

Exploratory games and their impact on primary school students' acquisition of basic motor skills

الألعاب الاستكشافية وأثرها في اكتساب تلاميذ المرحلة الابتدائية للمهارات الحركية الأساسية

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Abstract:

The objective of this research was to evaluate the efficacy of a novel educational program, incorporating exploratory games, in fostering physical creativity, particularly fluency and flexibility, among children aged 7-8 years at the elementary education level. The investigation was situated at Khadraoui El Taher Primary School within the Zeribet El Oued municipality, located in Biskra province. Employing the experimental research methodology, the study was structured with a single-group design. A sample comprising 14 students was selected for this research. Throughout the study, the researchers implemented the proposed educational program and conducted both pre- and post-intervention assessments. The results of these assessments indicated a substantial impact of the program on the enhancement of the motor creative abilities under examination. This conclusion was substantiated by the statistical analysis, which revealed that the p-value in both tests was below the established threshold of statistical significance, set at 0.05. Therefore, these findings underscore the program's effectiveness in advancing the physical creative skills of fluency and flexibility in the target age group within the elementary education context.

Keywords : physical education ; kinetic creativity ; educational program ; fluency ; motor flexibility

01 – Introduction:

Undoubtedly, the significance of physical education and sports holds substantial prominence globally, particularly in advanced nations. This is evidenced by the considerable resources allocated in educational institutions within these countries, encompassing physical facilities (sports facilities) and human resources (physical education supervisors). These resources are imperative for the effective implementation of physical education classes, serving as integral components within any educational system or curriculum. The emphasis on physical education stems from its myriad positive outcomes, evident in individuals actively participating in it across emotional, motor skills, cognitive, and social developmental domains.

Furthermore, physical education plays a pivotal role in preparing individuals to become valuable contributors to society. Institutions catering to children are of particular importance, given that this developmental stage lays the groundwork for societal constructs. Childhood assumes a paramount role in an individual's life, representing a pivotal and opportune period for shaping various facets of a child's personality, including physical, moral, social, intellectual, and psychological dimensions. This developmental stage significantly influences the acquisition of concepts, values, and the nurturing and development of a child's capabilities.

Childhood serves as a cornerstone for subsequent life stages, playing a fundamental role in shaping one's personality. Acknowledging the critical nature of childhood, it becomes apparent that focusing on this stage is imperative for any developmental movement aspiring towards an enhanced quality of life. As underscored by Zahran (1997) and Ratiib (1999), childhood shapes future outcomes based on the experiences and skills provided during this period. (Mansouri, Lounas, & Saoudi, 2019) Similarly, Mansouri, Lounas, and Saoudi (2019) and Ben shaa & Chrayat (2020) emphasize the formative nature of childhood, highlighting its influence on behavioral habits and attitudes. (Ben shaa & Chrayat, 2020)

Play on the other hand, considered an essential educational medium, contributes to the holistic development of a child, encompassing cognitive, physical, social, moral, intellectual, emotional, and linguistic aspects. It functions as a mechanism to alleviate negative emotions and stands as a fundamental element in a child's world. (al_Tikriti, 2019, p. 07). Research indicates that 75 % of brain development occurs after birth, with play playing a crucial role in stimulating the brain and fostering the development of fine and gross motor skills (Anderson-McNamee, 2010). Salama (2014) emphasizes the significance of play for all children, asserting that a child not inclined towards play is inherently unbalanced. Transitioning to the realm of primary school, which serves as the foundational educational institution for this developmental stage, it is recognized as a pivotal entity for nurturing children and shaping their personalities. (Salama, 2014, p. 03).

Primary education, as highlighted by Nahida Zaid Al-Dulaimi, plays a crucial role in the educational framework, acting as the cornerstone upon which countries construct their educational systems. (Leghrou, Elhadi, & Chanouf, 2019). The diversity in play activities during childhood, encompassing various forms, content, and methods, is a direct result of the evolving needs of children through different developmental stages. Providing adequate care and attention during a child's early years in primary school becomes a top priority for those overseeing the educational process. This care significantly shapes a child's personality across

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intellectual, physical, and emotional dimensions. (Jradi, Boubaker, & Mouiza, 2021) Stress the distinct characteristics exhibited by children during these early stages of learning, emphasizing the importance of an environment conducive to exploratory behavior and play. (Addiri, 2014, p. 36)

Exploratory games, a specific type of play, provides opportunities for learners to experiment with motor tasks and gain an understanding of the elements involved in each movement they perform (Dawood, 2009). This type of play aligns with the child's inclination towards exploration and play during this stage, addressing the diverse needs, including the enhancement and development of creative motor abilities. In this context, fostering creative skills becomes a key objective in educational institutions. Physical and sport education, being integral to general education, should play a significant role in nurturing creative individuals. This is crucial for the early identification of intellectual potential, serving as a foundation for societal advancement and contributing to the scientific progress of the country. Activities during these crucial stages, particularly for children aged 7 to 8, play a vital role in stimulating creativity. Motor activities in physical education lessons, as emphasized by Al-Dairi, are fundamental for fostering innovation and creativity. (Addiri, 2014, pp. 37 - 38) In the realm of physical education, creativity finds expression through movement, particularly in play designed to promote it—referred to as kinetic creativity. Studies consistently demonstrate a strong and positive correlation between play and creative thinking (Swalha, 2010, p. 151).

The research problem can be formulated by addressing the overarching question and the following sub-questions:

- General question :
- Does the proposed educational program with exploratory games have an effect on the development of motor creativity (fluency and motor flexibility) for a 7-8 year old primary school child ?
 - Sub-questions :
 - Are there statistically and practical differences between the pre- tests and the post-tests in the level of motor fluency?
 - Are there statistically and practical differences between the pre- tests and the post-tests in the level of motor flexibility?

02 - Material & methods:

2-1 The research methodology employed in the study involved the utilization of the experimental method, specifically adopting a single-group design with the experimental group being the sole participant. The focal point of the experimentation was the introduction of the educational program, constituting the experimental factor, to the designated group. The primary objective was to scrutinize the influence of this educational program on the variables under investigation. The assessment of this impact was conducted by analyzing the disparities between pre-tests and post-tests and evaluating their statistical significance.

2-2 Research Community: The target population for this study encompasses all students enrolled in the primary stage aged 7-8 years old within the Biskra province during the

academic year 2021-2022. The accessible population, on the other hand, comprises all students falling within the specified age group in the Zeribet El Oued municipality.

2-3 Research Sample: The sample for the study was randomly selected from Taher Khdarawi Elementary School, comprising 14 students aged 7 to 8 years. Prior to their participation, a thorough health screening was conducted to ascertain their physical fitness and to identify any potential illnesses or symptoms that could impede their involvement in physical activities. This precautionary measure was essential to guarantee both the safety of the participants and the validity of the study's findings. Furthermore, the students' willingness to engage in the program was explicitly confirmed, complemented by obtaining parental consent for each participant. The objectives of the program, along with a detailed description of the planned activities, were clearly communicated to both the students and their parents, ensuring informed and voluntary participation.

3-4 Sample Homogeneity: In order to establish homogeneity in the variables of height, weight, and age among the sample participants, the Levene's test for homogeneity of variances was administered. This pre-program assessment aimed to verify the absence of significant differences among individuals in the sample concerning these variables. The objective was to ascertain that the participants shared similar levels, particularly in attributes that could potentially influence their performance. The outcomes of this analysis are presented in the subsequent table:

Table 01 shows the results of the test for homogeneity of variance in the variables of height, weight and age of the sample

<i>variables</i>	<i>Means</i>	<i>SD</i>	<i>Levene's test</i>	<i>P-value</i>
<i>Age (months)</i>	91.86	2.88	0.22	0.65
<i>Height (cm)</i>	125.14	5.04	0.025	0.88
<i>Weight (kg)</i>	23.93	4.71	1.11	0.31

Note: Sig level: 0.05 / (N=14)

Observing the table, it becomes apparent that all p-values surpass the designated level of significance ($p\text{-value} > \text{sig level}$). This outcome indicates a uniformity in the variation of the height, weight, and age variables within the sample. Consequently, no statistically significant differences exist among the sample members concerning these variables. The homogeneity in these attributes among the participants is thus affirmed by the statistical analysis.

2-5 Data Collection Tools: The data collection process employed a series of physical performance tests, including the Wierck reck test. This assessment, recognized as a test, comprises a set of stimuli strategically designed to quantitatively or qualitatively measure specific behaviors. The test yields a numerical value, score, or rank for the individual undergoing examination. In the specific context of evaluating creative motor abilities, the Wierck reck test is utilized to discern variations among individuals across diverse domains of motor creativity (Mahboubi, 2020, p. 158).

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The Wierck test evaluates two primary traits: motor fluency and motor flexibility. Motor fluency pertains to the learner's capacity to execute as many appropriate movements as possible within a three-minute timeframe. Each repetition earns one point. On the other hand, motor flexibility gauges the ability to diversify appropriate movements within the same three-minute duration. This aspect is linked to the variety of movements, with a higher flexibility score corresponding to a greater diversity of movements. Again, one point is awarded for each distinct movement.

02 – 06 the proposed educational program:

The educational program under discussion is structured into twelve distinct instructional units, which were systematically executed over a four-week duration. This timeframe encompassed three sessions each week. At the heart of this program are pedagogical games and essential motor skills, including activities like walking, jumping, rolling, throwing, and comparable movements. The program's design incorporates a competitive element among various groups, capitalizing on the inherent appeal this has for children at the respective age. This competitive aspect is instrumental in enhancing their motivation for learning.

The primary objective of the proposed program is to foster motor creativity, with educational goals specifically tailored to meet the developmental needs of 7-8-year-old learners. These goals encompass a range of areas including the enhancement of cognitive skills, the promotion of social values like responsibility, cooperation, and a healthy competitive spirit, as well as the advancement of spatial awareness in play, agility, flexibility, and authentic motor skills. The formulation of these objectives is underpinned by the expertise and insights of specialists in the fields of motor learning and physical education programming.

In implementing the program, the researcher employed problem-solving techniques alongside an exploratory approach to motor learning, identifying these as the most efficacious methods for fulfilling the aforementioned developmental needs of children. To enhance the effectiveness of the program, the researcher proposed increasing the duration of each instructional unit to 60 minutes, surpassing the conventional 45-minute timeframe typically allocated for physical education sessions. This augmentation in duration is crucial as it allows for the repetition of motor tasks at least twice, a vital factor for the thorough understanding and resolution of motor challenges. This recommendation stems from the researcher's field observations in primary school physical education classes, where it was noted that the standard duration often falls short in providing many opportunities for effective comprehension and problem-solving in motor activities.

The researcher structured the lesson into distinct segments, commencing with a 10-minute introductory phase, followed by a 45-minute main segment comprising three games or instructional settings, each allocated a 15-minute duration. The lesson concluded with a 5-minute wrap-up. Recognizing the importance of rest during transitions between motor tasks,

the researcher incorporated dedicated rest periods. Additionally, the researcher actively engaged with the participants, offering feedback through encouragement and motivation to enhance the learning experience.

Table 02 shows the division of the educational program objectives and educational activities on the classes

<i>The general objective</i>	<i>Weeks</i>	<i>Sessions</i>	<i>The specific objective (educational)</i>
<i>Improving motor creativity (7-8 years old children)</i>	Week 1	Session 1	Improve the child's auditory response + improve fluency and motor flexibility
		Session 2	Improve the child's visual response + improve fluency and motor flexibility
		Session 3	Improve the child's fluency and motor flexibility
	Week 2	Session 4	Improving the child's mental abilities (focus and attention) + improving motor fluency
		Session 5	Improving the child's mental abilities (intelligence) + improving motor flexibility
		Session 6	Enhancing the child's ability to navigate correctly through motor pathways + improving motor fluency.
	Week 3	Session 7	Improving the child's ability to navigate in a specific path from various positions + enhancing motor flexibility.
		Session 8	Improving the child's speed in solving motor tasks + enhancing motor fluency.
		Session 9	Enhancing motor flexibility.
	Week 4	Session 10	Improving the child's coordination + enhancing motor fluency
		Session 11	Improving the child's ability to generate a greater number of motor solutions + improving motor flexibility.
		Session 12	Improving the child's ability to utilize play space + improving motor fluency and flexibility.

2-7 Test Standardization: Ensuring the reliability of the tests, the researchers employed the test-retest method. In the preliminary phase, the initial test was administered to a distinct experimental sample comprising 10 students, who were subsequently excluded from the study sample. Subsequently, the identical tests were re-administered to this same sample after a 10-

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day interval, maintaining consistent testing conditions. The ensuing table provides a presentation of the obtained results.

Table 03 shows the results of the reliability test

		<i>Mean</i>	<i>SD</i>	<i>Shapiro–Wilk p - value</i>	<i>correlation coefficient</i>
<i>motor fluency</i>	test	3.90	2.62	0.003	spearman correlation = 0.907**
	retest	4.60	3.66		
<i>motor flexibility</i>	test	1.90	0.99	0.000	spearman correlation = 0.965**
	retest	1.80	0.92		

Note: **: significant at the 1% level / (N=10) / Sig level: 0.05

Upon examination of the table, it becomes evident that the tests exhibit a commendable level of reliability. The results indicate a statistically significant correlation between the outcomes of the pre-tests and post-tests, affirming the consistency and dependability of the assessment measures.

03 - Presentation and Analysis of Results:

1st hypothesis: The educational program has an effect on improving the motor fluency

Table 04 shows the values of Wilcoxon and Cohen test on the motor fluency test

	<i>Pre-test</i>		<i>Post-test</i>		<i>Shapiro–Wilk p - value</i>	<i>Z test p- value</i>	<i>effect size d value</i>
	Mean	SD	Mean	SD			
<i>motor fluency</i>	2.86	1.17	9.43	3.95	0.02	0.001	0.88

Note: (N=14) / Sig level: 0.05

Analyzing the data presented in the table, we observe that the Shapiro test's p-value stands at 0.02, which is below the significance threshold of 0.05. This indicates that the data does not follow a normal distribution, necessitating the use of the Wilcoxon test for comparing means. The Wilcoxon test yielded a p-value of 0.001, leading to the rejection of the null hypothesis that asserts no statistically significant differences exist between the two variables. Consequently, we accept the alternative hypothesis, which posits that there are statistically significant differences between the two variables.

Focusing on the arithmetic means, we note that the pre-test mean for the group was 2.86, while the post-test mean significantly increased to 9.43. This substantial increase is indicative of the development in motor fluency within the group following the implementation of the program. It reflects a progression from an average capability of performing only two or three movements in the given period to achieving more than nine

movements. This denotes the acquisition of at least seven new movements, evidencing that the students were able to rely on and activate these movements in a short time span, effectively adapting to the motor tasks presented to them.

Cohen's effect size test, which yielded a value of + 0.88 further underscore the significance of the program's impact. This value signifies a difference of 0.88 standard deviations between the two means. Such a substantial effect size distinctly points to the influence of the educational program. An effect size of this magnitude is indicative of a robust change, suggesting that the application of the educational program had a significant and positive impact on the outcomes measured, in this case, the improvement in motor fluency. Cohen's effect size thus provides a quantitative measure of the effectiveness of the educational intervention, reinforcing the conclusions drawn from the statistical tests.

2nd hypothesis: The educational program has an effect on improving the motor flexibility

Table 05 shows the values of Wilcoxon and Cohen test on the motor flexibility test

	<i>Pre-test</i>		<i>Post-test</i>		<i>Shapiro–Wilk p - value</i>	<i>Z test p- value</i>	<i>effect size d value</i>
	Mean	SD	Mean	SD			
<i>motor flexibility</i>	1.36	0.50	4.57	1.28	0.01	0.001	0.88

Note: (N=14) / Sig level: 0.05

From the data presented in the table, it is evident that the Shapiro test's p-value is 0.02, which falls below the significance level of 0.05. This suggests that the data does not follow a normal distribution, necessitating the use of non-parametric methods, specifically the Wilcoxon test, for comparing the means. The Wilcoxon test shows a p-value of 0.001, which leads us to reject the null hypothesis stating that there are no statistically significant differences between the two variables. Instead, we accept the alternative hypothesis, indicating that there are statistically significant differences between the two variables.

Examining the arithmetic means, we find that the group's mean score in the pre-test was 1.36, which then rose to 4.57 in the post-test. This increase is indicative of an improvement in motor flexibility because of the educational program. The program facilitated the acquisition of a substantial number of new movements, thereby broadening the range of movements that participants could perform within a given period. This progression is evidenced by the learners' shift from utilizing only one or two movements (as per the pre-test average) to engaging in more than four distinct movements, a development attributed to the educational program.

Additionally, Cohen's effect size test, with a value of +0.88, reinforces this interpretation. An effect size of +0.88 standard deviations between the two means underscores the significant impact of the educational program. The magnitude of this effect size clearly demonstrates the program's effectiveness in enhancing motor flexibility among the participants, highlighting the substantial difference achieved through the implementation of the educational intervention.

04 – Discussion

After conducting the statistical analysis as presented in Tables (04) and (05), it was ascertained that there exist statistically significant differences between the mean results of the study's tests, with a favoring bias towards the post-test outcomes. The Wilcoxon test yielded a p-value of 0.001, which is less than the 0.05 significance level, thereby indicating statistical significance at the 0.05 level. Additionally, as depicted in Tables (04) and (05), the result of the effect size test, which stands at 0.88, demonstrates that the program significantly affected the learners, particularly favoring the post-test results. This suggests that the proposed program had a substantial effect on the development of the motor creativity abilities under examination. Consequently, we can conclude that the hypotheses of the study have been validated.

The observed enhancement in comparison to regular programs can be attributed to the innovative structure of the proposed program, which encompassed a series of exploratory games instrumental in augmenting the development of motor creative abilities, specifically fluency and motor flexibility. The effectiveness of the program is a result of its meticulous design and systematic evaluation, incorporating insights and assessments from experts in the field.

As per Al-Dulaimi, effective motor education can contribute to multiple objectives, including fostering initiative, satisfaction with performance levels, group cooperation, and self-reliance. It also reduces the likelihood of injuries and accidents, in addition to fostering cognitive-motor skills (Kadri, 2017).

The researcher links this improvement in creative motor abilities to the teaching methodology centered on motor exploration, which provides children with the autonomy to creatively solve motor tasks. This approach encourages children to be inventive in resolving assigned motor tasks, with the teacher playing a role limited to supervision and guidance. This perspective is supported by Ibtihaaj (2009), who stressed the importance of developing students' creative skills by enhancing their mental abilities through imaginative and dramatic motor games, encouraging them to express and showcase their creative talents (Ben_Amara & Doudou, 2017).

The need for physical activity and play at this stage is pivotal in improving children's creative abilities, a view supported by child psychologists who regard play as an essential aspect of children's lives (Shehata, 2016, p. 133). Learning theories also highlight that play is an effective learning method, serving as a catalyst for active and educational learning, and a driving force for innovative thinking (El-Said, 2003, p. 25).

Furthermore, the games designed within the program, aimed specifically at developing creative abilities, significantly stimulated children's mental capacities, enabling them to generate a greater number of motor solutions and variations. These games also allowed children to tailor their motor responses to the demands of specific situations or tasks.

This aligns with the assertions of Yakoubi (2011), citing Othman (1986), that play liberates children from constraints, opens their minds, ignites their imagination, and facilitates engagement in creative activities. The act of playing is itself a form of training in creativity

(Mekhnach & Mrabet, 2022). This confirms the verification of the general hypothesis of the study.

This study correlates with the findings of Akram Mekhnach and Masoud Marabet (2021) in their study "The Effect of a Proposed Program of Motor Games in Developing the Kinetic Creative Abilities of Fourth Year Primary School Students (9-10 Years Old)," published in the Professional Journal. The study discovered that the proposed program positively influenced the development of motor creativity in its sample. Additionally, our results are in line with the research of Mariam Mubarak and El-Saeed Yahyaoui (2017) titled "The Effect of a Physical Education and Sports Program on the Development of Creative Motor Thinking in Elementary Stage Students (6-7 Years Old)," published in Ma'arif Journal, which concluded that the physical education and sports program significantly benefited the development of creative thinking in primary school students aged 6-7 years.

05 - Conclusion

In this study, we undertook an investigation into the influence of a proposed educational program employing exploratory games on the advancement of physical creativity, specifically targeting fluency and flexibility, in children aged 7-8 years within the elementary stage. Building on prior research findings, we discerned that exploratory games have a positive impact on the development of physical creativity among children in this age bracket. The tests conducted in conjunction with the proposed educational program yielded the following key results:

- The proposed program utilizing exploratory games exhibited a positive influence on the enhancement of physical creativity, specifically in terms of agility and flexibility.
- The proposed program demonstrated a significant impact on the development of agility and flexibility when compared to a traditional program.

Based on the study's objectives and the outcomes derived, we propose the following recommendations:

1- Tailor Physical Education Programs to Children's Developmental Stages: Develop physical education programs that are meticulously aligned with the developmental requirements of children at each stage of primary education. This tailored approach ensures that the content and methodologies employed are suitable and effective for the specific age group.

02- Emphasize Physical Creativity Development: Place a distinct focus on fostering physical creativity in children during the elementary stage. Recognizing the importance of creativity in physical activities can contribute not only to physical development but also to cognitive and socio-emotional aspects.

03- Provide Adequate Material Resources and Facilities: Ensure the provision of necessary material resources and facilities to support teachers in delivering smooth and effective physical education and sports classes in the elementary education stage. Adequate resources can enhance the learning experience and facilitate the implementation of innovative and engaging activities.

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These recommendations aim to guide educators, curriculum planners, and policymakers in creating an environment conducive to the holistic development of children in the realm of physical education, with a specific emphasis on nurturing creativity, agility, and flexibility.

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