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EFFECTS OF MOVEMENT GAMES ON MOTOR SKILL DEVELOPMENT IN PRESCHOOL CHILDREN

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Abstract Motor skill development during the preschool period is a fundamental component of children's overall growth, while movement games represent one of the most effective strategies for stimulating motor abilities. The aim of this study was to evaluate the effects of a movement game-based intervention program on the motor development of preschool children aged 5–6 years. The research was conducted on a sample of 16 preschool children using an experimental design between January and June 2025. The research methods included pedagogical observation, motor performance testing, and a pedagogical experiment. Motor development was assessed through age-appropriate tests measuring strength, speed, coordination, balance, and agility, administered before and after the intervention program. The results indicated improvements in most of the evaluated motor abilities, demonstrating the effectiveness of systematic movement games in preschool educational activities. The findings support the integration of movement games into early childhood education programs as an effective strategy for enhancing motor development and promoting an active and healthy lifestyle from an early age.

Introduction

Motor development represents one of the fundamental components of preschool children's overall development, contributing to physical, cognitive, emotional, and social maturation. During the ages of 5–6 years, children acquire and refine fundamental motor skills such as running, jumping, throwing, catching, balance, and coordination, which constitute the basis for future participation in physical activity and sports [2,4,6].

Motor development is influenced by biological maturation, environmental factors, and the quality of educational experiences. The author [11] emphasized the

interaction between heredity and motor experience, whereas [7] highlighted the close relationship between motor, cognitive, and emotional development. Similarly, [10] reported that regular physical activity during early childhood promotes healthy musculoskeletal growth and functional development. The author [14] considered movement an essential component of children's learning process, while [5] associated active participation in play with the development of initiative and self-confidence.

Movement games are recognized as one of the most effective educational strategies for enhancing preschool children's motor competence because they combine physical exercise with play, increasing motivation, enjoyment, and active participation. According to [3], movement games contribute simultaneously to the development of motor qualities, motor skills, and social behaviours. The author [6] emphasized their importance in acquiring fundamental movement skills, while [13] demonstrated their positive effects on cooperation and social interaction. The authors [8] and [17] also underlined the contribution of movement experiences to motor competence and physical literacy. Furthermore, [12] showed that movement-based educational programmes encourage lifelong participation in physical activity, whereas [9] reported significant improvements in fundamental motor skills following structured interventions. Recent studies have shown that [16] and the [18] recommend the systematic inclusion of movement activities in early childhood education to support healthy growth and development.

Although numerous studies have demonstrated the educational value of movement games, evidence from Romanian preschool settings remains limited. Therefore, the present study aimed to investigate the effects of a structured movement game programme on the motor development of preschool children aged 5–6 years, providing practical evidence to support the integration of movement games into preschool physical education.

Material-method

The aim of the study was to analyse the effectiveness of movement games as a means of improving the general motor development of preschool children aged 5–6 years through the implementation of a structured age-appropriate motor programme.

The research hypothesis assumed that the systematic use of movement games would significantly improve the children's fundamental motor abilities (strength, coordination, balance, speed, and agility), contributing to the harmonious development of general motor skills.

The research objectives were to assess the initial level of motor development, design and implement a movement game programme, monitor motor progress, compare the initial and final assessment results, and formulate recommendations regarding the use of movement games in preschool education.

The study was conducted between 8 January and 20 June 2025 at Constantin Morariu Secondary School, Pătrăuți, Suceava County, during Modules III-V of the 2024-2025 school year. The sample consisted of 16 healthy preschool children aged 5-6 years (5 boys and 11 girls).

The research methods included literature review, pedagogical observation, motor testing, pedagogical experiment, and statistical methods for data processing and interpretation.

The experimental programme consisted of the systematic implementation of age-appropriate movement games integrated into physical education activities.

Motor performance was assessed using the following tests: standing long jump, object reach test, balance on a line, ball catching and throwing, shuttle running between cones, and obstacle crossing (15 cm). A measuring tape, stopwatch, cones, low obstacles, balls, and recording sheets were used during testing.

The research was carried out in five stages: planning and documentation, initial assessment, implementation of the experimental programme, final assessment, and statistical processing, analysis and interpretation of the data, followed by the formulation of conclusions and recommendations.

The experimental programme was implemented over three consecutive school modules during the 2024-2025 academic year and was progressively structured according to the developmental characteristics of preschool children. The activities were organized as movement games designed to enhance the main motor abilities while promoting children's active participation. The summary of the experimental programme is presented in Table 1.

Table 1. Summary of the Experimental Movement Games Programme

Module	Period	Duration	Main objectives	Examples of movement games	Motor abilities developed
III	8 January – 21 February 2025	6 weeks (2 sessions/week × 30 min)	Development of balance, coordination and spatial orientation	*The Bear Is Sleeping*, *Cross the River*, *Walk on the Line!*	Static and dynamic balance, coordination, spatial orientation
IV	3 March – 17 April 2025	7 weeks (2 sessions/week × 30 min)	Development of reaction speed, coordination and mobility	*Who Reaches the Colour First?*, *Touch and Run*, *Relay with Small Balls*	Speed, hand–eye coordination, fine and gross motor skills
V	28 April – 20 June 2025	7 weeks (2 sessions/week × 30 min)	Development of dexterity, cooperation and endurance	*Carry the Balloon Together*, *Tug of Rope*, *Throw at the Target*	Dexterity, strength, cooperation, endurance, accuracy and motor control

Results

The results obtained from the initial and final assessments were comparatively analysed to identify changes in the level of motor abilities of preschool boys aged 5-6 years following the implementation of the experimental movement games programme. The comparative analysis of the recorded values

allowed the evaluation of motor performance improvements and the effectiveness of the intervention.

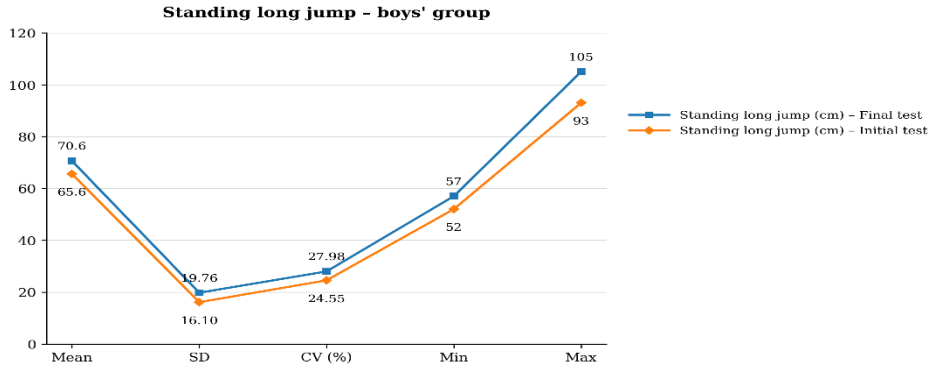

Fig. 1. Comparison of Standing Long Jump Test Results Between the Initial and Final Assessments in the Boys' Group

In the Standing Long Jump test, the mean score increased from 65.6 cm at the initial assessment to 70.6 cm at the final assessment, indicating an improvement in lower-limb explosive strength following the implementation of the experimental programme. The minimum (52-57 cm) and maximum (93-105 cm) values reveal normal individual differences among the children, which can be attributed to the developmental and motor maturation characteristics typical of the 5-6-year age group. The coefficient of variation, ranging from 24.55% to 27.98%, indicates a relatively high degree of heterogeneity within the group, a characteristic commonly observed in preschool children attending the senior kindergarten group.

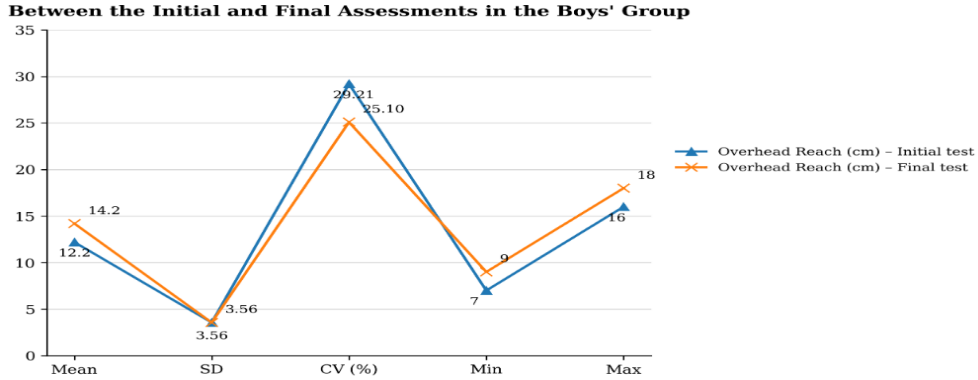

Fig. 2. Comparison of Overhead Reach Test Results Between the Initial and Final Assessments in the Boys' Group.

In the Overhead Reach test, the mean score increased from 12.2 cm at the initial assessment to 14.2 cm at the final assessment, demonstrating an improvement in muscular strength and segmental coordination following the implementation of the experimental programme. The recorded values were within the expected range for children aged 5-6 years, while the individual differences may be attributed to variations in somatic development, joint mobility, and motor maturation. The

decrease in the coefficient of variation from 29.21% to 25.10% indicates greater homogeneity of performance within the group at the end of the training period.

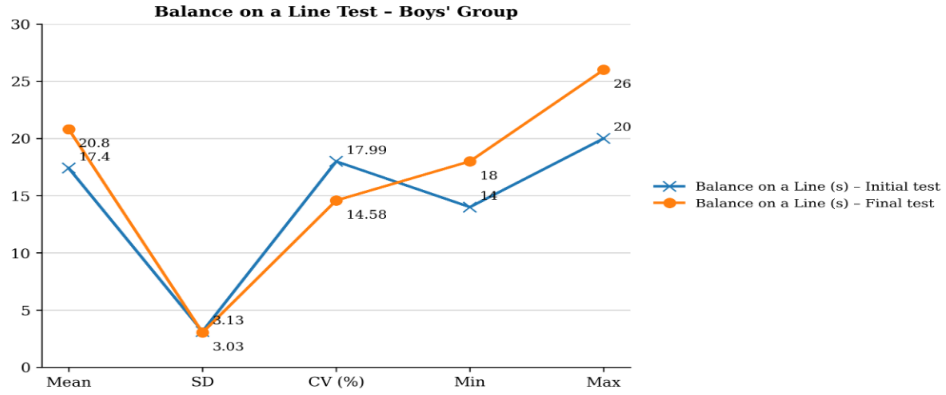

Fig. 3. Comparison of Balance on a Line Test Results Between the Initial and Final Assessments in the Boys' Group.

In the Balance on a Line test, the mean balance time increased from 17.4 s at the initial assessment to 20.8 s at the final assessment, demonstrating a significant improvement in postural control and static balance following the implementation of the experimental programme. The increase in the maximum value from 20 s to 26 s indicates enhanced motor stability in some participants. Furthermore, the reduction in the coefficient of variation from 17.99% to 14.58% reflects greater homogeneity of performance within the group, suggesting relatively consistent progress among the children throughout the training period.

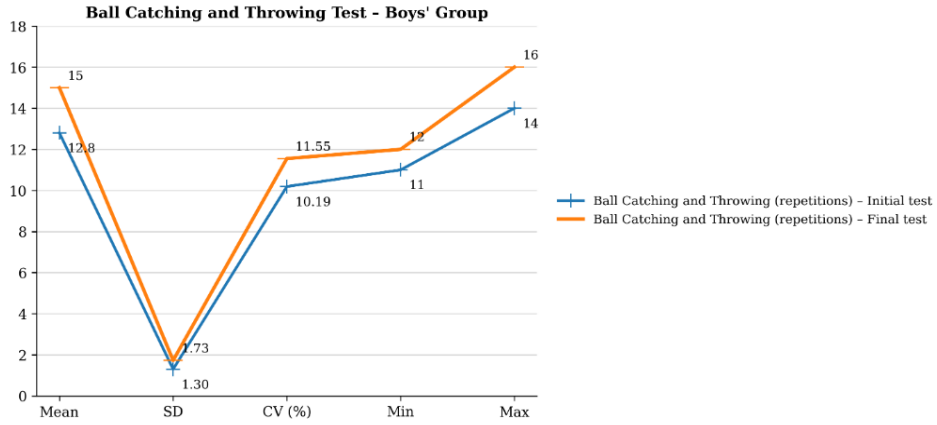

Fig. 4. Comparison of Ball Catching and Throwing Test Results Between the Initial and Final Assessments in the Boys' Group.

In the Ball Catching and Throwing test, the mean number of successful repetitions increased from 12.8 at the initial assessment to 15.0 at the final assessment, demonstrating an improvement in hand-eye coordination and motor control following the implementation of the experimental programme. The minimum

(11-12 repetitions) and maximum (14-16 repetitions) values indicate a high level of mastery of this motor skill within the group. The coefficient of variation, ranging from 10.19% to 11.55%, reflects a high degree of homogeneity in performance, suggesting relatively consistent development of this skill among the children included in the study.

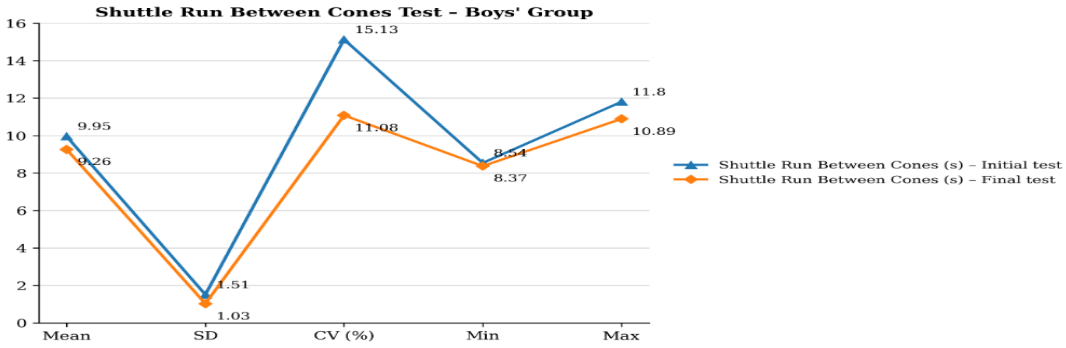

Fig. 5. Comparison of Shuttle Run Between Cones Test Results Between the Initial and Final Assessments in the Boys' Group.

In the Shuttle Run Between Cones test, the mean completion time decreased from 9.95 s at the initial assessment to 9.26 s at the final assessment, demonstrating improvements in running speed, agility, and spatial orientation following the implementation of the experimental programme. The minimum (8.37 s) and maximum (11.80 s) values were within the expected range for children aged 5-6 years. Furthermore, the reduction in the coefficient of variation from 15.13% to 11.08% reflects greater homogeneity of performance and a more effective adaptation of the children to the requirements of the test.

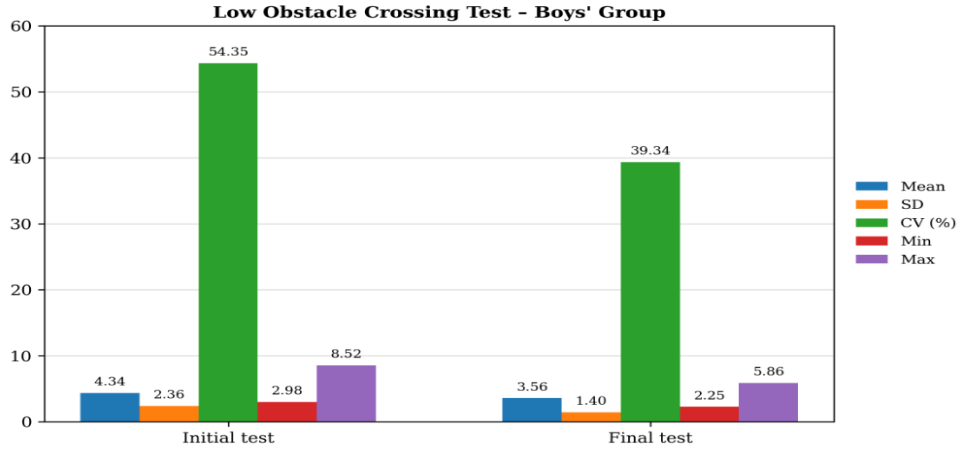

Fig. 6. Comparison of Low Obstacle Crossing Test Results Between the Initial and Final Assessments in the Boys' Group.

In the Low Obstacle Crossing test, the mean completion time decreased from 4.34 s at the initial assessment to 3.56 s at the final assessment, demonstrating improvements in agility, dynamic coordination, and movement speed following the implementation of the experimental programme. The coefficient of variation decreased from 54.35% to 39.34%, indicating reduced individual differences among participants and better mastery of the obstacle course at the end of the training period. Although the coefficient of variation remained relatively high, these values are characteristic of this age group and reflect the particularities of motor development and individual differences in the rate of motor skill acquisition.

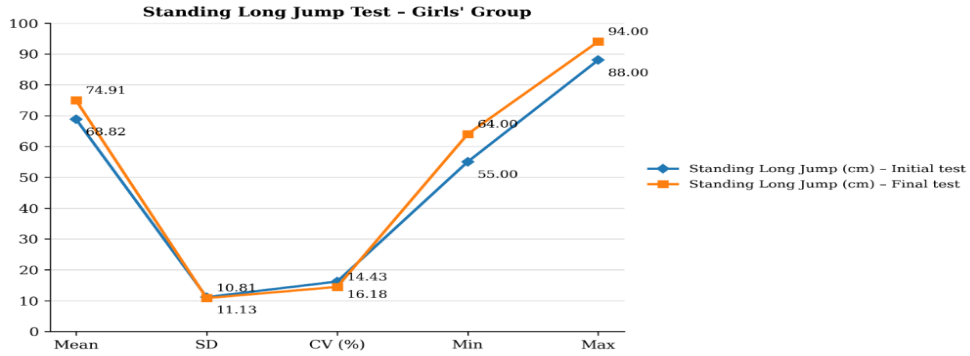

Fig. 7. Comparison of Standing Long Jump Test Results Between the Initial and Final Assessments in the Girls' Group.

In the Standing Long Jump test, the mean score increased from 68.82 cm at the initial assessment to 74.91 cm at the final assessment, demonstrating an improvement in lower-limb explosive strength following the implementation of the experimental programme. The minimum (55 cm) and maximum (88-94 cm) values were within the expected range for children aged 5-6 years, reflecting an appropriate level of motor development. The reduction in the coefficient of variation from 16.18% to 14.43% indicates greater homogeneity of performance within the group at the end of the training period.

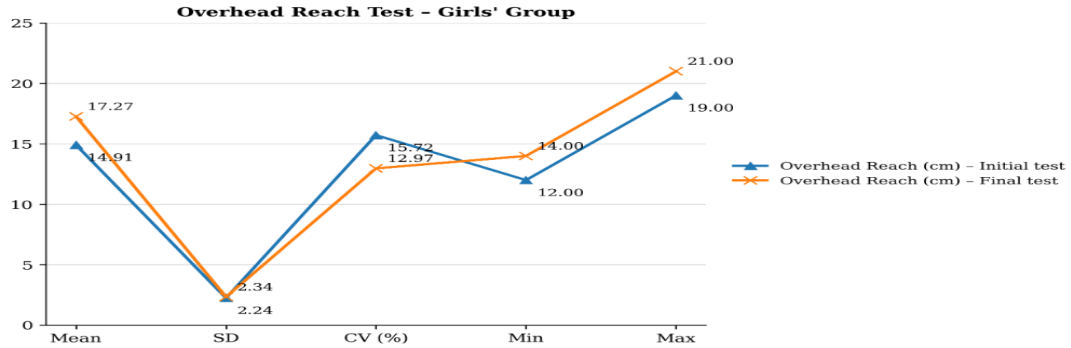

Fig. 8. Comparison of Overhead Reach Test Results Between the Initial and Final Assessments in the Girls' Group.

In the Overhead Reach test, the mean score increased from 14.91 cm at the initial assessment to 17.27 cm at the final assessment, demonstrating an improvement in segmental strength and upper-limb coordination following the implementation of the experimental programme. The individual differences observed among participants may be attributed to variations in somatic development, joint mobility, and motor maturation. The reduction in the coefficient of variation from 15.72% to 12.97% reflects greater homogeneity of performance within the group, suggesting consolidation of this motor skill through the implemented training activities.

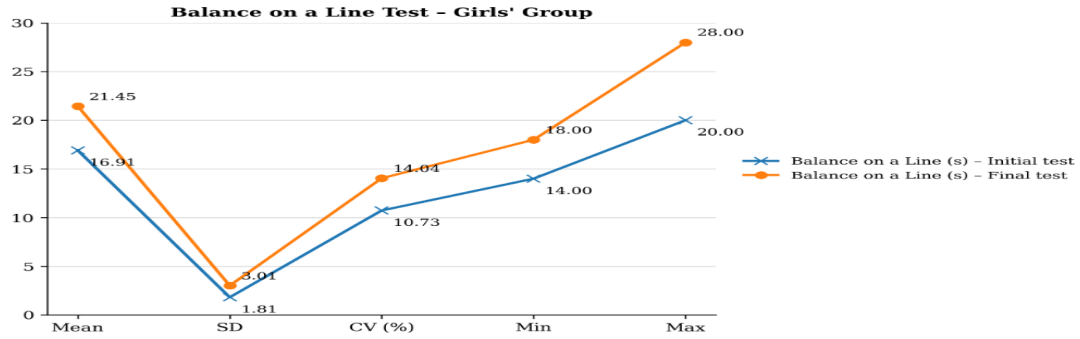

Fig. 9. Comparison of Balance on a Line Test Results Between the Initial and Final Assessments in the Girls' Group.

In the Balance on a Line test, the mean balance time increased from 16.91 s at the initial assessment to 21.45 s at the final assessment, demonstrating a significant improvement in postural control and static balance following the implementation of the experimental programme. The maximum value of 28 s indicates a higher level of motor stability in some participants. The increase in the coefficient of variation from 10.73% to 14.04% suggests the presence of individual differences in the rate of improvement, reflecting the particularities of motor development and maturation characteristic of this age group.

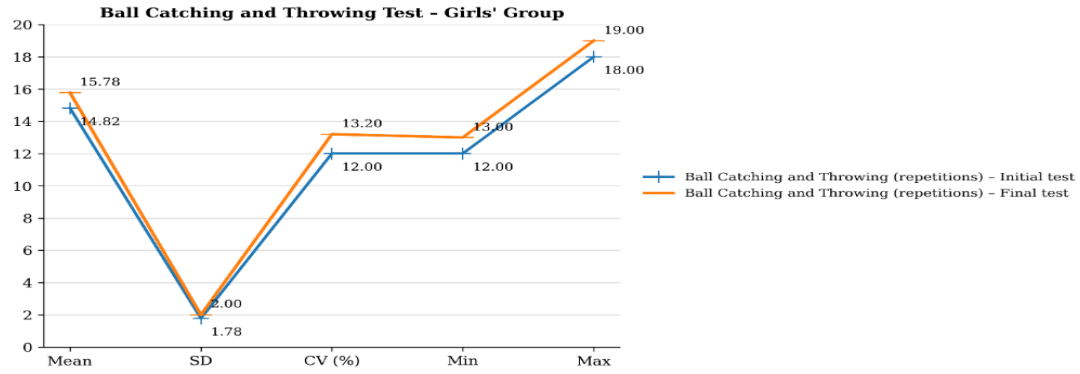

Fig. 10. Comparison of Ball Catching and Throwing Test Results Between the Initial and Final Assessments in the Girls' Group.

In the Ball Catching and Throwing test, the mean number of successful repetitions increased from 14.82 at the initial assessment to 15.91 at the final assessment, demonstrating an improvement in hand–eye coordination and motor control following the implementation of the experimental programme. The minimum (12-13 repetitions) and maximum (18-19 repetitions) values reflect a good level of mastery of this motor skill within the group. The coefficient of variation, ranging from 12.00% to 13.32%, indicates a high degree of homogeneity in performance, suggesting relatively consistent development of this skill among the participants.

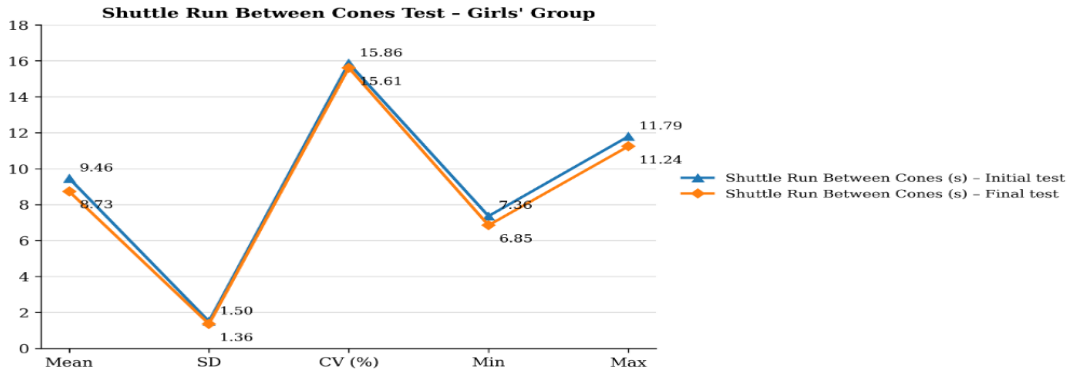

Fig. 11. Comparison of Shuttle Run Between Cones Test Results Between the Initial and Final Assessments in the Girls' Group.

In the Shuttle Run Between Cones test, the mean completion time decreased from 9.46 s at the initial assessment to 8.73 s at the final assessment, demonstrating improvements in running speed, agility, and spatial orientation following the implementation of the experimental programme. The recorded values were within the expected range for children aged 5-6 years. The coefficient of variation remained relatively stable, decreasing slightly from 15.86% to 15.61%, indicating a good degree of homogeneity in performance and relatively consistent progress among the participants throughout the training period.

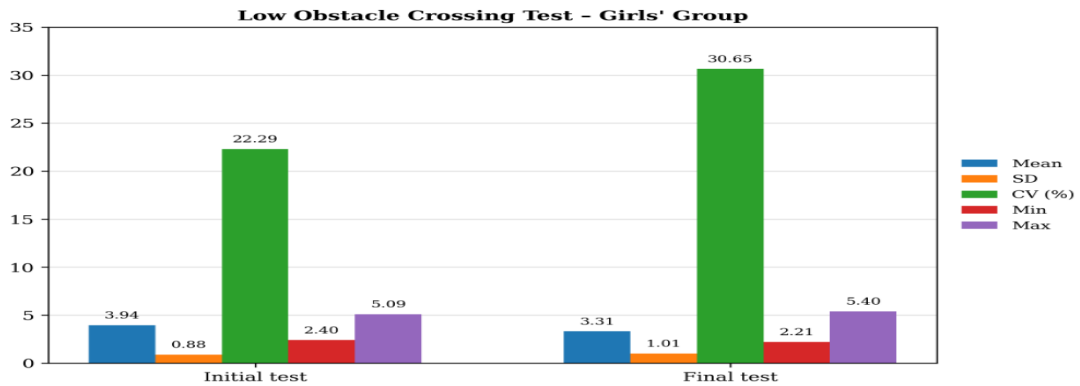

Fig. 12. Comparison of Low Obstacle Crossing Test Results Between the Initial and Final Assessments in the Girls' Group.

In the Low Obstacle Crossing (15 cm) test, the mean completion time decreased from 3.94 s at the initial assessment to 3.31 s at the final assessment, demonstrating improvements in agility, dynamic coordination, and movement speed following the implementation of the experimental programme. The minimum (2.21 s) and maximum (5.40 s) values were within the expected range for children aged 5-6 years. The coefficient of variation, which reached 30.65% at the final assessment, indicates the presence of individual differences in execution speed and adaptation to the test requirements, reflecting characteristics typical of this age group and the motor development process**.**

	1. Standing Long Jump – Initial Assessment	2. Standing Long Jump – Final Assessment	3. Overhead Reach Test – Initial Assessment	4. Overhead Reach Test – Final Assessment	5. Balance on a Line Test – Initial Assessment	6. Balance on a Line Test – Final Assessment	7. Ball Catching and Throwing Test – Initial Assessment	8. Ball Catching and Throwing Test – Final Assessment	9. Shuttle Run Between Cones Test – Initial Assessment	10. Shuttle Run Between Cones Test – Final Assessment	11. Low Obstacle Crossing Test – Initial Assessment	12. Low Obstacle Crossing Test – Final Assessment
1. Standing Long Jump – Initial Assessment	1											
2. Standing Long Jump – Final Assessment	0.98	1.00										
3. Overhead Reach Test – Initial Assessment	0.62	0.61	1.00									
4. Overhead Reach Test – Final Assessment	0.79	0.80	0.91	1.00								
5. Balance on a Line Test – Initial Assessment	0.85	0.84	0.70	0.88	1.00							
6. Balance on a Line Test – Final Assessment	0.76	0.79	0.81	0.92	0.88	1.00						
7. Ball Catching and Throwing Test – Initial Assessment	0.71	0.74	0.79	0.84	0.83	0.83	1.00					
8. Ball Catching and Throwing Test – Final Assessment	0.72	0.74	0.78	0.83	0.82	0.83	0.93	1.00				
9. Shuttle Run Between Cones Test – Initial Assessment	0.06	0.06	0.65	0.53	0.47	0.51	0.58	0.53	1.00			
10. Shuttle Run Between Cones Test – Final Assessment	0.04	0.03	0.62	0.46	0.41	0.42	0.53	0.49	0.98	1.00		
11. Low Obstacle Crossing Test – Initial Assessment	-0.46	-0.49	0.23	-0.05	-0.15	-0.11	0.04	0.06	0.72	0.77	1.00	
12. Low Obstacle Crossing Test – Final Assessment	-0.50	-0.53	0.18	-0.11	-0.22	-0.18	-0.02	-0.01	0.67	0.72	0.99	1.00

Fig.13 Pearson Correlation Matrix of Motor Test Results in the Girls' Group

The correlation analysis revealed positive relationships among most motor tests, confirming the interdependent nature of motor development in girls aged 5–6 years. The findings suggest that improvements in one motor component are associated with progress in other motor abilities, reflecting the integrated development of motor functions during this stage of childhood.

The main relationships identified were as follows: Balance on a Line Test – Ball Catching and Throwing Test; Strong positive correlations (r = 0.82-0.83) indicate that better postural control is associated with improved hand–eye coordination; Overhead Reach Test - Balance on a Line Test; Very strong correlations (up to r = 0.92) highlight the close relationship between upper-limb coordination and body stability; Standing Long Jump – Balance on a Line Test; High positive correlations (r = 0.76-0.85) suggest that lower-limb explosive strength is associated with better postural control; Ball Catching and Throwing Test - Overhead Reach Test; Positive correlations (r = 0.78-0.84) indicate a relationship between upper-limb coordination and segmental strength; Shuttle Run Between Cones Test -

Ball Catching and Throwing Test; Moderate positive correlations (r = 0.53–0.58) suggest that general coordination and spatial orientation contribute to performance in both tests; Shuttle Run Between Cones Test – Overhead Reach Test; Moderate positive correlations (r = 0.62-0.65) indicate that running speed is associated with general body coordination; Low Obstacle Crossing Test - Shuttle Run Between Cones Test; High positive correlations (r = 0.67-0.77) confirm the close relationship between agility, speed, and dynamic coordination.

	1. Standing Long Jump – Initial Assessment	2. Standing Long Jump – Final Assessment	3. Overhead Reach Test – Initial Assessment	4. Overhead Reach Test – Final Assessment	5. Balance on a Line Test – Initial Assessment	6. Balance on a Line Test – Final Assessment	7. Ball Catching and Throwing Test – Initial Assessment	8. Ball Catching and Throwing Test – Final Assessment	9. Shuttle Run Between Cones Test – Initial Assessment	10. Shuttle Run Between Cones Test – Final Assessment	11. Low Obstacle Crossing Test – Initial Assessment	12. Low Obstacle Crossing Test – Final Assessment
1. Standing Long Jump – Initial Assessment	1.00											
2. Standing Long Jump – Final Assessment	1.00	1.00										
3. Overhead Reach Test – Initial Assessment	0.01	0.02	1.00									
4. Overhead Reach Test – Final Assessment	0.23	0.23	0.97	1.00								
5. Balance on a Line Test – Initial Assessment	0.69	0.66	0.61	0.76	1.00							
6. Balance on a Line Test – Final Assessment	0.80	0.77	0.16	0.35	0.75	1.00						
7. Ball Catching and Throwing Test – Initial Assessment	0.75	0.70	0.38	0.58	0.94	0.86	1.00					
8. Ball Catching and Throwing Test – Final Assessment	0.76	0.72	0.31	0.50	0.90	0.94	0.96	1.00				
9. Shuttle Run Between Cones Test – Initial Assessment	0.26	0.25	0.71	0.74	0.68	0.65	0.65	0.65	1.00			
10. Shuttle Run Between Cones Test – Final Assessment	0.48	0.45	0.60	0.71	0.80	0.77	0.84	0.79	0.94	1.00		
11. Low Obstacle Crossing Test – Initial Assessment	-0.42	-0.40	0.84	0.69	0.18	-0.17	-0.05	-0.09	0.60	0.37	1.00	
12. Low Obstacle Crossing Test – Final Assessment	-0.41	-0.39	0.85	0.71	0.19	-0.15	-0.04	-0.07	0.61	0.37	1.00	1.00

Fig.4. Pearson Correlation Matrix of Motor Test Results in the Boys' Group

The correlation analysis revealed significant positive relationships among the motor tests, confirming the interdependent nature of motor development in boys aged 5–6 years. The findings indicate that improvement in one motor ability is associated with progress in other motor components, reflecting the integrated development of motor functions during this stage of childhood.

The main relationships identified were as follows: Standing Long Jump - Balance on a Line Test; High positive correlations (r = 0.66-0.80) indicate an association between lower-limb explosive strength and postural control; Balance on a Line Test - Ball Catching and Throwing Test; Very strong positive correlations (r = 0.86-0.94) highlight the close relationship between body stability and hand-eye coordination; Overhead Reach Test - Balance on a Line Test; Moderate to high positive correlations (r = 0.61-0.76) suggest a relationship between segmental strength and postural control; Ball Catching and Throwing Test – Overhead Reach Test; Moderate positive correlations (r = 0.38-0.58) indicate that upper-limb motor skills develop in a complementary manner; Shuttle Run Between Cones Test – General Coordination; The Shuttle Run Between Cones test showed moderate to high positive correlations with the Balance on a Line Test (r = 0.65-0.80) and the Ball Catching and Throwing Test (r = 0.65-0.84), highlighting the relationship between running speed, spatial orientation, and general coordination; Low Obstacle Crossing Test - Shuttle Run Between Cones Test; Positive correlations (r = 0.60-0.61) confirm the association between agility, speed, and dynamic coordination.

Discussions

The present study demonstrated that movement games significantly improved motor performance in preschool children, particularly in explosive strength, balance, coordination, agility, and object control, confirming the study hypothesis. These findings are consistent with those reported [15], who found that an 8-week coordinative exercise programme enhanced motor competence, balance, and hand-eye coordination in children aged 5-6 years. Similarly [1] showed that coordination-based training significantly improved physical fitness, motor competence, balance, and agility in preschool children.

Conclusions

The results of this study demonstrate that the systematic implementation of movement games significantly improved the motor development of preschool children aged 5-6 years. Significant progress was observed in strength, balance, coordination, agility, and speed, confirming the effectiveness of movement games as an educational tool in preschool physical education. The positive correlations among the motor tests indicate the integrated nature of motor development, suggesting that improvements in one motor ability support the development of others. Furthermore, the structured intervention programme promoted not only motor competence but also children's motivation, cooperation, and self-confidence. Overall, the findings support the regular inclusion of movement games in preschool activities to foster healthy and harmonious child development.

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