

## **Rhythmic education, interconnection between the typology of mathematical and rhythmic intelligence**

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### **ABSTRACT**

The paper highlights that the study of rhythm and eurythmy alike, contributes to the development of some musical but also logical skills. The amplification of the rhythmic side through its component elements is favored by logical-mathematical thinking. In the educational field, when the child engages in rhythmic activities, he will involuntarily be involved in the use of mathematical cognitive abilities.

### **KEY WORDS**

rhythm, education, eurythmy, intelligence, experiment

### **INTRODUCTION**

Howard Gardner, professor at Harvard University, claims that IQ (intelligence quotient) has its limitations, suggesting other 8 types of intelligence that would be more appropriate to the human intellect. The types of intelligence Dr. Gardner refers to are: verbal / linguistic, logical-mathematical, spatial, kinesthetic, musical, intrapersonal, interpersonal, and naturalist (Gardner 1983). The type of intelligence corresponds to certain specific abilities that have defined these types. We will lean on two types of intelligence that are interconnected, i.e. the logical-mathematical intelligence and the musical intelligence. Mathematical intelligence is about working with figures, logical thinking, deductibility. While the musical has the ability to play an instrument or sing, compose a song. Children with a developed musical intelligence have a developed sense of sound rhythm, easily learn to play an instrument, they love to listen to music at an early age (Gardner 1983). The musical rhythm, as an important component of music, through its measured (rhythmic formulas and meter) and fit in structures is closely related to the mathematical side. Those who are endowed with a prominent mathematical intelligence have an increased ability to perceive the rhythm with everything that is relevant to it and the other way around.

## **About rhythm**

Rhythmic is that part of the general theory of musical rhythm, which includes the study of the forms of the structure of rhythm itself. underlying the actual rhythm, "there is the long-lasting ratio between two sounds, which form the rhythmic formula, the simplest rhythmic protocell." (Alexandrescu 1997)

Musical rhythm consists in three elements with distinct functions: rhythm itself, meter (measure) and tempo.

Since ancient times and the Middle Ages to the modern age, rhythm has been a concern for many thinkers of each stage, as it has been found in many areas. At first the rhythm meant movement, so that in time it would be possible to conclude that the rhythm is the organization of the movement in a certain order. Thus, in the musical field, we can follow the evolution of the rhythm until the appearance of polyphony based on the measured rhythm. For more information please consult: [http://www.rasfoiesc.com/educatie/didactica/gradinita/RITMUL-MUZICAL-SI-FORMELE-SALE48.php#\\_ftn6](http://www.rasfoiesc.com/educatie/didactica/gradinita/RITMUL-MUZICAL-SI-FORMELE-SALE48.php#_ftn6)

The study of the rhythm was a major concern of Emile Jaques Dalcroze, who saw in mastering the rhythm not only the correct reproduction of durations, but also the ability to harmonically coordinate the limbs of a student's body, which would bring enormous benefits to the study of an instrument. It also would be much easier to acquire a proper technique (Dalcroze 1921), by mastering the muscular reactions of your own body.

Even though Rudolf Steiner laid the foundation for eurhythm, Jaques Dalcroze took it over later on and developed it as a method. From the perspective of didactics, eurhythm involves the suggestive movement of stories or happenings. It has been developed in several branches, including the musical one, consisting of walking exercises (walking), or successive movements of the hands and feet, listening exercises and observation of the musical discourse. Through this method, Dalcroze aims to develop aspects such as:

1. Attention, concentration, self-control, memory;
2. Knowledge of space and body;
3. Coordination of movements, independence of gestures;
4. Imagination, originality, meaning and sense of nuances;
5. Relationship and social integration, sense of responsibility;
6. Re-education (Chircev 2010).

Little known in Romania, eurythmy is known and appreciated in other countries like Switzerland, Germany, France, and Russia (Nedelcuț, 2008).

## **FORMATIVE-APPLICATION EXPERIMENT**

In vocational high schools with a musical artistic profile, the initiation of the study of an instrument, as well as the discipline of the theory-solfeggio-dictation, begins only

in the first grade. The curriculum for the infant class in specialized high schools does not provide disciplines such as music theory or instrument. Instead, there is music and movement, which reproduces many elements and features of the pre-school curriculum (3-6 / 7 years old) drafted by the Ministry of Education and Research in 2008.

As far as the subject of *Music and movement* is concerned, compulsory subject, to be found in the primary school curriculum, not just in the vocational ones, the framework objectives are relatively simple, suitable for general knowledge schools and not for musicians:

- "The formation and development of basic motor skills as well as utilitarian-applicative skills;
- The stimulation of intellectual, voluntary and affective qualities for the independent application of acquired skills;
- Knowledge of hygienic and sanitary skills to maintain health."(Curriculum for preschool education 3-6 / 7 years, 2008)

They do not aim at coordinating according to a musical rhythmic plan, but are limited to a brief motor coordination. Although necessary in the development of any preschool child in music schools, this skill should be developed to anticipate the technical problems that will follow in the coming year, in the first grade, within instrument classes. That is why I proposed an experiment with the role of analyzing the effects of studying the musical rhythm and eurhythm within the theory-solfeggio-dictation discipline.

By this experiment, we want to highlight the possible improvements of some factors contributing to the development of the student musician:

- **Musical hearing** is a necessary and important quality for a musician. Even if we are born with this quality, each individual has his way of perceiving and assimilating sounds. That is why musical hearing needs to be educated and developed.

The development of musical hearing can be achieved only through exercise and only with the help of a specialized teacher. For the first time the student will have to be aware of the height of the sounds, then recognize them after hearing, tune them, correlate the sounds with the rhythm, and eventually be able to write after the rhythmic-melodic line. Once this last stage has been reached, it is being improved by complicating the musical examples to the level where the student is able to write rhythmically melodic dictation.

Rhythmic contribution to hearing development is crucial. Ordering the sounds heard within the temporal space could be accomplished only by good assimilation of the musical rhythm. Awareness and recognition of successions of rhythmic formulas make it possible to focus one's attention on identifying the heights of sounds.

- **Rhythmic sense** is an element as important as hearing, even if there are biological factors (heartbeat, breathing, walking), or externalities that may contribute to perceiving the rhythm more easily. Developing rhythmic sense requires a more complex approach.

In primary school, as a method of developing the sense of rhythm, Dalcroze's method would be appropriate. Due to this this method, students get to feel the rhythm at the physical level, through the movements associated with it, eurhythmy movements that reflect in detail the score. This movement of moves can be mastered to such an extent as to give an integral score. Each body rhythm corresponds to a movement of the body, which requires careful coordination, since the body parts are divided not only into two parts (hands and feet), but they comprise also their subdivisions (foot, ankles, pulp, knees, thighs, fingers, wrist, forearm, elbow, shoulder, shoulder). Memorizing a musical piece passes through the more intense sensations of the body. The student's challenge is greatly enhanced, but the interest gradually increases (from simple movements to complex rhythmic aspects).

- **Memory** an important factor in the existence of any individual, regardless of the type or subject of study chosen, whether musical, artistic or other. The development of memory matters more than the capacity of each individual, and the multitude of types of memory is part of it as pertaining to neuroscience. Exercises that contribute to the evolutionary process of memory can aim at short-term or long-term memorization. Both methods being in favor of the student.
- **Logical thinking.** The study of rhythm, with all its underlying features, can help in the formation of logical thinking considering the structures of rhythm and measure. Perceiving rhythm and organizing it in measures (the meter) channel the brain to a logical, well-structured and organized thinking.

### **Research hypothesis**

The present experiment starts from the hypothesis that the rhythmic exercise organized and put in the forefront of theory-solfeggio-dictation theory classes, to the detriment of the learning of musical sounds, leads to the facilitation of the development of musical hearing in the child, respectively an increased performance in the realization of a rhythmic- melodic exercise.

Demonstrating the way the methods presented in the experiment operate (Kodály, Dalcroze and Orf method) as well as their implementation starting from a younger age can lead in the long run to the pupil's development of learning and memorizing capacities. Students pertaining to the experimental group may have the advantage of perceiving and assimilating acquired knowledge more quickly and effectively precisely because they will have access to more information that enables them to acquire them in a natural manner.

At the end of the experimental samples, the students involved must be able to:

- Recognize written and auditory note values and the breaks associated with them
- Sit correctly the measures studied
- fit correctly the values of the notes in the studied measures
- faithfully reproduce rhythmic formulas
- recognize metric accents
- write a rhythmic dictum after hearing
- perform physical exercises in combination with the playback of the rhythm and the metric stored in a musical piece

### **Applicative-informative experiment**

The experiment was conducted in a 17-week high-school musical high school, with a sample of 22 pupils divided equally into two groups. One group was designated as the control group, while the other as the experimental group, so that at the end of the experiment, we can outline a hierarchy of the results obtained and the effect of the experiment on the children. If the control group studied the subject matter of the curriculum, the experimental group, in addition to the curriculum, performed a series of rhythmic exercises as well as eurythmic activities, extracurricular activities.

All the aforementioned factors were taken into consideration for the examination, and the methods to be used were varied. For the most part, it took the form of a game specially to facilitate its evolution. Small children are more likely to receive information when they are involved in the game than when they are asked to stay motionless and careful to understand and assimilate new information. Once part of the game, the child is more likely to capture natural information, assimilate it and fix it better. It is very important that during the so-called game, all the children to be involved, because some may feel ignored, thus defending the interest in the studied subject. Even if not all have the same ability to perceive, the fact that all of them have the same or similar attributes, gives the less endowed the wish to progress.

During the experiment we used methods extracted from the arsenal of the great pedagogues who laid the foundations for musical and rhythmic education.

One of the methods used in the experiment in primary classes was the Kodály method. Through games, poems and songs familiar to them or not (from children's literature, previously studied in the kindergarten or proposed by the teacher), they were able to create their own favorable exercises. The first stage was largely based on chanting the poems learned after hearing or already known to them. They were taught the values of the notes (the fourth, the eight and the half) on the syllables of the poem. Each syllable, depending on its duration, had the correspondence of the musical duration. Another basic principle taken from the Kodály method was the name of syllable values; your quarter, the optimal - you and your doom.

Example 1:

Example 2:

Example 3:

5

Another method considered necessary in the experimental process was eurythmy, which implies, among other things, physical movement (mainly walking) transposed into music. With this method, the student is more likely to perceive the role of the metric, the times and the rhythm of the musical discourse, and the assimilation of knowledge in this case is produced simultaneously. Exercises will also be integrated in the form of a game, and in order to stimulate creativity small toys (ball, tambourine, maracas) will be allowed in order to highlight the subject that us being studied. For example, to throw the ball from one to the other on each metric, or to distinguish the time from the measures by shaking the tambourine/maracas, etc. Another asset of Dalcroze's method is the impact on memory. By playing a rhythmic-melodic fragment of the right size, students have to memorize the fragment so that they can reproduce the rhythm of the fragment, but also the meter. Longer fragments will be played multiple times until most children have saved the strain.

From the Carl Orff's method, we adopted a small part, namely the use of percussion instruments, the rhythm of speech and the expression of dance rhythm. Although some elements of the methods of these teachers have common parts, each has developed his method in a unique style, thus contributing to the foundation of today's education and pedagogy.

These methods have enabled all those involved (teacher and pupils) to discover another facet of the teaching-learning process as well as a traditional lesson in Romanian state education.

### Formative intervention

Conducting the experiment allowed us to observe the process of student development, and it was possible to intervene whenever necessary to correct some

erroneous skills. In order to intervene in a timely manner, a number of factors had to be observed:

- perception and assimilation of new notions
- precision in performing rhythmic exercises
- measure Accuracy
- recognition of rhythmic, written and auditory terms
- Bold execution of the exercises proposed

All these factors have led to the student's development both from a musical point of view and at a psychomotor level, by correlating the brain with the body and the voice movements.

the experiment on the two groups of students, the control and the experimental one, led to a wide variety of results while revealing also the difference between the two groups.

## RESULTS

At the initial evaluation, all children achieved similar results because they had no knowledge of rhythmic notions, this factor being an advantage for making it easier to notice the differences in the experiment but also during the experiment.

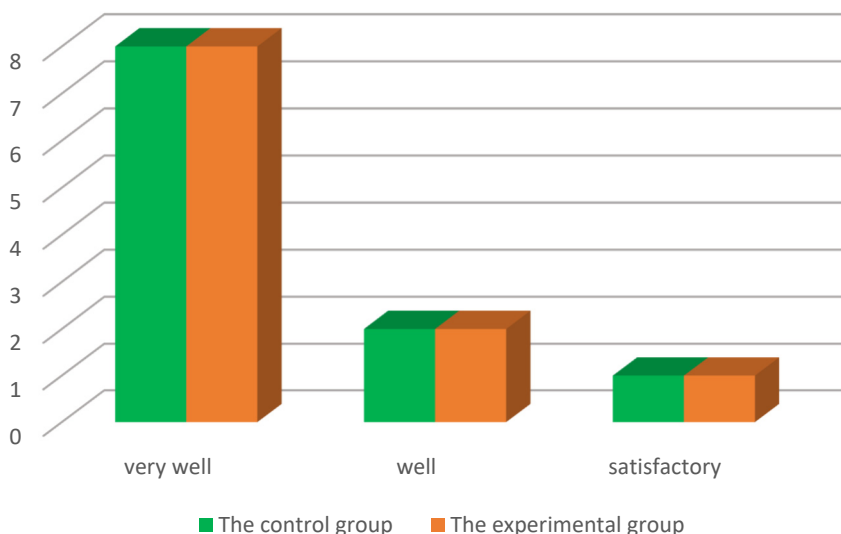


Chart 1 - Initial evaluation scores

The mid-term evaluation was carried out in order to observe the evolution of the students in the two groups, as well as to identify possible mistakes in students' skills and their correction. The evaluation was conducted orally because students still lacked the necessary skills to write and read. The requirements were designed for the children. From this second evaluation, the small differences between pupils in the

control group and those in the experimental group began to be visible. If students in the control group had a natural attitude and the responses were satisfactory, those in the experimental group had quicker reactions, more consistent but better formulated responses. Besides the rhythm notions that had been, the students in the experimental group had advanced capabilities in reading a solfeggio at first sight.

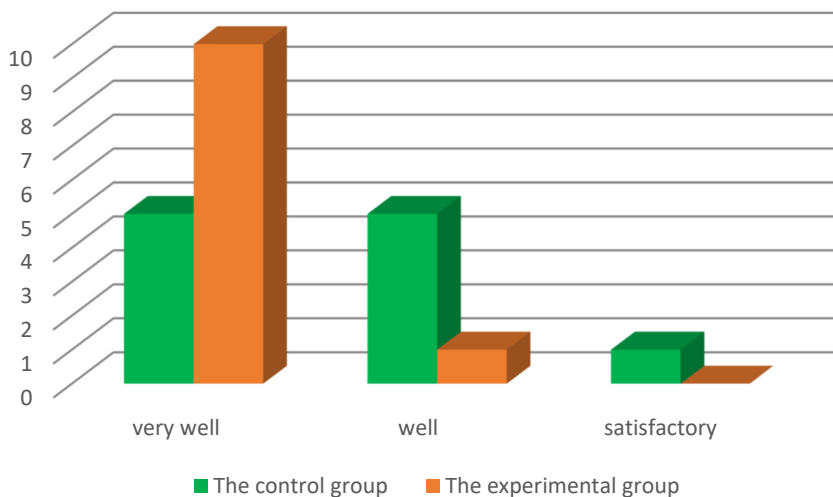


Chart 2 - Interim evaluation scores

For the latest evaluation of the experiment, written tests were prepared. The requirements were the same for both groups so that we could determine the differences between the two study groups and the results were as follows:

**The control group** has responded satisfactorily and well. Students did not have a constant pulse, and the coordination of rhythmic times and formulas raised little execution problems. Some responses were uncertain, elusive, others were wrong, and some were good. Steps have been taken to rectify and review rhythmic notions in order to overcome the moments of skill and formation of rhythmic reflexes. Because of the low share of rhythmic elements in the current curriculum (as a component integrated in theory-solfeggio-dictation), the skills have become more difficult, always resorting to their review. Of the 11 children in the group, 6 children needed corrections.

The results of **the experimental group** were highlighted by the consistency and confidence of the children in relation to the assimilated knowledge during the first weeks of school. Of the 11 children, only 2 children required minor interventions to correct faulty skills. Reflexes were already formed and well fixed.



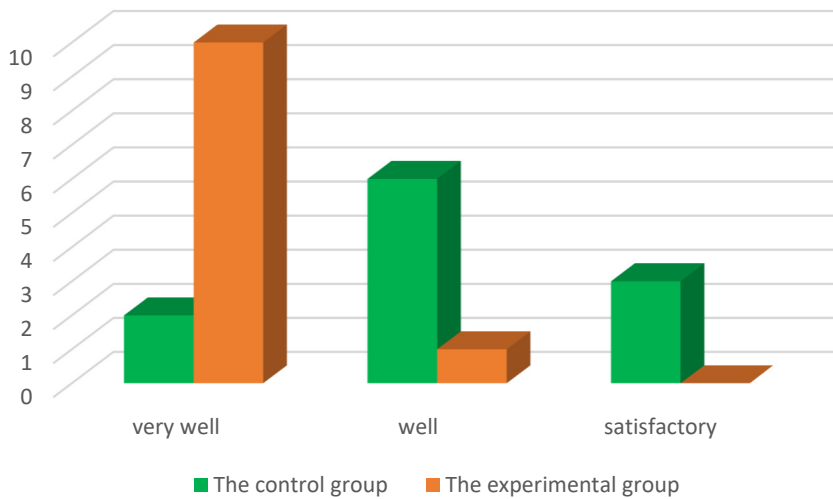


Chart 3 - Final evaluation scores

At a statistical level, of the 11 pupils in the experimental group, 10 pupils scored **very well** and one student scored **well**.

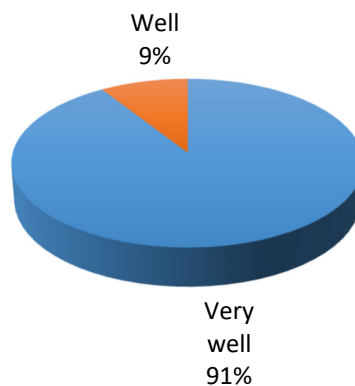


Chart 4 – The experimental group scores

The control group obtained the following results: out of 11 pupils, 2 students received the qualification **very well**, 6 students scored **well** and 3 pupils were rated **satisfactory**.

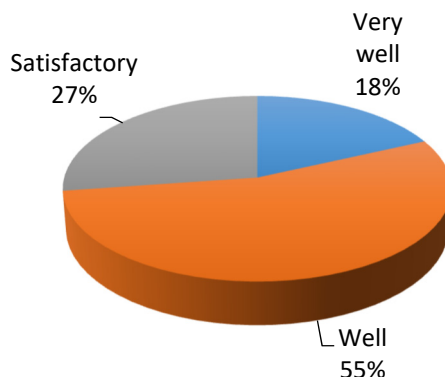


Chart 5 – The control group scores

## CONCLUSIONS

After initial, intermediate and final tests, real progress was made in the experimental group.

Rhythm and eurythmy helped the students to perceive, overlap and execute the melodic line accompanied by rhythm (solfeggio), but also to be able to extract the rhythm from a memorized melody and then to render it with great precision (clapping, stamping their feet or keeping the beat with their pencil/pencils hitting the desk). At the same time, the reproduction of a given piece of music (solfeggio or small piece) showed that the students were able to lead the musical discourse to an evolved level.

The study of rhythm did not only initiate these students into musical art but channeled them towards a more harmonious and faster development than usual, teaching children at an early age how to think and solve the small obstacles that occurred during the learning process but also to find and apply solutions to solve the difficulties encountered in the process.

The purpose of the experiment, besides the assimilation and consolidation of knowledge, was to teach students to think, process and use information for purposes other than rhythmic.

The introduction of the rhythmic study as a matter adjacent to the theory of solving-dictation would lead to an improvement of the quality of the musical education system in the music vocational schools, by the contribution made to the student's cognitive musical development.

With the perception of the musical rhythm, the rhythmic formulas and the meter, we can see the contribution of logical-mathematical thinking in the process of learning it. Young students develop these capacities through concrete arithmetic computing

activities, through the counting operation, by understanding the relationship between correspondences (Gavreliuc).

In order to achieve the educational goal and objectives, it is essential for the teacher to take into account the idea of multiple intelligence and the benefits that its access to the instructive-educational process can bring (Gardner, 1983).

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