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THE EFFECTIVENESS OF AN EXPLORATION-ENHANCED MOTOR GAMES PROGRAM IN DEVELOPING CERTAIN MOTOR ABILITIES AND KINESTHETIC INTELLIGENCE AMONG MIDDLE SCHOOL STUDENTS IN ALGERIA

ABSTRACT

This study is aimed at examining the effectiveness of using exploration-enhanced motor games in developing balance, motor coordination, and kinesthetic intelligence among male middle school students aged 12 to 14 years. The researcher hypothesized that adopting exploratory motor games would positively contribute to the development of balance, motor coordination, and kinesthetic intelligence among middle school students.

The study adopted an experimental design and included a sample of 48 students, who were divided into two equal groups: a control group and an experimental group. The homogeneity and equivalence of the two groups were verified, and the participants were randomly selected. The statistical results of the study revealed significant differences in favor of the experimental group in all tests related to balance, motor coordination, and kinesthetic intelligence. These findings indicate that the use of exploration-enhanced motor games contributes to improving balance and motor coordination, in addition to demonstrating a clear correlational relationship with kinesthetic intelligence among the participants in the experimental group.

Based on the findings of this study, a number of recommendations were made regarding the integration of exploration-enhanced motor games into classroom sessions and school activities; conducting similar field studies using different samples and *assessment tools to validate the findings; examining gender differences in the effect of motor games on motor abilities and kinesthetic intelligence; employing active learning strategies that encourage thinking and exploration during motor activities; optimizing the use of available space and resources to maximize students' engagement and the repetition of motor activities; emphasizing balance, motor coordination, and kinesthetic intelligence within teaching programs and organized children's activities; promoting exploration-enhanced motor games as enjoyable means for learning motor skills and as a basis for designing more effective educational programs in early developmental stages.*

***Keywords**: motor games, exploration-enhanced learning, physical education, motor abilities, kinesthetic intelligence, middle school students, Algeria.*

ЕФЕКТИВНІСТЬ ПРОГРАМИ РУХЛИВИХ ІГОР ІЗ ДОСЛІДНИЦЬКИМ ПІДХОДОМ У РОЗВИТКУ РУХОВИХ ЗДІБНОСТЕЙ ТА КІНЕСТЕТИЧНОГО ІНТЕЛЕКТУ УЧНІВ СЕРЕДНЬОЇ ШКОЛИ В АЛЖИРІ

АНОТАЦІЯ

Дослідження спрямоване на вивчення ефективності використання рухливих ігор із дослідницьким підходом у розвитку рівноваги, координації рухів та кінестетичного інтелекту серед учнів середньої школи чоловічої статі віком від 12 до 14 років в Алжирі. Була висунута гіпотеза, що застосування дослідницьких рухливих ігор позитивно впливає на розвиток рівноваги, координації рухів і кінестетичного інтелекту в учнів середньої школи. У дослідженні було використано експериментальний підхід, а вибірка складалася з 48 учнів, яких було поділено на дві рівні групи: контрольну та експериментальну. Було перевірено однорідність і еквівалентність обох груп, а учасників обрано випадковим чином. Статистичні результати дослідження показали наявність значущих відмінностей на користь експериментальної групи в усіх тестах, пов'язаних із рівновагою, координацією рухів і кінестетичним інтелектом. Отримані результати свідчать про те, що використання рухливих ігор із дослідницьким підходом сприяє покращенню рівноваги та координації рухів, а також демонструє чіткий кореляційний зв'язок із кінестетичним інтелектом серед учасників експериментальної групи.

На основі результатів дослідження сформульовано низку рекомендацій щодо інтеграції рухових ігор, що сприяють дослідницькій діяльності, у навчальні заняття та шкільні заходи; проведення аналогічних польових досліджень із використанням різних вибіркових сукупностей та інструментів оцінювання для підтвердження отриманих результатів; вивчення гендерних відмінностей у впливі рухових ігор на рухові здібності та кінестетичний інтелект; застосування стратегій активного навчання, що стимулюють мислення та дослідницьку діяльність під час рухових занять; оптимізації використання наявного простору та ресурсів для максимального залучення учнів та повторення рухових дій; надання пріоритету рівновазі, моторній координації та кінестетичному інтелекту в навчальних програмах та організованих дитячих заходах; популяризації моторних ігор, що сприяють дослідженню, як ефективного засобу для навчання моторних навичок та як основи для розробки більш ефективних освітніх програм на ранніх етапах розвитку.

***Ключові слова**: рухливі ігри, навчання на основі дослідження, фізичне виховання, рухові здібності, кінестетичний інтелект, учні середньої школи, Алжир.*

INTRODUCTION

The progress and prosperity of nations largely depend on the extent to which they care for the education of younger generations across different age groups. This is clearly reflected in the level of attention devoted to children, who represent the true human capital and the cornerstone for confronting the challenges of the twenty-first century. The future of any society is largely determined by the educational conditions experienced by individuals during their early developmental stages. Education is considered one of the most important factors of progress, upon which responsible citizenship is built and through which generations advance. In the contemporary world, education has become an effective form of human investment, as it represents one of the most efficient means of achieving the development of both the individual and society. In essence, education is a process of social formation of the individual, enabling him or her to utilize and invest personal abilities, while also representing a process of modifying human behavior with the aim of achieving comprehensive and integrated development in the physical, cognitive, and social domains (Al-Hayek, 2011, p. 196).

Physical education constitutes an essential component of general education due to its effective role in building the individual's personality in its intellectual, physical, and emotional dimensions. From this perspective, the Ministry of National Education in Algeria introduced physical education and sports as a subject in primary education, delivered by specialized physical education teachers starting from the 2023/2024 academic year. This decision represents a positive step toward strengthening the status of physical education within the Algerian educational system, given its fundamental role in the upbringing of young generations and in preparing responsible citizens who possess physical competence and good health, enabling them to positively influence and interact with their society.

The primary and middle school stages are of great importance, as they represent some of the most critical periods in an individual's life. During these stages, children's abilities develop, their talents evolve, and they become more receptive to guidance and influence that help shape their future orientations (Hassanein, 1987, p. 106). In this context, motor activity plays a fundamental role in achieving the child's comprehensive and integrated development, particularly through educational games, which are considered among the most effective teaching methods suited to younger age groups, as they provide enjoyment, motivation, and opportunities for self-discovery as well as exploration of the surrounding environment.

Play represents the natural medium of learning during childhood, as it allows students to acquire diverse forms of exploratory activities and develop their motor abilities, which constitute the foundation for balanced and healthy development. According to Natalie, motor education provides students with extensive bodily experiences, particularly during motor performance situations. Moreover, motor activities within physical education classes are among the most widely practiced activities, as they contribute to the development of physical qualities and fundamental skills, particularly balance and motor coordination. These two abilities constitute a fundamental basis for various motor practices due to their close relationship with the functioning of the nervous system and the control of body posture, making them essential components for specialized sports performance (Al-Kaabi & Mohsen, 2001, p. 27).

Considering the Theory of Multiple Intelligences proposed by Gardner (1983), kinesthetic intelligence is regarded one of the most important types of intelligence, reflected in an individual's ability to skillfully use the body to express ideas and accomplish various tasks. From this perspective, the development of this type of intelligence becomes particularly important during the age stage of 9–11 years, which is considered an appropriate period for acquiring, consolidating, and stabilizing fundamental motor skills.

However, despite the importance of teaching physical education at the middle school level and its recent introduction at the primary level, several field challenges have emerged. Among these challenges is the reliance on traditional teaching methods characterized predominantly by a command style, with limited attention to sensorimotor perceptions and the appropriate intensity levels for this age group. Furthermore, the emergence of certain injuries has been observed as a result of applying programs that do not sufficiently consider individual differences and developmental characteristics, which may negatively affect the child's future motor and health trajectory.

Interviews conducted with several physical education teachers revealed a limited use of games specifically designed to develop balance, motor coordination, and kinesthetic intelligence. This situation highlights the need to search for more suitable and effective pedagogical alternatives adapted to the characteristics of this age group. Traditional motor activities may not provide students with sufficient opportunities for self-expression and exploration of their abilities, and they often lack the exploratory dimension that serves as an important stimulus for the development of intelligence in the sports domain.

Based on the foregoing, the need emerged to design a motor learning program based on exploration-enhanced motor games aimed at developing certain fundamental motor abilities, particularly balance and motor coordination, in addition to kinesthetic intelligence among middle school students. Such a program takes into account the specific characteristics of this sensitive developmental stage and contributes to enriching the pedagogical practices of physical education teachers.

The results of this research therefore seek to address several questions regarding the extent to which the use of exploration-enhanced motor games can positively influence the development of balance, motor coordination, and kinesthetic intelligence among middle school students.

THE AIM OF THE STUDY

This study aims to examine the effectiveness of using exploration-enhanced motor games in developing certain motor abilities, specifically balance and motor coordination, as well as kinesthetic intelligence among middle school students. It also seeks to identify the nature of the relationship between these motor abilities and kinesthetic intelligence, and the extent to which they are influenced by the integration of this type of activity within physical education classes.

In addition, the study aims to determine the scientific and pedagogical foundations for selecting exploration-enhanced motor games that are appropriate to the developmental characteristics of children aged 12–14 years. In doing so, it takes into consideration the psychological, motor, and cognitive aspects that distinguish this age group. The study also examines the specific characteristics of children at this stage and the extent to which the proposed games correspond with their needs and motor tendencies, as well as their impact on the development of kinesthetic intelligence.

From an applied perspective, the study seeks to highlight the importance of integrating exploration-enhanced motor games into the content of physical education classes at the middle school level. This is achieved by proposing a practical framework that may contribute to improving pedagogical practices and enhancing the effectiveness of the lesson. Such an approach can support the success of physical education classes at this educational stage by adopting modern teaching strategies that are better suited to students' characteristics and more capable of motivating them while promoting the comprehensive development of their motor and cognitive abilities.

THEORETICAL FRAMEWORK AND RESEARCH METHODS

Scientific studies confirm the efficacy of training in improving balance despite genetic influences. Research by Smith, Gendin, and Garrison, as well as Sincer, indicates improvement in balance with practice and age (Metwally Abdullah, 2011, p. 151). Studies also show that children's balance abilities begin to improve significantly from age seven (Mahmoud Saad & Fahim, 2004, p. 196).

Al-Kayyali noted that individuals with bodily-kinesthetic intelligence learn through practical experience, experimentation, and bodily expression using multiple senses. Darar (2019, p.43) emphasized that such individuals possess control over their body, balance, agility, and coordination.

Studies of Shaltout & Abdel-Halim (1988) and Askar (1990) demonstrated the positive effects of experimental play programs on motor skills, as well as Al-Kalabi (2008), who highlighted the effect of games on sensory-motor perception. Afaf Osman (2017, p. 88) emphasized children's rapid acquisition of new movements and motor adaptability under varying conditions.

Maria Rosaria et al. (2015) highlighted the importance of motor activities and training programs for cognitive development, and studies by Wafaa Al-Turki Al-Ghriri (2010) and Yaqoubi Fateh (2012) found positive correlations between intelligence and motor abilities and the role of motor games in fostering motor creativity. Fatima Nasser Hussein et al. (2014) also emphasized that perception-based motor programs enhance talent and kinesthetic intelligence.

Current study adopted the experimental method, as it is the most appropriate approach for the nature and problem of the research. This method is considered one of the most suitable for examining causal relationships and measuring the effect of an independent variable on dependent variables under controlled conditions. It allows the researcher to control influencing factors, thereby enabling the attainment of accurate and objective results based on the practical implementation of a scientific experiment.

The research population consisted of middle school students aged between 12 and 14 years, from both sexes. The total number of students in the population was 87.

Given the nature of the study and the adopted methodology, the research sample was selected purposively and consisted of 48 students, representing 55.17 % of the original population. Participants involved in the pilot study were excluded, as well as students who did not meet the equivalence conditions or those who had health conditions preventing them from participating in the experiment.

The sample participants were equally divided into two groups: an experimental group and a control group, drawn from two different classes within the same educational institution. Care was taken to ensure the equivalence of the two groups in the variables under study prior to the implementation of the experimental program.

Control of study variables. Independent Variable: the independent variable consisted of the educational program based on exploration-enhanced motor games, whose effect the researcher sought to measure by applying it to the participants of the experimental group according to a predetermined schedule.

Dependent variables: the dependent variables included balance, motor coordination, and kinesthetic intelligence. These variables were expected to be influenced by the proposed program and were measured through pre-tests and post-tests to determine the magnitude of change resulting from the application of the independent variable.

Study delimitations. Human Scope: the research sample consisted of 48 male students, purposively selected from Mahi Mohamed Middle School. They were divided into two equivalent groups:

– control group consisting of 24 students (Class A)

– experimental group consisting of 24 students (Class B).

Spatial Scope: The proposed program and the pre- and post-tests were conducted at the sports field of Mahi Mohamed Middle School in Yellel, Relizane Province, Algeria.

Temporal scope*:* The study was conducted from 01/09/2025 to 31/12/2025. The research began with the theoretical framework, followed by the pre-tests for both the experimental and control groups on 27/09/2025. Subsequently, the proposed program was implemented with the experimental group from 01/10/2025 to 30/12/2025, at a rate of one session per week. At the end of the experiment, the post-tests were conducted on 31/12/2025, under the same conditions and specifications as the pre-te*sts.*

Research instruments

The researcher relied on several tools, including:

1) selecting an appropriate educational institution based on proximity and ease of administrative procedures;

2) reviewing Arabic and foreign references and sources related to the research topic;

3) physical tests designed to measure balance, motor coordination, and kinesthetic intelligence;

4) personal interviews with several physical education teachers;

5) systematic scientific observation;

6) sports equipment necessary for implementing the program and conducting the tests.

Statistical methods. The researcher used several statistical methods appropriate to the experimental design and data analysis, including:

1) arithmetic mean to measure the central tendency of the data;

2) standard deviation to determine the dispersion of values around the mean;

3) student's t-test to examine differences between means, whether between pre- and post-measurements or between the two groups;

4) spearman correlation coefficient to study the relationship between variables;

5) test validity to verify the appropriateness of the measurement tools.

Pilot Study. In light of the research problem and objectives, and given the variety of tests used in the study, the researcher sought to verify the suitability of the measurement tools and the field application procedures in order to obtain accurate and objective results. For this purpose, two pilot studies were conducted to verify the scientific foundations of the tests used, including validity, reliability, and objectivity, as well as to identify the various factors that might influence the success of the experimental work.

The pilot study aimed to ensure proper preparation for the main experiment by identifying the correct procedures for administering the tests, detecting potential difficulties that might accompany the field implementation, and ensuring the smooth progression of the research stages. In this context, the researcher visited several primary schools to examine the available facilities and select a suitable environment for conducting the study. After collecting the necessary information, Mahi Mohamed Middle School in Yellel was selected as the field site for the study.

Scientific foundations of the tests. Test Reliability: Test reliability refers to the ability of a test to produce similar or identical results when repeated under similar conditions. To calculate the reliability coefficient, the researcher used the test–retest method, whereby the tests were administered twice with a one-week interval between applications. The Pearson correlation coefficient was then calculated between the two administrations.

According to the results presented in Table 01, the reliability coefficients ranged between 0.79 and 0.93, which exceed the statistically acceptable minimum threshold (0.70). This indicates a high level of consistency and stability in the results, confirming that the tests possess good reliability.

Test Validity: validity refers to the extent to which a test measures the attribute it is intended to measure. To verify the validity of the tests, self-validity was calculated by taking the square root of the reliability coefficient. According to Table 1, the validity values ranged between 0.88 and 0.96, which are high values confirming that the tests possess a high degree of validity and accurately measure the intended variables.

Test Objectivity: test objectivity refers to minimizing the influence of subjective judgment by evaluators when assessing performance, ensuring that results do not vary depending on who conducts the measurement. The lower the variation among evaluators, the higher the degree of objectivity.

To ensure test objectivity, the researcher selected tests that were clear and easy to administer. These tests were presented to the supervising professor and discussed with specialized faculty members from the Department of School Physical and Sports ***Activities***, where they were approved as indicated in the appendices, thereby reinforcing their objectivity and suitability for application.

Table 1

The reliability and validity results of the tests for the pilot experiment

Tests	Test Type	Reliability	Validity
Coordination	Jumping Rope	0.93	0.96
Balance	Crossing over Marks	0.83	0.91
Kinesthetic Intelligence	Ball Drop	0.79	0.88

Results of Balance tests: cross-the-marks test (Table 2):

Table 2

Pre-test and post-test results of the Cross-the-Marks Test for the control group

Variables	Arithmetic Mean	Standard Deviation	Calculated *t*	Tabular t	Significance Level	Degrees of Freedom	Statistical Significance
Pre-test	3.31	2.10	0.60	2.07	0.05	23	Not statistically significant
Post-test	3.64	1.71					

The arithmetic mean of the pre-test was 3.61, which is slightly lower than the post-test mean of 3.64. The pre-test standard deviation was 2.10, while the post-test standard deviation was 1.71, indicating a small dispersion of values around the mean. The calculated t-value was 0.60, which is less than the tabular t-value of 2.07 at 23 degrees of freedom (n–1) and a significance level of 0.05.

Conclusion: there were no statistically significant differences between the pre-test and post-test results, although there was a slight improvement in the post-test mean, favoring the post-test performance for the control group in the Cross-the-Marks Test.

Experimental Group. Cross-the-Marks Test (Table 3):

Table 3

Pre-test and post-test results of the Cross-the-Marks Test for the experimental group

Variables	Arithmetic Mean	Standard Deviation	Calculated t	Tabular *t*	Significance Level	Degrees of Freedom	Statistical Significance
Pre-test	4.58	3.03	2.64	2.07	0.05	23	statistically significant
Post-test	6.77	2.71					

The arithmetic mean of the pre-test was 4.58, which is lower than the post-test mean of 6.77. The pre-test standard deviation was 3.03, while the post-test standard deviation was 2.71, indicating a moderate clustering of values around the mean. The calculated *t*-value was 2.64, which is higher than the tabular t-value of 2.07 at 23 degrees of freedom (*n*–1) and a significance level of 0.05.

Conclusion: There is a statistically significant difference between the pre-test and post-test results in favor of the post-test, indicating that the experimental group showed improvement in the Cross-the-Marks Test after participating in the exploration-enhanced motor games program.

Effect Size Calculation (Cohen's d) (Table 4):

Table 4

The effect size results (Cohen's d) of the independent variable on the dependent variable, balance

Independent Variable	Dependent Variable	Cohen's *d*	Effect Size
Educational Program	Balance	0.76	Large

There are statistically significant differences between the pre-test and post-test results for the experimental group in the Cross-the-Marks Test, in favor of the post-test. Table 4 indicates that the effect of the independent variable on the dependent variable (balance) was large, according to Cohen's d.

***Comparison of post-test results between the two groups* (*control and experimental*).** Cross-the-Marks Test (Table 5):

Table 5

The post-test results comparison of the Cross-the-Marks Test for the control group and the experimental group

Variables	Arithmetic Mean	Standard Deviation	Calculated *t*	Tabular *t*	Significance Level	Degrees of Freedom	Statistical Significance
Pre-test	3.64	1.71	4.78	2.01	0.05	46	statistically significant
Post-test	6.77	2.71					

Analysis of post-test results between the two groups. The arithmetic mean of the control group was 3.64, which is lower than the experimental group mean of 6.77. The standard deviation for the control group was 1.71, while for the experimental group it was 2.71, indicating a relatively small dispersion of values around the mean. The calculated t-value was 4.78, which is higher than the tabular t-value of 2.01 at 46 degrees of freedom and a significance level of 0.05.

Conclusion: there is a statistically significant difference between the two groups in the post-test of the Cross-the-Marks Test, in favor of the experimental group. Motor Coordination Tests.

JUMPING ROPE TEST in the Control Group (Table 6):

Table 6

Pre-test and post-test results of the Jumping Rope Test for the control group

Variables	Arithmetic Mean	Standard Deviation	Calculated *t*	Tabular *t*	Significance Level	Degrees of Freedom	Statistical Significance
Pre-test	3.12	1.55	0.41	2.07	0.05	23	Not statistically significant
Post-test	2.95	0.32					

Analysis of the jumping rope test – control group. The arithmetic mean of the pre-test was 3.12, which is slightly higher than the post-test mean of 2.95. The pre-test standard deviation was 1.55, and the post-test standard deviation was 1.32, indicating a small dispersion of values around the mean. The calculated t-value was 0.41, which is lower than the tabular t-value of 2.07 at 23 degrees of freedom (n-1) and a significance level of 0.05.

Conclusion: there are no statistically significant differences between the pre-test and post-test results for the control group, although there is a slight difference in the means favoring the post-test in the Jumping Rope Test.

Experimental Group – Jumping Rope Test (Table 7):

Table 7

Pre-test and post-test results of the Jumping Rope Test for the experimental group

Variables	Arithmetic Mean	Standard Deviation	Calculated *t*	Tabular *t*	Significance Level	Degrees of Freedom	Statistical Significance
Pre-test	1.06	1.55	6.96	2.07	0.05	23	statistically significant
Post-test	4.01	1.38					

Analysis of the Jumping Rope Test – Experimental Group. The arithmetic mean of the pre-test was 1.06, which is lower than the post-test mean of 4.01. The pre-test standard deviation was 1.55, and the post-test standard deviation was 1.38, indicating a relatively small dispersion of values around the mean. The calculated *t*-value was 6.96, which is higher than the tabular *t*-value of 2.07 at 23 degrees of freedom (*n*–1) and a significance level of 0.05.

Conclusion: there is a statistically significant difference between the pre-test and post-test results for the experimental group in the Jumping Rope Test, in favor of the post-test. This indicates that the exploration-enhanced motor games program had a positive effect on motor coordination for the experimental group.

Effect Size (Cohen's d) (Table 8):

Table 8

The effect size results (Cohen's d) of the independent variable on the dependent variable, motor coordination

Independent Variable	Dependent Variable	Cohen's d	Effect Size
Educational Program	Motor Coordination	2.01	Very Large

Conclusion – jumping rope test (*experimental group*). There are statistically significant differences between the pre-test and post-test results for the experimental group in the Jumping Rope Test, in favor of the post-test. Table 08 indicates that the effect of the independent variable on the dependent variable (motor coordination) was large, according to Cohen's d.

Post-Test Comparison Between the Two Groups (Control and Experimental) (Table 9):

Table 9

The post-test results comparison of the Jumping Rope Test for the control group and the experimental group

Variables	Arithmetic Mean	Standard Deviation	Calculated *t*	Tabular *t*	Significance Level	Degrees of Freedom	Statistical Significance
Pre-test	2.95	1.32	2.72	2.07	0.05	46	statistically significant
Post-test	4.01	1.38					

Analysis of post-test results between the two groups – JUMPING ROPE TEST

The arithmetic mean of the control group was 2.95, which is lower than the experimental group mean of 4.01. The standard deviation for the control group was 1.32, and for the experimental group it was 1.38, indicating a small dispersion of values around the mean. The calculated t-value was 2.72, which is higher than the tabular t-value of 2.07 at 46 degrees of freedom and a significance level of 0.05.

Conclusion: There is a statistically significant difference between the two groups in the post-test of the Jumping Rope Test, in favor of the experimental group.

Kinesthetic Intelligence Tests

Ball Drop Test: Control Group (Table 10):

Table 10

The pre-test and post-test results of the Ball Drop Test for the control group

Variables	Arithmetic Mean	Standard Deviation	Calculated *t*	Tabular *t*	Significance Level	Degrees of Freedom	Statistical Significance
Pre-test	58.27	17.39	0.51	2.07	0.05	23	Not statistically significant
Post-test	55.72	17.49					

Analysis of the ball drop test – control group. The arithmetic mean of the pre-test was 58.27, which is higher than the post-test mean of 55.72. The pre-test standard deviation was 17.39, and the post-test standard deviation was 17.49, indicating a wide dispersion of values around the mean. The calculated t-value was 0.51, which is lower than the tabular *t*-value of 2.07 at 23 degrees of freedom and a significance level of 0.05.

Conclusion: There are no statistically significant differences between the pre-test and post-test results of the Ball Drop Test for the control group, although there is a slight difference between the means favoring the post-test.

Experimental group – ball drop test (Table 11):

Table 11

The pre-test and post-test results of the Ball Drop Test for the experimental group

Variables	Arithmetic Mean	Standard Deviation	Calculated *t*	Tabular *t*	Significance Level	Degrees of Freedom	Statistical Significance
Pre-test	42.35	15.11	5.44	2.07	0.05	23	statistically significant
Post-test	22.02	10.40					

Analysis of the ball drop test – experimental group. The arithmetic mean of the pre-test was 42.35, which is higher than the post-test mean of 22.02. The pre-test standard deviation was 15.11, and the post-test standard deviation was 10.40, indicating a relatively wide dispersion of values around the mean. The calculated *t*-value was 5.44, which is higher than the tabular *t*-value of 2.07 at 23 degrees of freedom and a significance level of 0.05.

Conclusion: there is a statistically significant difference between the pre-test and post-test results for the experimental group in the Ball Drop Test, indicating a notable improvement in kinesthetic intelligence following the exploration-enhanced motor games program. Effect Size Calculation (Cohen's d) – Kinesthetic Intelligence (Table 12):

Table 12

The effect size results (Cohen's d) of the independent variable on the dependent variable, kinesthetic intelligence

Independent Variable	Dependent Variable	Cohen's d	Effect Size
Educational Program	Kinesthetic Intelligence	1.5	Very Large

Conclusion – ball drop test (experimental group). There are statistically significant differences between the pre-test and post-test results for the experimental group in the Ball Drop Test, in favor of the post-test. Table 12 indicates that the effect of the independent variable on the dependent variable (kinesthetic intelligence) was large, according to Cohen's d.

Post-Test Comparison Between the Two Groups (Control and Experimental) – Ball Drop Test (Table 13):

Table 13

The post-test results comparison of the Ball Drop Test for the control group and the experimental group

Variables	Arithmetic Mean	Standard Deviation	Calculated *t*	Tabular *t*	Significance Level	Degrees of Freedom	Statistical Significance
Pre-test	55.72	17.49	8.12	2.01	0.05	46	statistically significant
Post-test	22.02	10.40					

Analysis of post-test results between the two groups – ball drop test. The arithmetic mean of the control group was 55.72, which is higher than the experimental group mean of 22.02. The standard deviation for the control group was 17.49, and for the experimental group it was 10.40, indicating a wide dispersion of values around the mean. The calculated t-value was 8.12, which is higher than the tabular *t*-value of 2.01 at 46 degrees of freedom and a significance level of 0.05.

Conclusion: there is a statistically significant difference between the control and experimental groups in the post-test of the Ball Drop Test, in favor of the experimental group. Presentation and Analysis of the Relationship Between Balance, Motor Coordination, and Kinesthetic Intelligence is shown in Table 14:

Table 14

Results of the relationship between the Balance and Motor Coordination tests and Kinesthetic Intelligence

Intelligence	Abilities	
	Balance	Motor Coordination
	Cross-the-Marks	Jumping Rope
Ball Drop Test	0.68	0.74

From the table, it is observed that the correlation coefficients for all relationships are positive, ranging from moderate to strong:

1. The correlation between Kinesthetic Intelligence and the Cross-the-Marks Test (Balance) is r = 0.68, indicating a moderate to good relationship.

2. The correlation between Kinesthetic Intelligence and the Jumping Rope Test (Motor Coordination) is $r = 0.74$, indicating a strong relationship with the Ball Drop Test.

Conclusion: the correlation coefficients for all relationships between balance and motor coordination tests and kinesthetic intelligence tests are positive and range from moderate to strong, indicating a clear positive relationship between the development of balance and motor coordination and the enhancement of kinesthetic intelligence.

RESULTS

The first hypothesis posited that there would be a statistically significant difference between the pre-test and post-test results of the experimental group in favor of the post-test on the balance test. The results presented in Tables 2–5 revealed clear statistically significant differences with a large effect size, confirming the validity of this hypothesis.

This outcome can be attributed to the variety of exploration-enhanced motor games implemented by the researcher, which included elements of excitement and allowed students freedom of movement. This motivated students to engage in the activities and improved their performance in the post-tests. This aligns with the observations of Al-Hamami and Mustafa, who noted that play depends on the type of tools, children's imagination, and freedom of movement, highlighting the necessity of providing students with diverse exploratory motor games to develop both mental and motor capacities, particularly kinesthetic intelligence.

The selection of the age group (12–14 years) was purposeful, considering the slower development of balance compared to motor coordination in younger children. As Mohamed Sobhi Hassanein notes, training plays a crucial role in developing balance at this stage. The variety of games within the educational units further enhanced balance due to the close relationship between the nervous and muscular systems in maintaining body stability during fundamental and athletic movements.

Scientific studies confirm the efficacy of training in improving balance despite genetic influences. Research by Smith, Gendin, and Garrison, as well as Sincer, indicates improvement in balance with practice and age (Metwally Abdullah, 2011, p. 151). Studies also show that children's balance abilities begin to improve significantly from age seven (Mahmoud Saad & Fahim, 2004, p. 196). Based on the statistical results and scientific analysis, the first hypothesis is confirmed, with significant differences observed between pre-test and post-test scores in favor of the post-test for balance in the experimental group. The second hypothesis stated that there would be a statistically significant difference between the pre-test and post-test results of the experimental group in favor of the post-test in motor coordination tests. The results shown in Tables 06, 07, 08, and 09 revealed clear differences, reflecting the positive impact of the proposed educational units on enhancing motor coordination in the experimental group with a very large effect size.

This improvement is attributed to the variety of exploration-enhanced motor games designed to stimulate motor coordination and improve neuromuscular signaling, facilitating adaptation to speed and changing positions across different sessions, in accordance with scientific principles of training load construction (Nasr Eldin & Abdel-Fattah, 2003, p. 173). This aligns with Al-Faqi and Hassanein, who highlighted that motor coordination encompasses balance, rhythm, and movement speed, and is a key indicator of motor development (Al-Faqi, 1975, p. 11).

Additionally, the selected games enhanced motor integration between the eyes and limbs, improving both individual and group performance. Students had opportunities to repeat skills in a competitive yet supportive environment, further developing neuromuscular coordination (Hamada, 2004; Abdel-Fattah, 1997, p. 205). Based on the statistical analysis, the second hypothesis is confirmed, with significant differences favoring post-test results in motor coordination for the experimental group.

The third hypothesis suggested statistically significant differences between pre-test and post-test results of the experimental group in favor of post-tests in kinesthetic intelligence. Results in Tables 10, 11, 12, and 13 showed clear differences, reflecting the positive effect of the proposed program based on exploration-enhanced motor games, with a very large effect size.

Various indicators of kinesthetic intelligence, such as using bodily movements, learning through motion and interaction, coordination, imitation, and mimicking others' movements, contribute to developing fundamental motor skills, including balance, coordination, running, and grasping. This aligns with Hassan & Zouqan, who described bodily-kinesthetic intelligence as the ability to use one's body or body parts to solve problems, perform movements or skills, and express ideas through motion (Hassan & Zouqan, 2005).

Al-Kayyali noted that individuals with bodily-kinesthetic intelligence learn through practical experience, experimentation, and bodily expression using multiple senses. Darar (2019, p.43) emphasized that such individuals possess control over their body, balance, agility, and coordination. Kinesthetic intelligence develops from childhood and is influenced by environmental opportunities for practice, eventually enhancing performance in physical activities and visuomotor coordination (Khawla Hassan & Zouqan Obaidat, 2006; Obaidat, 2005).

Based on statistical results and scientific analysis, the third hypothesis is confirmed, showing significant differences between pre-test and post-test scores in favor of post-tests for kinesthetic intelligence in the experimental group. The fourth hypothesis posited that there would be statistically significant differences in post-test results between the control and experimental groups in favor of the experimental group. Tables 5, 9, and 13 show that the experimental group outperformed the control group across all measured variables: balance, motor coordination, and kinesthetic intelligence.

This superiority is attributed to the effectiveness of exploration-enhanced motor games tailored to children's abilities, incorporating variety, excitement, freedom of expression, and changes in activity methods, which positively impacted the experimental group's performance.

These findings align with previous studies, such as Shaltout & Abdel-Halim (1988) and Askar (1990), who demonstrated the positive effects of experimental play programs on motor skills, as well as Al-Kalabi (2008), who highlighted the effect of games on sensory-motor perception. Afaf Osman (2017, p. 88) emphasized children's rapid acquisition of new movements and motor adaptability under varying conditions. In contrast, the control group showed limited improvement due to the standard Ministry program, which develops motor and cognitive abilities in a less structured and targeted manner (Al-Mumarrasa, 2018, p. 49).

Hence, the fourth hypothesis is confirmed, showing statistically significant differences in favor of the experimental group.

The fifth hypothesis proposed a positive and significant correlation between the development of balance, motor coordination, and kinesthetic intelligence. Table 14 shows a clear positive correlation between balance and coordination tests and kinesthetic intelligence, reflecting the positive impact of exploration-enhanced motor games. These games develop kinesthetic intelligence by encouraging children to solve movement-based challenges actively.

This aligns with prior research, including Maria Rosaria et al. (2015), which highlighted the importance of motor activities and training programs for cognitive development, and studies by Wafaa Al-Turki Al-Ghriri (2010) and Yaqoubi Fateh (2012), which found positive correlations between intelligence and motor abilities and the role of motor games in fostering motor creativity. Fatima Nasser Hussein et al. (2014) also emphasized that perception-based motor programs enhance talent and kinesthetic intelligence.

Mechanistically, motor exercises increase oxygen delivery to the brain, stimulating the formation of new neural synapses and enhancing information processing. Mustafa (2015) noted that the efficiency of sensory receptors and children's movement patterns correlates with kinesthetic intelligence. Similarly, Mishal Badr & Salwa Abdel-Hadi Majid (2016) emphasized that kinesthetic intelligence involves skillful body use to integrate natural movements for problem-solving and expression (Allaba, 2020, pp. 176–177).

Therefore, the fifth hypothesis is confirmed, indicating a statistically significant positive correlation between the development of balance, motor coordination, and kinesthetic intelligence in the experimental group.

The study's findings support the general hypothesis, confirming that using exploration-enhanced motor games positively affects the development of balance, motor coordination, and kinesthetic intelligence among middle school students. Statistical analyses in Tables 2, 3, 6, 7, 10, and 11 revealed significant differences between the experimental group exposed to exploratory motor games and the control group following traditional methods.

Varied motor games, such as static and dynamic balance tasks and jumping on different surfaces, stimulated the nervous and muscular systems, improving stability and coordination. Interactive games enhanced neuromuscular integration, visual-motor coordination, and response speed, contributing to improved motor coordination.

Significant improvements were observed in kinesthetic intelligence, as students demonstrated problem-solving, adaptability to new situations, and rapid decision-making through exploratory play, which encouraged trial-and-error learning and flexible motor thinking.

Overall, the findings validate the general hypothesis, highlighting the positive impact of exploration-enhanced motor games on balance, motor coordination, and kinesthetic intelligence in middle school students.

CONCLUSIONS AND PROSPECTS OF FURTHER RESEARCH

This study examined the effect of exploration-enhanced motor games on developing motor abilities among middle school students, focusing on balance, motor coordination, and kinesthetic intelligence. Results indicate that these games are an effective educational tool for promoting both physical and cognitive development.

Exploratory games fostered balance improvement, enhanced motor coordination, and strengthened kinesthetic intelligence by providing opportunities for problem-solving, adaptation, and rapid decision-making. The games' experiential and stimulating nature created an engaging learning environment, promoting neuromuscular integration, visual-motor coordination, and response speed, positively impacting physical and cognitive performance.

The study emphasizes the importance of integrating innovative and interactive motor games into curricula to achieve holistic physical and cognitive development, preparing children with strong physical health, mental flexibility, and advanced cognitive-motor skills.

Based on the findings of this study, the following recommendations can be made:

1. Integrate exploration-enhanced motor games into classroom sessions and school activities to develop students' motor skills and kinesthetic intelligence.
2. Conduct similar field studies using different samples and assessment tools to validate the findings.
3. Examine gender differences in the effect of motor games on motor abilities and kinesthetic intelligence.
4. Employ active learning strategies that encourage thinking and exploration during motor activities.
5. Optimize the use of available space and resources to maximize students' engagement and the repetition of motor activities.
6. Emphasize balance, motor coordination, and kinesthetic intelligence within teaching programs and organized children's activities.
7. Promote exploration-enhanced motor games as enjoyable means for learning motor skills and as a basis for designing more effective educational programs in early developmental stages.

The results of this study highlight several future and practical avenues in physical education and motor development for children:

1. Expanding the application of exploration-enhanced motor games: similar motor programs can be applied across other educational stages, such as upper elementary grades or early childhood, to examine their impact on children's motor and cognitive abilities at different ages.
2. Exploring the impact of motor games on other cognitive and behavioral aspects: future studies can investigate the effects of these games on creative thinking, attention and concentration, social intelligence, and the development of personal skills, contributing to the preparation of well-rounded children.

3. Integrating technology into motor games: Development of digital motor programs or interactive educational games using virtual reality or smart devices can expand exploratory possibilities and diversify children's motor experiences.

4. Training teachers and educators: Specialized training programs can be designed to guide teachers in developing and implementing exploration-enhanced motor games in ways that match children's age-specific characteristics and abilities, ensuring effective learning experiences.

5. Long-term developmental follow-up: The study opens opportunities for longitudinal research to track the effects of exploration-enhanced motor games on children's physical and cognitive development over time, allowing evaluation of their sustained impact on athletic performance and kinesthetic intelligence.

6. Curriculum development: Research findings can inform the enrichment of physical education curricula, incorporating diverse motor games that combine exploration and cognitive stimulation into daily lessons, promoting the integration of physical and cognitive growth.

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