitive theory, young children in kindergarten are still in the pre-operational stage of thinking, which makes gymnastics a great fit for them. These young students often have lots of imaginative ideas and haven't fully developed logical thinking yet. Even though gymnastics is a fun and creative activity, it helps energetic children keep moving and stay active while following songs.

The study's conclusions show that the kindergarten pupils' gymnastics training program was successful in improving their balancing skills. The development of dynamic balance is the goal of gymnastics, which combines planned movements carried out in time with musical rhythm. Exercises like body level shifts, one-foot standing, tiptoes, and jumping are all included. It has been shown that certain movement patterns encourage gains in balance performance and call for controlled postural

ISSN 0216-1699 (print) | 2581-2300 (online)

modifications. Gymnastics exercises also place a strong emphasis on developing the core muscles, especially the back and abdominal muscles, which are essential for preserving bodily stability when moving. Therefore, regular participation in gymnastics activities immediately aids in young children's development of balance skills.

The developed gymnastics program solely targets kindergarteners, which is another limitation of this study. The fantasy gymnastics curriculum that was created was based on the pre-operational thinking skills of kindergarten pupils; therefore, it would not be appropriate for use with elementary, junior high, or high school students. The study is influenced by the following factors: 1) Children who have been physically active since kindergarten will exhibit a reduced gain in balance ability since active children often have high balance skills. Additionally, kindergarteners' motivation and enthusiasm in gymnastics have a significant impact on their involvement and level of seriousness about making moves, which ultimately affects their ability to balance.

The study's findings have the following implications: 1) Gymnastics, which teaches balance movements, should be incorporated into the weekly learning program on a regular basis rather than only as a time-waster. 2) Based on the findings of the study, gymnastics programs can be put into place by scheduling at least two to three gymnastics sessions each week for more kindergarteners to improve balancing skills. 3) Optimization of educational materials by promoting the use of gymnastics as the primary medium to stimulate the physical motor components of teaching kindergarteners how to balance, and 4) Balance assessment: In order to measure children's growth beyond observation, schools must use valid balance assessment tools (pretest and post-test) on a regular basis.

CONCLUSION

When kindergarteners use gymnastics as a teaching method, their ability to move and balance gets better. They learn by watching others, following examples, and being part of a group. Learning makes a big difference in the skills of young children. Getting older and changes in the body aren't the only reasons for this change. Learning plays a big role; when lessons are fun and tailored to each child's needs, it can change how well kindergarteners can move and balance. Gymnastics is a teaching approach that works well with the way kindergarteners learn.

As a result, it successfully aids in the improvement of their mobility and balance. The experiment's pretest and posttest results, which show that the pretest data was 72.59 and the posttest data was 89.65, demonstrate this. Kindergarten children' balance can be improved by learning through the gymnastics program, as evidenced by the post-test data, which is larger than the pre-test data. Participating in gymnastics at school helps students' general health, physical fitness, and motor abilities. The gymnastics learning model has an impact on how kindergarten students are taught movement balance. Kindergarten pupils who participate in gymnastics can efficiently practice balance of motion. Pupils perform gymnastics while listening to music. Repetitive and continuous movements during gymnastics instruction help kindergarten kids' basic movement balance. The outcomes of the gymnastics program to enhance kindergarten pupils' balance abilities demonstrate this.

ACKNOWLEDGMENT

This study was supported by Physical Education, Health and Recreation Study Program, Faculty of Social Sciences and Sports, Universitas PGRI Semarang.

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