



**DOES MUSIC THERAPY IMPROVE LINGUISTIC SKILLS OF CHILDREN WITH DYSLEXIA? A GREEK STUDY**

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**ABSTRACT**

It is supported that intervention programs based on music therapy can enhance the linguistic skills of students with learning difficulties, and especially children with dyslexia. This is based on the assumption that there is an association between language and music skills. The present study aims at examining whether such a program can result in an improvement in linguistic skills of children with dyslexia, through the effect of music therapy on their Distinction of Graphs, Synthesis of Sounds and Distinction of sounds linguistic skills. For the purposes of this study, quantitative research method was chosen, using the methodological instrument ATHENA Test. The sample of the study consisted of 24 Greek elementary school children, aged between 5 and 8 years old, who have a diagnosis of dyslexia and have no prior musical training. These children formed two groups of students, the experimental and the control group. The results of the present study indicated that music therapy can help children with dyslexia concerning their ability in recalling words, but it may not be so efficient in their written - phonemic awareness. Overall, however, it was found that intervention programs based on music therapy can have a positive effect on improving the linguistic skills of children with dyslexia.

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**INTRODUCTION**

Learning disabilities are distinguished into general learning disabilities, in specific learning disabilities and in secondary learning disabilities. Dyslexia falls in the specific learning disabilities (Papadomarkakis *et al.*, 2011). Verbal memory is considered a main factor for the dyslexia-associated deficits in reading skills and phonological awareness (Hammond and Hercules, 2003; Kramer, Knee and Delis, 2000; Tijms, 2004).

As Kramer *et al.* (2000) and Hammond and Hercules (2003) notice, dyslexic children tend to have significant deficits in various linguistic skills; thus dyslexic children exhibit lower skill levels in linguistic tasks. These deficits in verbal memory can be located in difficulties in recalling, retrieving and encoding verbal information (Hammond and Hercules, 2003; Kramer *et al.*, 2000). Xiaoli *et al.* (2016) also suggest that individuals with dyslexia are characterized by deficits in short-term verbal skills. Verbal memory deficits and deficits in phonological awareness have a common causality in the dyslexic individuals' difficulty in encoding verbal information (Tijms, 2004). A series of studies (Anvari *et al.*, 2002; Brandel and Rammsayer, 2003; Ho *et al.*, 2003; Franklin *et al.*, 2008) indicate that musical ability is associated with better reading skills, as well as with better phonological awareness.

According to Huss *et al.* (2011), musical skills and abilities are associated with better language and phonological skills, while according to Emmerson (2013) children with advanced musical skills have significantly better auditory perception, compared to children with no musical education. More specifically, several researchers locate the link between musical skills and language skills in the role of musical training in developing verbal memory skills and activating certain brain areas involved in verbal memory, such as the left temporal lobe (Broca area and Wernicke) (Chan *et al.*, 1998; Ho *et al.*, 2003) and the left planumtemporale (Franklin *et al.*, 2008). The use of music indicates promising results in the area of language development for children with dyslexia (Overy, 2000; Emmerson, 2013), because of the similar features of music and language, since both include the combination of elements (phonemes vs. notes) in order to produce a specific auditory result, according to specific rules (syntax vs. melody / harmony) (Anvari *et al.*, 2002).

According to Alloway (2006, p. 167), "short-term memory refers to the capacity of storing units of information, and is typically assessed by serial recall tasks involving arbitrary verbal elements such as digits of words". Brady (1986, p. 147) also refers that short-term memory is "a limited capacity system that briefly stores information in a phonetic code". Because of the limited capacity of short-term memory, it is supposed that deficits in it will affect negatively various cognitive tasks, such as listening, reading and decoding written

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text (Brady, 1986). Alloway (2006) argue that linguistic skills are not strongly associated with the children's academic and cognitive performance. On the contrary, verbal short-term memory skills are strongly associated with language, as for example with the learning of sound patterns of new words. This is the reason for which children with poor verbal memory skills show impairments in phonological process and the acquisition of new vocabulary (Alloway, 2006).

Dyslexia is related to deficits in the phonological processing, as well as in verbal working memory (Kramer *et al.*, 2000; Beneventi *et al.*, 2009). However, it is not so clear if the phonological deficit derives from the impairment in the verbal working memory, or there is a distinct deficit in the verbal working memory (Beneventi *et al.*, 2009). One more question raised is whether deficits in short-term verbal memory in individuals with dyslexia derive from problems associated with information about the items that should be remembered, or the order in which these items are presented (Trecy *et al.*, 2013; Xiaoli *et al.*, 2016). The fact that researchers have not succeeded in finding this association yet may be attributed to the fact that typical verbal short-term memory tasks may be usually used in order to measure two types of ability: the items that should be remembered (item memory) and the order in which they are presented (order memory) (Xiaoli *et al.*, 2016). A third question is whether individuals with dyslexia have difficulties in acquiring or retrieving information about items. There is a debate in the international bibliography concerning whether children with dyslexia have difficulties in recognizing items / acquisition of information, or recalling verbal information that have been stored (Kramer *et al.*, 2000).

## METHODOLOGY

The present research aims at examining the effectiveness of music therapy in improving language skills and phonological awareness, as proved by the above studies, but by focusing on its effect on Distinction of Graphs, Synthesis of Sounds and Distinction of sounds linguistic skills of children with dyslexia, since there is lack of research data concerning the effect of music healing in linguistic skills of dyslexic children, especially in the case of Greece. The study will examine the following research question: Are there any significant differences in linguistic skills, between children with dyslexia who have received a music therapy intervention and children with dyslexia who have not?

This study used a positivist-quantitative methodological approach, seeking to collect quantifiable data with the use of specific tools - questionnaires. The quantification of data in such a methodological approach seeks to generalize the conclusions drawn from them, if this is possible based on the size and representativeness of the sample (Beins, 2013). Thus, quantitative research aims at providing generalizable results (Creswell, 1994). This methodology was selected according to the aims and purposes of the present study. Since the scope of the project is to measure the efficacy of a music healing intervention in children with dyslexia, the data collected must be quantifiable, allowing their statistical analysis and interpretation, in order to examine possible differences between the experimental and the control group after the intervention.

## Research Instruments

The Athena Test Diagnostic Learning Disabilities was built in the psychometric laboratory of the Department of Psychology of the Philosophy Department of the University of Athens in 1999 (Paraskevopoulos and Paraskevopoulou, 2011). The Athena Test was based partly on the Illinois Test of Psycholinguistic Abilities, but it was standardized in typical developing children in Greece (Prassouli *et al.*, 2007). Apart from this, the Athena Test was based also on the Aston Index test, which is a tool for the assessment and diagnosis of learning difficulties (Toki and Pange, 2012).

This test consists of various diagnostic tests to assess cognitive, perceptual, motor and psycholinguistic processes related to the difficulties faced by the children to meet the learning requirements of the school. In this research we used the subscales Distinction of Graphs, Synthesis of Sounds and Distinction of sounds. This test corresponds to the developmental level of children aged 5-9 years, namely children studying in the first four classes of the elementary school, but this does not prevent its use to children aged above 9 years old (Paraskevopoulos and Paraskevopoulou, 2011). Through Cronbach's  $\alpha$ , the internal reliability was examined. The index was found to be equal to 0.879, which means that the data are consistent for statistical analysis.

## Sample

The sample of the research consisted of 24 children, from which 13 took part in music therapy programs in a music centre located on Thessaloniki, Greece. All 24 children were diagnosed with dyslexia. Concerning their age, the mean is 7.5 years old (SD = 1.92).

## Procedure

The group was separated in two subgroups, the control group (N=11) and the experimental group (N=13). Both groups were measured with ATHENA test after the intervention program.

As mentioned, 13 children took part in the intervention program that lasted for two weeks. In this program, the research undertook various activities:

1. **Memory-melody:** The students read a text and then the music was added. The students try to remember the song, both the music and the lyrics
2. **Memory-theory of music:** The students answer to questions posed by the researcher regarding theory of music, e.g. the researcher drew a cycle in blue colour symbolizing the time signatures, each one of which had different colour. Then the students answered to oral questions about the colour of each time signature. The same was applied to the notes: each not had different colour
3. **Vocabulary learning:** the review of the motifs of words of sentences in the songs, the rhythm and the rhyme help the children to be familiar with the new vocabulary in the song
4. **Phonemic awareness:** the students sang all together as a choir, primarily via rhymes, because the rhymes help more in the distinction of the musical tone, and the memorizing and recalling of the lyrics and the melody
5. **Use of musical instruments:** a) percussion, because they are easy to be used, the rhythm is easy, and thus the children can improvise; b) guitar, where the teacher

plays the guitar and the students, sitting as a circle, learn the songs; c) piano, because it help children to develop many of their senses (e.g. memory, motor skills). The teacher stuck papers of different colours in notes

6. **Vision:** when the students looked at the hand of the teacher, they could pay attention to the movement of the hand in accordance to the rhythm.
7. **Acoustic memory:** the teacher vibrates various objects of the direct environment (e.g. table, board, chair)

Overall, via the various musical activities, the children should enhance their vision and acoustic skills, their memory regarding the recalling of the song (both the lyrics and the melody), their linguistic skills (singing the song), their motor skills (coordination of hands, legs, vision, hearing, voice, breathing). All the above tend to enhance the children's attention. The intervention lasted for 14 days and the children participated every day for 2 hours per day.

### **Statistical Analysis**

The results are based on the percentage of the correct answers that the children answered to the three sub-tests of Athena Test (Distinction of Graphs, Synthesis of Sounds and Distinction of sounds) due to the small number of the sampling.

In the synthesis of sounds, the mean of the correct answers of both groups was 62.03 ( $\pm 13.39$ ), in the distinction of sounds was 66.83 ( $\pm 11.99$ ) and in the distinction of graphs was 60.48 ( $\pm 6.02$ ). In the synthesis of sounds in the experimental group, the mean of the correct answers was 65.01 ( $\pm 10.10$ ), in the distinction of sounds was 68.51 ( $\pm 13.83$ ) and in the distinction of graphs was 59.18 ( $\pm 5.40$ ) whereas in the control group in the synthesis of sounds, the mean of the correct answers was 59.06 ( $\pm 15.87$ ), in the distinction of sounds was 65.15 ( $\pm 10.11$ ) and in the distinction of graphs was 61.79 ( $\pm 6.53$ ).

As it can be seen from the above two tables, as well as from the table below, there are differences between the two groups, namely the experimental and the control group. As it can be seen, the experimental group had better performance in the synthesis of sounds ( $M = 65.01$ ,  $SD = 10.10$ ) compared to the control group ( $M = 59.06$ ,  $SD = 15.87$ ). Moreover, the experimental group had better performance in the distinction of sounds ( $M = 68.51$ ,  $SD = 13.83$ ) compared to the control group ( $M = 65.15$ ,  $SD = 10.11$ ). However, in the distinction of graphs the control group had better performance ( $M = 61.78$ ,  $SD = 6.52$ ) in comparison to the experimental group ( $M = 59.17$ ,  $SD = 5.40$ ).

What should be examined is whether the differences in the performance between the experimental and the control group are statistically significant. The test was conducted using Independent samples t-test, since the data follow the normal distribution, based on the Kolmogorov-Smirnov test. The level of statistical significance is .05. Results have shown that differences which exist in the performance of the two groups in the three tasks of ATHENA test are not statistically significant (synthesis of sounds,  $F = 387$ ,  $p > 0.5$ , distinction of sounds  $F = 1.002$ ,  $p > 0.5$ , distinction of graphs,  $F = 0.003$ ,  $p > 0.5$ ).

### **DISCUSSION**

From the ATHENA test it was found that the experimental group had better performance in the synthesis of sounds, and in the distinction of sounds, but the control group had better performance in the distinction of graphs. Despite the fact that there are differences, these are not statistically significant. From these results it cannot be ascertained whether children in the experimental group had better performance compared to children in the control group. It can be implied that music therapy can help children in the written - phonemic awareness, but further research needs to be done in order to be able to support with precision this argument.

Moreover, the above results imply that children who have attended the music therapy group had better performance in verbal learning and more precisely in the recalling of the words that have been set by the researcher. This means that music therapy can enhance their linguistic skills. Therefore, these outcomes partially coincide with the findings of previous studies (Chan *et al.*, 1998; Pellitteri, 2000; Overy, 2000; Ho *et al.*, 2003; Lamprianidou, 2006; Sausser and Waller, 2006; Rickson and McFerran, 2007; Franklin *et al.*, 2008; Moreno *et al.*, 2011; Emmerson, 2013), according to which interventions of music therapy can help in improving linguistic skills in children with dyslexia. Further, this indicates that there is an association between language and music skills, as several researchers (Chan *et al.*, 1998; Huss *et al.*, 2011; Franklin *et al.*, 2008; Jentschke *et al.*, 2008) have proposed.

### **Educational Implications**

From the above results it was indicated that the music therapy programs can help children with dyslexia in improving their linguistic skills, even though more research should be done in this field. Music therapy has been acknowledged as a therapeutic tool for children with learning disabilities, since it can help in the improvement of the physiological, mental, and psychological health, as well as in the rehabilitation of the physical, behavioural, developmental and social skills of the individuals with problems in these areas (Stephenson, 2006). Music can help children to practice their hearing, vision, verbal, and coordinating abilities (e.g. hand - eye), so as to be able to discriminate between sounds, recall the rhythm, the melody, and the lyrics of a song, thus helping them in improving their linguistic and verbal skills, and contributing to the understanding of patterns of language (Skeja, 2014).

From the above literature it became obvious that music therapy can help children with learning disabilities, concerning the improvement of their linguistic skills. Therefore, music interventions programs should be implemented in mainstream schools where children with learning difficulties and especially children with dyslexia attend, as well as in schools of special education. Music therapy has the ability to create a responsive environment for these children, helping them to develop their sense of self, and cultivate their relation to music and musical instruments, contributing to the creation of their interpersonal relations and the development of motor, linguistic and verbal skills (Stephenson, 2006).

What should be mentioned is that there are numerous forms of music therapy (Stephenson, 2006; Coroiu, 2015). Therefore the accurate diagnosis of the needs of children with specific forms of learning disabilities, such as dyslexia, along with the cooperation of the school principal, the teachers, the parents, music therapists, and child psychologists are important and necessary, so as to create the appropriate program that can

effectively address the needs of these children. The diagnosis is also necessary in order to precisely define the skills that need to be enhanced, for example communicative, motor, social, cognitive, linguistic skills.

Another point that should be mentioned is that there are not so many and up-to-date valid clinical research about the accurate areas of the brain that each music therapy form can trigger, aiming at improving short verbal memory, communication, motor, cognitive, and linguistic skills. Perhaps the fact that the results of this study did not confirmed the research hypotheses in an absolute way can be attributed to the fact that the researcher did not make use of the appropriate music therapy activities. For this reason, the help of a neurologist is important, in order to help in this procedure via observation of the brains of the children, and the areas that are activated through the various forms of music therapeutic programs.

### Limitations

There are numerous limitations in the conduct of this study. The first is that the sample of the research consists of only 24 children, and only from a specific region of Greece, Thessaloniki. These two limitations mean that the results of this study cannot be generalized. For this reason, further study should be conducted with regard to the effect of music therapy on children with dyslexia, concerning the improvement of linguistic skills. In this study a bigger sample of children with and without dyslexia should participate, in order for the results to be more accurate and reliable. Moreover, the sample should come from other regions of Greece as well, in order for the results to be generalized.

Apart from the above, this study concerned the children with dyslexia. However, there are some other forms of learning disabilities as well, such as dysarithmisia, aphasia, and dyspraxia that have not been included in this study. For this reason, it would be of great interest to examine the effects of music therapy in children diagnosed with other forms of learning disabilities. Perhaps the results would be different forms other than dyslexia. Thus, the outcomes of such a study could be useful in determining whether music therapy can help these children.

A further study with the participation of children who have attended other kinds of music therapy programs could be conducted. This comparative analysis would be useful in examining the effects of different kinds of music therapy programs that exist in other countries in children with dyslexia and / or other forms of learning disabilities, so as to identify the elements that are the most effective in enhancing the linguistic skills in these children. This comparative analysis could be also conducted with the participation of children from other countries as well. Such a study could be useful in providing results that allow us to determine elements of the wider environment of the children (e.g. cultural, educational) plays some role in improving the short linguistic skills in children with learning difficulties.

Last but not least, a future study could be based upon the use of other forms of music therapeutic programs, namely the use of other musical activities. As mentioned above, there are numerous forms of music therapy programs. In addition, a possible explanation for the results of this study is the fact that the researcher did not make use of the appropriate musical activities, so as to increase the efficiency of the program. For

this reason, other activities may be used, which may be much more effective. The participation of a neurologist in this procedure could be very helpful, as explained earlier.

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