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THE IMPACT OF MOTOR ACTIVITY ON THE REGULATION OF THE MUSICAL RHYTHM AND THE NUMBER CONCEPT AT THE ELEMENTARY LEVEL

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ABSTRACT
The objective of this study was to examine the effect of motor activity on rhythmic control in session of music and the concepts of numbers in math class among students in first grade. It is a comparative experimental study between two methods of learning in music and mathematics. Two groups of students participated in this study, an experimental group participated in the sessions based on motor activity and a control group participated in teaching classical sessions during 12 weeks. Our results show a significant difference inter and intra group. Improving the learning of musical rhythm and math numbers in the experimental group is much higher than the control group. These results also highlight the interest to involve the student active in the requested task and the importance of using Active methods in the teaching-learning process.

Keywords: Motor Activities; Rhythmic Music; Learning; Mathematics Number.

1. INTRODUCTION
Physical Education and Sports (EPS) is a teaching discipline that aims and privileges the expression of the body, an important and compulsory discipline as the other disciplines in the school system. It allows the acquisition of knowledge and the construction of knowledge and the management of physical life at different ages of the existence of the individual, it is also a means of access to the field of culture that constitute sports practices [1].

[2] argue that motor education is an integral part of physical education and represents the primary branch. Indeed, it has an impact on the different dimensions of the child's personality: the cognitive dimension, the social and relational dimension, the affective dimension, and finally the expressive and creative dimension. For [3], physical education and intellectual activity, which is a sensorimotor activity, cannot do without each other. They also emphasize that there is no effective brain activity without the support of the body because the brain does not give its maximum when it is not stimulated .It is therefore important to use it within other disciplines which imply the notion of interdisciplinarity.

2.LITERATURE REVIEW
The following body of information makes up the literature review, which has direct bearing on the study.

2.1.Motor activity and facilitation of learning
In each learning process, the teacher must find the best staging possible to convey his message and this according to the time and the means at his disposal. In this context, [4] mentions that the

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playful dimension of motor experimentation enables the student to approach the learning activity positively and favors the assimilation of acquisitions. It looks like a reinforcement function throughout the learning process.

Indeed, in the classroom being a student actor, actively building his knowledge, has an extraordinarily more dynamic and fruitful effect on the learning process than being a passive receiver of a message. Also[5] argue that action influences the process of memorization. The learning content constructed from a motor exploration at the origin of the movements is likely to be fixed in the memory more sustainably than if the learning is done according to other approaches of auditory and visual origin.

In summary, pedagogical situations based on motor experimentation contain conditions that facilitate the learning process and maximize learning. Thus, it lends itself well to activities integrating school learning and makes it possible to solve certain learning difficulties of perceptual origin.

Finally, it can largely help the pedagogue to achieve preschool education goals and primary education goals.

2.2.The teaching of musical rhythm

Music education in schools is considered a so-called secondary discipline. So that for hours of music to regain value and importance, you need to understand and explain their issues. This education provides a holistic approach to the development of the student's personality, and gives everyone the opportunity to express themselves. Then, the rhythm is at the beginning of the music, it characterizes it. As [6]-[7] indicate, rhythm is the primary and essential element in music. The latter cannot do without it. In this context, [7] explains that "without physical life, there is neither emotion nor intelligence. In the same way, without rhythm there is neither melody nor harmony. To make more obvious the physical character of the rhythm, we will say that by the intelligence we can understand the rhythm and by the sensitivity we can feel it. However, we cannot live it, and perform it only through physical dynamism.

In the same vein,[8] thinks that, with regard to the practice of rhythm in school, a real activity involves not only physical activity, but the capacity to represent action and to be able to master, not to mention the notion of pleasure.

We conclude that in the teaching of musical rhythm, there are several teaching methods to teach rhythm. Indeed, we find so-called classical methods where the body does not have a great importance in the minds of most teachers and other so-called active people who are primarily interested in the learner and place it at the heart of the teaching process.

Indeed, the perception of music is never a purely auditory process, but it is always auditivo-motor.

2.3.The development of mathematical concepts

[9] state that one of the most commonly held misconceptions by teachers about early mathematics education is that Young children are not ready for mathematics education, by which they underestimate children’s mathematical abilities in their early years.

The authors believe that the root cause can be found in their interpretation of Piaget’s theory, which they believe focuses on what children cannot do, that is, that children are still

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insufficiently cognitively mature and unable to understand abstract concepts or the logical thinking required in mathematics.

Mathematical concepts truly are abstract concepts, that is, concepts that are free from all properties of material reality, excluding the properties of spatial form and quantitative relationships.

Therefore, when talking about mathematical concepts, we have in mind the term that contains certain general properties in the field of quantitative relations and spatial forms, while other properties of reality are ignored[10]. According to Jean Piaget's theory of cognitive development, this would mean that in order to adopt mathematical concepts, it is necessary for thinking to reach the cognitive stage of formal operations.

For example, at a preoperative stage, a child can know how to count, but that does not mean that he or she is familiar with the concept of number. The concept of number (not just the notion, names of numbers, or simple reciting of numbers) is a synthesis of classification operations and seriation. It implies an abstraction of qualities that make each specific element equal to another element (1=1=1=1). After this is established, the class-inclusion of these elements is done (1 < 1+1 < 1+1+1 or 1<2<3). [11]

[12] investigated one of the myths about mathematics learning which says that Young Children Must Sit Down and Learn Math – learning mathematics usually involves sitting with a book and writing home worker. Contrary to this claim, and especially in young children, learning mathematics is linked to engagement and interest. High-quality early mathematics... is about building with unit block sand estimating and checking how many steps it is to the playground. It involves playing games, counting the dots on dice, and moving a game piece that many [13]-[14]-[15].

Observations of scholar's show that when they play, they engage in mathematical thinking at least once in almost half of each minute of play. Almost 9/10 of children engage in at least one or more math activities during play episodes [16]. It is widely known that the school period is extremely important for the development of motor and perceptual functions, and their development in this period is of great importance. The ability to learn movement competence creates the essential nerve cell networks which are the very essence of the learning process.

However, many early year practitioners are reporting that more children appear to be entering nurseries and schools without the physical skills for large motor and fine motor play (Do and discover, fun activities to develop physical skills in the early years), Piaget himself also said that skills and relationships learned during physical activity carry over to the learning of other relationships and concepts. This would suggest that it is the movement involved in activity that is important, rather than the actual physical exertion.

The large majority of research in this field found a positive association between children‟s physical activity participation and academic achievement. For instance, the conclusion that some intervention and longitudinal studies was that physical activity intervention leads to significant improvements in children‟s math scores [17]-[18]- [19] and motor skills [20].

2.4.Relationship between motor development and cognitive development of the child

In psychology, school age in children aged 6 to 12 years is shown to be the longest time in childhood where children can learn and develop in primary school. The development of the

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child is divided into three or four major areas which are on the one hand motor development, on the other hand cognitive development and finally, emotional and social development, even if it is very artificial and criticized because individual can be conceived only in its entirety.

In the school context, several studies state that the development of the motor skills of the child will have an impact on the development of his other abilities: emotional by the autonomy that gives it control of his motor skills, intellectual by the exploration and the adaptation to the environment that enables his motor skills, social through play with his peers and friends[21].

Indeed, several components of this development (body schema, spatial and temporal structuring, etc.) are even considered as important prerequisites for school learning,[22]-[23].In this sense,[24] and [25] neuroimaging studies suggest that the cortical areas (cerebellum, UCS) associated with motor learning and those associated with cognitive activities (prefrontal cortex) are coactive in certain motor and cognitive tasks.

On the one hand, several cognitive activities use modulation and control functions located in the cerebellum and the basal ganglia (UCS) that develop during the acquisition of basic motor skills. On the other hand, the neural structures that are being implemented in motor development, between the prefrontal cortex and the motor areas, are also used in cognitive learning.

In addition, in cognitive psychology,[26] set out three reasons underlying the links between cognitive research and motor skills:

The first is related to the fact that the movement itself can be the object of cognitive processes. The second is the fact that, for a number of authors, motor skills appear as the source of thought [3] or, through their roles in the processes of socialization, personality and The third, finally, stems from the fact that integrated motor performance is the integration of processes that ensure its organization and control.

In conclusion, an analysis of the links between engine development and cognitive development should be built around the task and its role and the representation of the task and its role [27]

3. METHODOLOGY

3.1.Procedure

Our experimental procedure would be based on a teaching/learning program: an intervention program lasting 12 weeks, at the rate of 5 sessions of 50 minutes per week for math classes and at the rate of one hour per week for music classes.

The sessions included individual and team activities. The intensity and difficulty of the exercises continued to increase to develop the motivation and creativity of young children. We have therefore designed games-based exercises and situations for the experimental group. The control group underwent a regular learning program.

It should be noted that after one day of completion of the learning program, the cognitive tests were retaken for both groups. The agility test was passed individually according to the protocol indicated by its author.

For the music program, the motor games used are easy to practice, jumping exercises with both legs and one leg according to the proposed rhythm.

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The students perform activities with or without gear: the jump with both legs represents a strong blow (Dom) and the jump with only one leg designates a weak blow (Tec).

hopscotch is a simple example of learning by motor activity.

- The American jump to teach a fast pace
- The use of circles of different shapes: big and small

Students jump with both legs in large circles and with one leg in the small ones.

- Also the use of a rhythm scale

For mathematic concepts, we're developing a motor activity program based on concept of number and additional equation that confirms with the national Tunisian math program for the first year in primary school

3.2.Participants

Forty students had voluntary participated in this study. They are schooled in both mixed classes of the First year primary school each one containing twenty student. The classes belong to the same public school and with the same teacher. To this end, we arrange to work with an experimental group and a control group. The average age of the participants is 6.3 years. These children attend a public primary school. Their middle parent socio-cultural level is defined by the father's job. All these participants are considered normal and well- adjusted to schooling. They are all in the classes corresponding to their chronological age and are average students for all school subjects. Their parents were informed and give their agreement signature about the participation of their children in the experiment research and they have the opportunity at any time to withdraw their children from it. The results of this research guarantee anonymity and confidentiality and the parents may be aware of their children's skills assessment.

3.3.Instruments

Verification of rhythm regulation

To check the rhythm regulation of the students, we used the Mira Rhythm Test [28] which is intended for children aged 6 to 12 years. It consists of three tests: a spontaneous tempo test, a reproduction of rhythmic structures and a final understanding of the symbolism.

The objective of the second test lies in the reproduction of the rhythmic structure which focuses on three points:

- The first: the number of strokes in a structure
- The second: the number of subgroups in a structure
- The third: the role of the disposition of these subgroups (symmetrical or asymmetrical) Our test consists of 21 structures that we have classified in order of increasing difficulty. Our structures consist of groups of 3 to 8 strokes, divided into subgroups by long intervals.

We have structures that only have one subgroup(No. 12 for example) and others that have 5 (No. 21 for example). The subgroups can be arranged symmetrically (No. 18) or asymmetrically (No. 20).

For the running of the event, we have, first of all in front of the child, the cartons on which are symbolized the different rhythmic structures using points.

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Once the cards are placed in front of the child, the examiner taps one of the rhythmic structures on the table with a pencil, and then asks the child to designate the cardboard corresponding to the structure heard, by the instruction: "Show me the rhythm that you have heard. We start the test only when the student has managed to distinguish the short and long intervals of two shots 00 and 0 0. We count as success a good answer on 2 tests, we note the number of the stranded structure and we stop after 4 successive failures.

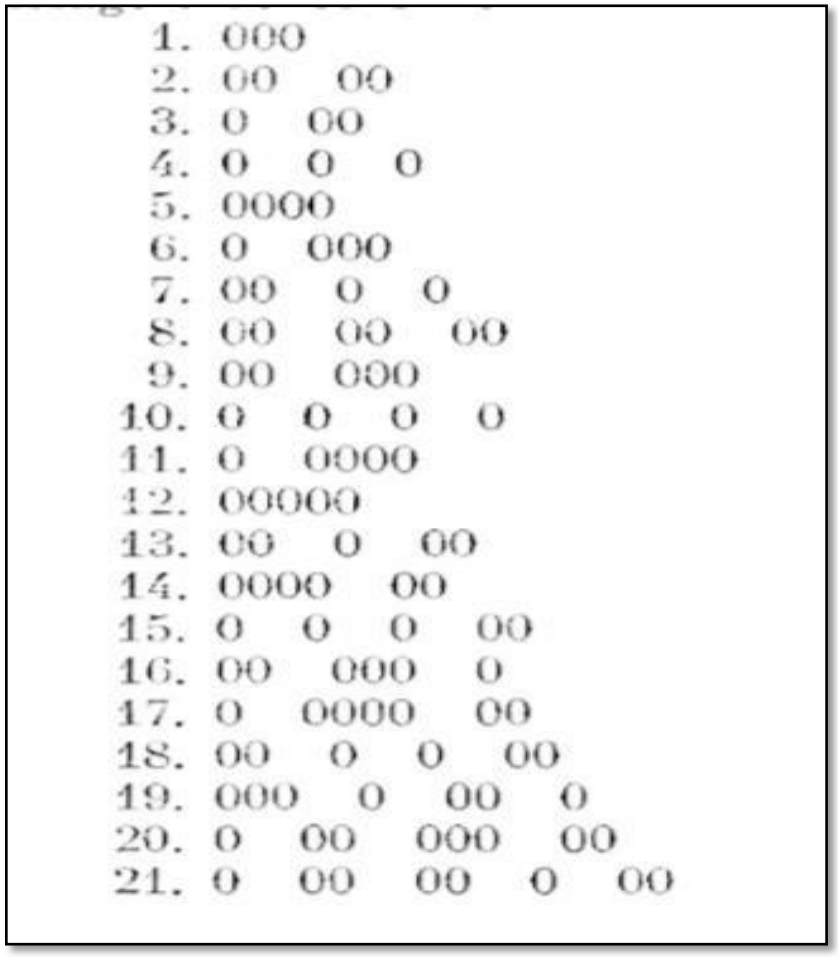

Figure 1: Test of reproduction of the rhythmic structures of Mira Stambak Mathematic test

The math teacher of the two classes participating in this study developed pre and post instructional math tests. These tests consisted of math concepts, questions, and problems that paralleled the math portion of the standardized national Tunisian program.

The pre and post tests each consisted of math problems covering addition, numbers concepts, number comparison. Students were allowed 45 minutes to complete each test.

3.4.Data Analysis

The statistical tests were carried out using the STATISTICA software (StatSoft, France). The

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data were reported as a mean standard deviation. Once the normality hypothesis was confirmed by the Shapiro- Wilk test, parametric tests were performed. For each of the analyses, when the ANOVA showed a significant effect, a post- hoc tukey test was applied to compare the experimental data two to two. All observed differences are considered statistically significant for a probability threshold below (p0.05).

We also calculated the delta variation (Δ) between the test and the pre test with the formula [Δ = test- retest] and the percentage of the delta variation (Δ%) with the formula [Δ% = ((retest-test) / test) × 100]

4. RESULTS

At the beginning, before the experiment, the two groups were homogeneous for all parameters (no significant difference between them before the new learning method). Afterward, the experimental group showed significant differences between the before and after training for all tested parameters, which led that significant differences were recorded between the control group and the experimental group at the after. It's obvious that the progress (Δ = before − after) recorded by the experimental group is significantly different from the control group at all settings. All the used data in this test assessment are obtained from the analysis of the answers of all the participants.

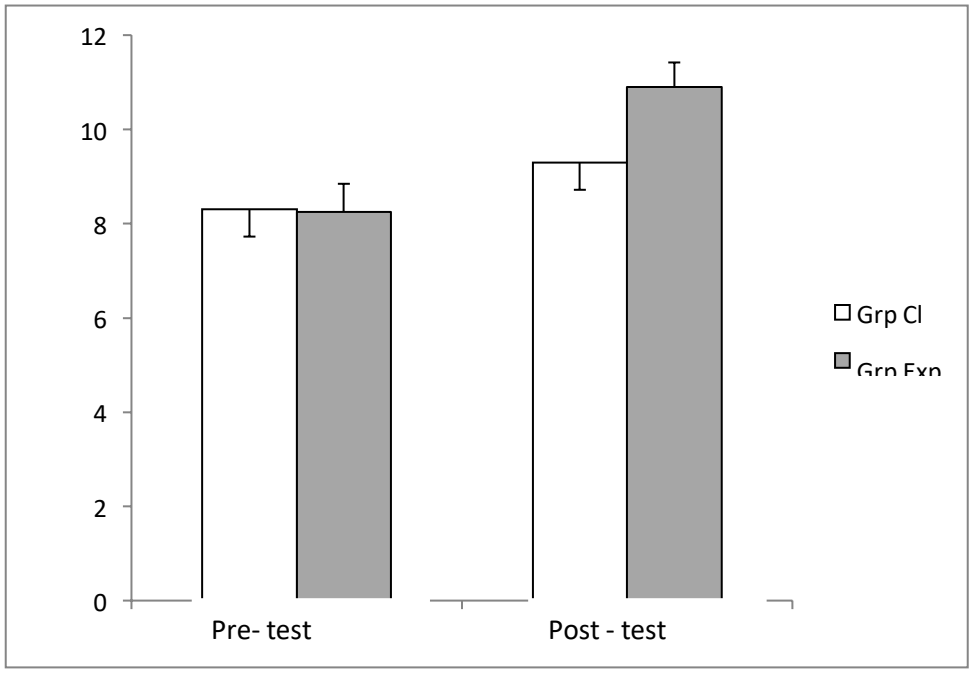

Figure 2: Effect of motor activity on rhythmic control in music

Regarding the test of pace, the ANOVA showed an improvement at the level of rhythmic regulation for the G.E. This improvement has been observed within same group (G.E.) between

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test and retest and a lack of improvement at the level of rate regulation of the control group. As shown in Figure 2 a significant learning effect is noted [F(1 ; 1) = 76,07 ; p < 0,001] ; η2 = 0,667 concerning an group learning interaction is significant [F(1 ; 38) = 15,55 ; p < 0,001] ; η2 = 0,29

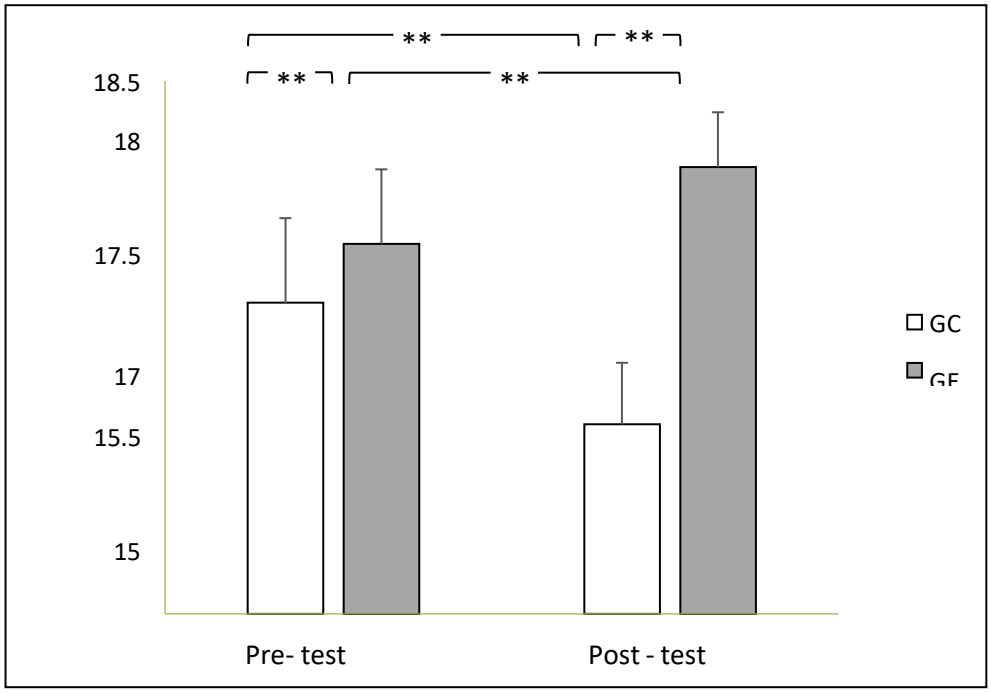

Figure 3: Effect of motor activity on mathematics scores for EG and CG

For the mathematic scores, the ANOVA showed an improvement at the level of math notes for the G.E. This improvement has been observed within same group (G.E.) between test and retest and a lack of improvement at the level of the control. As shown in Figure 2 a significant learning effect is noted [F(1 ; 38) =

0.39 ; p = 0.533] ; η2 = 0.01 concerning an group - learning interaction is significant [F(1 ; 38) = 7.88 ; p = 0.008] ; η2 = 0.172.

5. DISCUSSION

The aim of this study is to evaluate the effects of the use of a motor education program on the rhythmic regulation in a music session and the mathematics concepts for the children aged 6-7 years old on primary school. The results of the study show that students mainly in the experimental group performed better than those who followed a traditional learning.

[29]emphasizes that [30], and by his experience, the rhythm appealed to the physical, emotional and mental aspect. Indeed, the rhythm is "physical education that allows developing various skills across the whole body, different body, and the issue of voice segments. Similarly,

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she has a technique which, relying on the music, to make the body "the musical instrument par excellence" [30].

On the other hand, Understanding number magnitude is an important prerequisite for children's mathematical developments. The possibility of using mathematics learning content to stimulate the development of a school child stems from the educational system goals, because nowadays the importance of developing mental structures that are at the core of mathematical thinking is specifically emphasized. That is why the preschool and school period is very important for mathematical education, both for the process of further mathematics education, and for the overall child's cognitive development [31]Physical education (PE) is a field that advocates a holistic approach to human development. This approach emphasizes that the mind and the body are one entity, and that anything that happens to the one will affect the other. Physical educators therefore believe that the "whole child" comes to school to be educated and that this requires both mental and physical training [32]. The development of intellectual abilities in this period can be crucial for the later progress of children in school. It is also important for the development of motor and perceptual skills because school children have a great need for movement, are vigorous and eager for physical activity, their physical development is distinguished by elasticity, speed and endurance.

[33, 34]claim that the integration of PE with other subject areas is something that must inevitably be considered. According to [33]integration can and must be conducted not only directly, by expanding the activities, but also indirectly by integrating theoretical goals of PE in other subject areas. Therefore, since learning at this age must not be limited only to the intellectual sphere of personality, but it is also necessary to engage all aspects of its development (physical sphere and emotions, as much as children's mental skills) [35].

However, the game changes the zone of proximal development. Apprenticeships located in this area are oriented towards a level of cognitive development processes that the child has not yet acquired, but which becomes accessible with a pair support, a parent or a teacher. Thus, among [36], learning by the game is a good learning because it precedes the development [37].

6. CONCLUSION

The main goal of this paper is to suggest possible models of integration of preschool and school mathematics, music and physical education (PE) in accordance with the characteristics of children's cognitive development in this period, goals and objectives of school's education. The primary goal of school education is to contribute to the overall development of a school age child, in the sense that it should provide children with the conditions and stimulus to develop their abilities and personality traits, to expand their experience and build knowledge about themselves, other people and the world. At the same time, different aspects of child's knowledge . Therefore, the integration of these subject areas is important for the overall development of a school aged child, that is, for the development of physical, social, emotional and cognitive skills as well as knowledge, understanding and attitudes.

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