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Effect of Aerobic Rhythmic Exercises with and without Music on Emotional Intelligence and Motor Proficiency in Preadolescent Males

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Abstract

Objective: This study investigated the effect of aerobic rhythmic exercises with and without music on emotional intelligence (EI) and motor proficiency (MP).
Method: Participants were 45 boys (M_{age} = 11.8 ±1.34) who volunteered for the study while attending summer programs. EI was accessed with the Schutte Self-Report Emotional Intelligence Scale, and MP was evaluated by the Bruininks-Oseretsky Test for Motor Proficiency– 2. Participants were randomly divided into three groups: control (G1), aerobic exercise with (G2), and without music (G3). Experimental groups trained completed an eight-week program, three sessions per week, while the control group performed their normal activity. Analysis of covariance was used to compare post-testing outcomes among the groups.
Results: Changes in EI in G2 group were significantly higher compared to the G1 group ($p = 0.01$), but there were no significant differences between G1 and G3 ($p = 0.19$), and between G2 and G3 ($p = 0.21$). In MP G2 was better than G1 ($p = 0.00$), and G3 ($p = 0.02$), and also G3 was better than G1 ($p = 0.00$).
Conclusion: The results of this study show that combining aerobics with music can be effective in improving both EI and MP, which can be used to strengthen motor skills and intelligence in schools and clubs.

Introduction

Emotional intelligence (EI) describes the ability, capacity, skill, or self-perceived ability to identify, assess, and manage the emotions of one's self, of others, and of groups (Serrat, 2017). People who possess a high degree of EI know themselves very well and are also able to sense the emotions of others, they are affable, resilient, and optimistic (Serrat, 2017). In children and adolescence, EI has several advantages, as success in academic performance, and risk factors in behavior are reduced (Paavola, 2017). Now there are several statistically reliable measures of EI and emotional competence for preadolescence and children. EI is an important element for success, happiness, communication and interaction, so is one of the important aspects of a person's life (Paavola, 2017).

In recent years, the concept of that EI become one of the main research topics in psychology. Researchers have found that EI affects individual and professional success. In confirming the importance of EI, recent research has reported its

relevance and its positive impact on academic performance (Shah, Sanisara, Mehta, & Vaghela, 2014), motivation (Naik & Kiran, 2018), learning (Buzdar, Ali, & Tariq, 2016; Ebrahimi, Khoshsima, & Zare-Behtash, 2018), task and contextual performance (Bozionelos & Singh, 2016), and athletic performance (Konter, 2010).

Psychologists believe that the first years of human life determine their future development throughout the whole life. High EI in childhood and preadolescence will lead to higher mental health in adulthood. Yale's Center for EI has argued that EI is effective in learning, decision making, creativity, relationships, and health (Paavola, 2017). Therefore, efforts to improve the EI of children and preadolescence seem to be an important component in improving individual life and providing a healthy community.

Another factor that can affect the future of children and preadolescence, Motor proficiency (MP), is considered an important component of health and well-being should be improved in childhood and preadolescence (Haywood & Getchell, 2014). MP is defined as the optimal level of fundamental movement skill (FMS) and has a positive correlation with physical activity (Gallahue, Ozmun, & Goodway, 2006; Ozmun & Gallahue, 2016). Further, MP has a positive association with learning and academic performance (van der Niet, Hartman, Smith, & Visscher, 2014). Based on the motor competence model, MP increases the level of physical activity by improving confidence and self-esteem (Gallahue et al., 2006). In this way, increasing MP leads to high perceived motor competence, and this increases a person's self-esteem and makes the person participate more in physical activity, that this is associated with health. Stodden et al., (2008) suggested that MP is a primary factor in physical activity engagement and not achieving the optimal MP may be an obstacle that hinders children from enjoying in physical activity. Then later in adulthood, there may be problems in performing motor skills (competitive, recreational, daily activities) that possibly leads to negative health outcomes such as cardiovascular disease (Gallahue et al., 2006).

Motor interventions are known as one of the ways to increase MP and EI. In McMorris & Graydon, (2000), incremental exercise affects cognitive performance positively. Also, Dave & MathildeSt, (2010), examined the effect of physical exercise on cognitive function during development, and reported positive results of motor intervention. Etnier & Al, (1997) performed a meta-analysis which showed the positive effect of exercise on cognitive and emotional variables. Van Capelle, Broderick, van Doorn, Ward, & Parmenter, (2017) summarized and reported different types of interventions affecting MP. Wick et al (2017) also summarized the effects of various types of motor interventions on MP improvement. These studies have emphasized that one of the most important factors in improving MP and EI are motor interventions.

Some exercises, because of their nature, have a greater impact on emotional, physical, psychological and motivational status. Aerobics is one of these exercise that increases physical fitness, agility, strength and other functional variables

(Garnham, Finch, & Salmon, 2001). Music and aerobics are a good combination for development and happiness, moreover, when aerobics is practiced in a group with music, the release of the endorphin hormones affects psychological and emotional variables and exercises associated with music may increase cognitive stimulation by raising motivation (Clarke, 2003; Davis & Bobick, 1998; Salmon, Finch, & Garnham, 2000; Torre III & Howell, 2008; Zhang, 2014). Music may facilitate information about physical activity that reaches the brain (Clarke, 2003; Davis & Bobick, 1998; Salmon et al., 2000; Torre III & Howell, 2008; Zhang, 2014). That said, the effect of music combined with aerobic exercise on EI and MP is unknown.

Research over the past few decades has examined the effects of music intervention on various factors and, showed positive results, such as reducing anxiety (Hernandez-Ruiz, 2005), development and cortisol secretion (Lindblad, Hogmark, & Theorell, 2007), reduces aggression and improves Self-Esteem (Choi, Lee, & Lee, 2010), and improving mood (Saarikallio & Erkkila, 2007). Other studies have examined the use of music intervention as a psychotherapeutic strategy in different populations (Kim et al., 2006; Talwar et al., 2006). Music interventions are effective in improving social, emotional and external pressure and relaxation (Bamford, 2006; McFerran & Crooke, 2014; Vaughan, Harris, & Caldwell, 2011).

The influence of music on physical performance has been discussed in previous studies, additionally, research has shown participants who had music intervention during physical activity had a higher level of perseverance (Copeland & Franks, 1991). But in a study that was conducted on darts throwers, the effect of music on performance was not significantly different from that of the non-music group (Dorney, Goh, & Lee, 1992). Other research implies that stimulating music may have more influence over strength than relaxing music. It seems that stimulating music can be effective in improving physical and mental factors (Lim, Atkinson, Karageorghis, & Eubank, 2009).

Some evidence suggests that an aerobic training intervention along with stimulus music improves the emotional factors alongside motor proficiency but so far, no research has been done in this field. Given that childhood is an important age in the developmental process in terms of learning motor and emotional skills, finding the best way to teach these is very important. So, the purpose of this study is to: (1) the effect of aerobic exercise on EI and MP in 10-14 years old boys. (2) The effect of music on EI and MP in combination with aerobic exercise in 10-14 years old boys.

Method

Research Method

The population of the study was all boys aged 10-14 years old in (deleted for referee). The statistical sample included 45 boys who participated in a summer training program. Participants participated in the study voluntarily, for which a notice was distributed in schools, and those who wished to participate in the study were selected (see more in figure for referees). All

participants were from the same area, and none of them participated in special sports teams and exercises and only participated in school physical activities. Participants had to be: (A) 10-14 years old (B) no medical problems that can affect the results, such as restricted vision, ADHD, DCD or so; based on their health records at school. The study was approved by the Institutional Review Board, and participants were informed of the benefits and risks of the investigation before signing an institutionally approved informed consent document to participate in the study and, parental consent form was received from all participants.

Given that the purpose of the study was to control the disturbing conditions and were wanted to use one instructor for aerobics exercises and, considering the social and cultural conditions in (deleted for referee), it was not possible to combine girls and boys. Thus, we decided to work with boys and it was one of the limitations that we were forced to face.

Measures

Emotional intelligence (EI) was measured with the Schutte Self-Report Emotional Intelligence Scale (SSEIT; Schutte et al., 1998). The SSEIT is a self-report scale consisting of 33 items measuring the following categories of EI: appraisal and expression of emotion in the self and others, regulation of emotion in the self and others, and utilization of emotions in solving problems. Participants rated the extent to which they agreed with statements by using a 5-point Likert-scale (ranging from "strongly disagree" (1) to "strongly agree" (5)). Thus, total scores ranging from 33 to 165, with higher scores indicating higher emotional intelligence. The SSEIT has been proven to be a reliable, valid measure (Schutte et al., 1998). The internal and test–retest reliabilities of the SSEIT total score are high, αs = .93 and .73, respectively, and has been recently used in studies to assess emotional intelligence in adolescence (Mohammadi Oranghi, Ghadiri, Aghdasi, & Yaali, 2020; Zeidner, Shani-Zinovich, Matthews, & Roberts, 2005), and children (as; Ghorbanzadeh, Mohammadi Orangi, & Aghdasi, 2020) .

Motor proficiency were assessed using the short form of the Bruininks-Oseretsky Test of Motor Proficiency-2nd Edition (BOT-2 SF; Bruininks, 2005). This test is a standard tool to assess motor skills in children and adolescents ages 4- (Wuang & Su, 2009; Yoon, Scott, Hill, Levitt, & Lambert, 2006). The test includes four composite motor domains: Fine motor control (fine motor precision and fine motor integration), manual coordination (manual dexterity and bilateral/upper-limb coordination), body coordination (bilateral coordination and balance), strength and agility (running speed/ agility and strength). Raw scores were converted into standardized scores that were used to compute a Total Motor Composite score (Bruininks, 2005).

Procedure

Participants were randomly assigned to each of the control groups (G 1), with (G 2) and without music (G 3). The research program was 10 weeks in duration. The first week was dedicated to the pre-test. The next eight weeks were dedicated to

aerobic training, and post-test was performed in the tenth week. The pre-test was taken by the author and two of his assistants. At first, the method of implementing the Bruininks-Oseretsky test was presented by the researcher to all students once. Then the students took the test. Also, each person had the opportunity to take a symbolic test once. During the test, the researcher measured the score according to the Bruininks-Oseretsky test, and one of the assistants filmed the subjects from the sides and front view via a Samsung Galaxy On5 2016. The researcher once again used these videos to ensure that the grade was assigned correctly. After completing the Bruininks-Oseretsky test participants fill out the Schutte EQ test. The scores of this questionnaire were also added up by the researcher and written for each person. After the pre-test, an aerobics instructor trained the experimental groups for eight weeks. With music (G2) and without-music (G3) groups exercised in the same gym and the same day (with different hours) with the same coach. Exercises were on Saturdays, Mondays and Wednesdays. Training hours were from four to five-thirty and from six to seven-thirty. The group with music practiced the first twelve sessions from four to five-thirty, and the next twelve sessions the group without music practiced at this hour. After completing the training, another researcher took the post-test in the same way as the pre-test

Aerobic rhythmic exercises with music were performed in a group. Participants were organized in three lineups and sorted from shortest to tallest. The instructor stood in front of them and subjects mirrored his movements.

At the beginning of each session, movements related to each individual part of the body, such as the legs, were practiced including a simple march. For example, in addition to marching the participants had to coordinate the left and right foot moves with the coach, and whenever the coordination in the whole group reached an appropriate level, the coach made the task harder. As the participants progressed, the trainer combined the hand and foot movements. When the group reached the harmony, the movements became more complex again. In the final sessions, when coordination between groups reached its peak, the instructor performed all the moves together. Every 5 minutes there was a short break. Throughout the exercise, participants were able to drink water and comment on the process whenever they wanted. These exercises and their teaching methods were conducted in a linear method and they were similar in both groups with and without music. These exercises were practiced for eight weeks and three sessions were held each week. Sessions were one hour long (15 minutes of warming, 15 minutes of cool down and half an hour of rhythmic exercises) (Mohammadi Orangi, Ghadiri, & Mohammadnejad, 2019). The only difference between the two groups was the use of music. One of the groups trained with music and the other one without it. During this period, the control group performed their routine activities.

Music intervention

One of the experimental groups was randomly performed aerobic training with music. To do this, in the first step, all of the music from the site

(http://www.pumpyouup.com/free-exercise-music.aspx) which were suitable for aerobic exercise were downloaded. Subsequently, 24 tracks were chosen and every session one of them was played at the gym. Selected music must: 1. Absence of the reader, 2. Follow a rhythmic theme, and 3. Different rhythm of music (up, down, normal) to match movements. Music was played from an 8-inch Active V8 speaker with 60 dB power, and the instructor designed the movements to fit the music, and the participants repeated the movements to mimic the instructor. The training program was same to that of the group without music (Mohammadi Oranghi, Aghdasi, & Yaali, 2019).

Statistical Method

The Kolmogorov– Smirnov test was used to determine the normality of the data ($p>0.05$). One-way ANOVA test was used to assess the demographic differences of the participants and pre-test of EI and MP. Analysis of covariance was used to compare post-testing outcomes among the groups while accounting for group differences in baseline performance. An alpha of 0.05 was used for all statistical tests. For effects size, partial eta squared are reported, with 0.14, 0.06 and 0.01 referring to large, moderate and small effect size, respectively. Post hoc comparisons were made using LSD tests.

Results

Participant's information is presented in Table 1. One-way ANOVAs did not reveal differences between groups in terms of their demographics (see Table 1).

Table 1. Descriptive information of subjects.

	All N=45 mean±SD	Control Group N=22 mean±SD	With Music Group N=15 mean±SD	Without Music Group N=15 mean±SD	F	P
Age (years)	**11.8±1.34**	**11.85±1.36**	**11.54±1.30**	**12.03±1.40**	**0.48**	**0.61**
mass (kg)	**41.50±9.16**	**40.1±7.2**	**40.92±8.48**	**43.48±11.56**	**0.14**	**0.86**
Height (cm)	**141.91±9.92**	**140.8.1±9.1**	**142.73±10.42**	**142.2±10.75**	**0.54**	**0.58**

All participants who completed the pre-test also returned for post testing. The participants' EI and MP scores are presented in Table 2. Based on the results of ANCOVA test significant differences were observed between the groups in EI ($F_{(2,42)} = 430.92,\ P = 0.00, \eta p2 = 0.68$) and MP ($F_{(2,42)} = 101.85,\ P = 0.00, \eta p2 = 0.46$).

Table 2. The participants' EI and MP scores.

		All N=66 mean±SD	Control Group N=22 mean±SD	With Music Group N=22 mean±SD	Without Music Group N=22 mean±SD
EI	Pre-test	79.1±18.98	78.53±18.54	77.8±18.6	81.07±20.88
	Post-test	86.98±17.97	78.87±18.47	94.93±14.33	87.13±18.16
MP	Pre-test	59.64±5.41	58.47±5.54	60.07±5.23	60.4±5.65
	Post-test	64.47±7.07	58.60±5.6	69.80±5.63	65±5.14

Post hoc tests for EI showed changes in EI in G2 were significantly higher compared to the G1 ($p = 0.01$), but there were no significant differences between G1 and G3 ($p = 0.19$), and between G2 and G3 ($p = 0.21$). In MP G2 was better than G1 ($p = 0.00$), and G3 ($p = 0.02$), and also G3 was better than G1 ($p = 0.00$).see Figure 1.

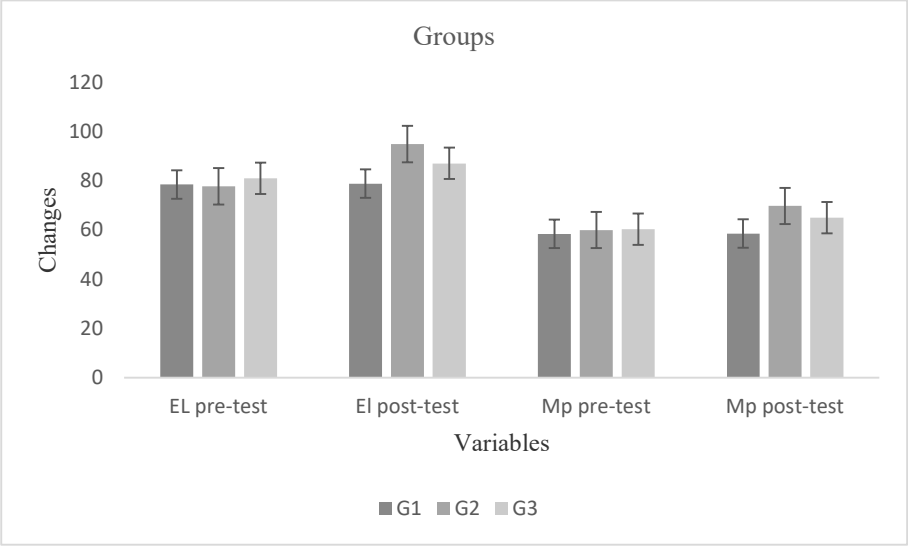

Figure 1. Differences between groups in pre-test and post-test.

Discussion

Results showed that the experimental group had a significant difference in EI and MP compared to the control group in the post-test. Also, the group with music has had more progress than the without-music group in both variables.

The first aim of this study examines the positive effects of aerobic exercise on EI and MP. Research results support this hypothesis; these results are consistent with the Ellemberg & St-Louis-Deschênes, (2010); Etnier & Al, (1997); McMorris & Graydon, (2000) which examined the effect of aerobic exercise on cognitive variables. According to the results of this research, EI is mutable and one of the ways to increase EI is aerobic rhythmic exercise. This can be explained by the EI model, based on this model (Serrat, 2017), the basis for EI is having higher social communication, participation in activities, leadership power, high level of collaboration with the group, and the ability to combine and coordinate different activities. Therefore, the reason for the effect of

rhythmic exercises can be explained as follows: In aerobic exercise, individuals must coordinate their movements with the group, and this increases the team spirit and collaboration among individuals; moreover, this sport brings together the coordination and combination of movements, thereby increasing the power of coordination both individually and between different individuals. Furthermore, this exercise is practiced in a progressive manner and the individual increases their self-confidence and social skills by matching the rhythm of the movements and coordination with the group. Therefore, aerobic exercise with the promotion of essential factors in the EI model is one of the most effective exercises to improve EI.

The study also reported the effect of aerobic exercise on positive MP, which is consistent with the results of studies by Van Capelle et al., (2017) and Wick et al., (2017) that examined the effects of various types of motor interventions on MP.

Based on the Harter's self-esteem theory, the child's sense of adequacy or inadequacy affects her participation in physical activity, and children with high self-esteem participate more in physical activities (Harter & Younie, 1987). In addition, increased MP improves self-esteem in individuals which increases their ability to participate in daily activities, sports, and group playing (Stodden et al., 2008). According to the Stodden et al. (2008) model, exercise interventions are one of the ways to enhance the MP, which in previous studies the effects of various types of exercise on MP were studied and this study also reported the role of aerobic rhythmic exercise in this regard. In fact, teaching and performing rhythmic movement's increases learning and coordination in people. When an activity is regularly practiced, this practice will make individuals react to that exercise and adapt themselves to the exercising schedule. This encourages individuals to correct their motor deficiencies and improve their MP through practice. Thus, aerobic exercises are appropriate for enhancing MP.

The second hypothesis of this study was to examine the positive effects of aerobic exercise with music on EI and MP compared to aerobic exercise without music. The results of this study also support this hypothesis and show that aerobic exercise with music has a greater effect on EI than without-music exercise. These results indicate the impact of music on EI and are consistent with the results of Bamford, (2006); McFerran & Crooke, (2014); Vaughan et al., (2011) studies, which introduced music as the main factor for improving mood, emotions, and excitements. They are also consistent with the results of Lee's, (2010) study, who reported the positive impact of music on EI and Shin's, (2006) who reported the positive impact of music on the EI of children. However, it is not in agreement with the results of the Kim & Kim's, (2018) research, which did not find a meaningful link between the two music groups on the overall EI. This latter research studied the effect of two types of musical methods on EI and the results indicated that the instructed group did not have a significant difference compared to the other group. The contradiction between the present study and the results of Kim & Kim's, (2018) research can be attributed to the fact that in our research one of the groups did not receive music at all.

Regarding another aspect of the second hypothesis, the results of this study showed that the group with music had a significant difference in the post-test compared to the group without music in MP. This is consistent with previous studies such as BL & BD, (1991); Lim et al., (2009). However, it is not consistent with the research by Dorney et al., (1992). This may be attributed to the exercise which was used in the present study and that of Dorney et al., (1992). They studied dart throwing with music but in this research aerobic exercise and music was studied. It can be said that this difference was due to the very different nature of these two sports. Therefore, it seems that music can be more influential with certain sports.

In explaining the results of the second hypothesis, it can be said that when exercise is practiced alongside music athletes can coordinate the speed of music and their movements which, in addition to individual coordination, also stimulates the coordination between groups and encourages the person to continue the activity. This affects the feelings and emotions, thereby improving EI. Furthermore, the combination of music and aerobics provides a link between sense and movement which replaces the information related to physical activity that moves from sensory organs to the central nervous system. This increases efficiency and improves the level of activity-induced excitement. Another explanation can be the individual's attention to music. When a person is exercising without music, the level of motivation declines due to physical tiredness and this fatigue reduces an individual's ability to continue training. While training with music, one can continue exercising by coordinating his movements with the rhythm of music and ignore the disruptive factors such as fatigue. Thus, music makes people more likely to benefit from the positive effects of physical activity which improves EI and MP (Lim et al., 2009). Motivation is another effective factor that is increased by music. Since motivation has a strong connection with participation in activities, it ensures an increased activity. Hence, the higher MP in the group with music can be linked to their higher motivation resulted from listening to music (Bamford, 2006; McFerran & Crooke, 2014; Vaughan et al., 2011). The third factor that can be explained with the results of this study is aerobic exercise itself since it is designed as a series of physical and motor fitness exercises. In aerobic exercise, the large muscles perform rhythmic movements with music for at least 12 minutes. In addition to promoting physical fitness, this sport is very joyful and exciting. When this exercise is performed in a group and using music, in addition to increasing the physical fitness factors, it also affects the cognitive and emotional factors and releases endorphin hormones that are exhilarating. Thus, it motivates the individual for further activity (Clarke, 2003; Davis & Bobick, 1998; Salmon et al., 2000; Torre III & Howell, 2008; Zhang, 2014) which results in improved MP and EQ.

One of the limitations of this study is the focus on males. Also, this study considered only aerobic exercise in which the participants practiced in a linear method. However, the use of other exercises (in comparison with aerobic exercise) for both sexes and with new methods such as nonlinear pedagogy will may have better results.

Conclusion

The results of this study emphasize the effectiveness of aerobic exercise and its integration with music for MP and EI in middle school students. According to these results, combining aerobics with music, can affect factors such as EI and MP in school students.

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