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Motivational Effects of Music on Performance and Learning a Chain Skill in Children

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Abstract

The aim of this study was to evaluate the effect of motivational factors of music on performance and learning a chain skill in children. For this purpose, 24 healthy non-athlete 11-year-old girls were selected from two fifth grade class by available sampling method and were randomly divided into experimental and control groups. After the training the participants were given a pre-test. The training program in the acquisition phase was a chain skill including rolling, shooting football and receiving and passing the basketball for 8 weeks (two sessions per week with a pack of 4 attempts) which was performed with the existence of motivational factor of music in the experimental group and then a post-test was taken. Finally, after three weeks of not training, retention and transfer tests were taken. The data were analyzed through co-variance analysis and independent and paired sample t-test. The results showed that both groups have had progress in acquisition of the skill ($p<0.01$) but there was no significant difference between scores of the two groups ($p>0.05$). There was also no significant difference between retention and transfer test scores of the two groups. According to the findings of the study, it can be said that the motivational factor of music alone is not effective on motor performance and learning of children.

Keywords: Music, acquisition, retention, transfer, chain skill, children

Introduction

There are many reasons why children should have various musical experience. Among these, there is a belief that children who are exposed to music have a high motivation for connecting with the world around them. Perhaps because music allows them to have a contact with life and cultural richness as well as the heritage and culture of other nations and lands for the first time, and another reason is that music creates a non-verbal communication between people and therefore can fill the gap between people with different backgrounds. In fact, music is the international and universal language of the world and part of the cultural identity of a nation (Dokhani. 1382).

Over the past two decades, research on the psychology of music has expanded and has covered various social areas (Bateman et al. 2008). Much evidence suggests that music can have extensive psychological impacts and can act as an energizing factor depending on the right conditions to be provided (Bateman et al. 2008). Music is usually used for athletes to have improved performance. Athletes report that they become mentally aroused after listening to their national anthem or a piece of popular music. Many of these improvements in performance are attributed to the increase of arousal. Some studies on arousal showed that after listening to a music, arousal and then stamina increase (Leonard. 2012).

Other researchers stated that motor performance through music is facilitated in different ways (Bateman et al. 2008). For instance, music acts as an arousing or relaxing agent and is effective before or during physical activity and it also arouses the right hemisphere of the brain and through this, it facilitates cognitive tasks such as mental practice and imagery (Bateman et al. 2008). Although athletes have repeatedly reported the beneficial effects of music during physical activity, there is insufficient scientific evidence to support this idea (Eliakim, et al. 2007).

Music simultaneously stimulates both the right and left brain hemispheres, allowing to analyze and integrate processing data in a shorter time. In addition, simultaneous activation of two brain hemispheres enhances the learning process and absorption of the information and ultimately the development of cognitive skills. Many studies have proven that with the help of this phenomenon, we can increase learning by 5 times (Shoeibi. 2013).

In a study in Hong Kong, children who had received music training were compared against other children and the results showed that children who had been trained in music in the past have much stronger verbal memory and can remember more words from a list of words read to them and in each measurement perform better than the previous one. Learning music stimulates the left hemisphere of the brain and verbal learning is done by the same hemisphere. Further studies of this researcher showed that human memory improves by continuing to learn music and is stopped by stopping learning music (Shoeibi. 2013).

Although the review of literature encompasses the effects such as mood improvement, arousal control, reduction of pressure perception, improved rate of work output, improvement in skill learning, creating mental state and its flow (Crust et al. 2004), most studies suggest that music probably affects the improvement of physical performance in four directions that include reductions of fatigue perception (Aghdasi et al. 2014), increase in arousal level (Karageorghis et al. 1997), improvement of motor coordination or synchronization and increase in relaxation (Karageorghis et al. 2010).

Many researches have been done on the relationship between performing body movements accompanied with music and the majority of them have been done to determine the role of music in various aspects of performance and its impacts (Bernardi et al. 2006, Salekmoghaddam et al. 2007). The effects of music on the memory processing have been of interest to researchers and these effects have been explored from cognitive, physiological and psychological perspectives (Karageorghis et al.2007).

Lane et al (2011) offered two types of music freely to the subjects during running and reported that the performance of individuals who reported music to be arousing regardless of its type, was improved. Simpson et al (2006) reported improved performance of 400 meter running as a result of music and Mokhtari and Rostami (2005) rejected the effect of music on speed running. Chtourou et al (2012) also suggest using music during warm-up and before doing activities that require powerful muscle contractions of the lower limb. Gester and Leith (2001) examined the effect of different musical rhythms on basketball free throw and no significant effect was observed in non-athletes. In a recent study, Torabi et al (2009 & 2012) showed that the subjects who were exposed to music performed better in retention and transfer test but they were not superior to the control group in performance. In another study, Taheri et al (2012) showed that players' throw accuracy improves by music. Crncec et al (2006) showed that listening to classical music can improve environmental-spatial performance. This phenomenon, called Mozart effect (Chikahisa et al. 2006) due to various reasons including the instability of the results that are obtained in the laboratory and also lack of reliability, has not yet been emphasized (De Groot. 2006). In a research on the effect of music on physical performance, Flint (2010) observed that music had no effect on the dynamometer holding time, but subjects who were listening to fast music, walked the stairs more quickly.

Considering the research conducted in this field and the contradictory results obtained by researchers, and on the other hand due to the lack of research of this kind in the country and the need to improve the performance and learning in children, the current study seeks to answer the question that whether there is a significant difference between offering music in the acquisition stages, retention and transfer of a chain skill in children or not?

Methodology

In this study, quasi-experimental research design with two groups of experimental and control was used and the attitude was applied.

Participants

The population of the study were female elementary students of district 4 of Tabriz city and for sampling, after prior arrangement, one of these schools was visited and 26 11-year-old students from two 5th grade classes were selected through availability sampling method and were randomly assigned to equal sized (n=13 each group) experimental and control groups. But later, one of students due to the unwillingness to participate and another student due to the 3 session absence were excluded from experimental and control groups, respectively.

Training Program and Treatment Method

a) Training program

After selecting and grouping participants and giving explanations on the processes of performing activities on first session before offering any research treatment, the correct way of how to do the chain skill considered for groups was explained through Schmidt's (1988) instructional method that included verbal instruction and display of skilled model. The manner and order of performance was similar for both groups (4 attempts were considered for each group to practice how to do the skill). In the next session, a pre-test was taken from each group, and then the participants were placed in their practicing area. Sessions of participants of each group were completely distinct from each other. Next, the experimental group being provided with motivational factors and the control group receiving no treatment were entered into acquisition phase, which included 8 weeks of training and 2 sessions in each week. In all sessions, in order to learn better, all the participants received equal amount of feedback. After the acquisition stage, a post-test similar to pre-test was taken and finally after three weeks of detraining, retention test was taken in a similar condition to acquisition stage, and finally 1 hour after retention test, transfer test was taken from both groups in a new condition.

In each session, after 10 minutes of stretching, the skill is performed. Skills include items of tumbling, futsal shooting and basketball chest pass that are performed consecutively. This means that after standing up from tumbling, the person shoots to the goal and then receives a diagonal pass and shoots to a goal consisting of two small squares of 30 and 60 centimeters drawn inside each other on the opposite wall. Each of these items was taught in a systematic way to the subjects. Each item had separate scores which were calculated by adding up the hole execution time including errors made in each item and was considered as the score of an individual.

The intended skill for transfer test was similar to the one practiced in acquisition phase. The difference was the order of performing of the items. Also the distance of shooting to the goal and receiving and passing was increased and the participants performed two basketball chest pass.

b) The method of providing motivational factor

Three very energetic instrumental trance tracks, with the tempo of between 125 and 150 (table 1), were used to provide an exciting environment for the participants while performing. The music was played with a pair of speakers in the gymnasium.

With the start of the implementation of skills, three music tracks were played via portable computer (DELL-INSPIRON 510) using Media Player Classic MPC.HC.13.1359.0 software.

Table 1. Music Used in the Study

Trance Style Music
Awaited Moment-Jedmar
London Time-Miller
Select(Sport Song)

Statistical methods

Kolmogorov-Smirnov test was conducted to determine the normality of the data. Obtained data were analyzed by descriptive and inferential statistics methods using Excel and SPSS software. To investigate the progress in acquisition phase the paired t-test was used. Then according to the research plan and the existence of two independent groups (control, experimental) covariance analysis was used to analyze pre- and post-test data. To analyze the retention and transfer test data, independent t-test is used. The level of significance was considered $p < 0.05$.

Research findings

Participants' explanatory variables are presented in Table 2.

Table 2. Descriptive characteristics of subjects (mean±sd)

Groups	Control	Experimental
Weight	37.91 ± 8.87	37.75 ± 5.62
Height	146.66 ± 4.71	149.5 ± 3.23

The mean and standard deviation of the groups in pre-test, post-test, retention and transfer are shown in Table 3 (data are shown in seconds and is descending).

Table 3. Mean and Standard Deviation of Group Scores in Pre-test, Post-test, Retention and Transfer stages

Groups	Pre-test	Post-test	Retention	Transfer
Experimental	24.74 ± 5.43*	15.08 ± 5.09	15.03 ± 4.14*	21.53 ± 2.94*
Control	28.02 ± 4.84	14.03 ± 3.82*	15.037 ± 3.95	23.24 ± 5.91

Figure 1 shows the mean of test scores of the groups at different stages (data are descending).

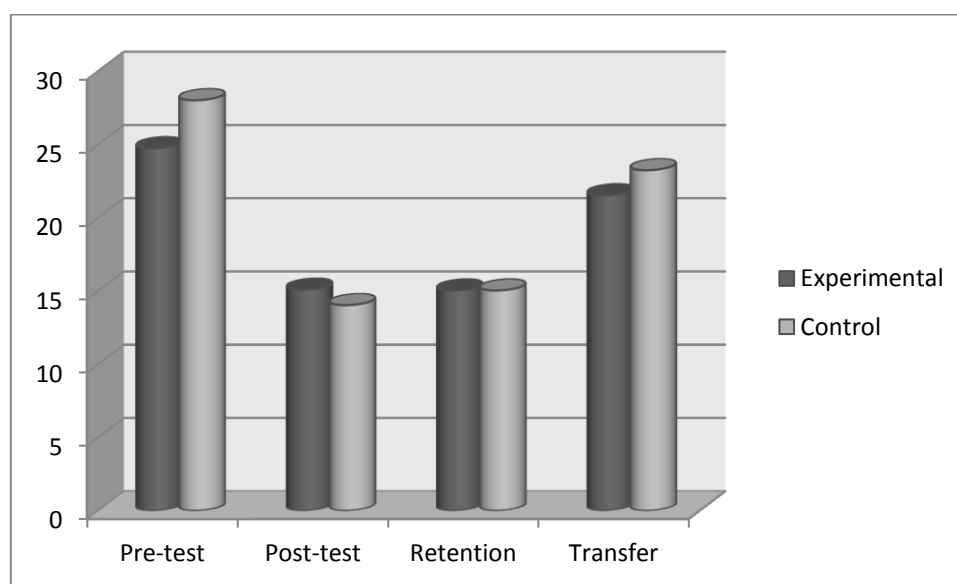


Figure 1. Comparison of the mean of the test scores of groups at different stages

In Table 4, paired t-test is used to determine the effect of 8 weeks of training on the performance of participants in two groups in acquisition phase. As the results show, the performance of both groups is better in the post-test than the pre-test. In other words both groups have improved during acquisition phase ($p < 0.01$).

Table 4. Paired T-test Results, to Assess Improvement in the Acquisition Phase

Groups	Mean	Standard Deviation	T statistic	df	Level of Significance
Experimental	9.65	7.88	4.24	11	0.001
Control	13.99	6.47	7.48	11	0.000

Covariance analysis is used to control the effect of pretest. ANCOVA results in Table 4 show that with the control effect of pretest, the experimental and control group do not have significant difference from one another. Because the calculated value of F (-0.136) at ($P < 0.05$) is not significant ($P = 0.716$).

Table 5. Results of ANCOVA on Post-test

Source of Variability	Sum of Squares	df	Mean of Squares	F level	Level of Significance
Pre-test	5.702	1	5.702	0.272	0.608
Group	2.847	1	2.847	0.136	0.716
Error	440.859	21	20.993		

Independent t-test results in Table 6 also show that there is no significant difference between the scores of two groups in retention and transfer tests ($p > 0.05$).

Table 6. Results of Independent t-test to compare the retention and transfer test on control and experimental groups

Stage	Groups	Mean	Standard Deviation	T statistic	df	Level of Significance
Retention	Experimental	15.037	4.148	0.005	22	0.996
	Control	15.030	3.953			
Transfer	Experimental	21.539	2.949	-0.892	22	0.382
	Control	23.241	5.915			

Discussion and Conclusion

Most of the researches emphasize the role of motivation on performance in sports. Accordingly, in this paper, it has been tried to study the effects of the motivational factor of music on the performance and learning of chain skills by children. The results showed that there is no significant difference between the groups in improvement of performance in

acquisition phase. Even the control group showed greater improvement. Also in retention and transfer tests, no significant difference was observed between two group's scores.

Often research shows music is ineffective when more attention and focus is needed in a skill (Crust et al. 2004). For instance Gester and Leith (2001) studied the effect of the different rhythms of music on penalty throws, and found no significant effects on non-athletes. This finding is consistent with the findings of the recent research. Interestingly, the negative impact of the increase in the rhythm of music on the performances that need less concentration rather than coordination has been reported by the research (Gester & Leith.2001).

Karageorghis et al (2011) in a research on the effects of listening to music with slow (115-120 bpm), fast (135-140 bpm) and very fast (155-160 bpm) rhythms on running and fatigue, reported more prominent effect of the fast rhythm and stated that excessive increase in rhythm does not necessarily lead to better performance. Another study conducted by Brunel University in West London suggest that music can enhance endurance and power up to 15 percent and thus helps one to feel less fatigue during exercises and sports. Besides music boosts energy and raises efficiency (Shoeibi.2013). But recently Sabaghyan and Hafez (2013) have reported that listening to fast music does not cause a significant difference in 100 meters swimming in women. Also research findings of F. Torabi et al (2013) showed that the results of general coordination (dot drill test) was 13.5 percent better in the absence of receiving any kind of music and in the control stage compared to the presence of fast music and 6.4 percent better compared to the presence of slow music. Likewise, in terms of agility, participants showed better results without music streaming compared to the presence of fast music. According to these results, music of any sort, leads to a weakening in general coordination. But on the other hand, Young (2003) had studied the effect of music on the execution time of a puzzle task over male and female participants and reported that the performance of the group who listened to the music was better than the control group which is inconsistent to the findings of this study.

To justify the equality of the performance in acquisition phase, reverse theory can be used. According to this theory, the effect of motivation on performance differs according the interpretation of the levels of motivation by the individual. If the motivation is interpreted as enjoyable, the performance is facilitated. If the motivation is interpreted as undesirable, the performance is weakened (Torabi et al. 2009 & Torabi et al. 2012). So it might be possible that the type of music used is not suitable for this kind of chained skill and listening to music while performing the task has been interpreted as unpleasant in experimental group and resulted in almost identical performance for both groups in the acquisition phase.

In discussion of the findings related to the skills in two recent studies, Farnaz Torabi et al (2009 & 2012) showed that both motivational factors of music and spectators causes an advantage in the favor of the participants of experimental group over control group in retention and transfer tests. These results are inconsistent with the findings of this study. This contrast can be due to the difference in the age of the participants in these studies. Because the current study was conducted over children while the study mentioned above was done over university students. Of course, the degree of complexity of the skills might also be effective in such results. In this study, controlling the participants was difficult due to their age and the lack of control over their mental state was one of the limitations of the study.

But to justify this recent finding it can be referred to results of a study by Schmidt and Lee (1988) who stated that the most important condition for learning is the amount of practice and

motivational factors are consideration factors and are of secondary importance (Torabi et al. 2009).

In general, studies that have examined the effect of music on performance, have reported contradictory findings. These inconsistencies can be due to the difference in the type of music used, type of skills, training program used and participant differences (age, gender, physical fitness, skill level etc.) in the studies.

Finally, further research with various music types and other chained skills over subjects of different age and sex is recommended.

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