

Research Article

# Psychological Bases of Formation of Sense of Musical Rhythm in Preschool Age Children

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## Abstract

The present situation in music education shows that it is carried out without taking into account the psychological aspect of musical art, and this greatly reduces the efficiency of learning. This study attempted to examine the psychological bases of formation of sense of musical rhythm in preschool age children, identify the methods of individual training of the children on the formation of sense of rhythm and to contribute to the general understanding of the psychological mechanisms of musical abilities and patterns of their formation. The study adopted pre-test – post-test, control group experimental design. Thirty (30) children of 3-6 years were selected from two kindergartens in a Russian city for the study. The results indicated that the children after a specially organised learning acquired a higher level of development of sense of rhythm as a sensory ability. It also confirmed that development of the sense of rhythm can be improved not only with musical material, but also using non-musical tasks. The study recommended that use of visual models of the rhythmic structure greatly simplifies and speeds up the learning process. It was also suggested that special role should be given to the diagnosis of the initial level of development of the sense of rhythm, and also to identifying gifted children and children with challenges, and on that bases develop and implement individualised learning and teaching strategies.

## Keywords

Sense of Musical Rhythm, Yearly Years Music Education, Cognitive Development, Psychological Principles of Music Training

## 1. Introduction

Music occupies a large space in human's life, and many children are covered by the system of music training and education. It is from this perspective the understanding of the importance of psychological principles of the musical activities in childhood becomes very vital among educators.

Today the stream of music information has grown to colossal size. To teach children to select it appropriately and identify the most valuable music is an urgent task of contemporary education system, including pre-school institutions [1,

2]. Unfortunately, the present situation in music education shows that it is carried out without taking into account the psychological aspect of musical art, and this greatly reduces the efficiency of learning. In this connection, to identify, formulate and implement psychological principles of music training at elementary level of education appears important because early years are the period when formation of musical perception and experience begin.

A number of studies [3-7] established that children gener-

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ally have musical responsiveness, which can be defined as child's musicality. The researchers were able to define the structure of musicality and its major components (pitch perception, rhythm, meter, melody, harmony, timbre, form, creativity, expression, etc). These components are interconnected and influence one another, and they can be developed and improved through music education and experience. However, individual and psychological characteristics of those components have not been studied enough, and this prevents the development of age appropriate methodology and practices of formation of musicality as a whole and its separate components. The study of psychological principles of formation of sense of rhythm in pre school age children is the subject of special attention and became the central focus of this study.

Having studied the related literature, this work assumed that the formation of sense of rhythm occurs through adaptation/adjustment to a system of sensorial models in a certain sequence. This hypothesis was supplemented by the assumption that acquisition of sensorial models occurs through the motoric modeling, i.e. movement adjustment to the given rhythmic structure. The following specific objectives were set:

- 1) To identify the age differences in the sense of rhythm in preschool age children.
- 2) To determine the levels of development of sense of rhythm among children participated in this study.
- 3) To identify the methods of individual training of the children on the formation of sense of rhythm.
- 4) Based on the results of this study, contribute to the general understanding of the psychological mechanisms of musical abilities and patterns of their formation.

## 2. Method

To diagnose the level of the sense of rhythm, a methodology inspired by Venger (1984) was used [7]. He posited that studying a complex system like the sense of rhythm in preschool children necessitates its maximum differentiation. Therefore, Venger intentionally focused on the primary elements of music – tempo, beats, and rhythmical patterns – while setting aside the emotional aspects of rhythm.

This study adopted pre-test – post-test, control group experimental design. Thirty (30) children of 3-6 years (regardless to gender) participated in the study.

Participants were recruited from two kindergartens in Volgograd, Russia. These kindergartens follow a standard Russian preschool curriculum that includes regular music activities such as singing, rhythmic games, and movement exercises. Children with diagnosed developmental disorders or significant prior formal musical training (e.g., private lessons or music school) were excluded to ensure a relatively homogenous sample in terms of musical experience. Parental consent was obtained for all participating children after a detailed explanation of the study's purpose and procedures.

The selected children were purposively divided into two groups, ensuring equal representation by age in each group (n=15 per group). Pre –test stage of the study consisted of two parts. In part 1, the first group of children participated. Traditional methods were used: clapping of unmusical rhythm patterns and identification by the children of the rhythmic structure a piece of music. For the clapping task, researchers clapped simple rhythmic patterns (e.g., two short, one long) using unpitched sounds. The children were asked to imitate these patterns. For the music identification task, short musical excerpts were played, and children were asked to identify the underlying rhythmic structure by clapping along. Four (4) attempts were given for each type of task. The protocol recorded correct or wrong performances on the tasks and the number of attempts used to reach the solution. When children performed the musical tasks, the components of the sense of rhythm structure (tempo, meter/beats, rhythm pattern) were also adequately documented. Three levels of development of sense of rhythm were identified:

- 1) **ARRHITHMICAL** - (disordered) - children did not reproduce any of the components of the structure. They randomly clapped their hands outside of the music.
- 2) **STEADY** - children reproduced two components only: the tempo and meter. They clapped the rhythm by regular beats only.
- 3) **ADEQUATE** - all 3 components were adequately demonstrated.

In part 2, the second group of children was used. The sequence of appearance of components of rhythm was established. The tasks given to children contained only one of the components at a time. Children were asked to produce by clapping:

- 1) Tempo: fast, moderate, slow;
- 2) Beats (meter) - 2, 3, 4-parts;
- 3) Variation in the length of each sound.

The data collected in part 2 showed that the first component, which was heard and repeated by children, was the tempo.

This likely appears around the age of 2 years, since all 3-year-old children participating in the experiment were able to demonstrate this component successfully. However, the slow tempo was considerably harder for children to repeat.

Following the tempo, children could distinguish between accented and unaccented sounds, i. e metric pulsation/beats. This ability was occurring abruptly in the 4 year olds. While children of the 3rd year did not cope with this kind of tasks, the next age group (4<sup>th</sup> year) solved them in 58% of cases. The ability to perceive and produce the duration of sounds was demonstrated only by 4-6 year olds. Even though the process starts at the 4th year, but goes slower and more difficult.

The experimental stage of this study was scheduled to last for 12 weeks with 5-7 minutes of group training sessions twice a week.

The experimental group of participants was exposed to the

treatment in 2 levels.

1) The goal of this level was to trace the sequence of mastering of rhythmic structure and identify the type of mastering. Non-musical tasks were prepared on fast and slow tempo, on accent - non-accent, on rhythmic patterns, and complex tasks on all three components.

The assignment for a child was firstly to reproduce the task together with the teacher (adjusting to a sounding sample), and then, to perform the task without the sample.

2) The tasks were built on a system of rhythmic standards. To make the reproducing easier, the visual models/aids were offered. Abilities to use sensory standards and to construct and use model images are primary cognitive abilities, which begin developing in yearly years.

To test the effectiveness of this method, children were divided into two groups:

- 1) Children who worked only with sounding samples;
- 2) Children who first of all placed on the table a visual model of the rhythm and only after that they reproduced the rhythm.

To set the visual models, we used light blue and dark blue strips of paper of different lengths, corresponding to accented and unaccented sounds of different duration. Light blue strips represented unaccented beats, and dark blue strips represented accented beats. The length of the strip corresponded to the duration of the sound, with a consistent scale (e.g., 1 cm = 1 beat). For example, a short light blue strip would represent a short, unaccented beat, while a long dark blue strip would represent a long, accented beat. The rationale for this color-coding was to provide a clear visual distinction between accented and unaccented beats, aiding in the understanding of rhythmic structure. The strip lengths were used to help the students to understand the duration of each sound within the rhythm.

### 3. Results and Discussion

The most interesting results were obtained while working with children of the 5th year. The first part of pre-test showed that at this age there was a significant jump, when the percentage of correct performances increased more than twice (4 year olds - 17%, 5 year olds - 50%), and the number of attempts leading to an adequate solution decreased (4 year olds - 2.5 times; 5 year olds - 1.6). Such comparisons in other age groups did not give such significant difference in data. Analyzing the part 2 of the pre-test, it was noted that 100% of 5 year old children showed the Steady Type, while 4 year olds children showed 25% cases of Arrhythmic Type.

This "jump" in rhythmic ability around age 5 could potentially be explained by Piaget's theory of cognitive development. At this age, children are typically in the preoperational stage but are beginning to develop concrete operational thinking [8]. This allows them to better understand and manipulate concrete representations of abstract concepts, such as the visual models used in this study. The increased ability

to focus and maintain attention, also characteristic of this stage, would contribute to improved performance. Additionally, Vygotsky's sociocultural theory suggests that at this age, children benefit more from collaborative learning and scaffolding, which were elements incorporated into the experimental design [8].

Also, results showed that it was at the age of 5 years, children who successfully completed the non-musical tasks, performed musical tasks better as well. Results of 2nd part also showed that 5 year old children were able to demonstrate all the three components of the rhythm. This "jump" in performance occurred in the 4th year (3 year olds - 0% made the metric pulsation and rhythmic pattern; 4th year - 58% reproduced the meter and 68% - a rhythmic pattern). However, it should be noted that the formation of the ability to perceive and reproduce the duration of sounds was slower because children of 5 years solved the problem in 68% of cases.

Summarizing the results of part 1, it was concluded that the children of the 4<sup>th</sup> and 5<sup>th</sup> year of age should take part in the treatment group of the study.

The experimental work with the treatment group allowed us to identify the types of adjustment for sounding models. The indicators, which formed the basis to identify the kind of adjustment, were:

- 1) The degree of adjustment to the model;
- 2) The degree of independence in finding of the pattern as a whole.
- 3) The degree of stability of the solution found.

Based on these indicators, we found the 5 types of adjustment to sounding models:

- 1) Children begin mastering of arrhythmic movements, i.e., at first they do not hear any rhythm. Then they caught the vivid elements (accent-nonaccent). They could not play the whole task even after receiving the verbal principle of its construction. Their clapping was very unstable.
- 2) Children of this type began the mastering with reproducing of metric pulsation. After receiving the verbal principle of construction, they moved to produce the task in its whole structure. But no child could do it on its own.
- 3) Children discovered the principle of tasks construction on their own. Initially, the producing was uncertain. However, after some moments, the clapping became more confident, coinciding with the rhythm of the teacher. Within 5-10 seconds children could work without sounding reference, but later they accelerated the tempo.
- 4) Children of this type were more confident in clapping of rhythmic structures. Adjustment processes were shorter.
- 5) Children immediately could reproduce the structure independently and kept it well throughout the attempt. This type of children showed the maximum percentage of adequate solutions in pre-test.

These characteristics of solutions' types showed the significant qualitative difference in the development of perception of rhythmic structures, which occurs at the 5th year.

In the second level the visual models were used. Their use, especially in the separate components of the rhythm structure, may be considered reasonable, since it was a process of mastering of the first 5-6 tasks which, we realised, was the most difficult and took more time.

Summarizing the outcomes of the treatment group, it should be noted that all children, even those who had the lowest results, were able to acquire proposed system of the sensorial models of rhythmic standards. These results go in line with the findings of [5] who is in opinion that abilities to use sensory standards and to construct and use model images are formed in early years. In other words, in the specially organized learning situations, children could attain positive and quality results in acquiring very complex rhythmic standards.

In the post-test, 5 year old children after the treatment sessions showed 92% successful results on musical tasks solutions with the average number of attempts equal to 1.4. The non-musical tasks were solved adequately by 50% of children; others showed steady results.

For comparison, the data of the control group who did not participate in the treatment sessions were presented:

- 1) Non-musical tasks: 58% success, 2.4 attempts in average;
- 2) Musical tasks: 77% of children demonstrated steady type; 22% demonstrated arrhythmic type.

These results indicate that the children after a specially organised learning, acquired a higher level of development of sense of rhythm as a sensory ability. Therefore, the possibility of the formation of sense of rhythm through the adaptation/adjustment to the system of sensorial models in a certain sequence was confirmed, as it was evident from the results obtained in other studies [9-11]. Therefore, the complex structure of the sense of rhythm is formed not as a whole but component by component. The ability to perceive and produce the tempo appears first (from fast to slow). The ability to produce accented and unaccented sounds appears next. The mastery of the standards concerning the length/duration of sounds is the last component in the line.

The process of mastering of standards begins with the mastering of the order of sounds with the same duration. Then they master the different durations: firstly elementary square structures (2, 4, 8), and then non-square rhythmic patterns (3, 6, 12).

The perception of complex rhythmic structure is a gradual process. Firstly, child perceives any one structural element of complex standard. Most often, it is previously mastered elementary rhythmic standard or 2-3 first elements of the new structure. Then, the most striking rhythmic relationships are perceived, and then complex model is perceived as a whole.

It is also important to acknowledge the limitation of this

study in terms of longitudinal data. The 12-week intervention period provides valuable insights into the immediate effects of the visual modeling technique. However, it does not address the long-term sustainability of these improvements. Future research should consider conducting follow-up assessments to determine whether the gains in rhythmic ability are maintained over time. Factors such as continued music exposure, home environment, and individual differences could influence the longitudinal outcomes.

## 4. Conclusion and Recommendations

Based on the observations of the effectiveness of some methods of training, we believe that the work on the development of sense of rhythm in pre-school children can be carried out with the following recommendations:

- 1) Teaching based on the gradual mastering of rhythmic standards by the child, provides a significant positive shift in the development of a sense of rhythm of pre-school children.
- 2) In the early stages of training, it is effective to introduce to the children the sensorial standards corresponding to each element of a rhythm pattern with the subsequent transition to complex patterns.
- 3) The use of visual models of the rhythmic structure greatly simplifies and speeds up the work process, which is explained by the peculiarities of perception and concrete and thinking of pre-school children.
- 4) The development of the sense of rhythm can be improved not only with musical material, but also using non-musical tasks. It enriches the sensory experience of children, promotes the development of perception, thinking, musical memory.
- 5) The special role should be given to the diagnosis of the initial level of development of the sense of rhythm, and also to identifying gifted children and children with challenges, and on that bases develop and implement individualised learning and teaching strategies.

## Author Contributions

Anna Awopetu is the sole author. The author read and approved the final manuscript.

## Conflicts of Interest

The author declares no conflicts of interest.

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