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## Cognitive, visual-spatial and psychomotor development in students of primary education through the body percussion – BAPNE Method

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### Abstract

The importance of the music and movement in the music learning is vital in the formation and development of people. The BAPNE method enables the development of each of the multiple intelligences, founded by Howard Gardner, through the teaching of body percussion, relying on five disciplines such as Biomechanics, Anatomy, Psychology, Neuroscience, and Ethnomusicology. This article arises from the need for empirical data evidence that this methodology has great benefits in primary education. Focusing on the visuospatial intelligence, and body and kinetic intelligence this research establishes that the objective is to demonstrate that students who use this methodology will better achieve their cognitive, visuospatial, and psychomotor development. So we have developed a study of 60 subjects in the 2nd year of primary education, between 7 and 8 years of age. The sample is divided into control group (N=30), which does not carry out the teaching of body percussion - Method BAPNE, and the experimental group (N=30), wherein the method is employed. The design is used quasi-experimental study with measures before and after the treatment, being used the Movement Assessment Battery for Children ABC (MABC-2) as pre-test and post-test. After carrying out ANOVA statistical analysis of repeated measures, in which we contrast the results of the pre-test to post-test results in both groups, we have found that the experimental group presented a significant improvement in overall post-test scores.

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*Keywords:* BAPNE Method; the Movement Assessment Battery for Children ABC (MABC-2); multiple intelligences; cognitive development; visuospatial development; psychomotor development; primary education; ANOVA statistical analysis of repeated measures.

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## 1. Introduction

At present, we know about the importance of music and movement for people's development and the relationship there is between those with the brain. This has been possible thanks to the numerous studies that try to prove the relationship between music and body movement (Levitin, 2011, Alonso & Estévez & Sánchez, 2008). However, it has not always been like this.

Dualist thoughts by Plato and Descartes, who considered that body and mind were independent entities, influenced on educational music approaches for many centuries, and those ignored movement through musical learning (Vicente and Alonso, 2013).

On the other hand, and focusing on our ancestors' day-by-day experiences, music has had room from Pre-history times. Since the human being produced musical messages from inherent elements to their nature as humans: voice, movement, body percussion (Romero, 2008).

Thus, it can be seen the incipient interest to relate music and movement, what encourages researchers to carry out studies about this topic. Therefore, the importance of music and movement in musical learning is vital in the formation and development of people. Everything must start with early-aged children in order to allow them good musical, cognitive and psychomotor development.

In Spain, the Education Curriculum intends to give importance to music and movement although, in several occasions, separately. Taking into account the Spanish Official State Bulletin (BOE, from now on) in Pre-school Education is prior to make children recognize their body, their body language, and psychomotor movements, with basic notions of movement coordination. In the BOE, regarding Primary education, psychomotricity is not included properly. That is included in Artistic Education, denominated Musical Education, which is divided into three sections: the first one refers to listening; the second, to the development of musical interpretation skills; and the third, focused on creative and expressive skills from dancing and knowledge's viewpoint.

Comparing Pre-school Education with Primary Education, it is considered suitable to carry out an agreement in which music and psychomotricity are closely related with the objective of obtaining an efficient development of children's cognitive and psychomotor skills.

The objective is to achieve that by the Music subject through body percussion-BAPNE Method.

The BAPNE Method enables the development of each of the multiple intelligences, through teaching of body percussion, relying on five disciplines such as Biomechanics, Anatomy, Psychology, Neuroscience, and Ethnomusicology (Romero, 2011)

Multiple Intelligences (Gardner, 1995) are logical-mathematical, linguistic, musical, spatial, bodily kinaesthetic, naturalist, interpersonal, and intrapersonal intelligences. They are considered as a whole in which there is a connection among them with neural-scientific fundaments.

According to Howard Gardner, every person possesses the eight multiple intelligences, but they differ in quantity, that means, they are developed differently.

This study arises from the need for empirical data evidence, what promotes that this methodology has great benefits in Primary Education. Focusing on the visual-spatial intelligence, and bodily kinaesthetic intelligences, this research establishes that the objective is to demonstrate that students who use this methodology will better achieve their cognitive, visual-spatial, and psychomotor development.

According to Howard Gardner, bodily kinaesthetic intelligence "is the capacity to resolve problems or to make products using the body, or parts of the body. It involves physical coordination and ability; use of fine and rough motor skills; and an expressing, or learning, through physical activity, using the body as a tool.

The visual-spatial intelligence is used to solve spatial problems. This intelligence is related with the visual perception of the surroundings, the capacity to create and manipulate mental images, and the orientation of the body in space. (Gardner, 1995)

Here it is determined whether there is or there is not a development of these intelligences through the Movement Assessment Battery for Children - Second Edition (MABC-2). This test is preceded by Harris's test, that determines pupils' laterality. This test is necessary to evaluate the bodily kinaesthetic intelligence and the visual-spatial intelligence, because, generally, human behaviour is asymmetric.

‘This is shown when an action requires more effort from a side of the body than the other. Every time that we shake somebody’s hand, blink an eye, clap our hands, place ourselves before a telescope, cross our arms or our legs, we favour a side of our body at the expense of the other’ (Romero, 2012).

As it can be seen in Romero’s, laterality brings several functional aspects of the human being, for this reason; we possess oral, visual, hearing and foot laterality. Thus, the BAPNE Method, through this specific activity strategy, achieves stimulation in determined brain areas that permit a larger cognitive, psychomotor and visual-spatial development.

So, the following hypothesis can be established: The use of body percussion-BAPNE Method has positive influence on the pupils’ cognitive, psychomotor and visual-spatial development.

## **2. Method**

### *2.1. Participants*

The sample consists of 60 pupils from a school of Alicante, in Spain. The selection of the sample is not random, it is formed by the following subjects. The population consists of a group of the second grade from primary education, aged 7 and 8. There is a 50% males and another 50% females. From the two classrooms available, a control group (N=30) is chosen randomly and the other class is formed by the experimental group (N=30). The first of them, named control group, continues music lessons with the use of the body percussion system of the BAPNE Method; the second one, the experimental group, introduces this method’s activities.

### *2.2. Instruments*

To start with, to be aware of the lateral dominance, the Harris’s test has been used. These tests were administered individually, and the children were rated as having right, left or mixed dominance for hand, eye, and foot. The recommended minimum age range to carry out this test is from 6 years. The time of performance is 10 minutes.

As a test and a pretest, the Movement Assessment Battery for Children - Second Edition (Movement ABC-2) has been used. Sheila E. Henderson, David A. Sugden, Anna Barnett. Concretely, the Spanish adaptation has been used by J. L. Graupera, L. M. Ruiz y Dpto. I+D Pearson Clinical & Talent Assessment - April 2012.

This test can be used to identify children who are significantly behind their peers in motor development, assist in planning an intervention program in either a school or a clinical setting, measure change as a result of intervention, or serve as a measurement instrument in research involving motor development.

There are 3 age ranges to carry out this test: 1=ages 4 to 6; 2=ages 7 to 10; 3=11 to 16. There are 8 proofs for each range that evaluate, from three specific domains of the motor competence of the child: handling skills, accuracy and catching, and balance. The time of performance is between 20 and 40 minutes.

Both tests are easily administered and are usually enjoyable to the subjects.

### *2.3. Procedures*

The school direction was asked for permission to carry out this study, guaranteeing anonymous treatment of data in order to keep the right of intimacy for the subjects of study.

Once obtained the necessary permissions, we developed a chronogram, because it is obligatory to structure the timing of the pre-tests, for the sessions in which the method is performed and the post-test as well. Furthermore, before starting with the study, the programme of activities for the experimental group was done.

The pre-tests were carried out between the following dates: from February 17th to March 4 in 2014. As a first step, in this phase of the pre-test, the Harris’s test was used continuing with the MABC-2 proof.

Next, the practices were performed between March 5th and May 7th in 2014. Some of the days were holidays. There was total of 10 weeks practice sessions:

With the control group, music lessons are carried out as usual, without body percussion. Every Monday from 12 a.m. to 1 p.m.

With the experimental group, music lessons are carried out introducing the body percussion activities of the BAPNE Method. Every Tuesday and Wednesday from 12 a.m. to 1 p.m.

The post-tests were done during the following dates: from May 8th to 23rd in 2014.

2.4. Design and data analysis

The design used is quasi-experimental with measures before and after the treatment. Data will be analyzed as if it were a mixed factorial designed inter-subject (treatment) and intra-subject (measures repeated before and after) using factorial ANOVA variables analysis. These statistical analyses will be covered with the version 21 SPSS/PC package, with license at the University of Alicante.

3. Results

In table 1, descriptive statistics are shown, in which intra-subject variables appear, before the treatment (pre-tests) and after the treatment (post-tests); and the inter-subject variables, control group and experimental group.

Table 1.Descriptive statistics.

	Group	Media	Typicaldeviation	N
Pretest (Before treatment)	Control	11,43	3,510	30
	Experimental	11,03	2,773	30
	Total	11,23	3,143	60
Posttest (After treatment)	Control	12,43	3,370	30
	Experimental	14,37	2,327	30
	Total	13,40	3,032	60

Measures of the control group and the experimental group can be seen as similar values. However, the control group measures are slightly higher.

On the other hand, in the after-treatment results there is a difference of 1,94 points, being the experimental group the one which obtains a higher measure.

Next, the factorial ANOVA values establishes how effective is the body percussion method-BAPNE Method

Table 2.Results of mixed factorial ANOVA among intra-subjects.

Source	C	Gl	MC	F	p	Eta square partial
Factor1	140,833	1	140,833	93,531	,000	,617
Factor1 x Group	40,833	1	40,833	27,118	,000	,319
Error intra	87,333	58	1,506			
Group	17,573	1	17,573	1,044	,031	,018
Error entre	327,583	58	2,776			

Significant differences can be observed before and after the treatment (Factor 1). Moreover, there are differences between the control group and the experimental group (Group) and, furthermore, a relevant interaction effect (Factor x Group) can be observed.

While contrasting results in Figure 1, which will be seen below, and results from table 1 and table 2, interaction can be observed as significant; due to the measures of the control group and the experimental group before the treatment, there are no relevant differences. On the other hand, difference appears after the treatment.

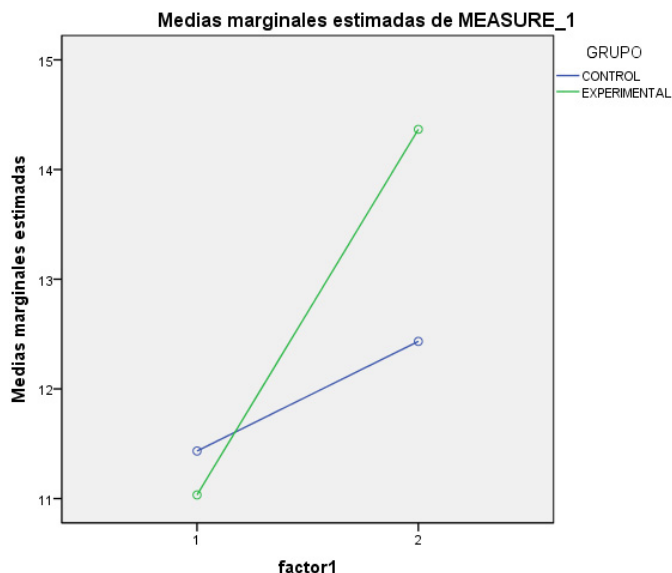


Figure1. Interaction

Footnote 1. The spot #1 that appears on the X axis, where the tangents are originated, makes reference to the phase before the treatment, and the spot #2, where the tangents end, makes reference to the phase after the treatment. The Y axis, show the qualification marks.

It can be appreciated that the experimental group places below the control group in the pre-test phase. Moreover, it is perceived that the tangents open and split by the other side, this means that the control group remains more horizontal than the experimental group. This last group ascends notoriously.

Therefore, there is interaction between the control group and the experimental group because the variables tangents are not parallel, this is to say, they form an angle.

#### 4. Conclusions

As it can be seen in the results, the factorial ANOVA analysis with measures before and after the treatment indicates that there are significant differences between the control group and the experimental group, and before and after the treatment with body percussion activities –BAPNE Method.

To reply the question that was proposed as first hypothesis, ‘Does body percussion-BAPNE Method contribute to the improvement of coordination and laterality?’, results show through statistical analyses that the use of body percussion activities- BAPNE Method does improve coordination. Body intelligence and kinetics is developed and so spatial vision; because, as it was seen above, there is a rise in the total marks in the post-test of the experimental group after working for 10 weeks with this body percussion and multiple intelligence method.

Apart from other contributions, it is important to highlight the main limitations of the study. First, having to do with the sample; in education research a massive study should be done in order to cover a high percentage of the whole population. In this study, the sample used consists of 60 subjects; therefore, further investigation with a larger number of subjects should be done to confirm the results obtained in this study in order to make it general. From this research team, this process has already begun. Furthermore, it also happens in the manner in which the rest of intelligences are evidenced.

As a conclusion, in the present research null hypothesis are rejected attending to the results that show the body percussion activities-BAPNE Method, that influences positively in the pupils’ coordination since it develops bodily kinaesthetic and visual-spatial intelligences. Moreover, the fruit of this study is focus on teachers, who can take this

trend as part of their resources. If movement and experience are the basis of our learning, motor and body actions must be the beginning point to learn, know, and understand music (Vicente & Alonso, 2001).

So, the last intention of the present study is to encourage teachers to carry out this method, body percussion-BAPNE, with the purpose of improving their own students' cognitive development, spatial vision, and psychomotor skills.

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