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FACTORS INFLUENCING THE DEVELOPMENT OF MUSICAL ABILITIES IN PRESCHOOL CHILDREN

Abstract: This paper examines the influence of specific factors on the development of musical abilities in preschool children within the territory of the City of Raška. The research aim is focused on assessing the level of development of musical abilities in preschool children within the determinants defined in this study: a musically stimulating family environment and extracurricular musical activities. The research employed testing and survey techniques. The sample consisted of children from the preparatory preschool group of the “Veselo detinjstvo” kindergarten (N=118) and the parents of the children whose musical abilities were examined (N=104). Descriptive statistics and t-test were utilized for data analysis.

As expected, the study found that a musically stimulating family environment and extracurricular musical activities positively influence the development of musical abilities in preschool children. However, it was found that the level of development of children's musical abilities deviates from expectations; this may be related to inadequately organized and guided musical activities that are not sufficiently aligned with the developmental characteristics of preschool children. These research results pave the way for further reflection on and improvement of pedagogical practice by providing support to parents and teachers in the process of identifying children's musical potentials and in the more careful selection of musical content that contributes to the musical and overall development of children.


Future research aimed at developing children's musical abilities may be directed toward examining the qualitative aspects of a musically stimulating family environment, as well as conducting longitudinal monitoring of the development of children's musical abilities depending on the type, frequency, and duration of musical activities.


Keywords: Musically stimulating family environment, extracurricular musical activities, musical abilities, preschool age.

Introduction

The development of musical abilities of preschool children is influenced by various factors, among which the environment in which the child grows up holds an important place, especially a stimulating family environment and opportunities for free musical activities. The development of musical abilities is based on a complex interaction between innate predispositions and

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environmental influences, and is conditioned by the interplay of personal and environmental factors whose intensity and mode of action vary depending on age and the specific forms of talent manifestation (Nikolić, 2020). Theoretical and empirical sources indicate that a significant portion of the potential for musical understanding, musical perception, or performing abilities has a hereditary component; however, these potentials can only be fully realized if the child develops in circumstances that provide adequate support (Gembris, 2006; Hallam, 2010, Nikolić, 2020). Inherited abilities do not, in themselves, guarantee a high level of musical development, but rather represent an initial biological framework that the environment can enrich, maintain, or completely neglect.

In scientific literature, the terms *musical capacity* and *musical abilities* are used to denote a specific set of psychological and perceptual abilities necessary for successful understanding, performance, and experience of music. Although these terms are often seen as synonyms, different theoretical approaches indicate their nuanced meanings and varying conceptual frameworks (Kojov-Bukvić, 1989; Nikolić, 2016).

Within theoretical discussions, two dominant approaches are distinguished: unitarian and elementarist. Unitarians operate on the premise of a single, general musical ability, while elementarists view musical abilities as a set of multiple, interconnected, yet relatively independent components. Supporting the elementarist approach is the research of Seashore, who defines musicality as a complex structure composed of a large number of individual abilities (Seashore, 1919; as cited in Kojov-Bukvić, 1989). Although he identified twenty-five musical abilities, for practical purposes, Seashore singles out six key dimensions: sense of pitch, sense of intensity, sense of time, sense of harmony, musical memory, and sense of rhythm. Summarizing pedagogical and psychological literature on musical abilities, Nikolić (2016, 2020) distinguishes two functional levels of their manifestation. The first, basic level encompasses auditory abilities, which involve the capacity for perception, understanding, structuring, memorizing, and comparing auditory stimuli. The second, higher level relates to the ability for emotional experience of music and its aesthetic evaluation, which certain authors equate with the concept of musicality (Radoš, 2010; Bogunović, 2010). A similar stance is held by Kojov-Bukvić (1989), who views musicality as a unity of two fundamental components - auditory and emotional. In her opinion, the central element of musicality is the ability to react emotionally to music, whereby this experience is not possible without developed auditory abilities that enable fine differentiation of melodic, rhythmic, and other musical changes (Kojov-Bukvić, 1998).

Based on the aforementioned, the term *musical abilities* will be used to denote the set of specific abilities (sense of pitch and rhythm, musical memory, harmonic ear, capacity for aesthetic experience of music) that represent the fundamental element of the development of musical talent.

The family is primarily responsible for the first informal experiences. According to Mirković Radoš (1996), a musically stimulating family environment is considered to be “the musical activity of the parents, encouragement, [and] interest in the child’s musical progress and development” (Mirković Radoš, 1996: 44). Enriched environmental conditions from the youngest age are often reflected in the form of “a highly skilled parent or a long-term home tutor who provided lessons and daily practice under supervision” (Lehmann, Sloboda, & Woody, 2012: 53). In order to support the development of musical abilities, skills, and musical talent, it is important that parents provide adequate musical stimuli to their children from early childhood. Parents’ positive attitudes toward music, their involvement in musical activities, and the encouragement of children’s initiative in musical expression contribute to the development of intrinsic motivation and the child’s positive attitude toward music. Musical learning in the family context takes place primarily through informal, spontaneous, and experiential forms, which is in accordance with the developmental characteristics of preschool children. Research indicates that a stimulating family environment is

one of the key factors in the development of musical abilities, with the following activities highlighted as significant: encouraging initial musical behaviors and spontaneous singing, fostering family singing and playing, listening to artistically valuable and genre-diverse music, guiding children toward available musical activities in the local community, and enabling attendance at concerts, musical performances, and other cultural and artistic events (Gembris, 2006; Hallam, 2010, Nikolić 2025). A family in which music is an integral part of daily life significantly influences the formation of a child's musical habits and interests and provides support for the development of musical abilities (Vujanović, 2009; Bender, 2013). The quality and frequency of musical stimuli in the family environment directly influence the development of the perceptual, performing, and creative aspects of musical development. A musically stimulating family environment contributes to the child's more successful inclusion in organized instructional musical activities and represents an important foundation for the development of musical abilities in collaboration with teachers. In this process, preschool institutions also play a significant role by providing a musically enriching environment, access to various instruments, and encouragement for improvisation and group music-making, thereby contributing to the development of children's creativity and motivation. Through the synergistic influence of the family and the institutional environment, conditions are created for the successful stimulation of musical abilities and the timely recognition of giftedness (Nikolić, 2025).

However, outside the institutional framework of the kindergarten, children have the opportunity to participate in numerous programs that further broaden their musical experience. In the context where the research was conducted, extracurricular musical activities available to children outside the family and preschool institutions include: musical playgroups, preparatory classes in music schools, cultural and artistic societies, as well as ballet schools. According to a research (Sloboda & Howe, 1991; Welch, 2006), extracurricular musical activities represent a significant factor in the development of musical abilities. They enable more intensive pedagogical work focused on developing the voice, hearing, and sense of rhythm, mastering techniques of playing specific instruments, as well as developing interest in participating in public performances that strengthen musical motivation and self-confidence.

In this research, the musical abilities of children in the preparatory preschool group were examined in relation to the determinants defined as: a stimulating family environment and extracurricular musical activities. By observing these two areas, it is possible to perceive to what extent the quality of musical experiences in early childhood conditions the level of development of musical abilities in children before starting school.

Research Methodology

The subject of the research is the factors influencing the development of musical abilities in preschool children in the city of Raška: a musically stimulating family environment and extracurricular musical activities.

The research aim is focused on assessing the development of musical abilities in preschool children within the territory of the City of Raška, specifically within the determinants defined in this study: a musically stimulating family environment and extracurricular musical activities.

Research Tasks:

To assess the musical abilities of preschool children (vocal range; ability to reproduce rhythmic patterns with and without melody; ability to reproduce melodic-rhythmic motives with and without text; ability to reproduce a single tone of a given chord);

To determine whether significant statistical differences exist in the musical abilities between preschool children growing up in a musically stimulating family environment and children who do not;

To determine whether significant statistical differences exist in musical abilities between preschool children who attend extracurricular musical activities and those who do not.

The general hypothesis assumes that a stimulating family environment and extracurricular musical activities positively influence the development of musical abilities in preschool children.

Specific hypotheses:

It is hypothesized that, during the testing of musical abilities, children will successfully reproduce the given patterns (vocal range covering tones from c^1 to c^2 ; successful reproduction of rhythmic patterns with and without melody; melodic-rhythmic motives with and without text; one tone of a given chord).

It is hypothesized that significant statistical differences exist in musical abilities between preschool children growing up in a musically stimulating family environment and children who do not.

It is hypothesized that significant statistical differences exist in musical abilities between preschool children who attend extracurricular musical activities and those who do not.

The conducted research is empirical and non-experimental in nature, and is based on a comparative-correlational research approach aimed at examining differences in the development of children's musical abilities in relation to certain determinants. The methods used in this research are the theoretical method and the descriptive method. The research was realized through testing and surveying techniques. Testing was conducted using the musical abilities test developed by Emeša Terzić and Danijela Sudžilovski (Terzić & Sudžilovski, 2004). For the purpose of adapting the study to the research context, a partial modification of the musical abilities test was carried out. The modification referred to the final task, which in the original version of the test involved singing the initial motifs of simple traditional songs from the Užice region, while in this study it was replaced with a task requiring the reproduction of a single tone from a given chord. The internal consistency and reliability of the musical abilities test, consisting of 30 tasks (reproduction of rhythmic and melodic examples, as well as singing chord tones), were examined using the Cronbach's alpha coefficient. The obtained coefficient value was $\alpha = 0.853$, indicating high reliability of the measuring instrument and confirming that all five groups of tasks consistently measure a unified construct of children's musical ability. The survey was conducted using a questionnaire containing 14 open-ended and closed-ended questions.

The overall convenience sample of the study consists of 118 children from the preparatory preschool group (6-7 years old) at the "Veselo Detinjstvo" kindergarten in Raška as well as 104 parents of the tested children. Of the total number of children included in the sample, 68 (57.63%) were boys and 50 (42.37%) were girls.

The independent variables of the study include "musical stimulation of the family environment" and "children's participation in free musical activities outside preschool institutions."

The variable "musical stimulation of the family environment" was operationalized through the following indicators:

Presence of a formally educated musician in the family – the existence of at least one family member who has completed or is currently attending formal music education (elementary or secondary music school, Faculty of Music Arts). Measurement type: dichotomous indicator.

Questionnaire item: *Is there a formally educated musician in your family?* Responses and scoring: yes (1), no (0).

Informal engagement with music within the family – the presence of at least one musically talented family member without formal musical education who engages with music in any form (e.g., singing, playing an instrument, performing, participating in folklore ensembles, bands, etc.). Measurement type: dichotomous indicator. Questionnaire item: *Do your musically talented relatives, who do not have formal music education, engage in music in any way?* Responses and scoring: yes (1) – at least one such family member exists; no (0) – no such family member exists.

Perception of the presence of music in the child's environment – parental assessment of the extent to which music is present in the child's everyday environment. Measurement type: ordinal indicator. Questionnaire item: *To what extent do you consider music to be present in your child's environment?* Responses and scoring: not at all (0) – music is almost absent; little (1) – music is rarely present; sufficiently (2) – music is present to an adequate extent.

Based on the sum of scores from these three indicators, a Family Musical Stimulation Index (0–4 points) was formed. According to the total score, families were classified into three categories: low (0–1 point), moderate (2–3 points), and high musical stimulation (4 points).

The variable “child's participation in musical activities outside the preschool institution” is defined as the presence or absence of a child's organized engagement in music-related activities conducted outside the preschool institution (preparatory music school program, private lessons, choir, folklore ensembles, music workshops, etc.). Measurement type: dichotomous indicator. Questionnaire item: *Does your child attend any musical activity outside the preschool institution?* Responses and scoring: yes (1) – the child attends an organized musical activity; no (0) – the child does not attend musical activities outside the institution.

The dependent variable is represented by the level of development of children's musical abilities, manifested through vocal range, the ability to reproduce rhythmic motifs with and without melody, the ability to reproduce melodic-rhythmic motifs with and without text, and the ability to reproduce a single tone of a chord.

The data were analyzed using descriptive and inferential parametric statistics. The descriptive indicators included frequencies, percentages, and arithmetic means, while the t-test was applied to determine statistically significant differences and relationships between the variables. Statistical significance was tested at the level of $p < 0.05$.

Research results

Musical abilities of preschool children

The first task of the research was to assess the musical abilities (vocal range; ability to reproduce rhythmic patterns with and without melody; ability to reproduce melodic-rhythmic motifs with and without text; ability to reproduce a single tone of a given chord) of preschool children.

The total number of children making up the research sample is 118. The obtained research results will be presented through the results of all tested elements individually.

Table 1. Lower limit of the children’s vocal range

| Lower range limit | f | % |
|-------------------|-----|---------|
| c ¹ | 12 | 10,17% |
| H | 53 | 44,92% |
| A | 48 | 40,68% |
| G | 5 | 4,23% |
| Total | 118 | 100,00% |

By determining the lower limit of the range, we established that 12 individuals, that is, 10.17% of respondents sing c¹ as the lowest tone of their range, while 106 individuals, or 89.84% sing tones of the small octave (Table 1).

Table 2. Upper limit of the children's vocal range

| Upper range limit | f | % |
|-------------------|-----|---------|
| c ² | 5 | 4,24% |
| h ¹ | 4 | 3,39% |
| a ¹ | 27 | 22,88% |
| g ¹ | 32 | 27,12% |
| fis ¹ | 1 | 0,85% |
| f ¹ | 39 | 33,05% |
| e ¹ | 10 | 8,47% |
| Total | 118 | 100,00% |

By identifying the upper limit of the range, it was found that for a large number of children, the upper tone was lower than expected, so for the largest number of children (39 or 33.05%), e¹ is the highest reach, 10 respondents or 8.47% perform the tone e¹, fis¹ is performed by 1 or 0.85%, g¹ by 32 or 27.12%, a¹ by 27 or 22.88%, h¹ by 4 or 3.39%, and the expected range c¹–c² is performed by only 5 or 4.24% of respondents (Table 2).

Table 3. Ability to reproduce short rhythmic patterns

| Number of points | Patterns | | | | | |
|------------------|----------|--------|--------|--------|--------|--------|
| | 1. | 2. | 3. | 4. | 5. | 6. |
| 0 | 6,77% | 47,46% | 68,64% | 38,13% | 24,56% | 57,63% |
| 1 | 93,23% | 52,54% | 31,35% | 61,86% | 75,42% | 42,37% |

When checking rhythmic abilities, six rhythmic exercises without melody were selected, which were demonstrated to the children through manual performance—tapping a pencil on a desk or clapping hands together. The results for the ability to reproduce rhythmic patterns are not in accordance with our expectations. Out of the six patterns, the children successfully reproduced three. Successfully reproduced were a combination of quarter and eighth notes, a four-part division, and sixteenth and eighth notes. Taking into account that successful responses are 60.00% or higher, it was concluded that the respondents managed to achieve this percentage on certain tasks, as can be seen from Table 3.

Table 4. Ability to reproduce the same rhythmic patterns with melody

| Number of points | Patterns | | | | | |
|------------------|----------|--------|--------|--------|--------|--------|
| | 1. | 2. | 3. | 4. | 5. | 6. |
| 0 | 0,85% | 34,75% | 62,71% | 30,51% | 14,41% | 39,83% |
| 1 | 99,15% | 65,25% | 37,29% | 69,49% | 85,59% | 60,17% |

Based on the results of the ability to reproduce the same rhythmic patterns with melody (Table 4), it was observed that only one pattern was not successfully reproduced, while the other five patterns did not present a problem for the children during reproduction.

Table 5. Ability to reproduce melodic motifs

| Number of points | Patterns | | | | | | | |
|------------------|----------|--------|--------|--------|--------|--------|--------|--------|
| | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. |
| 0 | 50,00% | 50,85% | 72,88% | 65,25% | 55,08% | 33,05% | 70,34% | 44,92% |
| 1 | 50,00% | 49,15% | 27,12% | 34,75% | 44,92% | 66,95% | 29,66% | 55,08% |

Eight patterns were given to examine the ability to sing melodic motifs on a neutral syllable. To ensure all children could respond to the tasks as well as possible, the motifs were transposed into keys that individually correspond to their ranges. If we look at the results highlighted in Table 5, we can see that out of eight melodic motifs, only one was successfully reproduced. The reproduction of the major tetrachord presented in the sixth pattern proved successful because 66.95% of respondents successfully reproduced the sixth pattern.

Table 6. Ability to reproduce melodic motifs with text

| Number of points | Patterns | | | | | |
|------------------|----------|--------|--------|--------|--------|--------|
| | 1. | 2. | 3. | 4. | 5. | 6. |
| 0 | 38,98% | 62,71% | 27,12% | 55,08% | 58,47% | 56,78% |
| 1 | 61,02% | 37,29% | 72,88% | 44,92% | 41,53% | 43,22% |

When assessing the singing of melodic motifs with text, the initial motifs of the model songs were used. The model songs had not been previously analysed with the children. The results shown in Table 6 indicate that only the first (“Dobar dan” - Good day) and the third (“Mi idemo” - We are going) were successfully reproduced. The first pattern was successfully reproduced by 61.02%, and the third by 72.88% of respondents.

Table 7. Ability to reproduce a single tone of a given chord

| Number of points | Patterns | | | | | |
|------------------|----------|--------|--------|--------|--------|--------|
| | 1. | 2. | 3. | 4. | 5. | 6. |
| 0 | 49,15% | 56,78% | 50,00% | 47,46% | 49,15% | 56,78% |
| 1 | 50,85% | 43,22% | 50,00% | 52,54% | 50,85% | 43,22% |

The results of testing the ability to reproduce one of the three tones of a chord indicate that there are no successful responses (Table 7).

The highlighted results indicate that out of the total number of respondents, as many as 89.84% have the lower limit of their range in the small octave, and the upper limit is also shifted downwards, so that for the largest number of children, ef, is the highest reach. The range of the respondents does not fit the assumed norms (c¹-c²) because only 4.24% meet the expected standards. The obtained results are largely similar to the research results of authors Terzić and Sudzilovski (2004), Rašković (2019) and Popović and Rašković (2022) which showed that out of the total number of respondents, 96.64% have the lower limit of the range in the small octave, and the upper limit is also shifted downwards, so that for the largest number of children, e, f, or g from the first octave is the highest reach (Terzić, Sudzilovski, 2004: 66). Based on the results obtained by reproducing melodic motifs, it is concluded that the results are conditioned by the children’s ranges and that the number of positive responses when singing the initial motifs of the model songs is limited by the ability to intonate tones. Similar conclusions are stated by the authors (Terzić, Sudzilovski, 2004;

Rašković, 2019; Popović, Rašković, 2022), who emphasize the necessity of adapting the program to the current characteristics of children's musical abilities. The obtained results may be associated with the implementation of music activities in the preschool institution where the research was conducted. An analysis of the implementation of music activities indicated that musical content is not sufficiently precisely defined within the curriculum, leaving preschool teachers considerable freedom in selecting songs, musical movement activities, and musical compositions independently. Such practice may contribute to the selection of content that is thematically appropriate but developmentally insufficiently adapted to the age and abilities of children. Furthermore, a need was identified for stronger didactic-methodological guidance in the planning and implementation of music activities, particularly regarding the adaptation of tonality, vocal range, and complexity of content to children's abilities. In addition, material and organizational working conditions, such as large group sizes, a limited number of instruments, and insufficient availability of teaching resources, may hinder an individualized approach and the higher-quality implementation of music activities.

Aside from successfully reproducing the same rhythmic patterns with melody, responses to all other elements of musical abilities are considered unsuccessful. This rejects the first hypothesis that children would successfully reproduce the assigned patterns during the musical ability assessment (vocal range covering tones from c_1 to c_2 ; successfully reproducing rhythmic patterns with and without melody; melodic-rhythmic motifs with and without text; a single tone of a given chord).

The impact of a musically stimulating family environment and extracurricular musical activities on the development of musical abilities in preschool children

The second task was to determine if there are statistical differences in musical abilities between preschool children growing up in a musically stimulating family environment and children who do not grow up in a musically stimulating family environment.

The survey was conducted using a questionnaire containing 14 open and closed-ended questions on a sample of 104 parents of the children who were tested. The paper presents exclusively the results for which a statistically significant difference or correlation among the examined variables was determined, in accordance with the established level of statistical significance. Results that did not reach the threshold of statistical significance were not interpreted separately.

One of the questions in the survey examined how much a child growing up in an environment with musically educated family members influences the development of the child's musical abilities.

Table 8. *The difference between the test results of children whose families include trained musicians and the achievements of children whose families do not have trained musicians.*

| Are there trained musicians in your family? | Number | Arithmetic mean of achievement | Standard deviation | Standard error of the mean |
|---|--------|--------------------------------|--------------------|----------------------------|
| Yes | 10 | 21,80 | 3,49 | 1,10 |
| No | 94 | 16,68 | 6,39 | 0,66 |

Ten, or 9.61% of children, have musically educated relatives in their families, while ninety-four, or 90.40%, do not have musically educated relatives in their families. Children whose families have trained musicians, although there are few of them (10), have a significantly higher average score on the test, $M = 21.80$ compared to $M = 16.68$ (Table 8). We tested whether the difference of 5.12 is statistically significant using a t-test for independent samples.

Table 9. Independent samples t-test for test achievements of children whose families have trained musicians and achievements of children whose families do not have trained musicians.

| Levene's test for Independent samples t-test equality of variances | | | | | | | | |
|--|-------------------|-------------|--------------------------|-------------------------|-----------------|----------------------------------|---|-------------|
| F-statistic | Significance of F | t-statistic | Degrees of freedom (df). | Significance of t-value | Mean difference | Standard error of the difference | 95% confidence interval of the difference | |
| | | | | | | | Lower limit | Upper limit |
| 4,23 | 0,04 | 3,98 | 16,35 | 0,00 | 5,12 | 1,29 | 2,40 | 7,84 |

Using the t-test, we established that there are statistically significant differences, at the 0.01 level, in the average number of points scored on the test between children who have trained musicians in their family and those who do not ($t(16.35)=3.98$, $p = 0.001$), in favor of children with trained musicians in their family.

One of the questions in the survey aimed to determine whether families have musically talented relatives who are not formally educated in music but are involved in music in any way.

Table 10. Difference in test performance between children whose musically talented relatives without formal musical education are involved in music and children whose relatives are not

| Do your musically talented relatives, who do not have formal musical education, involve themselves in music in any way? | No. | Arithmetic mean of achievement | Standard deviation | Standard error of the mean |
|---|-----|--------------------------------|--------------------|----------------------------|
| Yes | 24 | 21,71 | 5,06 | 1,03 |
| No | 72 | 16,22 | 6,18 | 0,73 |

Twenty-four children, or 25.00%, come from families that have musically talented relatives who are involved in music in some way but are not formally educated in music. Children whose talented relatives are involved in music, although there are not many of them (24), have a significantly higher average score on the musical ability test, $M = 21.71$ compared to $M = 16.22$ (Table 10).

Table 11. Independent samples t-test of test achievement between children whose musically talented relatives without formal musical education are involved in music and children whose relatives are not

| Levene's test for Independent samples t-test equality of variances | | | | | | | | |
|--|-------------------|-------------|--------------------------|-------------------------|-----------------|----------------------------------|---|-------------|
| F-statistic | Significance of F | t-statistic | Degrees of freedom (df). | Significance of t-value | Mean difference | Standard error of the difference | 95% confidence interval of the difference | |
| | | | | | | | Lower limit | Upper limit |
| 1,96 | 0,16 | 3,93 | 94 | 0,00 | 5,49 | 1,40 | 2,71 | 8,26 |

Using the t-test (Table 11), we established that there are statistically significant differences, at the 0.01 level, in the average number of points scored on the test between those in whose families there are talented relatives involved in music and those where this is not the case ($t(94) = 3.93$, $p = 0.00$).

One hundred and three parents answered questions regarding the presence of music in the environment. Seventy-three of them, or 70.87%, believe that music is sufficiently represented in the child's environment, while 30, or 29.13%, believe it is little represented.

Table 12. Test performance in relation to the amount of music in the child's environment

| How present is music, in your opinion, in your child's environment? | No. | Arithmetic mean of achievement | Standard deviation | Standard error of the mean |
|---|-----|--------------------------------|--------------------|----------------------------|
| Sufficiently | 73 | 17,42 | 5,89 | 0,69 |
| Little | 30 | 14,30 | 7,03 | 1,28 |

We observe that the average value for children who have sufficient music in their environment is $M = 17.42$, while for children who have little music in their environment, it is significantly lower, $M = 14.30$ (Table 12).

Table 13. Independent samples t-test – children's test performance in relation to the amount of music in their environment

| Levene's test for equality of variances | | | | | | | | |
|---|-------------------|-------------|--------------------------|-------------------------|-----------------|----------------------------------|---|-------------|
| Independent samples t-test | | | | | | | | |
| F-statistic | Significance of F | t-statistic | Degrees of freedom (df). | Significance of t-value | Mean difference | Standard error of the difference | 95% confidence interval of the difference | |
| | | | | | | | Lower limit | Upper limit |
| 1,48 | 0,23 | 2,31 | 101 | 0,02 | 3,12 | 1,35 | 0,44 | 5,81 |

Using the t-test, we established that there are statistically significant differences at the 0.05 level in the average number of points scored on the test between those with sufficient music in their environment and children with little music in their environment ($t(101) = 2.31, p = 0.02$).

When summarizing the research results, we conclude that children in whose families there are formally trained musicians, as well as talented relatives who are not musically educated but are involved in music, have a significantly higher average score on the musical abilities test, and these differences are statistically significant. We also observe that better results are achieved by children whose parents believe there is sufficient music in the child's environment.

In families in which there are musicians, whether formally or informally educated, genetic factors undoubtedly have a certain influence on the development of children's musical abilities. However, in addition to heredity, a musically stimulating family environment represents an important factor in encouraging and developing these abilities. To a great extent, it depends on parents whether a child will be guided toward attending musical activities available in the environment in which they live. Furthermore, parents play a key role in enabling children to attend appropriate musical and cultural events, as well as in shaping the genre selection of music to which the child is exposed within the family environment.

The obtained results are consistent with the findings of numerous studies emphasizing the importance of the family environment in the development of musical abilities. Research has shown that the cultural-pedagogical climate of the family, as well as parents' musical experience, significantly influence children's interest in music and their musical development. Parents who sing, play instruments, or encourage children to engage in musical activities create a stimulating environment that contributes to the development of a positive attitude toward music and the enhancement of musical abilities (Bogunović, 2010; Leman, Sloboda, Woody, 2012; Nikolić, 2025). Similar findings are highlighted by Matić and Mirković, who point out that children growing up in a musically enriched family environment achieve better results on musical ability tests, since such an environment provides more frequent musical activities and a higher level of musical stimulation (Matić & Mirković, 1986).

This confirms the second hypothesis that there are significant statistical differences in musical abilities between preschool children growing up in a musically stimulating family environment and children who do not grow up in a musically stimulating family environment.

The third task was to determine if there are significant statistical differences in musical abilities between preschool children who attend extracurricular music activities and children who do not.

With the questionnaire, we wanted to determine if the children attend any musical activity outside of the preschool institution. Out of 26 children who attend a musical activity outside of the preschool institution, 23 are members of a folklore ensemble. They have the opportunity to attend instrument lessons (piano, violin).

Table 14. Relationship Between Extracurricular Music Activities and Test Performance

| Does your child attend any musical activity outside of the preschool institution? | No. | Arithmetic mean of achievement | Standard deviation | Standard error of the mean |
|---|-----|--------------------------------|--------------------|----------------------------|
| Yes | 26 | 23,15 | 4,00 | 0,78 |
| No | 77 | 14,39 | 5,42 | 0,62 |

We observe that the average value for children who attend a music activity outside of the preschool institution is $M = 23.15$, while for those who do not, it is significantly lower, $M = 14.39$ (Table 14).

Table 15. Independent samples t-test – Children’s performance on the test in relation to attending a music activity.

| Levene's test for equality of variances | | | | | | | | |
|---|-------------------|-------------|--------------------------|-------------------------|-----------------|----------------------------------|---|-------------|
| Independent samples t-test | | | | | | | | |
| F-statistic | Significance of F | t-statistic | Degrees of freedom (df). | Significance of t-value | Mean difference | Standard error of the difference | 95% confidence interval of the difference | |
| | | | | | | | Lower limit | Upper limit |
| 4,04 | 0,05 | 8,78 | 58,26 | 0,00 | 8,76 | 1,00 | 6,77 | 10,76 |

Using the t-test, we established that there are statistically significant differences, at the 0.05 level, in the average number of points scored on the test between children who attend a music activity outside of the preschool institution and those who do not ($t(58.26) = 8.78, p = 0.00$) (Table 15). This confirms the third hypothesis and the existence of a significant statistical difference in musical abilities between preschool children who attend extracurricular music activities and children who do not.

Discussion

The results of the musical abilities test indicate that of the total number of respondents, as many as 89.84% have the lower limit of their range in the small octave, and the upper limit is also shifted downwards, so that for the largest number of children, f₁ is the highest range. The range of the respondents does not fit the assumed norms (c₁–c₂) because only 4.24% meet the expected standards. The obtained results are largely similar to the research results of authors Terzić and Sudzilovski (2004), Rašković (2019) and Popović and Rašković, (2022).which showed that of the total number of respondents, 96.64% have the lower limit of their range in the small octave, and the upper limit is also shifted downwards, so that for the largest number of children, e, f or g of the first octave is the highest range (Terzić, Sudzilovski, 2004: 66). Based on the results obtained through the reproduction of melodic motives, it can be concluded that the results are conditioned by the children’s ranges, and that the number of positive responses when singing the initial motives

of model songs is limited by the ability to intonate tones itself. Apart from the successful reproduction of identical rhythmic patterns with melody, responses to all other elements of musical abilities are considered unsuccessful. This rejects the hypothesis that children, when testing musical abilities, will successfully reproduce the given patterns (vocal range covering tones from c_1 do c_2 ; successfully reproduce rhythmic structures with and without melody; melodic-rhythmic motives with and without text; one tone of a given chord). The obtained results may be associated with the implementation of music activities in the preschool institution where the research was conducted. An analysis of the implementation of music activities indicated that musical content is not precisely defined within the curriculum, leaving preschool teachers considerable freedom in independently selecting songs, musical movement activities, and musical compositions. Such a situation may lead to the selection of content that is thematically appropriate but developmentally insufficiently adapted to the age and abilities of children. Furthermore, a need was identified for stronger didactic-methodological guidance in the planning and implementation of music activities, particularly regarding the adaptation of tonality, vocal range, and complexity of content to children's age and abilities. In addition, material and organizational working conditions, such as large group sizes, a limited number of instruments, and insufficient teaching resources, may hinder an individualized approach and the higher-quality implementation of music activities.

When summarizing the research results, we conclude that children in whose families there are formally trained musicians, as well as talented relatives who are not musically educated but are involved in music, have a significantly higher average score on the musical abilities test, and these differences are statistically significant. This supports the claim of genealogical studies that a larger number of talented descendants originate from families with gifted ancestors (Mirković Radoš, 1996: 44). We also observe that better results are achieved by children whose parents believe there is sufficient music in the child's environment (Table 12). In families with musicians, whether formally or informally educated, genetic factors certainly influence children's musical abilities, but in addition to this, a musically stimulating family environment makes a significant contribution to development. Similarly, Hallam (2006) points out that a genetic basis can be improved by a musically stimulating environment. The responsibility lies with the parents to facilitate their children's involvement in music activities within their immediate surroundings. The parent is there to enable the child to visit available and appropriate musical and cultural events, as well as to influence the genre choice of music the child is exposed to in the family.

Comparing the children's performance on the musical ability test we observe that the average total score for children who attend a musical activity outside of the preschool institution is $M = 23.15$, while for children who do not, it is significantly lower, $M = 14.39$, and these differences are statistically significant (Table 14; 15).

Conclusion

The survey results confirmed the assumptions regarding the existence of a significant statistical difference in musical abilities between preschool children growing up in a musically stimulating family environment and those who do not. Furthermore, the existence of a significant statistical difference in musical abilities was confirmed between preschool children who attend extracurricular music activities and children who acquire musical experiences only within preschool institutions.

The research results indicate that a musically stimulating family environment and extracurricular music activities positively influence the development of musical abilities in preschool children. However, by recording the current state of musical abilities, it was found that the development of musical abilities deviates from expectations. Such a finding can be linked to the limited scope of systematic and professionally guided music activities aligned with the developmental characteristics of preschool children. This opens space for further reflection and improvement of

pedagogical practice through strengthening support in the process of identifying musical potential and the thoughtful selection of musical content that contributes to their gradual and even development. In addition, material and organizational working conditions (a large number of children in groups, a limited number of instruments, and insufficient teaching resources) may hinder an individualized approach and the higher-quality implementation of music activities.

The pedagogical implications of the obtained results are reflected in the possibility of strengthening cooperation between preschool institutions and families, as well as in designing developmentally appropriate musical activities that encourage children's active musical participation in different contexts. Of particular importance is continuous support for teachers in the process of planning, implementing, and reflecting on musical activities, with the goal of fostering children's individual musical potentials.

Future research could be directed towards a more detailed examination of the qualitative aspects of a musically stimulating family environment, as well as a longitudinal monitoring of the development of children's musical abilities depending on the type, frequency, and duration of musical activities. Also, it is recommended to include larger and more diverse samples, as well as the application of combined methodological approaches, for a more comprehensive understanding of the factors that contribute to the development of musical abilities in the preschool period.

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