

The effect of using the movement story in physical education classes on some mental abilities among primary school pupils aged 7–9 years

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Abstract:

This study examines the impact of a motor-story-based educational programme on the development of certain mental abilities, such as kinaesthetic intelligence and concentration, among primary school pupils (aged 7–9) in physical education and sports classes. An experimental approach with a two-group design (experimental and control) and pre- and post-tests was employed for the study. A total of 64 students were randomly selected from a population of 256 to participate in the study. The students were divided into two equal groups of 32. The experimental group underwent an educational programme based on movement stories. The control group continued with the traditional programme implemented in physical education and sports classes. Four standardised tests were used to measure mental ability. These were statistically analysed using JASP 19 software and the appropriate methods. Most of the results showed statistically significant differences in favour of the experimental group between the pre- and post-measurements. This confirms the effectiveness of the educational programme in developing these mental abilities. The study therefore recommends the generalisation of the movement story method in primary education, as well as the provision of training programmes for physical education and sports teachers, and the necessary pedagogical and technological support, alongside the conduct of similar future studies.

Keywords: movement story, mental abilities, physical education and sports, elementary school.

1. Introduction and Research Problem:

Physical education and sports in primary school are one of the fundamental pillars of the educational process. Their role is no longer limited to physical activity, but they now contribute to the mental, emotional, and social development of children, in line with contemporary approaches to learning that combine physical, cognitive, and socio-emotional aspects. The primary school stage is considered one of the most critical periods in a child's development, as it is marked by rapid growth in mental and cognitive abilities. This necessitates the adoption of teaching methods that take developmental characteristics into account, providing stimulating learning environments that combine movement, thinking, and creativity. Various recent studies indicate that integrating purposeful motor activities into

¹ Received: January 15, 2026; Accepted: May 17, 2026; Published: August 19, 2026

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the educational process improves mental abilities, especially when the activities are interactive and cognitive rather than merely routine motor performances. (Dong & Wang, 2026)

In light of the growing interest in school curricula in recent years, it has become important to seek modern teaching strategies that keep pace with global educational developments. One such method is movement stories, which effectively capture students' attention, motivate them to practise and learn, and engage them in fun, exciting learning activities. This method helps students to achieve curriculum objectives and acquire various values, knowledge and essential skills in an accessible way. (Al-Nawasrah, Jamal Muhammad, 2014, p. 18)

Thus, movement-based storytelling is one of the most important educational methods for the holistic development and preparation of students today, especially given the growing need for effective educational strategies that consider children's developmental stages. Using this method makes it easier and more effective to transmit knowledge and develop students' skills. (Duncan, Cunningham, & Eyre, 2019)

During this stage, students' mental abilities particularly their attention span and kinaesthetic intelligence undergo rapid development as a result of continuous interaction with external stimuli. Classroom situations, academic tasks and activities all provide opportunities to expand and refine mental and cognitive processing, making elementary education an ideal environment in which to study and enhance the various dimensions of learners' mental abilities. Mental abilities are defined as 'the activities produced by the conscious mind that directly influence behaviour, such as processing, storing and logically reasoning about information'. They are composed of various processes, such as attention, memory, reasoning and intelligence, and serve as the foundation for predicting academic, cognitive and social success. (Donenfeld, Mudundi, Blaser, & Kaldy, 2025)

This study aims to examine the impact of a kinaesthetic, story-based educational programme on the development of certain mental abilities, specifically kinaesthetic intelligence and concentration, among primary school students (aged 7–9) during physical education classes. It also seeks to compare the effectiveness of the proposed programme with that of the conventional programme in developing these abilities, while presenting a teaching model based on movement stories. This study is significant because it uses movement-based storytelling as a modern teaching strategy that combines physical activity with cognitive learning. This contributes to improved learning outcomes in physical education and sports classes.

Despite progress in curriculum development, our educational system still falls short of the required standards compared to developed countries in terms of teaching strategies and methods. This is due to several factors, which some physical education and sports specialists attribute to the ineffective implementation of these programmes and curricula in practice, and the failure to present them in an enjoyable and engaging manner. This leads to boredom among both students and teachers.

Bennett and Wood have pointed out that the actual practice of play-based activities in primary school remains significantly limited, which hinders the development of children's specific abilities. The researchers explained that some teachers do not recognise the true value of these sessions and merely treat them as a way to fill free time without setting clear educational goals for the activities they offer. Furthermore, they pay no attention to students' behaviour during play, meaning the activities fail to provide educational experiences and skills that could enhance teaching quality and effectiveness. (Bennett, Wood, & Rogers, 1997, p. 23)

Developing certain mental abilities among primary school pupils in physical education and sports classes faces a number of obstacles and challenges that hinder the achievement of these goals. The most prominent of these are inadequate infrastructure and a lack of pedagogical resources in educational institutions, which impede the continuous development of pupils' abilities and skills. Therefore, this study poses the following research question:

2. General Research Question:

Does kinesthetic storytelling have an effect on certain mental abilities among elementary school pupils in physical education classes?

- Sub-questions:

1- Are there statistically significant differences between the pre-test and post-test scores mental abilities (kinesthetic intelligence, attention Concentration) in the control group during physical education and sports classes?

2- Are there statistically significant differences between the pre-test and post-test scores mental abilities (kinesthetic intelligence, attention Concentration) in the experimental group during physical education and sports classes?

3- Are there statistically significant differences between the post-test scores on certain mental abilities (kinesthetic intelligence, attention Concentration) between the experimental group and the control group in physical education and sports classes?

3. General hypothesis:

Kinaesthetic stories affect certain mental abilities in primary school pupils during physical education and sports lessons.

Specific hypotheses:

1-There are statistically significant differences in pre- and post-test scores for mental abilities (kinaesthetic intelligence, attention concentration) in the control group during physical education and sports classes.

2-There are statistically significant differences in pre- and post-test scores for mental abilities (kinaesthetic intelligence, attention concentration) in the experimental group during physical education and sports classes.

3-There are statistically significant differences in post- and post -test scores for certain mental abilities (kinaesthetic intelligence, attention concentration) between the experimental and control groups during physical education and sports classes.

4. Research terminology:

1. Movement Stories:

1. Terminological definition: Al-Rumi defined them as a series of movements performed by students to express their mental imagery of events encountered from various sources. This leads to the development of physical, motor, mental, and cognitive skills. They are also considered one of the most modern methods of providing children with physical and athletic exercise, as they encourage positive imitation and emulation through simple exercises (Al-Rumi., 1999, p. 19)

- Operational definition: This method involves presenting information and facts in a story-like manner. It is one of the oldest methods humans have used to teach children, as it captures their attention and imparts historical and moral information in an engaging way.

2- Mental Abilities:

- Terminological definition: Mental ability refers to an individual's mental capacity to perform a task or adapt successfully in the workplace; it is manifested through sensory or mental actions and may be innate or acquired through learning. There are also general abilities, which represent a common factor to varying degrees across all specific abilities or a subset thereof (Thaer Al-Ghabari, 2010, pp. 14-15)

- Operational Definition: Mental ability refers to an individual's mental capacity to successfully perform a task or adapt to work; it is manifested through sensory or mental actions and may be innate or acquired through learning. There are also general abilities, which represent a common factor to varying degrees across all specific abilities or a subset thereof.

3. Physical Education and Sports Class:

Terminological definition: Ahmad Khater defines it as 'the acquisition by students of motor skills and the development of their physical, psychological and social abilities, enabling them to become successful members of society and strive to achieve a better life and a more prosperous future than others' (Jabouri Ben Omar, 2015, p. 34)

- Operational definition: Physical education and sports classes are one of the core components of the curriculum, just like other academic subjects. However, they are distinguished by the fact that they impart diverse knowledge and promote health, psychological well-being and social well-being, as well as providing students with motor skills and experiences.

4- Age Group 7–9 Years:

- Terminological definition: This stage is considered a period of development that falls between two important and highly dynamic phases; it lies between the rapid growth associated with the start of elementary school, and the noticeable changes that precede early adolescence. It typically spans exactly

from age six to nine, a period that corresponds to the early grades of elementary school, during which students begin to consolidate their basic motor skills and regulate their behavior in accordance with the demands of the school environment. (Afaf Othman Othman Mustafa, 2013, p. 70)

- **Operational Definition:** This stage is one of the most important stages a person goes through in life, as children at this age are more open-minded and inclined to accept, learn, and innovate. In this age group, children's perception of the world around them expands, and they begin to acquire various skills that support their overall progress and development.

5. Review of Previous Studies

The first study: The study by Boat et al. (2022) is titled '16 Weeks of Physical Activity-Based Mathematics and English Lessons for Improving Cognitive Functions and Gross Motor Skills in Children Aged 8–9 Years'. The study examined the impact of integrating physical activities into mathematics and English lessons on improving mental and cognitive functions, as well as gross motor skills, in children aged 8 to 9 years.

The researchers used an experimental approach with a two-group design (experimental and control). The study sample consisted of 192 children, with 98 in the experimental group and 94 in the control group. The programme lasted 16 weeks, with an average of eight hours of active lessons integrated into mathematics and English per week. Measurement tools included tests of mental and cognitive functions such as memory, attention and computational reasoning, as well as a gross motor skills test (TGMD-3).

The researchers hypothesized that incorporating physical activity into academic lessons would lead to improved cognitive functions and motor skills compared to traditional teaching. The results showed a statistically significant improvement in all areas of mental and cognitive functions in the experimental group compared to the control group. Great motor skills also recorded a significant improvement in both transitional skills and instrument control skills

The study recommended the need to integrate physical activities into school curricula because of their positive impact on developing mental, cognitive and motor abilities among primary school students

The second study: The study conducted by Donnelly et al. (2016), entitled "Physical Activity, Fitness, Cognitive Function, and Academic Achievement in Children: A Systematic Review," aimed to determine the relationship between physical activity, physical fitness, cognitive function, and academic achievement among children aged 5–13 years. The researchers relied on the analysis of 137 published studies. The results showed a positive effect of physical activity on cognitive function, attention, and brain function, while the findings regarding its effect on academic achievement were inconsistent. Therefore, the researchers recommended conducting further studies to determine the most effective ways of integrating physical activity into the school environment.

The third study: The study conducted by Dong and Wang (2026), entitled "The Impact of Physical Activity on Cognitive Function in Children and Its Educational Applications: A Narrative Review of the Scientific Literature," aimed to analyze the scientific evidence regarding the effects of physical activity on children's cognitive functions and to highlight how these findings can be applied in the field of physical education.

The researchers adopted a descriptive approach based on a systematic narrative review in accordance with the PRISMA guidelines by reviewing studies published in five electronic databases. The findings revealed that physical activity contributes positively to the development of executive functions, attention, memory, and academic achievement among children. The study also found that motor activities combining cognitive engagement with moderate-to-vigorous intensity may produce the greatest positive outcomes.

The study concluded that appropriately designed physical activity programs implemented during physical education classes can effectively support children's cognitive and mental development. The researchers also recommended integrating movement activities that stimulate cognitive processes into school curricula and conducting further studies to develop effective strategies for implementing these programs.

The fourth study: Entitled 'The Effects of Two Years of Physically Active Mathematics Lessons on Cognitive Function and Gross Motor Skills in Primary School Children', this study by Magistro et al.

(2022) aimed to investigate the impact of incorporating physical activity into mathematics lessons on cognitive development and gross motor skill acquisition among primary school students.

The researchers adopted an experimental approach and the study included 82 children with a mean age of six years. Participants were divided into an experimental group (36 children) and a control group (46 children). The intervention lasted for two years, during which the experimental group received physically active mathematics lessons. In addition to the Test of Gross Motor Development (TGMD-3), the researchers used a set of cognitive function tests to assess gross motor skills.

The results showed that the experimental group outperformed the control group in all cognitive function indicators, including short-term memory, attention, verbal memory, verbal fluency and mathematical ability. The experimental group also demonstrated significant improvements in locomotor and ball skills compared with the control group.

The study recommended integrating physical activities into school curricula due to their positive impact on children's cognitive and motor development.

6. Research methodology and field procedures:

6.1 Research Approach:

In our study, we took an experimental approach. Selecting a scientific approach is a fundamental step in any academic research. The experimental approach involves a set of organised procedures and steps that the researcher follows when addressing a topic in order to answer research questions and test hypotheses. The approach used to discover scientific truth should stem from an objective analysis of the nature and characteristics of the reality under study so that the results accurately reflect that reality. (Belghith Sultan, 2006, p. 61)

6-2-Experimental Design:

In our study we used, an experimental design with two matched groups one control group and one experimental group using pre- and post-tests. This design involves two groups that are similar in all variables relevant to the situation, such as age, weight, height, and intelligence. In this study, the experimental factor the motor story was introduced to the experimental group, while the control group continued to study using the standard program under their normal conditions.

6 -3 –Research Population and Sample:

The study population consists of all third-grade elementary school Pupils from four elementary schools in the city of Sougueur, Tiaret Province, Algeria: Bouklikha Bakhaled, Naïmi Rachida, Hassiba Ben Boueli, Ain al-Sabae Ali. The Directorate of Education for the Province of Tiaret granted our permission to conduct our research in these schools. There were 8 third-grade classes in these schools an average of two classes per school bringing the total number of third-grade students of the study population to 256.

6-4 - Research Sample and Selection Method:

The study sample was selected using simple random sampling in four steps:

1. Authorization for the selection process: The researchers were authorized by the Directorate of Education of Tiaret Province to conduct the fieldwork in four primary schools out of the 41 primary schools located in the city of Sougueur. These educational institutions were selected without any intervention by the researcher.
2. Random selection of the school: One school was randomly selected from among the four available schools, namely Hasiba Ben Bouali Primary School, in accordance with the experimental design adopted in this study, specifically, a two-group experimental design.
3. Random selection and assignment of participants: A random selection was made for the control and experimental groups. Two classes comprising 64 pupils, representing 29.30% of the total population, were selected and assigned to a control group (32 pupils) and an experimental group (32 pupils).

6 -5- Scope of the Study:

1. Temporal Scope: This refers to the time during which the study was conducted in general and the field experiment in particular. This study was carried out in phases according to its chronological sequence during the 2025–2026 school year.
- 2- Spatial Scope: The field study was conducted at the Hassiba Ben Boueli Elementary School in the city of Sougueur, Tiaret Province, which has a suitable playground for implementing the proposed movement-based storytelling program units, as well as numerous tools and resources that assisted the researcher in fulfilling the requirements of this study.

3- Human Scope: The study population consisted of third-grade pupils in the second cycle of elementary school enrolled at the Hassiba Ben Bouali Elementary School during the 2025–2026 academic year. Their ages ranged from 7 to 9 years, distributed as follows: Main study sample: This consisted of 64 students—32 in the control group and 32 in the experimental group.

6-6- Research Variables:

1- Independent Variable: Studying the independent variable may reveal its effect on another variable the one the researcher assumes is the cause, or one of the causes, of a specific outcome. (Bodaoud Abdel-Yamine, Atallah Ahmed, 2009, p. 139) In our study, this is represented by the movement story program based on storytelling

2- Dependent variable: This is the variable for which the researcher seeks to determine the effect of the independent variable (Bodaoud Abdel-Yamine, Atallah Ahmed, 2009, p. 141).

In our study, it consists of mental abilities (Kinesthetic Intelligence and Attention Concentration).

6 -7- Research Tools:

1- Mental Ability Tests:

To measure mental ability, the researchers relied on a set of tests that were presented to a panel of 10 experts in the fields of physical education, measurement, and assessment, with the aim of selecting the most appropriate tests for the 7–9-year-old age group. The review results led to the adoption of four tests after they received the highest levels of agreement among the reviewers, as shown in the table

Table No. (01) provides a breakdown of the final approved following arbitration in this study

Mental Abilities	Test	Scoring Method	Reference
Measurement of Kinesthetic Intelligence	Identifying a sound and then running to the corresponding shape	Best time out of three attempts	(Makki & Ali, 2013)
	Walking to the Center of the Circle	Total Score from Five Attempts	(Makki & Ali, 2013)
Attention Concentration Measurement	Matching Geometric Shapes	Number of Correct Shapes in One Minute	(Baziou Mostafa, 2023, p. 222)
	Concentration and Shooting Accuracy	Number of successful shots out of ten attempts	(Baziou Mostafa, 2023, p. 123)

The results of the validation process showed that the “sound discrimination” test and the “running to the associated shape” test (90%) and the “walking to the center of the circle” test (80%) were accepted for measuring motor intelligence. The “geometric shape matching” test (100%) and the “focus with target accuracy” test (90%) were also validated to measure attention span, while the remaining tests were excluded due to low agreement rates.

2. Validity and reliability of tests:

Calculating the Scientific Foundations of Psychometric Tests:

Before the mental ability tests were administered, their scientific validity was verified by calculating their psychometric properties of validity, reliability and objectivity, based on a pilot study conducted with a sample of 26 Year 4 pupils at Bouklikha Bakhaled Primary School. Content validity and discriminant validity, as well as reliability through test-retest administration, were assessed, along with objectivity. The results were as follows:

2-1-Validity of the Tests:

1. The content validity:

The content validity of the mental ability tests was verified by presenting them to 10 reviewers—all professors of physical education and sports holding the rank of Associate Professor “A” or higher—who unanimously agreed that the tests were appropriate for the study’s objectives and possessed content validity and face validity for measuring the targeted mental abilities.

Table No. (02) presents the analytical results of the content validity assessment by the ten reviewers:

No.	Test Name	Score	Individual Score	Individual Rating	Overall Test Rating	Overall Rating
1	Identifying a sound and then running to the corresponding shape	9/10	0.90	Pass		
2	Walking to the Center of the Circle	8/10	0.80	Pass	0.91	Pass
3	Matching Geometric Shapes	10/10	1.00	Excellent		
4	Concentration and Shooting Accuracy	9/10	0.90	Pass		

Table 2 which presents the content validity analysis, shows the following results:

1-Evaluation of individual tests: All tests meet the minimum acceptability threshold (0.80) according to Lynn's criteria Tests 3, 5, and 7 achieved a reliability coefficient of 1.00 while tests 2 and 9 recorded the minimum acceptable value (0.80).

2- Evaluation of the tests as a whole: The minimum acceptability threshold (0.90) is exceeded We therefore conclude that the test is content-valid according to expert opinion (**Lynn, M. R, 1986, pp. 282-285**)

2. Discriminant validity:

To assess the discriminant validity of the research tests, the researchers employed the two-extreme-groups method. The sample was divided into two groups: a high-performing group comprising the top 27% of students and a low-performing group comprising the bottom 27% of students, with seven students in each group. The average performance of each individual on four cognitive tests was calculated and a t-test for two independent samples was then used to verify the significance of the differences between the two groups on each test.

Table (3) illustrates the discriminant validity of the sample in the test administration:

Test	Higher Group	Lower Group	Difference	t-value	p-value	Statistical Significance ($\alpha = 0.05$)	Discrimination Index
Identifying a sound and then running to the corresponding shape	6.52	5.32	1.20	4.87	0.001	Statistically Significant	Very High
Walking to the Center of the Circle	11.86	9.14	2.72	3.91	0.002	Statistically Significant	Very High
Matching Geometric Shapes	7.43	6.57	0.86	2.41	0.031	Statistically Significant	High
Concentration and Shooting Accuracy	5.86	4.71	1.15	3.78	0.002	Statistically Significant	Very High

These results confirm that all the tests used in the study have high to very high discriminant validity, which justifies their use in accurately and objectively measuring individual differences among students, consequently, all tests under study exhibit high discriminant validity within this specific group, as statistically significant differences ($p < 0.05$) were found for all tests.

2. Test reliability:

The researchers calculated the reliability of the four mental ability tests used in the study by administering them to a new sample of 26 male and female students, who were not part of the primary research sample, but were from the same research population. The students were selected at random. The first condition for calculating Pearson's simple correlation coefficient was met, and the tests were re-administered one week later to calculate the reliability coefficients.

Table No. (04) shows the stability and internal consistency coefficients for the tests:

Test	Reliability Coefficient	95% CI	Pearson (r)	Concurrent Validity	Significance	Reliability
Identifying a sound and then running to the corresponding shape	0.96	[0.91, 0.98]	0.97	0.98	< 0.001	Good Reliability
Walking to the Center of the Circle	0.89	[0.76, 0.95]	0.91	0.94	< 0.001	Good Reliability
Matching Geometric Shapes	0.78	[0.57, 0.90]	0.81	0.88	< 0.001	Good Reliability
Concentration and Shooting Accuracy	0.92	[0.83, 0.96]	0.94	0.95	< 0.001	Good Reliability

Overall, the results presented in the table show that all the tests demonstrated good to excellent reliability and validity. The reliability coefficients ranged from 0.78 to 0.96, and the Pearson's correlation coefficients ranged from 0.81 to 0.97. All correlations were statistically significant ($p < 0.001$) and had relatively narrow 95% confidence intervals. These findings confirm that the tests have acceptable to high levels of reliability and concurrent validity, making them suitable for use in the main study.

3. Objectivity:

In terms of objectivity, we focused on ensuring the instructions for administering the tests and calculating their scores or results were clear. In this context, we used straightforward, clear tests and designed the scoring for each test to be free from difficulty and ambiguity. The language used to present and guide test-takers was simple, and the duration of breaks between tests was determined by their nature and requirements; all breaks were long enough for test-takers to demonstrate their abilities.

3 – Controlling for variables related to the research sample:

There are numerous variables associated with the research population, some of which relate to the sample under study. To control for these variables, homogeneity and equivalence were ensured between the experimental and control groups in terms of age, height, weight, IQ and gender prior to the start of the experiment.

4. Programme adopted for the study:

Expert review and selection of movement stories:

To ensure scientific and educational quality, 30 preliminary movement stories were presented to a judging panel consisting of 10 experts, including professors and inspectors specialising in physical education, sports, educational psychology, curriculum design and teaching methods. The judging panel used an evaluation form that included the story's objectives, stages, narrative style, activities and teaching aids. The judging process resulted in the selection of 20 movement stories and the rejection of 10 due to failure to meet pedagogical standards, repetitive content or poor wording. The experts also recommended simplifying some exercises, modifying certain objectives, improving the narrative, incorporating audio-visual effects and organising the stages of implementing the movement stories more effectively.

Table No. (05) shows the percentage of movement stories accepted by the Experts:

Criterion	Nimber	Percentage
Number of stories submitted for judging and nomination	30	100 %
Number of stories accepted	20	66.67 %
Number of stories rejected	10	33.33 %
Number of stories requested to be revised	12	40 %
Number of stories requested to be revised	8	26.67 %

Table No. (6) lists the titles of the movement-based stories and the main educational objectives proposed and implemented in the programme.

No.	Story Title	Specific Objective of the Lesson
01	A Journey into the Wild	The pupils should be able to combine speed, strength and protection in purposeful movement patterns inspired by nature.
02	Sultan Suleiman and His Strict Orders	The pupils should be able to carry out simple movement commands using their sense of hearing, distinguishing between correct and deceptive commands while maintaining order and discipline when executing the movements.
03	Omar Watches a Soccer Match	The pupils should be able to perform a sequence of movement exercises while maintaining focus during execution.
04	The Day I Saw Pelé... The Soccer Legend	The pupils should be able to apply basic manipulative movement skills (passing, moving, team play) in a structured, simulated context that promotes concentration.
05	Ahmed Became a Doctor	The pupils should be able to move the body in different ways to distinguish between large and small body parts.
06	The Magic Handball	Development of basic motor skills and concentration during performance
07	A Journey to the Rocky City of Sefar	The pupils ability to use crawling, jumping, balancing, throwing, and climbing skills. With ease
08	Ali Baba and the Forty Thieves	For pupils to participate through a series of movements (running, crawling, jumping, balancing), reinforcing values such as intelligence and courage.
09	The Search for Treasure in the Desert	Enables pupils to use their imagination and focus to perform a sequence of movements that achieve harmony between movement and intelligence
10	The Lying Sparrow	Enables pupils to take on movement roles through walking, running, and jumping, while learning about body parts, colors, and shapes
11	Rescuing Dom from the Digital World	For pupils to be able to develop and integrate motor skills such as passing with basic movements such as jumping and running and mental abilities such as imagination and creativity.
12	A Visit to the Park	For pupils to participate in performing a sequence of movements that enhances their speed, agility, and ability to respond to traffic signals in a purposeful manner.
13	The Battle of Wits in the Kingdom of Chess	Pupils should be able to demonstrate intelligence and logical thinking in accordance with specific movement rules.
14	The Brave Farmer Who Loves His Field	Pupils' ability to build endurance in various muscle groups.
15	A Journey Through the Forest of Riddles	Development of motor intelligence, reaction speed, and visual and auditory attention through a story-based activity using technology.
16	Sanjub and the Hazelnut	For pupils to be able to change their movement paths intelligently and with focus
17	The Adventure of X and O in the City of Intelligence	For students to be able to enhance their motor skills and concentration through precise execution of basic movements
18	The Search for Treasure	To develop motor skills through (balancing, running, crawling, jumping)

19	A Trip to the Moon	pupils will be able to perform basic movements that develop balance, imagination, and fitness, while creatively visualizing the story
20	The Journey of the Moving Colors	pupils will be able to perform a variety of physical movements in response to the colors displayed, thereby developing motor skills and quick reactions

6-8- Presentation and Discussion of Results

1. Presentation and Discussion of the Results of the First Hypothesis:

The hypothesis states that “there are statistically significant differences between the pre-test and post-test scores for certain mental abilities (kinesthetic intelligence, attention Concentration) in the control group in the physical education and sports class”

Table (07) shows statistically significant differences between the pre-test and post-test scores for certain mental abilities in the control group:

Pre-test (1)	Post-test (2)	t-value	Degrees of freedom (df)	Statistical significance (p)	Cohen's effect size (d)
Pre-test Voice Discrimination	Post-test Voice Discrimination	6.061	31	< 0.001	1.071
Walking to the center Pre-test	Walking to the center Post-test	-4.268	31	< 0.001	-0.755
Correlation of Pre-Tests	Correlation of Post-Tests	0.711	31	0.482	0.126
Pre-test scoring accuracy	Post-test scoring accuracy	1.488	31	0.147	0.263

Figure 1 illustrates a comparison of the differences between pre- and post-test measurements for the control group in cognitive abilities and basic motor skills using raincloud plots.

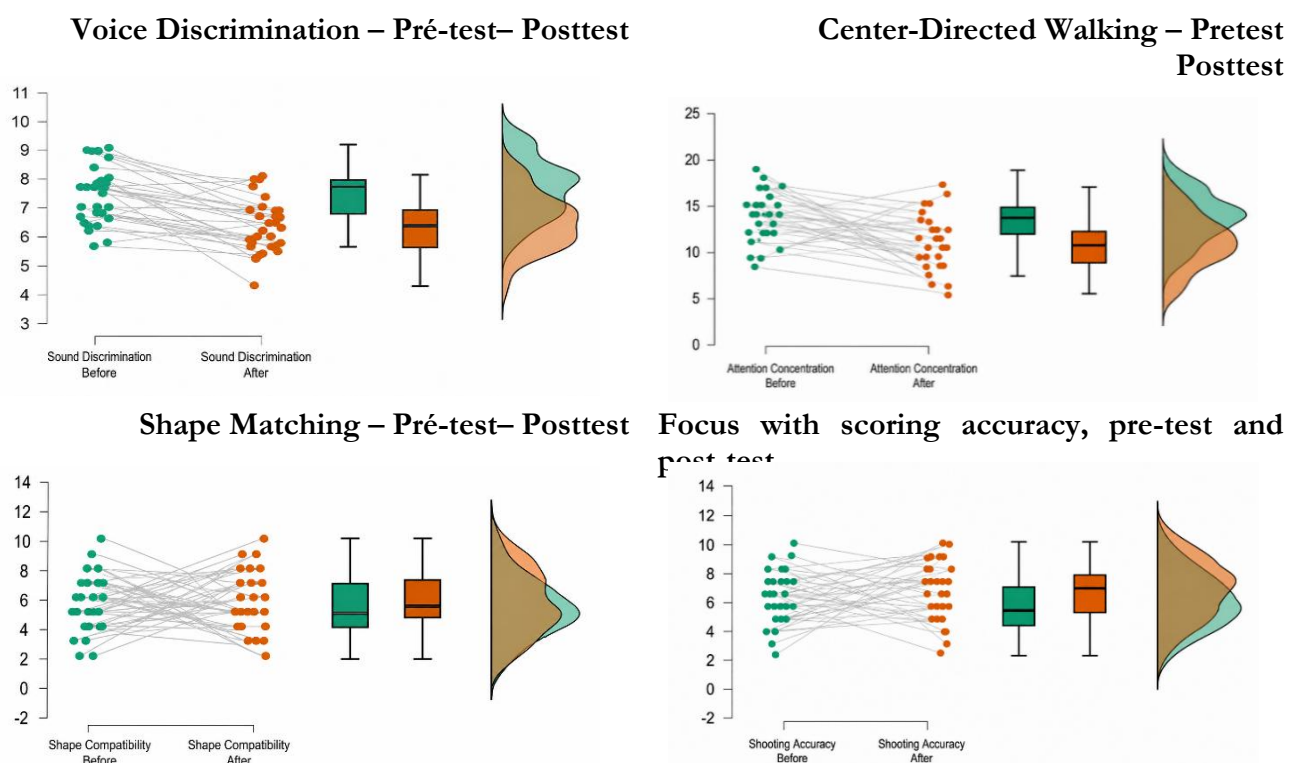


Table 7 shows that the results of the paired samples t-test in the control group indicate statistically significant differences in only some mental abilities. Specifically, the sound discrimination test showed a statistically significant improvement ($t = 6.061$, $p < 0.001$) with a large effect size ($d = 1.071$). In contrast, the walk-to-centre test showed a statistically significant decrease in performance ($t = -4.268$, $p < 0.001$) with a small effect size ($d = -0.755$). However, the shape matching and shooting accuracy tests did not show any statistically significant differences ($p > 0.05$) with small effect sizes. This indicates that the standard programme has a limited effect on the development of these abilities.

These results suggest that regular physical education classes may contribute to improving certain auditory perception-related abilities through practice and repetition. However, they do not lead to balanced development across all mental abilities. This explains why most variables showed no statistically significant improvement, and some even declined.

The results drawn from hypothesis 1 are consistent with those indicated by Pesce et al. (2016), who explained that practising physical activity improves some mental and cognitive abilities in children, particularly those related to sensory perception, attention and mental performance. However, the researchers confirmed that the extent of physical activity's cognitive impact varies depending on the nature and content of the activities provided. They also found that educational situations that include higher cognitive requirements achieve better results than traditional activities that primarily rely on motor practice. These results can be explained by the fact that traditional physical education activities focus more on developing skills and the motor aspect. In contrast, developing higher mental processes requires educational strategies that encourage greater mental and cognitive interaction, such as problem-based activities, storytelling or motor activities directed towards achieving specific cognitive goals. (Pesce, Crova, Cereatti, Casella, & Bellucci, 2016)

The results of the current study are also consistent with the findings of Donnelly et al. (2016), who indicated that school programmes based on physical activity can improve some cognitive abilities in children. However, the researchers emphasised that achieving clear improvements in complex cognitive abilities requires educational programmes that combine mental and physical activities, rather than relying on traditional physical education programmes alone. (Donnelly, et al., 2016)

These results can be explained by the fact that the standard physical education curriculum focuses on performing general motor activities as outlined in the syllabus. It does not employ instructional strategies that directly target the development of cognitive abilities. Therefore, improvement was limited to abilities influenced by repetitive practice. More complex abilities, such as figure-ground perception and attention focus, continued to require specialised educational programmes based on cognitive stimulation and structured interaction. This supports the hypothesis that achieving comprehensive growth in cognitive abilities requires planned educational interventions that go beyond traditional practice.

2. Presentation and Discussion of the Results of the Second Hypothesis:

The hypothesis states that “there are statistically significant differences between the pre-test and post-test scores for certain mental abilities (kinesthetic intelligence, attention Concentration) in the experimental group in the physical education and sports class.”

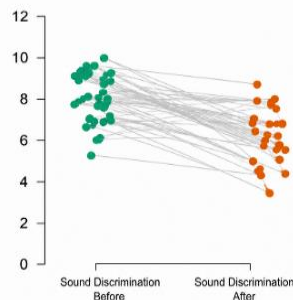
Table No. (08) Illustrates statistically significant differences between the pre-test and post-test scores for certain mental abilities in the experimental group:

Pre-test and Post-test	t-value	Degrees of freedom (df)	Statistical significance (p)	Cohen's effect size (d)	Cohen's Standard Error (SE)
Distinction of the sound of a pre-test and a post-test	5.887	31	< 0.001	1.041	0.280
Walking to the circle center is a pre-test and a post-test	-9.562	31	< 0.001	-1.690	0.276
Compatibility of pre-test and post-test formats	-2.934	31	< 0.006	-0.519	0.272

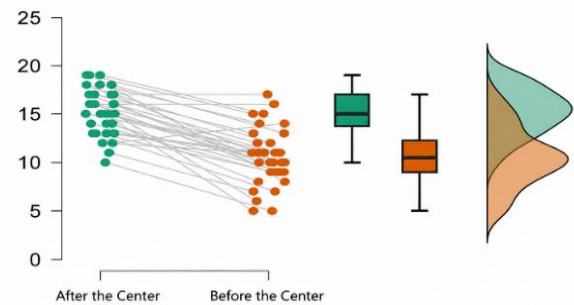
Focus with scoring accuracy, pre-test and post-test	-3.432	31	< 0.002	-0.607	0.276
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Figure 2 shows a comparison of the differences between the pre- and post-tests for the experimental group in mental abilities using raincloud plots.

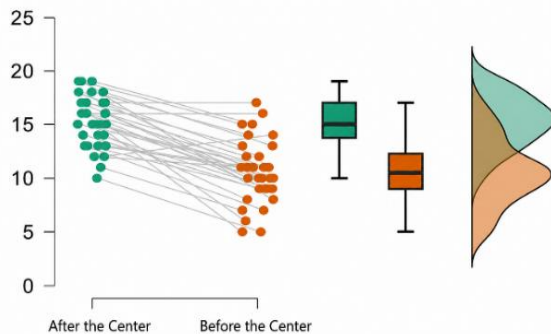
Distinction of the sound of a pre-test and a post-test



Walking to the circle center is a pre-test and a post-test



Compatibility of pre-test and post-test formats



Focus with scoring accuracy, pre test and post-test

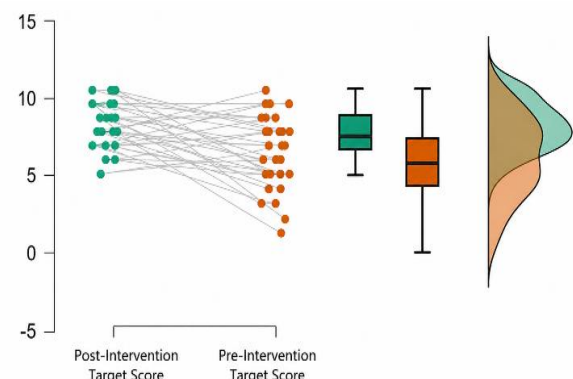


Table 8 shows a statistically significant improvement in all mental abilities among members of the experimental group following the implementation of the kinaesthetic, story-based programme. All tests showed significant differences in favour of the post-test ($p < 0.05$), with effect sizes ranging from large to very large. The sound discrimination test had the greatest effect size ($d = 1.041$), and the walk-to-the-centre test showed the most improvement in motor orientation and spatial attention ($d = 1.690$). Significant differences also emerged in the shape matching and target accuracy tests, reflecting the programme's effectiveness in developing cognitive abilities related to motor intelligence and attention focus.

These results suggest that the kinaesthetic, story-based educational programme provided an interactive learning environment combining visual, auditory and kinaesthetic stimuli. This contributed to increased attention and sensory perception, as well as improved decision-making speed and the accuracy of motor performance. This improvement can be attributed to the fact that the movement story presents learning in a meaningful and engaging context, integrates physical activity with cognitive processes and increases students' motivation to participate actively. This has a positive impact on the development of kinaesthetic intelligence and attention concentration.

These findings are also consistent with recent literature which confirms that educational programmes based on purposeful motor activities and supported by multiple stimuli have a greater impact on the development of cognitive functions than traditional classes. This is because they promote integration between cognitive processes and motor performance, and provide opportunities for active learning, problem solving and decision making during movement.

The results of the first hypothesis are consistent with the findings of a recent study by Vasilopoulos et al. (2023). This study confirms that incorporating physical and motor activities into the educational environment can enhance children's mental performance. In addition to its positive effects on basic

movements, educational situations provide children with opportunities to pay attention, perceive, respond, and interact with external stimuli simultaneously. This supports the development of mental and cognitive functions and abilities. Accordingly, the statistically significant improvement in the mental abilities of the experimental group recorded by the study reinforces the research trend emphasising the importance of integrating motor activity into the educational process to support cognitive development among primary school students. **(vasilopoulos, Jeffrey, WU, & dumontheil, 2023)**

The study results are also consistent with those of Melo et al. (2025), who employed organised physical and motor activities among primary school pupils. This can contribute to improving mental and cognitive performance. The two studies also agree that an improvement in a number of mental abilities and functions in children was recorded after the motor programme was applied, which supports the importance of integrating physical activity in the form of games and motor activities into educational situations as an effective way to contribute to cognitive development, as well as motor development. **(Melo, et al., 2025)**

Accordingly, the results of this study confirm the validity of the second sub-hypothesis and demonstrate that movement-based storytelling is an effective pedagogical approach that contributes to the cognitive development of primary school students. It achieves this by providing meaningful learning situations that combine movement-based learning, cognitive stimulation and positive interaction in physical education and sports classes.

3. Presentation and Discussion of the Results of the Third Hypothesis:

The hypothesis states that “there are statistically significant differences in the post-test measures of certain cognitive abilities (kinesthetic intelligence, attention span) between the experimental group and the control group in physical education and sports classes.”

Table No. (09) illustrates statistically significant differences in the post-test scores for certain mental abilities between the control and experimental groups:

Pre-test and Post-test	t-value	Degrees of freedom (df)	Statistical significance (p)	Cohen's effect size (d)	Cohen's Standard Error (SE)
Distinction of the sound of a pre-test and a post-test	0.876	62	0.285	0.219	0.251
Walking to the circle center is a pre-test and a post-test	-4.250	62	0.640	-1.062	0.283
Compatibility of pre-test and post-test formats	-4.890	62	0.428	-1.223	0.293
Focus with scoring accuracy, pre-test and post-test	-3.538	62	0.451	-0.884	0.273

Figure 3 illustrates a comparison of the differences between the control group and the experimental group in terms of cognitive abilities and basic motor skills, using raincloud plots.

Distinction of the sound of a pre-test and a post-test

Walking to the center of the circle Post-test - Post-test

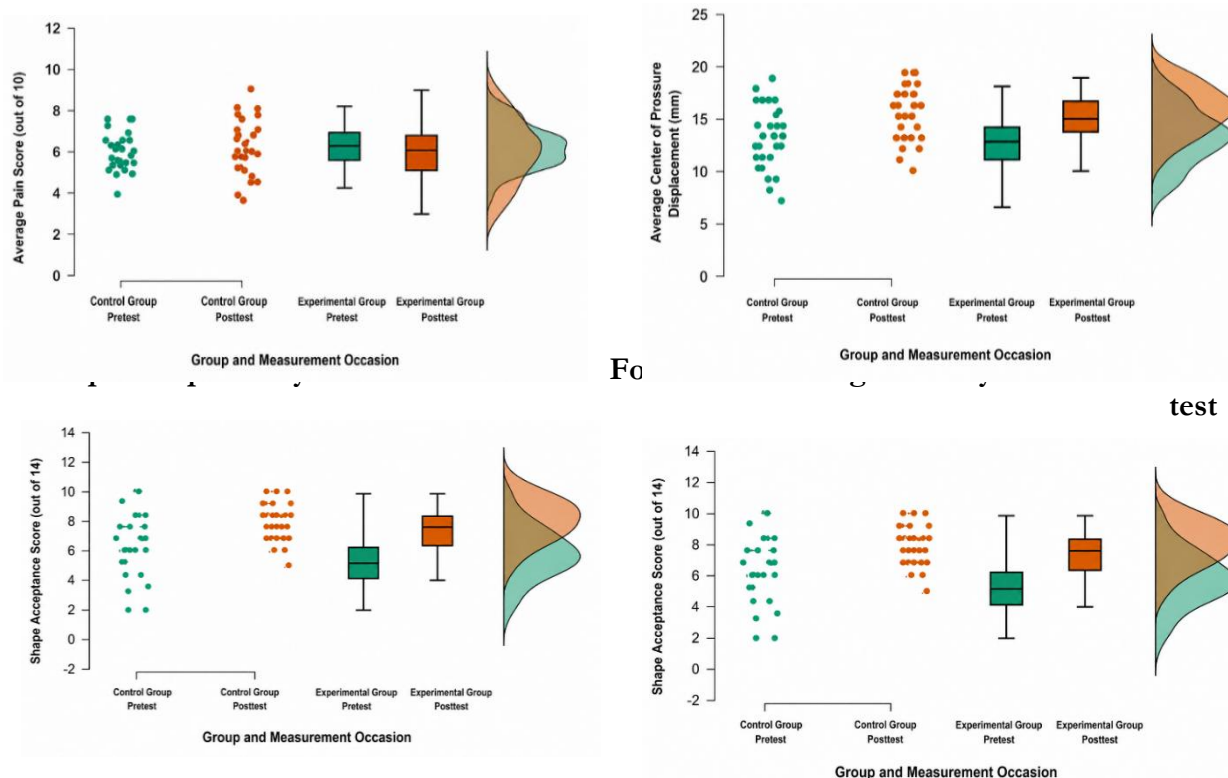


Table 9 shows statistically significant differences in post-test scores between the control and experimental groups, with the experimental group performing better in most cognitive ability tests. These include the 'Walk to the Centre' test ($t = -4.250$, $d = 1.062$), shape matching ($t = -4.890$, $d = 1.223$) and concentration and accuracy in goal-kicking ($t = -3.538$, $d = 0.884$). The large effect sizes indicate the high effectiveness of the proposed programme in developing abilities related to motor intelligence and attention focus. In contrast, the sound discrimination test showed no statistically significant differences ($t = 0.876$, $d = 0.219$), suggesting that this ability did not respond to the educational intervention to the same extent and may require more specialised programmes or a longer training period.

These results confirm that the experimental group performed better than the control group in the post-test, reflecting the positive impact of the motor-story-based programme on the development of mental abilities among primary school students. This can be explained by the fact that the programme provided diverse learning situations based on movement, play and interaction, utilising visual, auditory and kinaesthetic stimuli to enhance attention, spatial perception, neuromuscular coordination and decision-making speed during motor performance. Furthermore, the diversity of activities, gradual introduction of tasks and consideration of age-specific characteristics increased pupils' motivation to participate actively, improving their performance levels compared to the standard programme.

The results of the third hypothesis align with the findings of Boat et al. (2022). A pilot study involving 192 children aged 8–9 years found that integrating physical activity into 16 educational lessons led to a statistically significant improvement in various cognitive and mental functions in the experimental group compared to the control group. Cohen's effect sizes ranged from 0.34 to 0.42. The study suggests that incorporating physical activities in an organised and appealing way in the classroom can stimulate children's cognitive and mental processes, enhancing their performance in tasks requiring attention, memory, and intelligence. This outcome is consistent with our study's findings on the positive impact of the kinetic, story-based programme on developing mental abilities among primary school students. (boat, et al., 2022)

The results of the current study are also consistent with the findings of Magistro et al. (2022). Their study showed that, over a period of two years, incorporating physical mathematics lessons into recreational sports classes led to greater improvements in the experimental group than in the control

group. These improvements were evident in various dimensions of mental and cognitive functions and abilities, including working memory, information recall, selective visual attention, verbal fluency, and computational ability. Additionally, there was a significant impact on gross motor skills, transitional skills, and tool control skills. These findings provide strong support for our study's results. (Magistro, et al., 2022)

Accordingly, the study's results confirm the validity of the third sub-hypothesis, which states that there are statistically significant differences in the post-test measurements in favor of the experimental group in certain mental abilities, highlighting the effectiveness of the movement-based story program in improving motor and cognitive learning outcomes among elementary school pupils.

General Discussion:

Overall, the results of this study suggest that an educational programme incorporating movement stories in physical education and sports classes has a positive and statistically significant impact on the mental development of primary school students (aged 7–9). After the programme was implemented, the experimental group outperformed the control group in most of the measured variables. This can be explained by movement stories representing an integrated instructional strategy combining movement, imagination and language within a structured educational framework. This increases learners' engagement and motivation, thereby enhancing their information processing, attention, concentration, perception and decision-making during motor performance.

The current findings are consistent with those of recent studies which have confirmed that physical activities based on cognitive and educational principles positively impact the cognitive development of children. In a recent systematic review, Dong and Wang (2025) demonstrated that physical activities involving active cognitive engagement improve attention, executive function, memory and academic achievement more effectively than traditional physical activities. They recommended integrating these activities into physical education curricula, a finding consistent with the current study which showed that the experimental group, who used the movement story activity combining movement, thinking, imagination and problem solving, outperformed the control group. Recent reviews have also indicated that the positive impact of physical activity on mental abilities stems from the stimulation of neural processes and increased efficiency of the neural networks responsible for attention, perception and memory. Elevated levels of neurotrophic factors also contribute to improved learning and cognitive performance in children. (Dong & Wang, 2026)

On the other hand, the findings of this study are consistent with applied studies that have examined the use of storytelling and digital media in children's education, which have confirmed that integrating stories with physical activities and interactive media increases motivation and engagement in learning, and enhances children's ability to form mental representations and link motor experiences to educational situations. This explains that motor storytelling is not limited to developing motor performance alone but provides a multisensory learning environment that combines movement, language, images, sound, and social interaction which enhances cognitive processes, attention, and motor intelligence in a more effective manner compared to traditional teaching methods (Wang, Mee, & Kuo, 2025, pp. 133-159)

General Conclusions:

The programme's effectiveness is not solely due to physical activity, but rather to the integration of movement-based storytelling with purposeful learning situations, the progressive nature of the activities and consideration of the developmental characteristics of 7–9-year-olds. This integration created a stimulating learning environment that enhanced student engagement, improved attention spans and motor intelligence, and ultimately resulted in the experimental group outperforming the control group. This confirms that movement stories are an effective pedagogical approach for developing cognitive abilities in physical education classes at elementary school level.

After analysing and interpreting the results of the hypotheses, the study reached the following general conclusions:

The study revealed statistically significant differences in the post-test scores of the control and experimental groups, with the experimental group performing better in all the studied variables. This improvement reflects the effectiveness of the kinetic story programme in developing mental abilities, such as kinaesthetic intelligence and concentration. This superiority is attributed to the stimulating learning environment provided by the programme.

- Suggestions and Recommendations:

Based on the study's findings, the researchers can offer a set of suggestions that may contribute to improving the educational process in physical education and sports classes at the elementary school level through the use of movement stories

- Promote the use of the movement story method and program in elementary school physical education classes, given its effectiveness in developing mental abilities
- Train newly hired physical education teachers or those currently undergoing academic training at specialized universities to use and design interactive movement stories in line with students' developmental characteristics
- Carefully plan and design movement-based educational programs that take into account individual and gender differences among pupils, ensuring maximum utilization of their mental abilities
- Focusing on linking cognitive and motor aspects in educational content through integrated activities that help develop motor thinking and attention
- Conducting similar research at other educational levels—middle school, high school—or in different educational settings, with the aim of generalizing the findings and developing educational programs based on a broader body of data

- Conclusion:

When developing and designing the physical education and sports curriculum, particularly in the early years of schooling, specialists, psychologists and sociologists must take into account the unique characteristics of this sensitive stage, namely the elementary school years. This curriculum must be based on sound, well-researched scientific principles that rely heavily on creating an atmosphere of motivation and enthusiasm for all things positive, and fostering this attitude in students as well as in the community in which they live. One important method of achieving this goal is movement story programmes, or 'movement stories', which have been shown to be highly effective at this stage, as demonstrated by this study and most of the previously mentioned studies. Therefore, we must recognise the necessity of developing purposeful programmes with simple objectives and the necessary resources, with the aim of preparing future leaders.

The distinctive physical and mental aspects of movement story programmes promote physical health and fitness, especially when activities are varied and include the use of small props, games, dramatic play and role-playing. When designing these activities, it is essential to take into account the principles and guidelines that align with the different stages of development that primary school students go through, as play is a fundamental right of students.

As the results of scientific research form the basis of this and other studies, we believe that in-depth critical and analytical studies of the accompanying document and the physical education and sports curriculum for elementary school students should be conducted by specialists in physical education and sports, child psychology and school sociology. The aim should be to modify and improve the current curriculum to suit the diverse physical, mental, motor, psychological, social and emotional needs of Algerian elementary school students, ensuring that it includes programmes consisting of movement stories, role-playing games and small-group games.

There is also potential for in-depth research into identifying diverse methods and approaches, particularly those that link theoretical and scientific aspects with the practical application of physical education and sports classes with elementary school students. This is because these methods are particularly important in the processes of cognitive development and motor control.

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