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The Effect of Classical Music on Two Sports Skills, Agility and Quick Penalty Shot, in Female Basketball Players

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Abstract

Background: The psychological and physiological effects of music have become an attractive field of sports research in the past decade.
Objectives: This study investigated the effect of classical music on two sports skills, agility and free throw shooting, in female basketball players.
Methods: The study population consisted of all female basketball players on a team. From those who met the study criteria, 26 participants were randomly assigned to two groups: a control group (without classical music) and an experimental group (with classical music). The research variables were measured using pre-tests and post-tests. Independent *t*-test was used to test the research hypotheses.
Results: The results of the statistical tests showed a significant difference in post-test scores between the experimental and control groups ($P < .05$).
Conclusions: Listening to classical music significantly improved the performance of female basketball players on agility and free throw shoo ting tasks.

Keywords: Agility, Penalty Kick, Classical Music, Basketball

1. Background

Basketball is a physically demanding sport that requires a wide range of physical skills, including running at high speed and changing directions. Players also need to have a good level of aerobic endurance to be able to play for the duration of the game. The physical demands of basketball vary depending on the position played, so strength and fitness programs should be designed to meet the specific needs of each position (1). Success in any sport requires physical and physiological capabilities that are specific to that sport (2). Therefore, one of the main methods for determining the effectiveness of training programs for sports performance is to assess the physical fitness of athletes (3). Many sports require short, quick movements with changes of direction, rather than straight-line speed, for proper execution (4). In basketball, athletes must learn the skills of moving, stopping, throwing, and passing the ball while avoiding obstacles. They must do this quickly and efficiently, as basketball is a game of seconds and split-second decisions. The elegance, precision, timing, and agility required to execute these skills have made it essential for basketball players to be physically, mentally, and technically fit (1). Speed and agility are known as two important factors in the basketball (1). Success in sports, like other disciplines, depends on a variety of factors, including environmental factors, which are considered to be some of the most important and fundamental factors for success (5). According to researchers, success in the implementation and learning of skills depends on a number of factors, including arousal and the conditions that govern it (5). The conditions that govern arousal are considered to be among the most important factors in the implementation of skills (6). In recent years, researchers have been increasingly interested in the role of environmental factors in the implementation and learning of motor skills (6, 7). Music is one such environmental factor, and there is a significant theoretical basis for understanding how different types of music can affect different people and different tasks (8). Music has long been associated with sports, for a variety of reasons.

It can be used to entertain spectators, elicit patriotism and pride, and enhance the psychological state of athletes. There is evidence that music can also benefit athletes by helping them to control their arousal levels, reduce perceived effort, improve mood, and synchronize their movements (9). Research has shown that music can have a variety of effects, including improving mood, controlling arousal, reducing perceived pressure, improving work output, improving skill learning, creating a mental state, and helping athletes stay in the present moment (10, 11). Muscular strength and power are essential for optimal performance in everyday activities and sports (12).

2. Objectives

Based on the literature review and the limitations of previous studies, we aim to address the question of whether listening to classical music improves agility and quick penalty shot performance in female basketball players.

3. Methods

This study used a semi-experimental pre-test, post-test design with a control group to investigate the effect of classical music on agility and quick penalty shooting in female basketball players. Classical music is designed based on the Jones and Vista 2006 model (13). The study participants were 30 healthy and right-handed young women with an average age of 18 - 22 years. They were randomly assigned to two groups: an experimental group (13 participants) and a control group (13 participants). During the experimental period, 4 participants dropped out, leaving 26 participants to complete the study. The experimental group performed the agility and quick penalty shooting tests while listening to classical music. The control group performed the same tests without listening to music. The inclusion criteria for the study were age, level of education, satisfaction of the club manager, and attendance at the training program for one month. The exclusion criteria were absence from more than two sessions and failure to complete the tasks. The experimental group participated in a free throw and agility test with music, while the control group participated in a free throw and agility test without music. The participants first read and signed a consent form to participate in the study. They then warmed up and performed a free throw test of 30 throws. After a 5-minute rest, they performed an agility test to measure their agility. Both the control and experimental groups performed the protocol at the same time of day on two different days. The only difference was that music was played through the speakers of the hall for the experimental group from the beginning of the protocol until the end of the evaluation period.

3.1. Statistical Analysis

Descriptive and inferential statistical methods were used to analyze the data. The Shapiro-Wilk test was used to assess the normality of the data distribution. An independent *t*-test was used to compare the groups. Statistical analysis was performed using SPSS software version 26, and a significance level of $\alpha = 0.05$ was used.

4. Results

The Table 1 shows the mean and standard deviation of age, height, and weight for the subjects.

Table 1. Descriptive Statistics of Age, Height, and Weight

Variables	Number	Mean ± SD
Age	30	18.63 ± 1.21
Height	30	173.56 ± 5.15
Weight	30	73.23 ± 4.70

In Table 2, the descriptive indicators related to the research variables are presented.

Table 2. Mean and Standard Deviation of Research Variables

Variables	Number	Mean ± SD
Agility (seconds)		
Control (no music)	30	10.67 ± 0.51
Experimental (with music)	30	10.24 ± 31
Basketball free throw		
Control (no music)	30	12.83 ± 2.82
Experimental (with music)	30	16.96 ± 3.27

According to Table 3, the results indicated that the agility of female basketball players is significantly better in the presence of classical music (10/24) compared to the condition without music (10/67). The results of the study showed that listening to classical music significantly improved the agility of female basketball players (P = 0.001). The mean number of successful trials for the group that listened to classical music was 10, while the mean number of successful trials for the group that did not listen to music was 6.7. This means that the group that listened to classical music was able to complete the agility test with significantly more successful trials than the group that did not listen to music.

Table 3. Comparison of Agility in Experimental and Control Groups

Variable	Average	Mean Difference	df	t	Sig
Agility		0.430	29	4.181	0.0001*
Control (no music)	10.67 ± 0.51				
Experimental (with music)	10.24 ± 31				

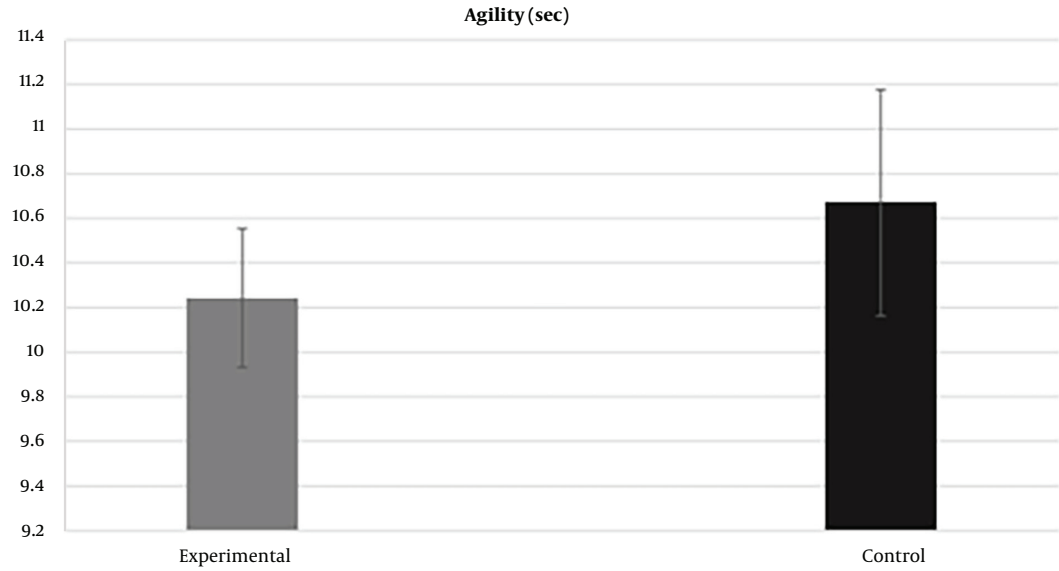

Figure 1. Mean agility scores of the control and experimental groups.

Figure 1 Shows the status of control and experimental groups with each other in agility.

The study found that listening to classical music significantly improved the free throw performance of female basketball players ($P < 0.001$). The mean free throw score for the group that listened to classical music was 16.96, while the mean free throw score for the group that did not listen to music was 12.83. This means that the group that listened to classical music was able to make significantly more free throws than the group that did not listen to music (Figure 2) (Table 4).

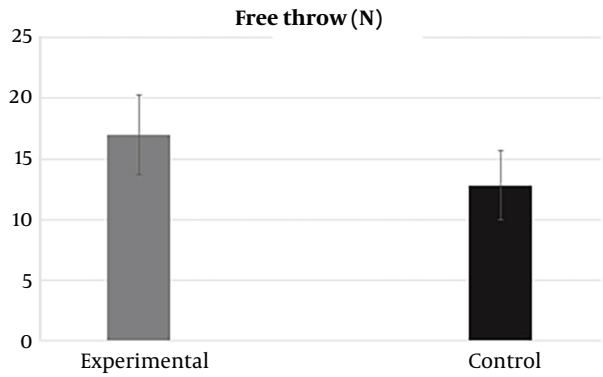

Figure 2. Average free throw changes in the presence and absence of music.

5. Discussion

The psychological and physiological effects of music have gained popularity in sports research in recent years. This study investigated the impact of classical music on two sports skills, agility and free throw shooting, in female basketball players. Overall, the results of this study showed that listening to music significantly improved the performance of the participants in free throw and agility. These findings are consistent with the results of previous studies by Koc (11) and Szmedra (14). A study found that listening to music before training can improve performance, reduce the perception of pain, and help athletes to exert more effort (15). These findings are also consistent with the results of a study by Burrell (2018),

Table 4. Results of Independent *t*-Test to Compare Agility in Conditions with and Without Classical Music

Variable	Average	Mean Difference	df	t	Sig
Free throw (N)		4.133	29	4.691	0.001*
Control (no music)	12.83 ± 2.82				
Experimental (with music)	16.96 ± 3.27				

which showed that listening to music during exercise can improve strength, power, and endurance (16). The study also found that runners reach their peak performance when the rhythm of the music matches their training pace. The researchers secretly sped up or slowed down the music that cyclists were listening to, and the cyclists' pace correspondingly increased or decreased (16). In fact, it is possible to change the brain's focus from distractions to the goal by resetting the brain's frequencies. This can help people avoid focusing on irrelevant thoughts due to the positive brain waves that are produced when listening to music (17). The results of Frey et al.'s research showed that music with higher frequency intensity causes more stimulation of brain activity and, as a result, increases movement and strength activities in athletes (18). In fact, listening to music can increase the intensity of exercise by releasing higher levels of dopamine in the brain. Dopamine is a neurotransmitter that is associated with pleasure and motivation (19). Listening to music can also improve emotional state by increasing neural activity in an area of the brain known to release dopamine. This area of the brain is activated when an athlete decides to continue training despite fatigue, which is known as the interpretive model of training adjustment (20). A study found that athletes who trained with music had lower heart rates than those who trained without music. This may be because music can disrupt the neural processing of stress, which can lead to a lower heart rate and a feeling of relaxation. The psychological effects of music can also help athletes to focus on their training and reduce the perceived exertion of the exercise. This can lead to better performance and a more enjoyable experience (21). From a physiological point of view, music can stimulate the cerebral cortex and increase the excitability of motor areas of the brain, such as the premotor cortex or the primary motor cortex (9). The human brain is one of the target centers for the effects of music. The brain understands the different components of music through nerve stimulation and the release of hormones from nerve terminals and endocrine glands. This improvement in mood is caused by increased relaxation, which is a result of changes in the nervous system and endocrine glands (secretion of endorphins) (19).

The study has several limitations that should be considered when interpreting the results. These limitations include: The study had a small sample size of only 26 participants, which limits the generalizability of the results to the wider population; the participants were all female; the study only looked at the effects of listening to preferred music; the study did not control for other factors that could have affected performance, such as the participants' level of motivation or fatigue; the study was conducted over a short period of time. The study did not measure the participants' motivation or enjoyment of the exercise. Hence, Future studies should address these limitations to provide a more comprehensive understanding of the effects of music on performance.

5.1. Conclusions

In general, music can have a positive influence on athletes' performance, regardless of their skill level. However, more research is needed to fully understand the mechanisms by which music affects athletic performance and to identify the optimal types of music for different athletes and sports.

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Footnotes

Authors' Contribution: Performed experiments and collected data; G.H.Z. Supervised, directed and managed the study; G.H.Z. Wrote and Edited manuscript.

Conflict of Interests: The author declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Ethical Approval: The present article was adopted from a M.A thesis approved by the Islamic Azad branch, Iran. This study was approved by the Human Subjects Committee of Islamic Azad Branch (Ref 2015K067).

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Informed Consent: The participants first read and signed a consent form to participate in the study.

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