

THE EFFECT OF MUSIC TRAINING AND LISTENING TO MOZART MUSIC ON COGNITIVE & SOCIAL DEVELOPMENT OF PRESCHOOL CHILDREN

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Abstract. The aim of this research was to comparison of the effect of music training and listening to Mozart music on cognitive & social development of preschool's children of Kerman City in 2013. This study was assigned in two groups of music training (experimental group) and listening to Mozart music (control group). For experimental, the music training and rehearsal in the Orff Approach were performed in 20 sessions of 75 minutes, and control group, exposed of fragments of Mozart's *D major* key at the 20 sessions of 75 minutes. Wechsler test and Vineland test were conducted on both groups before and after the interventions. Data analysis was carried out by one-way analysis of covariance. Results showed that the children attended at music training sessions have significantly gained higher scores than those listening to Mozart in terms of verbal and non-verbal abilities, IQ and social.

Keywords: music training; Mozart listening; cognitive and social development; preschool children

1 Introduction

Non-musical effects of musical training are examined and the results showed that they are mostly alluded to the childhood. Education in primary phases of childhood is of paramount importance in terms of sensitivity and receptivity of children from educational environments and sustainability of learning. Primary learning is an appropriate context for children's upcoming transactions; in fact, what are learnt in the childhood are more enduring and difficult to forget (Ghasem Tabar et al., 2011).

In the recent decades, musical learning has been taken in to account as an effective strategy to increase communicational, cognitive, and emotional capabilities of the children. Most scholars believed that musical responses of children are the most natural reactions which play important roles in various learning respects (Noor Mohammadi, 2004). In the recent years, there has been different scientific research (Bilhartz, Bruhn, and Olson, 1999) whose main common point has been the result that musical training is effective on cognitive growth and abstract thought. Gardner addressed music as an organizer of children's cognitive processes (cited by Ruscher & Zupan, 2000). Research indicates that musical lessons have positive relationship with performance in verbal abilities (Schellenberg, 2005; Marques, Moreno, Castro, and Besson, 2007; Patel & Iversen, 2007; Moreno et al., 2008), phonology awareness (Schellenberg & Peretz, 2008), spatial reasoning (Hetlnd, 2000), mathematics (Vaughn, 2000), memory (Rauscher et al., 1997; Lee, Lu & Ko, 2007; Stoesz et al., 2007; Jakobson et al, 2008), and IQ (Schellenberg, 2006). In describing the fact that musical capabilities and spatial reasoning abilities are related, Leng and Shaw (1991) put forward the "trion model of the cortex", based on which certain neuron activity patterns that are arranged in vast areas of the cortex for mental spatial-time processes are used for both spatial reasoning and musical activities. EEG-aided studies support trion model of the cortex. Leng and Shaw's model, together with theory of children's early sensitivity to music (Olsho, Schoon, Sakai, Turpin, & Sperduto, 1982; Krumhansl & Jusczyk, 1990; Jusczyk & Krumhansl, 1993), proposes the theory that musical training causes an improvement and evolution of neural paths involved in environment-dependent cognitive processes including spatial abilities. According to Hebb's learning principles, making reparative use of this neural network through musical learning can make it more capable to complete other abilities (Lefrancois, 2000).

There is overlapping between areas related to cortex's verbal abilities (BA22 and Wernicke's area) and areas of temporal stratum which is engaged for professional musical activities (Lotze et al, 2003). Since, according to conducted studies

(Gromko & Poorman, 1998; Rauscher, 1999; Mirbaha, Kaviani & Poorsaleh, 2003; Ho Cheung & Chan, 2003; Rauscher & Hinton, 2003; Schmithorst & Holland, 2004; Gromko, 2005; Jausovec, Jausovec & Gerlic, 2006; Bulduc, 2009; Hyward & Gromko, 2009; Amirian, 2011; Herrera et al, 2011), musical training can grows verbal abilities such as phonological awareness, verbal reasoning, and verbal memory.

Based on above-mentioned studies and aligned with them, this research is aimed at investigating the effects of musical training on children's cognitive and social abilities. Social development is an important aspect of growth that refers to interpersonal relationships (Seif, 2008). Social skill is a collection of learnt behaviors which enables individuals to make effective relationships with others and prevent from illogical social reactions. Social development is a balanced set of social skills and learnt adaptive behaviors. Masteries such as cooperation, responsibility, sympathy, continence, and self-reliance are components of social development (Amirtash, Sobhaninejad & Abedi, 2006). Slaby and Guara (2003) interpret social skill as social compatibility and the ability to make relationship with others in various social respects. Those whose social development is flourished have achieved a level of social relationship which enables them to easily live beside others. Basic indicators of social development can be found in fondness for others, self-confidence, relation with peers, development of social activities, tendency to criticism and reformation, and predisposition to leadership. Slawmouski and Dann (1996) consider social skill and recognition as a process which enables youngsters to predict and apprehend others' behaviors, control their own behaviors, and adjust their social interactions. Although several social groups and factors impact on the social development process (family, school, media, friends and etc), family is more influencing agent in social development of children (Shakerinia, 1997). It is the smallest, while the most important, social unit, which plays a key role in shaping children's personality and furnishing basic physical and emotional needs of the community individuals. Children's personality is directly influenced by their parents' genuine behaviors and is profiled in interaction thereto (Dillon, 2005, cited by Farrokhzad, 2008).

Hars, et al (2013), investigated effect of music-based multitask training on cognition and mood in older adults, were randomly assigned to intervention group, and control group. Six months of once weekly music-based multitask training was associated with improved cognitive function and decreased anxiety in community-dwelling older adults, compared with non-exercising controls. According to Schellenberg (2011a), 144 children were divided in to two groups, one of which was trained for 36 weeks and the other left untrained. Wechsler intelligence scale was used. Post-test showed that experimental group had significantly better scores in intelligence test as compared to control group. Schellenberg (2011c) investigated the relationship between musical lessons and intelligence in 106 male and female children of 9 to 12 years using Wechsler intelligence scale. 50 children were trained music for averagely 2 to 3 years and 56 children were left untrained. One-way analysis of variances indicated that trained group had significantly higher IQ rates than their untrained counterparts ($P < 0.001$, $F = 17.72$). Franklin et al (2008) in their research in the University of Michigan examined the impact of musical practices on verbal memory of 20 musicians of 10 years of experience using Reiven test and verbal memory. T-test showed that musicians gained significantly higher scores in verbal memory. In his study, Schellenberg (2007) investigated the relationship between musical training and IQ in Toronto, Canada, in 147 children of 6 to 11 years of old including 72 boys and 75 girls who had experienced musical training sessions for 23 months using Wechsler intelligence scale. Results of correlation test demonstrated that there is a positive and significant relationship between musical training and verbal IQ ($p < 0.001$, $r = 0.34$). He conducted the same study on 150 students of 16 to 25 years of age including 112 females and 38 males to examine the correlation between cognitive abilities in adulthood

and musical training in childhood in those who have experienced musical training sessions for an average of 3.7 years. Results showed that subjection to music in childhood has a positive relationship with IQ and educational performance ($p < 0.01$, $r = 0.23$ and $p < 0.05$, $r = 0.21$). On the basis of Sarkar & Biswas's review research (2015), the effect of music on the social behavior of ASD children can be established. In their investigation, Larijani and Razzaghi (2008) addressed application of performance art in social development of intellectually disabled students. They found that performance art-aided group training socially develops the intellectually disabled children ($P < 0.01$). Since the conducted research affirms the effectiveness of musical training, this study aims to examine the impact of musical training on cognitive and social development as compared to listening to Mozart in both male and female Kerman's preschool children in 2012-13 educational years. Following questions are put forward:

1. Does musical training of preschool children cause an improvement of their Intelligent Quotient (IQ) as compared to those who have listened to Mozart?

1-1. Does musical training of preschool children cause an improvement of their verbal abilities as compared to those who have listened to Mozart?

2-1. Does musical training of preschool children cause an improvement of their non-verbal abilities as compared to those who have listened to Mozart?

2. Does group musical training of preschool children cause an improvement of their social quotient as compared to the control group?

2 Methodology

This study was quasi experimental design that was carried out based on pre-test and post-test with control group. 52 children were randomly selected and divided in to training group and Mozart group, the members of the former of which were trained for 20 weeks (one session of 75 minutes per week) and the member of the latter were exposed to Mozart's *D major* key for 20 weeks (one session of 75 minutes per week). After termination of the sessions, post-tests were conducted on both experimental and control groups. Statistical analysis of the data was carried out by analysis of covariance where all its suppositions were taken into account: normality, homogeneity of variance (table 1), random independent samples and homogeneity of regression slopes (Table 2).

Table 1: Test of Homogeneity of Variances

Variables	F	df1	df2	Sig.
Verbal abilities	0.001	1	50	0.97
Nonverbal abilities	0.041	1	50	0.84
IQ	0.389	1	50	0.53
Social quotient (SQ)	0.09	1	50	0.79

Table 2: homogeneity of regression slope

Variables	SS	F	Sig.
Verbal abilities	431.89	5.00	0.3
Nonverbal abilities	39.78	0.5	0.48
IQ	93.99	1.22	0.27
Social quotient(SQ)	694.16	1.02	0.31

2.1 Statistical Population, Samples, and Sampling

Population of this research includes all Kerman's preschool children in 2012-13. One preschool center was randomly selected by cluster random sampling method. In this research, from among all preschool centers from Kerman Province, one center was firstly selected. Then, 26 students were randomly selected for experimental group and the same number of students for the control group.

2.2 Instruments of the Research

Wechsler intelligence scale for children (1974) was utilized for measuring verbal abilities, nonverbal abilities and IQ of children between 5 to 15 years of old. It consists of measurement of verbal and nonverbal abilities in 12 equally divided subtests

(Ganji, 2007). Reliability coefficient of Cronbach's alpha was calculated to be 0.72.

Vineland Social Maturity Scale (1935) was utilized for measuring social maturity. It consists of 117 items and developed with regard to social maturity or individuals' abilities to take care of themselves and meet their own needs. Questions are age-based and include birth to 25 years of old. Scale questions are propounded on the ground of eight abilities, including: SHG-Self Help General, SHE-Self Help Eating, SHD-Self Help Dressing, SD-Self-Direction, OCC-Occupation, COM-Communication, LOC-Locomotion, and SOC-Socialization. In this research, a total of 57 items were presented to the parents of the children. Total scores of the questions for children less than three years of ages were taken into account for all subjects. Reliability coefficient of Cronbach's alpha was 0.85.

Table 3: A summary of musical training package in Orff Approach

Sessions	Training axes
before treatment	Pre-test
1 st session	Acquaintance and communication Familiarity with sound characteristics
2 nd session	Teaching notes' sequence and their names Teaching thrumming Rehearing concentration Musical games to improve audition and mental accuracy
3 rd session	Teaching de major key Teaching notes on five carrier lines Improvement of pitches recognition and quality of sounds
4 th session	Teaching a short lyrics-included piece Developing motional skills, body coordination, rhythm recognition, and motional precision
5 th session	Teaching notes' traction and their written form

6 th session	Rehearsing notes' traction on a new piece Developing rhythm recognition as well as emotional and motional precision
7 th session	Familiarity with silence in music
8 th session	Teaching new music Developing imagination, visualization, and creativity.
9 th session	Group rehearsals for more coordination
10 th session	Performing a demo concert for parents
after treatment	Post-test

Table 4: Research Design with two groups, Pre-test & Post-test

Group	Pre-test	Treatment	Post-test	N
Experimental group = E	O	music training	O	26
Control Group = C	O	listening to Mozart	O	26

3 Results

Descriptive and ANCOVA findings are demonstrated in Tables 5 and 6. Scores averages of training group and Mozart group in verbal abilities, nonverbal abilities, IQ and SQ have significant differences in pretest. As seen in Table 6, effects of pretest in verbal abilities ($p < 0.001$, $F = 12.42$), non-verbal abilities ($p < 0.001$, $F = 82.39$), IQ ($p < 0.001$, $F = 42.29$) and Social Quotient ($p < 0.001$, $F = 58.05$) have been statistically significant and effective. In other words, pretest score has had an effect in

posttest, and some of variances of posttest scores has been impacted by pretest. Afterwards, to examine inter-mediatory effect on the dependent variable; pretest effect was omitted as covariate variable. After pretest scores were adjusted, a significant difference between two experimental and control groups in score average of verbal abilities ($p < 0.001$, $F = 91.56$, $\text{Eta-square} = 0.651$), non-verbal abilities ($p < 0.001$, $F = 22.31$, $\text{Eta-square} = 0.313$), IQ ($p < 0.001$, $F = 71.83$, $\text{Eta-square} = 0.594$) and Social quotient ($p < 0.001$, $F = 340.52$, $\text{Eta-square} = 0.861$) was obtained.

Table 5: Average of subjects' scores in pre- and post-tests

Indices	Tests	Training group		Mozart group	
		Average	SD	Average	SD
Verbal abilities	Pretest	102.92	13.07	97.69	13.11
	Posttest	109.96	15.36	99.53	13.19
Nonverbal abilities	Pretest	96.38	18.23	98.19	16.92
	Posttest	122.38	8.87	94.30	12.26
IQ	Pretest	99.15	14.6	97.42	13.02
	Posttest	118.23	11.7	96.5	11.98
Social quotient(SQ)	Pretest	180.68	22.52	183.81	21.84
	Posttest	243.48	22.2	178.65	17.92

Table 6: Analysis of Covariance (ANCOVA)

Tests		SS	df	MS	F	Sig.	Eta-square	adjusted mean Mozart	adjusted mean training
Verbal abilities	Pretest	1158.26	1	1158.26	12.42	0.001	0.202	-	-
	Group	8538.3	1	8538.3	91.56	0.001	0.651	95.26	121.4
Non Verbal abilities	Pretest	6428.50	1	6428.50	82.39	0.001	0.627	-	-
	Group	1740.88	1	1740.88	22.31	0.001	0.313	98.9	110.5
IQ	Pretest	3272.97	1	3272.97	42.29	0.001	0.463	-	-
	Group	5559.2	1	5559.2	71.83	0.001	0.594	97.1	117.7
Social quotient (SQ)	Pretest	11041.8	1	11041.8	58.05	0.001	0.542	-	-
	Group	57923.1	1	57923.1	304.52	0.001	0.861	177.6	244.5

*** $p \leq 0.001$

So, the answer to question "Does musical training of preschool children cause an improvement of their Intelligent Quotient (IQ) as compared to those who have listened to Mozart?" will be positive and the difference of pre-test averages to the post-test was the effect of musical education. Eta square is about 0.594 and 59.4 % of whole variance of IQ scores is being explained by the musical education. Adjusted mean in experimental group (117.7) in comparison of adjusted mean in control group (97.1) indicated that IQ increased in music training group.

Eta square in verbal abilities is 0.651 and based on the adjusted average of verbal ability scores of music group (121.4) to the adjusted average of Mozart group (95.2) refers to 65.1% of individual differences in the pre-test scores of verbal ability of

experimental group related to the effect of musical education. So, for answering this question " Does musical training of preschool children cause an improvement of their verbal abilities as compared to those who have listened to Mozart?" is positive and the reason was the difference of the average of pre-test scores to the post-test of musical education. In the non-verbal abilities, adjusted average of non-verbal ability scores of musical group (110.5) to the adjusted average of Mozart group (98.9) was shown, which attributed to eta square (0.313) which indicates that 31.3% of individual scores in the pre-test scores are related to the non-verbal ability of experimental group related to the effect of music education. Therefore, answer to this question "Does musical training of preschool children cause an improvement of their non-verbal abilities as compared to those

who have listened to Mozart?" is positive and the difference of the pre-test averages to the post-test was the effect of musical education.

The scores of social quotient of music group (244.5) to the average of Mozart group (177.6) and the effect size of 0.861 showed that 86.1% of individual differences to the pre-test scores of social quotient of experimental group was related to the effect of musical education. So the answer to this question "Does group musical training of preschool children cause an improvement of their social quotient as compared to the control group?" is positive.

4 Discussion

This research is aimed at comparing the effect of musical training and listening to Mozart on the cognitive and social growth of preschool's children of Kerman City. By neutralizing the effect of pre-test scores, it can be said that musical training affected the cognitive growth of children and had a positive effect on the verbal and non-verbal abilities of experimental group and finally on their IQ in comparison with the other group who listened to Mozart music.

This result is consistent with the studies of Schellenberg (2006, 2011a, 2011b, & 2011c), Ho, Cheung and Chun (2003), and also the study of Gromko and Poorman (1998) based on the positive and significant effect of music lessons on IQ. The positive effect of musical training on the verbal ability is consistent with the studies of Mirbaha et al(1993), Amirian (2011), Herrera et al. (2011), Schellenberg (2011b), Gromko (2005, 2004), Ho et al (2003), and Piro and Ortize (2009) as the training of music is along with the positive effect on the verbal abilities such as verbal reasoning, verbal perception, numerical rate, phoneme recognition, fluency, auditory perception, the sequence of letters, words and phoneme segmentation. The positive effect of musical training on the non-verbal abilities is along with the results of the studies by Ghasem Tabar et al.(2011), Schellenberg (2011b), Gromko(2004), Ho et al. (2003), Gromko & Poorman (1998), Rauscher et al. (1997) regarding that musical training affects the non-verbal abilities such as spatial reasoning, spatial-geometric relationships, mathematical skills and memorizing numbers. Group training of music showed the high social growth to Mozart group and this result is along with the study of Amirtash et al. (2006) as the cooperation of individuals in the group activities is effective in their social growth. In order to explain this finding, it can be added that being in the group activities require the cooperation and accepting the others which can be effective in the social growth of children. The final result is that music training has a positive and significant effect on some aspects such as verbal and no-verbal ability as well as intelligence and also the several aspects of social growth. The children who were participated in the musical classes accessed the high score of verbal and non-verbal abilities rather than the other who listened to Mozart music. The result of this study showed high score of cognitive growth to the control group (who listened to Mozart). The group of music training (in the field of sub-verbal tests) had a good performance to the Mozart group, however, in the sub-non-verbal tests (two of them), no significant difference was observed and in the domain of subtests of Mazes, Mozart group had a better performance to the former group and it can be due to two reasons: a) Music training affects the verbal abilities to the non-verbal ones, b) The effect of Mozart music is limited to the left hemisphere of brain which is related to the non-verbal abilities. Therefore, listening to Mozart increases the performance of children toward some of the non-verbal abilities. As a result, the music training is along with the social and cognitive growth of preschool children.

5 Conclusions

Importance of education and training in preschool periods is presently taken into more account than before (YazdKhashti, 1998). Many research's indicated that the students who have passed the preschool period in relevant educational centers are equipped with more social compatibility than those who have not passed the same. Moreover, passing preschool period stimulates learning, educational progress and social

development. Education before elementary school through environmental enrichment enables children to achieve new perspective. Therefore, education before formal schools has found vital importance and many countries have focused their attention there on. Since children are in constant give-and-takes with the environment, the more enriched and user-friendly the environment, the higher the impression of the children from the environment. The interval from three to six years of age is the span in which the personality shapes. The prominent function of the education in preschool years is empowering children with social life. Among other objectives of education are physical-motional growth, language and discourse development, cognitive growth, and creative evolution (Yazd Khasti, 1998). Since musical training is effective on cognitive and social development of children especially in preschool periods, it can be taken advantage of in assisting children to grow socially and cognitively parallel with other preschool training courses.

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