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Impacts of music education on different areas of personal development

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Abstract

Different issues that cause anxiety in people such as future plans, academic success, self-confidence, and health have caused increase in the number of researches focusing on the role of art and music in life. The support of music education in many different development areas of individuals, especially children, has been proven by many studies in the literature. These examples have been analyzed in this research study besides the studies focusing on the impacts of music on adults. It is observed that some studies focus on instrumental music education while some others focus on different musical activities. The basic purpose of this study is to present the effects of music education on different areas of personal development. A detailed literature review process is followed in the scope of this research; numerous Turkish and foreign resources are analyzed and the data are obtained with document review technique. In line with the obtained data, the impact of music on mathematics, brain, cognitive, and physical development, academic success, attention development, and the impact of music on individuals that have different learning abilities are separately analyzed in this research study.

Keywords: Music and mathematics**;** music, brain and cognitive development; music and physical development; music and academic success; music, attention development and individuals with different learning abilities

1. Introduction

Today, there is a big competitive environment in the globalized world, and nations that produce information and yield through this production process have become advantageous. Individuals that learn through memorization don't have any place in today's world. It is now necessary to have individuals that blend information, interpret, attribute different meanings to it, keep pace with the era they are living in, follow

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developments and reproduce information. It is believed that it is necessary to prioritize and support different training subjects such as music to raise individuals that have these characteristics.

The effect of music on men is one of the increasing research topics that have especially gained importance in recent years. Music is related to many different fields of science and the interaction with other domains is one of the topics studied by researchers (Ataman, 2014). Mathematics, brain, cognitive and physical development are examples of these domains. On the other hand, scientific study results are indicating that music affects academic success (Johnson & Memmott, 2006; Cardarelli, 2003; Trent, 1996; Morrison, 1994), supports the improvement of attention (Kuşcu, 2010; Kim, Wigram & Gold, 2008; Demirova, 2008; Scott, 1992), and individuals with different learning capacities (Shields, 2001; Hines, 2000; Duffy & Fuller, 2000; MacDonald, O'Donnell & Davies, 1999; Hallam & Price, 1998).

Music involves a variety of mathematical structures in its most basic and most complicated elements (Bora, 2002). When the general definitions of math and music are compared in general terms, it can be seen that the disciplines are quite different. Math is a science that requires order and computability while music is based on feeling and expression. Although these two disciplines are seemingly different, they are deeply connected for more than two thousand years. Math is the most abstract science while music is the most abstract art (Ayata, 2020). The relationship between music and math and the impact of math on music is perceived as important and frequently researched by many researchers. Results of the researches on this topic indicate that the relationship between two domains is highly meaningful (Ataman, 2014). This study involves examples of researches about the issue.

The human brain has a unique capacity to meet the demands of the environment. It is known that structural changes occur in the brain of a healthy adult in line with the education he/she receives (Hyde, Lerch, Norton, Forgeard, Winner, Evans & Schlaug, 2009). Daniel J. Levitin explains the role of music in structural brain changes as such: "Listening to music and making music, dancing, or simply thinking about these enable a simultaneous working process in different parts of the brain and new neural connections are established through these activities (cited in Keleş, 2021)." There are some important findings in recent studies about human cognition; according to these studies, the relationship between music and complicated brain functions in human cognition is significant. As a complicated brain activity, the musical perception process has been included in neurology's area of interest (Koelsch & Siebel, 2005, cited in Kandır & Türkoğlu, 2015). Cognitive development ensures persons learn the abstract and concrete reasons, enable them to make reasoning and organize the information they obtain from their environment (Kürkçüoğlu, 2010, cited in Kol, 2011). The domain of musical knowledge that combines neurophysiologic, behavioral, and theoretical studies attracts the attention of researchers from many different disciplines such as psychology, neurology, music theory, musicology, music therapy, and linguistics (Keleş, 2021). National and international scientific and academic researches indicate that listening to music and music education's contributions to cognitive education is very important. Researchers determined that music education improves cognitive thinking skills and there is a strong relationship between cognitive thinking and music (Gün, Duru &

Demirtaş, 2016). This study involves different studies about the effects of music on the brain and cognitive development.

Physical development is about the physical structure of the person, changes in the neural and muscle system functions, and the process of balance in these functions (Çelik, 2017). The area of development involves movement, one of the most basic requirements. Movement is especially an important element in child development. The discovery of movement and its reproduction is also based on movement education. Muscles of children develop through movement education, they learn to use their body in coordination, they stand in balance and most importantly they become aware of their environment and acquire vital skills (Dinçer & Tutkun, no date). Music is one of the most important domains that support physical development. Sun and Seyrek summarize the effects of music on physical education as such: Activities such as movements while listening to music, playing a musical instrument, and moving big and small muscles during this activity, dancing, and singing make great contributions to a child's physical development (1998). The relationship between music and physical development is analyzed in this study.

The human brain has a unique structure and improves its capacity all the time. It is open to development and evolvement. This important feature affects academic success. The importance of academic success has dramatically increased in recent years and there has been a great struggle to reach this success in life. In this environment of competition, studies about the elements that increase academic success have become important; there are numerous academic studies to find what kind of studies or which domains affect academic success. The focus of this study is on the kind of connection between music and academic success.

Turkish Language Society defines the word "attention" as "concentrating the senses and thoughts on one thing, wakefulness" (https://sozluk.gov.tr/, 2021), Dereceli defines the word as "the process of consciously focusing on stimulants" (2011). Attention is important both in academic and biological terms. Varış and Hekim define the individuals that have different learning abilities as the ones that have mental, sight, hearing, and physical insufficiencies, the ones that experience linguistic and speech disorders, the ones that have attention deficit and hyperactivity problems, autistic individuals or the ones with superior intelligence (2017). Individuals with different learning abilities have the right to benefit from all services of a state such as education, health, and transportation. Varış and Hekim stated that these persons need the support of developmental abilities the most (2017). It is known that music, a field that supports the individual in many dimensions, has many positive effects on improving the attention and learning process of individuals that have different learning abilities. This study involves an analysis of these impacts.

Impacts of music on individuals, especially children, in different dimensions are analyzed in this research study. A comprehensive literature review is carried out for this purpose and impacts of music are analyzed under the titles of mathematics, brain, cognitive, and physical development, academic success, attention development, and the impact of music on individuals that have different learning abilities.

Many researchers made literature reviews about the effects of music on individuals in their studies. These studies in general mention the results of the example researches and they have been studied every single year. However, in this study, studies carried out in a period between 1990 and 2000s are included in the research and older researches aren't taken into consideration. Most of the sample studies analyzed in the scope of this study are described in detail while results of some studies are included in this study.

It is believed that this study is informative about the effects of music on individuals; the study is not only useful for musicians but also for individuals and researchers who want to obtain knowledge on the topic.

2. Method

2.1. Research model

This theoretical study is a descriptive research focusing on the analysis and discussion of the effects of music on individuals. The document review technique is used in the study and it is attempted to make a detailed review with this technique.

The E-publishing literature review phase of the research method is based on the use of an internet database and Google Academic research engine. Studies obtained from the review are carefully read, eliminated, separated into categories, and interpreted.

3. Findings

3.1. Music and mathematics

Igor Stravinsky drew attention to the connection between music and mathematics by claiming that "music is something like mathematical thinking and mathematical relationships" (Vaughn, 2000). Studies on music and mathematics are analyzed in this section of the study.

Goeghegan and Mitchelmore (1996) researched the effect of a music program on pre-school students at the age of 4 and 5 on mathematical success. The study was carried out with 35 students who participated in a music program (experimental group) and 39 students who didn't participate in this program (control group). Experimental group students were trained for one hour per week; the program continued for 10 months. The students were trained about the concepts of pitch, dynamics, duration, timbre, and form; besides, they received a music education aiming at teaching the skills of moving, listening, singing, and organizing sounds based on Kodaly method. At the end of the study process, it is determined that the group of children who participated in music activities took higher scores in the mathematics success test when compared to the control group. Similarly, in the scope of their study, Gardiner, Fox, Knowles, and Jeffrey (1996) gave music and visual arts education to a group of children in the first grade for seven months in addition to their regular classes at school. It was seen that the mathematics scores of these children were higher than that of the children who received music and visual arts education only at school. The researchers continued to work with

the second-grade students at the same schools in the following year. All of the students took the success test again after seven months and the results were the same.

Cheek and Smith (1998) analyzed the relationship between music and mathematics with a study including 113 students in the 9th grade. It was determined that there was a meaningful difference between the math scores of students who took private lessons for 2 or more years and the ones who didn't take lessons. Math scores of students who took keyboard lessons were meaningfully higher than the scores of students who played other instruments. The study showed that learning the keyboard is more efficient in increasing math success when compared to the other instruments.

Graziano, Peterson, and Shaw (1999) carried out an interesting study and designed non-verbal computer software that can be used by 2nd-grade students in primary school by using spatial-temporal methods to teach fractions and proportional math. They created a Spatial-Temporal (ST) Math Video Game. One group (n=26) received piano education besides ST Math Video Game education (Piano-ST Group) for 4 months while another group (n=29) received online English education besides ST Math Video Game education (English-ST Group). The third group (n=28) didn't receive any education. At the end of the research, it was observed that the scores of the Piano-ST Group were 15% higher than the scores of the English-ST group. On the other hand, it was seen that the scores of these two groups (Piano-ST and English-ST) were higher than the group that received no education. Researchers stated that the children who received ST Math Video Game and piano education were more successful in math and fractions.

Catterall, Chapleau, and Iwanga (1999) presented the relationship between music and math with the data of the National Educational Longitudinal Survey (NELS: 88). Researchers stated that the students who practiced instrumental music continuously and frequently during secondary and high school years had significantly higher math sufficiency until 12th grade. On the other hand, Haley (2001) analyzed the relationship between the levels of primary school 4th-grade students' attendance to an instrumental music program and their academic success level. In the study, she presented evidence and stated that students who participated in an instrumental music program received meaningfully higher scores in arithmetic success and word definition when compared to the students who attended no program. At the end of the study, it was determined that if a musical instrument is related to increasing academic success, then a well-structured instrumental program would possibly increase the academic success of students as long as it is a basic component of the curriculum.

In another study, Whitehead (2001), studied with 28 students between the ages 11 and 17. He used a 20-week music education program supported by Orff-Schulwerk. He separated students into three groups: FULLTREAT, LIMTREAT, and NOTREAT. FULLTREAT group took 50-min. classes five days a week. LIMTREAT group took 50-min. class one day a week and NONTREAT group took no music class. At the end of the research process, the math scores of groups were compared and it was determined that the scores of students in FULLTREAT group were meaningfully higher than the scores of students in two other groups. LIMTREAT group had limited math development while NONTREAT group had the lowest math score. However, Rafferty (2003) determined that the Music Spatial-Temporal Maths Program had no impact on second-grade students'

math success. Types of musical activities and the length of the activities can be the reasons for the contradictory research results (Raffery, 2003, cited in Hallam, 2010).

In a study by Jones and Pearson (2013) a musician and a math teacher created a series of primary school classes and combined music and math. Researchers said that the classes in the article would ensure strategies that help primary school classroom teachers and music teachers combine music and math. Cranmore and Tunks (2015) attempted to learn the direct experiences of high school students about math and music and their perceptions about the relationship between these two fields. Different from most of the previous studies about the issue, they stated that most of the students in their study mentioned that math is the basis of musical talent.

When the studies in the literature are analyzed in general, it can be said that active participation in music might improve math performance. However, it is difficult to present absolute information about the types and duration of music that is necessary to ensure this effect. There is no doubt that it is necessary to research the issue more and obtain more results about the issue.

3.2. Music and brain development

The brain is the most important part and center of the neural system. Although the brain is only 2% of the body, it dominates 98%. Using the brain correctly can change human life in a way that is impossible to imagine (Sekman, 2018). This special multifunctional organ should be properly fed and given importance. It is believed that correct interventions and support especially at early ages increases the working capacity.

Sergent (1993) states that music is the art of combining different pitches in a harmonic pattern with different duration, intensity, and timbre. According to him, it is a phenomenon created by human intelligence and the brain (cited in Yazıcı, 2017). Music is one of the most important activities that use different functions of the brain and support cognitive development. This is why, the impacts of music in the brain, and the types of musical activities that activate the brain have been the center of researchers' attention throughout history (Author, 2020). In this section of the study, studies focused on the impacts of music on the brain are analyzed. Some studies about the thesis that music shapes the brain and activates different parts of it are presented below.

Schmidt, Trainor, and Santesso (2003) focused on babies in their study. They determined that music has a "calming" effect on babies and it has a significant developmental impact on brain activity in the first few years of human life.

Schlaug, Jancke, Huang, and Steinmetz (1995), and Elbert, Pantev, Wienbruch, Rockstroh, and Taub (1995) presented that the brain of musicians is different from the non-musicians. Schlaug et al. (1995) determined impressive differences between the brain structures of musicians and other people. Planumtemporal (PT) images revealed that early music training enhances neural connections and possibly adds new ones; according to this thesis, it is possible to physically shape and structure young brains. In their study, Elbert et al. (1995) showed that early music education has long-term effects on the organization of the brain.

Lotze, Scheler, Tan, Braun, and Birbaumer (2003) compared the activation maps of professional and amateur violinists while really and fictionally playing Mozart's G Major (KV216) Violin Concerto. Violinists are required to fictionally play the first 16 meters of the concerto (left hand) with their fingers really and fictionally. EMG (Electromyography) is used to record the actual and fictional performances. It is observed that professional musicians produced higher EMG amplitudes during the performance and there are cerebral activations in the contralateral primary sensorimotor cortex, the bilateral superior parietal lobes, and the ipsilateral anterior cerebellar hemisphere. The finding indicated that professionals had more activities during the practice in their contralateral primer sensorimotor cortex; this might indicate that they can build stronger audial-motor connections (connections based on hearing and movement). On the other hand, professionals followed more focused activation patterns during imaginary music performances. However, the auditory–motor loop was not involved during imagined performances in either musician group. This finding indicates that audial and motor systems trigger one another during the performance.

In another study, Schlaug, Norton, Overy, and Winner (2005) observed children between the ages 5 and 7 for 14 months. At the end of this process, the researchers stated that instrument training might have cognitive effects and positively affect the brain. Immonen, Ruokonen, and Ruismaki (2012) said that mental education is directly related to musical activity, its cognitive internal guidance, and sensual experiences.

Hyde et al. (2009) studied with children at the age of 6 studying at public schools. They focused on the effects of music education on structural brain development. Children who took private piano lessons half an hour per week for 15 months are compared to the ones who took no piano lesson. According to the obtained data, music education for only 15 months caused structural changes in the brain during the first childhood period. This study presents proof about the suggestion that there might be structural changes in the brain in line with education in the early childhood period.

In a study about listening to music, Kebapçılar (2009) analyzed differences between the perceptions of female musicians and female individuals who took to training about the subject. In her study, she used five female pianists and five female non-musician individuals. Kebapçılar researched the brain activation images of participants while listening to music by using fMRI. Although there was found to be no meaningful difference in Superior Temporal Girus of participants, findings indicate that there was activation in the motor cortex of pianists while listening to the piano pieces that they know well. At the end of the study, it was determined that there was simultaneous activation in the motor cortex (including cerebellum) of pianists -even during the practices that require listening- who practiced their audial and motor skills for years.

In another study about listening, Satoh, Takeda, Nagata, Hatazawa, and Kuzuhara (2003) analyzed non-musician male participants between the ages 20 and 30. Activations in the frontal part of their temporal lobe were analyzed with PET (Positron Emission Tomography). Two types of musical processes were followed in the study; the participants listened to harmony and soprano pieces. It was observed that the anterior portion of the temporal lobes, cingulate gyri and cerebellum were activated while listening to the

harmony. On the other hand, it was seen that the bilateral superior parietal lobules and the right precuneus were significantly activated while listening to the soprano part.

The interest of neurologists and psychologists in musician's brains in the studies about brain development is striking. Psychology and neuroscience help us understand the big potential of music. Neurologists observe musician brain by using special screening devices, which indicates that they see musicians as an ideal subject group. According to Schlaug (2001), the primary reason why the musician's brain is used as a model for functional and structural adaptation is that they have unique talents such as memorizing long and complex finger numbers, transforming the musical symbols they visually perceive into motor skills and having different audial abilities.

When brain researches that use many different neuroscience tools are analyzed, it can be seen that musical experiences and training create specific and predictable activity patterns in the brain (Teachout, 2005). However, the neural bases that lie behind these developments are not yet clear. Additionally, whether or not do the intensity, duration of instrumental training, and extracurricular activities contribute to brain development isn't known. The effects of other factors such as attention, motivation, and teaching methods in music on the brain aren't also clear (Shaluog et al., 2005).

3.3. Musical and cognitive development

Developments in the active mental activities of individuals that enable them to learn and understand the environment around them are called cognitive development. It is the process of understanding the world and the process is based on the changes and transformations in the ways of thinking and reasoning. The ways of thinking become more complex and efficient in this process that starts with infancy and continues throughout adulthood (Sönmez, 2000, cited in Kol, 2011). There are many studies in the literature about the effects of music on cognitive development. The prominent ones are included in this section of the study.

The study by Bilhartz, Bruhn, and Olson (1999) about cognitive development has an important place in the literature. The researchers' study included 71 children between the ages of 4 and 6; they separated them into two groups as experimental and control. The control group received no education while the experimental group took 75 min. music classes one day a week for 30 weeks. The classes included a variety of topics in music such as vocal exploration and matching pitch, singing, playing percussion instruments and the glockenspiel, exploring and notating basic rhythms, learning to read and write music on a treble staff, composing, and developing coordination and balance through movement. Additionally, children were given different homework to study music at home. Some tests were conducted on experimental and control group students before and after the education process to measure their cognitive and musical talents. There was no difference between groups in pretests while experimental group students had higher scores in last-tests in terms of musical development. They also had meaningfully higher scores when compared to the control group in the "Bead Memory", which is one of the Stanford-Binet tests. Results of this study support the hypothesis that there is an important connection between early music education and cognitive development.

Schellenberg (2004) carried out a study with a big sampling group at the age of 6. He randomly separated the sampling into four groups. Two groups took music classes (keyboard and Kodaly voice lessons). One control group took drama classes while the other control group took no class. Sampling was made of 144 students, 12 students quit classes and didn't complete the second part of the IQ test. The children took classes for one year and their IQ was measured before and after the classes. When the children in the music group were compared to the children in the control group, it was seen that there was a bigger increase in their full-scale IQ.

Spatial cognition is broadly defined as a specific type of mental processing involving subjects that exist in space (Rauscher & Zupan, 2000). The visual world can be perceived through spatial cognition, and images of the subjects can be envisioned. It is thus important to develop spatial ability at an early age. Studies especially around the 1990s on the development of spatial-temporal abilities through music attract attention; it is seen that the subject started to become one of the research fields of scientists during these years.

Rauscher, Shaw, and Ky made a groundbreaking study in 1993 at the University of California. They stated that university students who listened to Mozart for 10 minutes had meaningfully high scores in spatial task tests; however, the benefit of passive listening on spatial task performance was short-term (cited in Bilhartz, Bruhn & Olson, 1999).

In another study, Rauscher Shaw, Levine, Wright, Dennis, and Newcomb (1997) presented the relationship between non-passive early music education and spatial-temporal thinking. They separated 78 preschool children into four groups. One group received 10-15 minutes of private piano education twice a week and sang for 30 minutes per day. One group took only singing lessons, one group took computer lessons and one group took no lesson. Spatial-temporal thinking and spatial recognition tests were conducted before and after the education process. There had been no meaningful difference between the groups' pretest scores. After six months of education, it was determined that the spatial-temporal thinking test scores of the children who took piano lessons were meaningfully higher than that of the other groups. However, there was no increase in the spatial recognition scores of groups.

Rauscher, Shaw, Levine, Ky, and Wright (1994), Gromko and Poorman (1998) reached similar results in their study with preschool children who took music education. In their study, Rauscher et al. (1994) stated that music education is a valuable tool in supporting the mental development of preschool children. In their study, Gromko and Poorman (1998) mentioned that music education has a positive effect on the spatial intelligence of preschool children.

Costa-Giomi (1999) studied 78 children at the age of 9. The separated children into two groups; there were 43 children in the experimental group while there were 35 children in the control group. Experimental group students took piano education for three years while control group students didn't. The results of the study showed that music education significantly increased the general cognitive and spatial abilities of children, but the developments were temporary. It was determined that after two years of piano education,

the experimental group students' scores were meaningfully higher. Finally, at the end of three-year education, there was no meaningful difference between the two groups.

Rauscher and Zupan (2000) randomly separated 62 kindergarten students at the ages of 5 and 6 into two groups. One group took piano classes while the other one didn't. The first group took two classes for 20 minutes per week. When the pretests of both groups were analyzed, it was seen that there was no difference. When the last test scores were compared, it was determined that even after 4 months of training, the first group had meaningfully higher scores in spatial-temporal tests. It was observed that this gap increased more at the end of 8 months. This study indicates that music contributes to the spatial-temporal reasoning of kindergarten students.

Hetland (2000) carried out a meta-analytic review and reviewed 15 studies in her research. Based on her analysis, she stated that active music participation of preschool and primary school children increases spatial-temporal performance during training for minimum 2 years.

In addition to the studies focusing on instrument education, there are studies in the literature analyzing different musical activities. Rauscher et al. (2007) focused on this dimension and analyzed the effects of different musical activity types on preschool children at risk. Five groups took piano, singing, rhythm, and computer classes while one group didn't take any class. Three music groups received higher scores than the control group during training in the cognitive imagery tasks. However, the scores of the rhythm group were significantly higher than all other groups in tasks that require temporal cognition and mathematical skill. The findings of this research indicate that rhythmic education is the main thing for the development of temporal cognition and math (cited in Hallam, 2010).

When the example studies mentioned above are analyzed, it can be seen that studies focused mostly on preschool and primary school students. The common point that attracts attention is that active participation in music (Schellenberg, 2004; Hetland, 2000; Rauscher & Zupan, 2000; Costa-Giomi, 1999; Bilhartz, Bruhn & Olson 1999; Rauscher et al., 1997) has positive impacts on cognitive development.

3.4. Music and physical development

Physical development includes the development of all organs of the body, increase in length and weight, teething and changes in teeth, development of muscles, and different systems in the body (digestion, respiration, circulatory system, brain, and neural systems), and sensory organs (Erdoğan, 2011). It is possible to carry out studies that help the development of both small and big muscles of children through music education. On the other hand, some studies involve movement education in which adults can also participate. There are researches in the literature focusing on this issue. Some of these studies are presented below.

In his study, Gruhn (2002) observed 12 children at the ages 1 and 2 for 15 months. The focus of the observation was their musical behaviors in a music environment. This group was compared to a control group made of 9 children of the same ages. All children were

videotaped and evaluated by two independent judges by using an observation form based on some specific criteria. Although the children in both groups had similar development levels at the beginning of the study, differences started during the observation process. The increase in the body movement and voice performance of the control group students who listened to nothing but the song in their kindergarten was very low when compared to the other group. The most important impact for the experimental group was the powerful interaction between movement and voice production.

Derri, Tsapakidou, Zachopoulou, and Kioumourtzoglou (2001) researched the impacts of music and movement programs on locomotor performance quality. They studied with 68 children between the ages 4 and 6. 35 students in the experimental group participated in a 10-week music and movement program. Control group students (n=33) only participated in free playtime activities. In the scope of the study, it was observed that experimental group students had more progress in galloping, skipping, horizontal jump, and leaping. Results of this study indicate that a music and movement program might ensure important achievements in the quality of basic locomotor skills. The purpose of another study conducted by the same researchers was to determine and compare the effects of a proper music and movement program combined in a physical education program designed for children between the ages 4 and 6 on their jumping and dynamic balance development. Zachopoulou, Tsapakidou, and Derri (2004) studied 90 children for this purpose. They separated children into two groups as experimental (n=50) and control group (n=40). The experimental group followed the prepared music and movement program while the control group had a physical education program. All subjects took classes for 35-40 min. twice a week for two months. The data were analyzed with the multi-variate analysis of variance with repeated measures. Results indicated that the experimental group improved significantly in both jumping and dynamic balance abilities. However, it was observed that the movement program of the control group didn't have a meaningful effect on their jumping and dynamic balance development. Researchers stated that a developmentally appropriate music and movement program can positively affect the jumping and dynamic balance of preschool children.

Deli, Bakle, and Zachopoulou (2006) conducted a similar study and purposed to determine the effects of two different 10-week intervention programs on preschool children's fundamental locomotor skill performance. Experimental Group A followed a movement program while Experimental Group B participated in a music and movement program. Subjects in both programs took classes for 35 min. twice a week for ten weeks. Group C was the Free-Play group and students spent time with free play activities. Results of the study indicated that there was an important improvement in both experimental groups' performances in running, hopping, leaping, horizontal jump, and skipping when compared to the free-play group. Researchers said that the basic movement skills of kindergarten children can be supported and developed with different organized practices.

For six weeks, DeVries (2004) researched the non-musical effects of a music education program on preschool children. The class hadn't received a music class before the study process. Students took 25-30 min. music classes twice a week for 6 weeks. At the end of the study, it was determined that participation in music activities enabled children to work-off their extra energy, created opportunities for socialization, supported children to

express themselves, contributed to their listening skills and socio-dramatic games. On the other hand, it was observed that participation in music-movement activities developed the motor skills of children.

Most of the definite pieces of evidence are obtained from younger populations; this indicates that participation in music at early ages has a basic effect on a variety of skills. It is an undeniable fact that music experiences' level of impact on motor skills should be analyzed better and it is necessary to make more studies on all of the development levels (Teachout, 2005).

Some of the studies involving adults singing in the chorus are presented below.

Clift and Hancox (2001) conducted a short survey on 84 chorus members at a college. Their goal was to determine if the chorus contributed to them and if they had any benefit in terms of health. They conducted a short survey for this purpose. Most of the participants stated that they benefited socially and emotionally from singing in chorus while almost half of them said that they had physical and spiritual benefits. 93% of the participants stated that singing had a positive impact on their mood, 89% mentioned that it made them feel happier, 71% said that it supported their mental health and 64% stated that it helped them gain a better attitude. Besides, 80% of the participants said that singing helped them relax, 79% said that it decreased their stress, 66% stated that it made them forget their worries and 78% said that they felt calmer. Six dimensions of benefit associated with singing are determined in the study. These sub-dimensions are: Benefits about comfort and relief, benefits for breathing and posture, social benefits, moral benefits, sensual benefits, benefits for the heart and immune system.

Researches with adults who sing indicate that joining the chorus has many benefits in terms of health and comfort. These benefits are: Physical relief and releasing physical tension, sensual relief and decrease in stress, the sense of happiness, positive mood, joy and feeling good, a higher sense of personal, sensual, and physical relief, increasing sense of excitement and energy, stimulation of cognitive capacities- attention, concentration, memory, and learning, increasing sense of self-esteem and self-respect, the sense of curative benefit about psychological and social problems that have been going for a long time, the sense of disciplining skeleton-muscle system, participating in a valuable and meaningful activity that gives a purpose and motivation (Clift et al., 2008; Stacey, Brittain & Kerr, 2002, cited in Hallam, 2010).

3.5. Music and academic success

When the literature about music and academic success is analyzed, it can be seen that according to the results of most studies, music education has an important effect on academic success; however, some research studies in the same literature indicate that there is a lower or insignificant relationship between the two.

Morrison (1994) used the data of the National Center for Educational Statistics, which is a branch of the USA Ministry of Education. He analyzed data of over 13.000 students. He reported that 2nd grade high school students who participated in music had higher

scores in English, History, Science, and Math classes when compared to the ones who didn't participate in music.

Trent (1996) made a study to determine the impact level of instrumental music education on math, language arts, and reading in the scope of academic success. He analyzed the data of 136 senior students in two high schools. He separated students into three groups as instrumental music students, students who participate in other activities, and students who didn't participate in any activity except for the ones in the curriculum. It is determined that standardized test scores in math and language arts of music students were meaningfully higher than that of the other two groups. It is found that there was no statistically meaningful difference between reading scores.

Cardarelli (2003); Johnson and Memmott (2006) obtained similar results in their research studies. Cardarelli (2003) researched the impacts of instrumental music training on standardized tests and school attendance. He compared the test scores and attendance of two groups made of 3rd grade students (students who participated in instrumental music training program and students who didn't participate). At the end of the study, it was observed that music education had a positive impact on FCAT (Florida Comprehensive Achievement Test) reading and math scores. On the other hand, the absence level of students who took instrumental music classes was lower. Johnson and Memmott (2006) carried out a similar study. The researchers studied with 4.739 primary school (3rd and 4th grade; n=1.119) and secondary school students (8th and 9th grade; n=3.620) in the USA. According to the study results, students in the sample music education program had higher scores both in English and math standard tests when compared to the other students who didn't receive this high-quality education; however, the impact was low. Ciepluch (1988) determined that there is a meaningful relationship between reading and math success and the GPA of students who play an instrument (Ciepluch, 1988, cited in Hodges & O'Connell, 2005).

Another study carried out in the USA on the issue is carried out by Costa-Giomi (2004); he analyzed the effects of a three-year piano education process. He studied with 117 4th grade students in public schools. There was a meaningful increase in the self-esteem of students who completed their 3-year piano education program. On the other hand, changes in the self-esteem of students who didn't receive education or the ones who quit classes weren't meaningful. Besides, when the relationship between official music education and academic success was analyzed, it was determined that the education didn't affect academic success in terms of language and math which were measured with standard tests.

Yang, Ma, Gong, Hu, and Yao (2014) carried out a different study on the issue. This study examined the relation between long-term music training and child development based on 250 Chinese elementary school students' academic development of first language (L1), second language (L2), and mathematics. According to the findings of the study, musician children had better performance in musical success and L2 development when compared to the non-musician children. Besides, it was revealed that music education didn't independently contribute to the L1 and math success of students. Legette (1993) determined that 3rd, 4th, and 6th grade students who received music

education didn't have a better performance when compared to their peers who didn't receive music education (Legette, 1993, cited in Hodges & O'Connell, 2005).

When the relationship between music and academic success is analyzed, it can be seen that the issue has been analyzed by a variety of researchers around the world and there is found to be a direct and indirect relationship between music and academic success. Johnson and Memmott, 2006; Cardarelli, 2003; Trent, 1996; Morrison, 1994; stated that there is a direct relationship between music and academic success. Yang et al. (2014), and Costa-Giomi, (2004) said that even though music education doesn't affect academic success, it has a positive impact on self-esteem. According to this finding, it can be said that there is an indirect relationship between music and academic success (Yang et al., 2014; Costa-Giomi, 2004).

3.6. Music and increase in attention

Problems about attention are generally noticed when a child starts school as he/she is expected to direct his/her attention on an issue, and sit down for a time and be interested in a topic. This is why; the issue of focusing attention starts to become important especially during primary school, and to take precautions or find solutions if there is an extraordinary case (Özdoğan, 2001).

In his study, Scott (1992) analyzed the specific effects of some activities on the attention and endurance behaviors of preschool children. He separated 80 children between the ages 3 and 5 into five groups. Children in the first group enrolled in individual Suzuki violin classes, the ones in the second group enrolled in individual and group Suzuki violin classes, the third group enrolled in creative movement classes, the fourth group enrolled in preschool activities or classes. Students in the fifth group didn't enroll in any kind of organized preschool activity or class. Analysis of classroom and course videotapes presented information about teacher and student behavior. Children in both Suzuki classes (the 1st and 2nd group) had higher scores in all of the attention duty variables and spent more time in perseverance duty.

Kim, Wigram, and Gold (2008) researched the impacts of simultaneous music therapy on common attention behaviors in preschool children with autism. They determined that simultaneous music therapy was more efficient than games in easing and supporting common attention behaviors and non-verbal social communication skills. Session analysis indicated that simultaneous music therapy was meaningfully more efficient in increasing eye contact and getting in line.

In her study, Demirova (2008) aimed at determining the role of piano education in improving primary school students' ability to focus attention. For this purpose, she attempted to determine if there is a difference between primary school students who take piano lessons and the ones who don't. She used the "Bourdon Attention Test" and a specifically designed scale made of signs, graphics, patterns, pictures, and symbols. Besides, she took the opinions of the teacher and parents. The obtained results indicated that there was not a meaningful difference between the two groups. When the mean

ranks were analyzed, it was seen that the mistake scores of students who took piano classes were lower.

In her study, Kuşcu (2010) analyzed the effects of music activities -prepared with the Orff-Schulwerk approach- on the attention skills of 5-6 years old children group in a kindergarten. Experimental group children participated in the "Music activities program practiced with Orff-Schulwerk Approach" half an hour per day for 12 weeks while control group children continued their programs in kindergarten. "Focus Test" was used as a measurement tool for five years old children in the study. According to the results, attention skill, average scores of experimental group children were significantly higher than that of the control group.

Individuals, especially children, learn and develop to the extent that they concentrate. It is believed that the inner discipline of music directs the individual to be attentive and disciplined. Musical activities are thought to support children in terms of concentration without creating any kind of pressure; learning will thus become permanent and there will be benefits for different learning zones.

3.7. Music and individuals with different learning abilities

Individuals with different learning abilities have some unusual learning characteristics. These individual differences affect the learning speed, level, interest, attention, and permanency (Ulusoy, 2011, cited in Türkmen, 2019) and require different teaching processes. When a student learns faster or slower than the others, it means that he/she has a different learning ability. When these differences are noticed and defined at early ages, it is more possible to conduct much more efficient treatment methods with better results (Türkmen, 2019). Teachers and families have big responsibilities in these processes.

Hallam and Price (1998) analyzed the effects of using background music in the classroom on math performance and behavior of 10 children with emotional and behavioral difficulties. There was an improvement in the behavior and math performance of all children who participated in the study. Especially children with constant stimulus needs and the ones who are over-active benefited from this improvement. On the other hand, it was observed that there was an improvement in cooperation and a decrease in aggression in the lessons right after the study.

MacDonald, O'Donnell, and Davies (1999) researched the effects of structured music ateliers on mentally disabled individuals. They studied with 60 individuals who voluntarily participated in the process. All of the participants were evaluated by using a variety of techniques specifically prepared and approved for the study. According to the results of the study, music activities might create an environment that supports the skills of mentally disabled individuals.

In their study, Duffy and Fuller (2000) researched the efficiency of a music therapy program in improving the social skills of children with medium-level mental disabilities. 32 children from four centers for mental disabilities (ages between 5 and 10) were selected. Four children from each center were randomly selected for participating in the

music therapy program. Four children participated in a control group program without music. One worker at each center was trained for each group and trainers were required to conduct 30-min. group sessions twice a week for 8 weeks. Five social skills (turn-taking, imitation, vocalization, initiation and eye contact) were targeted for intervention and an especially designed social skills test was used for measuring the efficiency. Evaluation forms filled by teachers ensured feedback about the efficiency of the intervention. The researchers, important improvements in five social skills targeted for both conditions after 8-week intervention determined that it was independent of music/non-music intervention. In her study, Hines (2000) studied 58 students in different grades varying from kindergarten to the 9th grade with learning difficulties. The study continued for 16 days. The effects of motoric music instruction (music training with movements) and non-motoric music instruction (music training without movements) on academic success were analyzed. At the end of the study, it was determined that neither music education with movement nor the one without movement had an important effect on the academic success of students with learning disabilities.

In her research study, Shields (2001) researched the role and importance of music education as an intervention to teenagers at risk through participation in performance groups in mentorship practices. Students' sense of self in six different fields, including musical competence, was measured with the scales in the first and last tests. On the other hand, students' views and attitudes were collected with structured-interview and coded according to themes. A significant improvement was observed at the end of the study. 76% of students stated that music is important in their life at the beginning of the process; this ratio increased to 82% at the end. On the other hand, the importance and role of music, music education, and music teacher in students' life were proven by the interviews in the study.

The interest of individuals with different learning skills in music and the delight they get from music is noticeable. Music is a kind of advantage, an instrument that eases the education of these individuals; the skills they have can be supported and improved with proper music education. The important point is to know that each individual with a learning difficulty is unique, and we all have differences in learning processes (Türkmen, 2019).

4. Discussion and Conclusions

When the researches are analyzed in general, it can be seen that there are many strong proofs about the active participation's in music positive effects. Music education is important for math success, brain improvement, personal and physical development, academic success, and improvement of attention. On the other hand, it can be said that music has some specific positive effects on individuals with different learning skills. A proper, systematic, and sustainable music education and a lifelong learning process in line with it will contribute to the multi-dimensional success of individuals and support their academic success.

Studies analyzing the relationship between music and math, including instrumental music education (Haley, 2001; Graziano, Peterson & Shaw, 1999; Catterall, Chapleau & Iwanga, 1999; Cheek & Smith, 1998), and studies that focus on different music activities

(Whitehead, 2001; Goeghegan & Mitchelmore, 1996; Gardiner et al., 1996) generally indicate that music education has positive effects on math success. On the other hand, Rafferty (2003) defends that music doesn't affect math success (Raffery, 2003, cited in Hallam, 2010), while Cranmore and Tunks (2015) say that math is the basis of musical talent according to high school students.

It is seen that effects on music education on brain structure are analyzed in the studies on music and brain development by using neuroimaging (Hyde et al., 2009; Schlaug et al., 2005; Schmidt, Trainor & Santesso, 2003; Schlaug et al., 1995; Elbert et al., 1995). Besides these results, through neuroimaging, it is determined that music activates the brain (Lotze et al., 2003). Studies about listening indicate that (Kebapçılar, 2009; Satoh et al., 2003) some parts of the brain are activated. Ayata and Aşkın (2008) state that the issue of music and the brain has been mostly analyzed by neurologists and neuropsychologists until recently. However, musicians have become interested in the issue and the reason behind this is that they want to scientifically learn and more consciously practice the profession that they have intrinsically done until today.

When the relationship between music and cognitive development is analyzed, it can be seen that most of the studies are carried out with children at small age (Schellenberg, 2004; Hetland, 2000; Rauscher & Zupan, 2000; Bilhartz, Bruhn & Olson 1999; Gromko & Poorman, 1998; Rauscher et al., 1997; Rauscher et al., 1994) or children at primary school-age children (Hetland, 2000; Costa-Giomi, 1999). According to the results of these studies, students who take piano classes have higher scores in tests when compared to the ones who don't receive music education (Schellenberg, 2004; Rauscher & Zupan, 2000; Rauscher et al., 1997). Students generally emphasize that there is an important connection between early music education and cognitive development. Costa-Giomi (1999) observed an increase in cognitive scores of students after two-year piano education; however, at the end of the third year, there was determined to be no important effect. Based on these findings, the researchers stated that music educators should be careful in having too many expectations about the cognitive benefits of music education. Ayata and Aşkın (2008) emphasize that some studies prepared by Western researchers might be twisted because of economic concerns. Besides these views, Gün, Duru, and Demirtaş (2016) stated that although the effects of music on cognitive development have been presented in scientific studies, educators don't give sufficient importance to music education in preschool, primary and secondary education levels and this lack of importance is worrisome.

When the issue of music education and academic success is analyzed, it can be seen that music education has a positive effect on academic success (Johnson & Memmott, 2006; Carderelli, 2003; Trent, 1996; Morrison, 1994). On the other hand, there are some other studies defending that music education doesn't contribute to academic success (Yang et al., 2014; Costa-Giomi, 2004); however, in these researches, it is determined that even though music education doesn't affect academic success, it contributes to self-esteem (Costa-Giomi, 2004) and second language development (Yang et al., 2014).

The results about the positive effects of music on attention improvement are mentioned in many studies (Kuşcu, 2010; Kim, Wigram & Gold, 2008; Demirova, 2008; Scott, 1992). On the other hand, there are important studies in the literature about individuals with

different learning abilities. Students with sensual and behavioral difficulties (Hallam & Price, 1998), mentally disabled individuals (Duffy & Fuller, 2000; MacDonald, O'Donnell & Davies, 1999), teenagers at risk (Shields, 2001), individuals with learning difficulties (Hines, 2000) are some of the groups analyzed in these research studies. Some studies emphasize the positive effects of music (Shields, 2001; MacDonald, O'Donnell & Davies, 1999; Hallam & Price, 1998) while some others are defend that there is no effect of music (Hines, 2000; Duffy & Fuller, 2000).

As mentioned by Teachout (2005), we should support our profession as much as possible and be fully equipped in what we do; because of that, it is important to search for new information about the effects of music and music education in all of the dimensions of human development.

The possible highly positive effects of music on individuals, especially children, in many dimensions are presented in the studies above. However, it can be seen that most of the researches focuses on active participation in music. Susan Hallam (2010) states that specific music participation types that improve the skills that are automatically transferred to other dimensions should be well researched and the common points of these skills should be analyzed.

It is not possible to reach definite results in science; a piece of information thought to be certain today might become invalid tomorrow. Science brings innovations continuously in the ever-changing and developing world. In this context, it should be noted that today's information might become invalid in the future.

Besides the benefits of music education presented in this research study, it contributes to learning cooperation, obtaining information about the local and other cultural elements, being disciplined, and it ensures socialization. Such an important education resource deserves a status equal to the basic classes at schools as it not only has developmental effects but also ensures humanitarian values. It shouldn't be forgotten that the importance of individuals attributed by society is one of the most important indicators of social development.

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