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Original Article

The Effect of Fluoxetine (Serotonin Reuptake Inhibitor) on the Fatigue of Elite Male Basketball Players.

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Abstract

Background: Central fatigue is the most important factor in a person's inability to functionbetter, especially in short periods of time, high intensity exercises normally limit athlete performance and delay the desired result. Therefore, the aim of this study was to investigate the effect of Fluoxetine consumption (serotonin reuptake inhibitor) when reaching fatigue in elite male basketball players.

Methods: In this study, 24 healthy elite basketball players with mean and standard deviation of age, weight, height and BMI were 21.5±.16 years, 43.7±76 kg, 28.3±80 cm and 16.1±81.19 kg/m2 participated purposefully and voluntarily. All the subjects completed and signed the consent form of participation in the study, then were randomly assigned to two groups of 12 people. Six hours before the exercise, one group was given 20 mg Fluoxetine capsules and the other group was given a placebo. Also, half an hour before the start of the exercise, 5 ml of blood was taken from the subjects in order to determine the level of lactate and serotonin levels, and then the subjects ran on a carometer bike with 70% maximum oxygen consumption to the head of fatigue and immediately after Bruce test, 5 ml of blood was taken again from all subjects. Data were analyzed using independent t-test at the level of ($p \leq 0.05$)

Results: The results showed that the time to achieve fatigue in the group that had taken Fluoxetine was lower than the placebo group and they reached fatigue earlier than the group that had taken placebo.

Conclusion: These results show that there are central parts of fatigue that are regulated and adjusted by serotonergic neurons activity.

Keywords: Fluoxetine, Serotonin, Fatigue, Elite basketball players.

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Introduction

Training courses and intense competition are essential for optimal exercise performances and improve it (1). Athletes always try to showcase their best performances during competitions, and several factors prevent them from performing best (2). Central fatigue is one of the effective factors in reducing athletic performance and preventing continued activity (3). Exercises to the extent of fatigue increase serotonin release and release of Serotonin causes central fatigue (4). Researches have shown that increased serotonergic neuron activity is an important factor in central nervous system regulatory components in fatigue during long-term exercises (5, 6 and 7). Fluoxetine is a serotonin reuptake inhibitor that prevents serotonin absorption and thus increases serotonin levels and is commonly used as a treatment for depression and other psychiatric disorders (8). Tryptophan, an essential amino acid, is known as a precursor to serotonin synthesis that is transmitted by carriers during the cerebral blood barrier and later consumed by serotonergic neuron terminals (7). Most tryptophan in serum is not free but in combination with albumin. Other chain, branched and neutral amino acids also compete with Tryptophan to combine with albumin. Serotonin has been proven to play a variety of roles in controlling arousal, sleep and mood in intracerebral activities (5) and perhaps for this reason, it plays a role in causing fatigue during long-term exercises. Understanding the ways and how to generate the energy necessary for physical tasks causes athletes, especially basketball players, to recognize fatigue factors, delay the appearance of fatigue and in case of it, deal with it with appropriate measures. Therefore, most athletes, especially basketball players, use Fluoxetine tablets in successive weeks before training to delay their fatigue, and we also use it. In this study, we looked at whether increasing serotonin in elite basketball players will increase central fatigue or other factors contributing to central fatigue, so we used Fluoxetine capsules to see if by taking these drugs before training, which will increase plasma serotonin

Material and methods

First, the volunteers signed a written consent form, as well as smokers and those who Endocrine diseases, diabetes, heart discomfort and chronic diseases were excluded from the study and in order to conduct the research, the subjects were asked to observe normal sleep patterns (at least 8 hours of sleep), daily activity patterns and diet (12 hours fasting) during the study and from any intense physical activity, dietary supplementation, drug consumption,

coffee, tobacco, cocoa up to 48 hours before the test. Blood samples that affect the system and immune function were avoided until blood samples were collected.

One week before the main test, body characteristics of subjects such as age, weight, height and body mass index were measured and recorded. The weights of the subjects were measured using Seka scale with 1/kg accuracy as standard and minimum clothing, height using Ghodsanj device with 1/cm accuracy (Seka model) and body mass index using composite wind apparatus. Six hours before the test, one capsule containing 20 mg glucose (placebo group) and the same amount of glucose capsules plus 20 mg Fluoxetine e were given to the other group (experimental group) and during these 6 hours, the subjects were only entitled to water, the exercise was performed in each group in one day, half an hour before the start of the exercise in order to determine the level of lactate and serotonin levels of the subjects. 5 ml of blood was taken and then the subjects ran on the electronic treadmill of the Cosmed model (Germany) using Bruce's instructions and with the presence of a doctor to the point of fatigue. Treadmill speed at the beginning of the test was 6.1 km/h and its slope was 10%, which increased the speed and slope of the device every 3 minutes. Borg's pressure perception test was used to assess the training pressure and to be aware of helplessness, and immediately after Bruce test, 5 ml of blood was taken again from all subjects. To reduce the effect of circadian rhythm, all samples were collected at the same time of day (30.7 to 11 am). To prevent lysis, immediately the blood serum cells taken from the subjects were separated with high precision using Hettich refrigerated centrifuge (made in Germany) at 4°C, for 10 minutes with a round of 3,000 rpm with high accuracy and poured into separate microtubes. After each sampling and placed on dry ice, samples were labeled three times each subject and frozen and stored at -70°C for further analysis.

Statistical Analysis

To determine and measure serotonin levels from special kit (LSD company from Germany) and lactate level was determined by lactate. Elisa method was used to determine serotonin concentration. Data were analyzed using correlated t-test at $p<0.05$ level and the results were analyzed using SPSS21 software and $p>.05$ was valued.

Results

Based on the results, the mean and standard deviation of age, weight, height and BMI were 2.16±21.5 years, 43.7±76 kg, 28.3±180 cm, and 16.1±81.19 kg/m2, respectively. As the results showed, the mean of serotonin immediately after training was 430 in the experimental group and the placebo group was 350 ng/ml (Fig. 1). Therefore, there was a significant difference between the amount of serotonin in the two groups after training (0.05p<) and the mean of lactate immediately after training in the experimental group was 1.4±3.7 and the placebo group was 1.2±3.3 mmol/L (Fig. 2). There was no significant difference between the two groups after the exercise (0.05p>) and the time to achieve fatigue in the experimental group was 13.22 minutes and in the placebo group was 14.54. The above tests showed that there was a significant difference between the time of reaching fatigue in the two groups (p<./05).

As the results show, the resistance time and continuation of training in the group that consumed 20 mg Fluoxetine was lower than the placebo group. These changes cannot be attributed to differences in the intensity of practice between groups. The volume of water consumed was the same in both groups. Heart rate was the same in both groups at all times of training. Pressure perception rate increased progressively during training, but no significant difference was observed. Serotonin concentration increased immediately after training, but in the group taking Fluoxetine e capsules, lactate levels increased significantly in both groups immediately after training, but there was no difference between the lactate levels in the two groups.

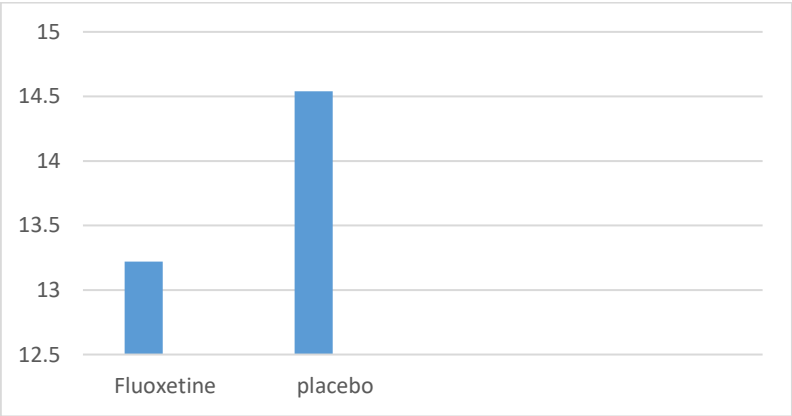

Figure 1. Time to achieve fatigue in the placebo group and the Fluoxetine group.

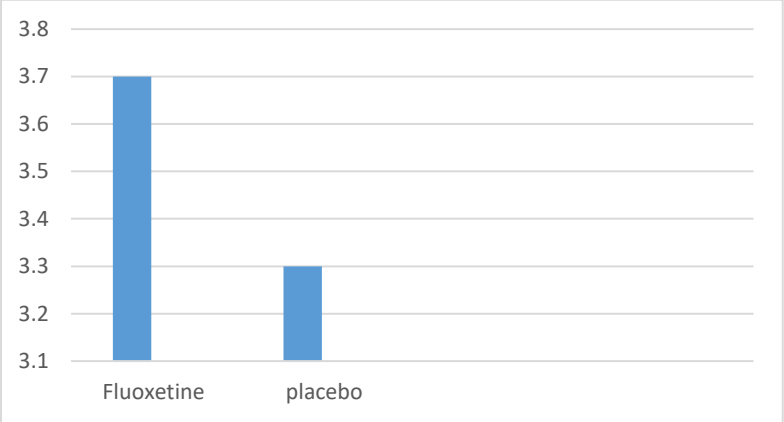

Figure 2. Lactate levels in the placebo and Fluoxetine e groups before and after training.

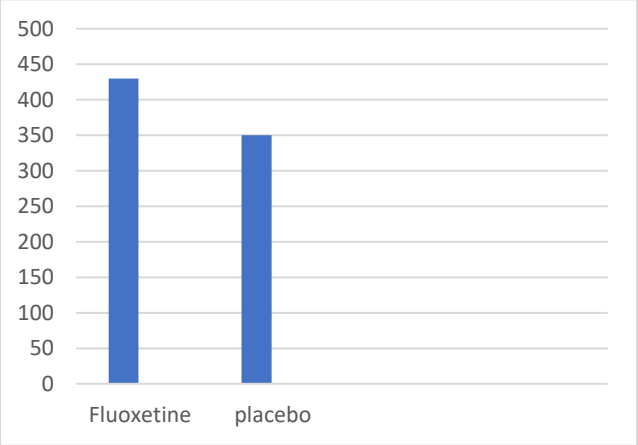

Figure 3. Serotonin levels in the placebo and Fluoxetine groups before and after training.

Discussion

The inability to continue training in some events may lead to loss of central conduction or motivation and cause changes in brain motor activity. The role of changes in neurotransmitters in fatigue and loss of motivation during the above-mentioned long-term maximum training is a subject that has been less researched. The results of this study showed that the time of resistance and continuation of training in the group who had consumed 220 mg Fluoxetine 6 hours before the exercise was lower than the placebo group. These changes cannot be attributed to differences in the intensity of practice between groups. The volume of water consumed was the same in both groups. Heart rate was the same in both groups at all times of training. Pressure perception rate increased progressively in both groups during training, but no significant difference was observed. Serotonin concentration increased

immediately after training, but in the group taking Fluoxetine e capsules, there was a significant increase in lactate level in both groups immediately after training, but there was no difference between the lactate levels in the two groups. Lasorda (2020) showed that changes in plasma amino acid concentrations can play a role in central fatigue by changes in the synthesis, concentration and release of transporters, and especially serotonin in the brain (9). In order to prove the role of Serotonin in central fatigue during long-term exercises, the question must be asked: Does the difference in serotonin activity in the brain that occurs among different people reflect the ability to continue and practice.

Serotonin has a specific selective property and is altered by some drugs, such as serotonin-absorbing inhibitors used in the treatment of depression (10 ,11). There are a wide range of medications that affect serotonin metabolism or activity. The first pharmacological treatment is to improve depression. As their names indicate their role, the first step is to break down Serotonin and then, possibly, increase brain serotonin levels. Some studies have shown that serotonin-absorbing inhibitors reduce workout tolerance during workouts. (12،6)

Mossen et al. (2021) showed that blocking serotonin absorbers by serotonin reuptake inhibitor treatment increases serotonin concentration (5). Wyten et al. (2021) in a study before the exercise divided 12 subjects into two groups who gave tryptophan supplementation to one group before and gave the other group a placebo with 80% maximum oxygen consumption. Fatigue was earlier in the group that had taken Tryptophan supplementation before exercise than the other group, which is consistent with the present study(13). Chiki et al. (2018) first used serotonin reuptake inhibitor (paroxitin) and the subjects were divided into two groups of 7 and divided into one group 3 hours before practice one. They gave 20 mg paroxitin capsules and gave the other group a placebo, and the subjects ran to the point of exhaustion on the treadmill. Mann et al. (2021) examined the effect of paroxetine on 20 male athletes and the results showed that the time to achieve fatigue significantly decreased after taking paroxetine, which is consistent with the present study(1). Shimo et al. (2021) have used serotonin antagonist (ritansrin). The subjects were divided into two groups of 11, and they gave a 20 mg ritancesrin capsule to one group for 24 hours and immediately before the training, and gave placebo to the other group, and those with 65% maximum oxygen ran to the maximum level of fatigue on the treadmill. The results showed no differences in fatigue between the groups, which was not consistent with the present study (2). Chiki (2018) used serotonin receptor agonist (busperin). The subjects were

divided into two groups of 8 and one group gave a 45 mg capsule of buspirin one hour before the exercise and gave the other group a placebo, and the subjects ran on a treadmill with 80% maximum oxygen to the level of fatigue, and the results did not show any changes between the two groups at the time of exhaustion, which is not consistent with the present study(14). This research has provided clear evidence that changes in the activity of serotonin in the brain are associated with changes in exercise tolerance.

Conclusion

The results of this study show that the time to achieve fatigue decreases following the consumption of Fluoxetine capsules and athletes reach fatigue faster. The research provided evidence to support suggestions that the role of serotogenic neurons in the fatigue process during endurance training has been noted. Fluoxetine is clinically used in the treatment of depression and is a serotonin reuptake inhibitor, so its effect as a Serotonin agonist, and considering that the amount of Serotonin in the group that had consumed Fluoxetine was higher after training, it is concluded that Fluoxetine consumption increases serotonin release and consequently increases serotonin causes faster fatigue.

Competing interests

There is no competing of interest to disclose

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