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Effects of moderate exercise intensity on serum nesfatin-1 levels in young females

Orta yoğunluktaki egzersizin genç kadınların serum nesfatin-1 seviyesine etkileri

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ABSTRACT

Purpose: Nesfatin-1 is known as an energy regulatory hormone. Exercise induced increase in nesfatin-1 levels has been considered as powerful mechanism against metabolic disorders. In this study we evaluated the effects of moderate exercise intensity on serum nesfatin-1 levels in young females.

Material and Method: Total of 12 females performed a 45 minutes of running exercise at their 70% of maximal heart rate. Venous blood samples were taken before and after exercise. Muscle activity condition were evaluated using serum creatine kinase levels (CK). Nesfatin-1 levels measured using enzyme linked-immunosorbent assay (ELISA) method. CK level was measured using autoanalyser. Paired t-test was used to analyse data for significance.

Results: Nesfatin-1 levels increased from baseline value of 159.9±18 ng/mL to 178.2±20 ng/mL to end of exercise (increase of 11%) ($p<0.005$). In addition, during exercise CK increased significantly from 115.5±20 U/L to 146.7±28 U/L ($p<0.05$). During exercise, there was no significant correlation between increase of nesfatin-1 and CK levels. There was a positive correlation between nesfatin-1 and fat mass ($R=0.66602$, $P=0.01$). Consequently, moderate intensity aerobic exercise induced muscle strain may cause elevate CK levels and stimulate increase in nesfatin-1 levels.

Conclusion: Thus, exercise is an important tool that may have additional effects on energy regulation via affecting nesfatin-1 secretion in young females.

Keywords: Aerobic exercise, nesfatin-1, creatine kinase, energy regulation

ÖZ

Amaç: Nesfatin-1 enerji düzenleyici bir hormon olarak bilinmektedir. Egzersize bağlı artan nesfatin-1 seviyesi metabolik hastalıklara karşı mücadelede önemli bir etken olarak düşünülmektedir. Bu çalışmada orta yoğunluktaki egzersizin kadın deneklerin serum nesfatin-1 düzeyleri üzerine olan etkilerini belirlenmesi amaçlandı.

Gereç ve Yöntem: Toplamda 12 kadın denek maksimal kalp atım seviyelerinin %70 ine denk gelen seviyede 45 dakikalık koşu egzersizine katıldılar. Venöz kan örnekleri egzersiz öncesi ve hemen sonrasında alındı. Kas aktivite durumu serum kreatin kinaz (CK) seviyesi ile belirlendi. Nesfatin-1 seviyesi enzim bağlantılı-immunosorbent essey (ELISA) yöntemi ile ölçüldü. CK seviyesi oto analizör ile değerlendirildi. Eşleştirilmiş t-testi istatistik önem analizinde kullanıldı.

Bulgular: Nesftin-1 seviyesi egzersiz başında 159,9±18 ng/mL olup egzersiz sonunda 178,2±20 ng/mL seviyesine artış gösterdi (11% artış) ($p<0,005$). Ek olarak Egzersiz CK seviyesinde 115,5±20 U/L den 146,7±28 U/L ye anlamlı atış gösterdi ($p<0,05$). Egzersiz sırasında nesfatin-1 ve CK artış değerleri arasında korelasyon gözlenmedi. Nesfain-1 seviyesi ile vücut yağ kitlesi arasında pozitif yönde anlamlı korelasyon gözlendi ($R=0,66602$, $P=0,01$).

Sonuç: Sonuç olarak orta yoğunluktaki aerobik egzersiz ile artan kas aktivitesi CK seviyelerinde yükselme ve nesfatin-1 artışının uyarılmasına neden olur. Böylece, genç kadınlarda egzersiz enerji düzenlenmesi üzerine nesfatin-1 artışı ile ilave bir destek sağlayabilen önemli bir yöntemdir.

Anahtar Kelimeler: Aerobik egzersiz, nesfatin-1, kreatin kinaz, enerji düzenlenmesi

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INTRODUCTION

The importance of physical activity and exercise on improvement of fitness status in subjects with various health capacity are well known (1). Exercise induced increased muscle activity may have significant influence on the balance of body metabolic systems. Acceleration of energy consumption as a result of exercise can be effectively used in diseases with impaired metabolic balance, including obesity and diabetes (2,3). The results obtained from weight-induced related research suggest that exercise is an important tool of effective body weight regulation (4,5).

The other important issue in clinical medicine and sports science is the hormonal regulation of energy homeostasis during or after exercise (6). There is an increasing interest in exercise induced hormones that has a potential role in metabolic activity and energy regulation. The introduction of nesfatin-1 hormone which regulates body energy metabolic activity and glucose metabolism, provide advantage against energy regulatory disorders (7,8). The production of nesfatin-1 has been shown in hypothalamus and various part of the peripheral tissues (7,9). The potential roles of nesfatin-1 in body systems are increasing issue among the investigator (10,11). The studies conducted on acute and chronic exercise on blood nesfatin-1 levels are generally performed in male subjects with different fitness status (12-15). However, there are no adequate results concerning nesfatin-1 and exercise relationships in female subjects.

Aerobic exercise induced skeletal muscle strain may also cause altered blood creatine kinase (CK) levels reflecting muscle activity performance (16,17). The CK levels response to the exercise may indicate muscle damage (18). The interrelationships between exercise induced alteration of blood CK levels and nesfatin-1 may present the metabolic defence in response to the muscular stress.

In this study we intended to evaluate the effects of moderate intensity acute exercise induced muscular stress on serum CK and nesfatin-1 levels in young females.

MATERIAL AND METHOD

The study was carried out with the permission of Bozok University Clinical Research Ethics Committee (Date: 2019, Decision no: 2019.02.28_14). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Total of 12 healthy young females were participated to this study. Each subject gave signed informed consents which were approved by the local ethical committee. The subjects' mean (±SD): physical characteristics are given in **Table 1**.

Table 1. The (mean±SD) values for age, body weight, height body fat mass, body fat free mass and body mass index of the subjects (n=12)

Parameters	Values
Age (yr)	21.1±0.3
Body weight (kg)	59.6±2.8
Height (cm)	168±0.37
Body fat mass (kg)	11.14±0.3
Fat free mass (kg)	48.4±0.5
Body mass index (kg/m²)	21.1±0.3

The hydration status of the subjects were carefully controlled to obtain valid and efficient body composition analysis using foot to foot bioelectrical impedance analysis (Tanita, Body Composition Analyser, TBF-300 M) (19). The subjects were chosen in young sedentary living females aged between 18 years to 25 years, in normal body mass index (18.5 kg/m² to 25.0 kg/m²), healthy, non-smoker, taking no medication, no surgical operation, free of cardiac, pulmonary and metabolic disease.

The subjects were taking no vitamins, coffee, alcohol and suggested to avoid performing any exercise before the study. They were also advised to avoid high amount of fatty and carbohydrate contains meals.

The moderate intensity of exercise protocol which is based on heart rate parameter was applied to the subjects during study (20). The subjects predicted maximal heart rate values was estimated using formula of 220-age. Each subject performed an aerobic running exercise at their 70% of their maximal heart rate for about 45 minutes in morning. Venous blood samples (5 ml) were taken before and immediately after exercise in to the approtinin containing tubes to avoid protein denaturation. Blood samples were centrifuged and separated their serums and kept in -20 degree until to analyses.

Serum nesfatin-1 levels were evaluated using ELISA method. Serum CK levels were evaluated to analyse subjects' muscular performance. CK level was analysed using an autoanalyser (Siemens Advia 120). The pre and post exercise values were analysed using paired t-test. $P<0.05$ was accepted as statistically significant. The Pearson correlation analysis was used to evaluate data between change of CK and nesfatin-1 values and their relationships with body composition.

RESULTS

Moderate intensity running exercise caused statistically significant increase in nesfatin-1 levels from baseline values of 159.9 ng/mL to 178.2 ng/mL to end of exercise ($p<0.005$). The 11% of increase in nesfatin-1 levels were observed.

There was a significant positive correlation between nesfatin-1 levels and fat mass in females ($R=0.66602$, $P=0.01$). The CK levels increased significantly from baseline value of 115.5 U/L to end of exercise value of 146.7 U/L ($p<0.05$). There was 26% of increase in CK levels. The individual response of nesfatin-1 and CK during exercise are presented in **Figure 1**.

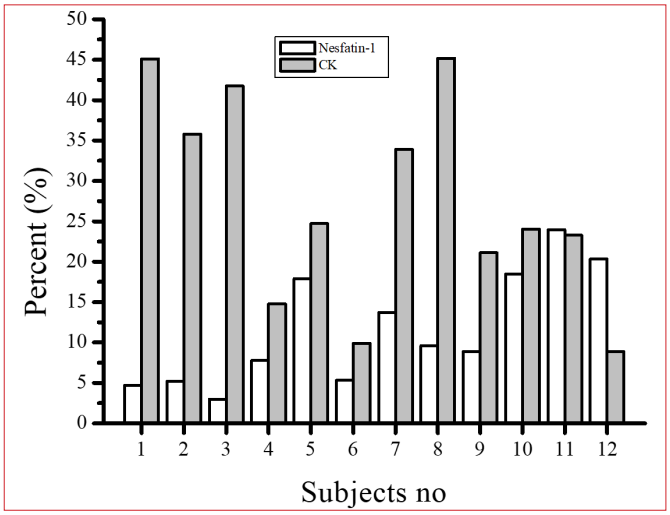

Figure 1. The response of nesfatin-1 (white column) and creatine kinase levels (grey column) during aerobic exercise for each individual subjects.

DISCUSSION

Aerobic exercise induced muscle activity resulted marked increases in both nesfatin-1 and CK levels in healthy females (Figure 1). Exercise and nesfatin-1 relationships has been evaluated in many studies with different subject's fitness condition and with varied exercise protocols (12-15). A significant increase in nesfatin-1 levels after exercise training in paraplegic men that reflects potential marker of effective weight regulation has been reported (21).

The impact of exercise on blood nesfatin-1 levels showed discrepancy among the studies. Nesfatin-1 level has been shown to be increased in exercise performed at night time while it did not change in morning exercise in trained and sedentary males (14). In addition, increase of nesfatin-1 levels response to the exercise did not observed finding in all subjects (14). In other study revealed increase in nesfatin-1 levels after high intensity training and not change in moderate intensity exercise training (12). In addition, during soccer match varied response of nesfatin-1 which is increase or decrease, among the study group have been reported (22). The training program performed in women with obesity and metabolic syndrome showed increase in nesfatin-1 levels (23). However, decrease (24) or unchanged in nesfatin-1 levels after exercise has been reported (14,15,25). The marked increase in nesfatin-1 levels in response to the acute maximal intensity and short duration exercise in normal body weight subjects (26). The increase of blood nesfatin-1 may control energy intake via prevent food intake (10,26).

In addition to the increase of nesfatin-1 levels, a systematic increase in CK levels during moderate intensity aerobic exercise was observed (17,27). However, there is no correlation between change of nesfatin-1 and CK levels in young females. The study performed in young healthy male also showed no significant correlation between change of nesfatin-1 and CK levels (28).

Exercise induced muscular stress may cause increase of circulation nesfatin-1 levels, but may not indicate the severity of metabolic stress levels. Increased blood nesfatin-1 levels may be contribute the treatment of obesity and diabetes (29) or indicate severiy of disease in patient with depressive disorders (11,30).

CONCLUSION

Consequently, despite the controversial results concerning the effects of exercise on increase of nesfatin-1 levels, we showed significant increase in nesfatin-1 levels in healthy young female who performed acute single aerobic running exercise. Thus, exercise has important tool to improve energy homeostasis via effecting energy regulatory hormone of nesfatin-1. However, to find optimal knowledge concerning this issue, further studies could be performed in large subject group with different body mass index and different fitness status.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Bozok University Clinical Research Ethics Committee (Date: 2019, Decision no: 2019.02.28_14).

Informed Consent: All patients signed the free and informed consent form.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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