The comparison of one session graded exercise test effect on fasting blood sugar in trained and untrained woman

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ABSTRACT: Among the effects of various exercising methods, intensity and duration on blood glucose; aerobic exercise is considered as the main strategy to decrease blood glucose. Compared to long term aerobic exercise, one-session graded exercise test (Bruce treadmill test) program as an intense training takes lesser time and wider variety of patients can make use of it. The effects of exercise training on blood glucose may be important but have not been extensively studied in one session training. Therefore, the purpose of this study was to examine the acute effects of a one-session Graded Exercise Test (Bruce treadmill test) program as an intense training on Fasting Blood Sugar while considering the potentially confounding effects of sex, race, age, and BMI as well as changes in training status and physical fitness levels. Fifteen young (18–25 years) trained and fifteen young sedentary untrained controls women, matched for age and body mass index (BMI), were enrolled in the study. In order to evaluate halting levels of glucose, 5th blood was drawn from anti-cubital vein in a sitting position after 12 hours of fasting in the beginning of the trial (pre-test) and at the end of the one-session graded exercise test (Bruce treadmill test) program (post-test). Concentrations of glucose were measured through GOD Photometric Method (using glucose kit made by Pars Azmoon Company-Iran with internal measurement degree of 1.28 and sensitivity of 5 mg/dl) respectively. A two-tailed independent samples t test was used for comparing of FBS means between the trained and untrained groups. The FBS means in pretest and posttest of each group compared with a two-tailed paired samples t test (p<0.05). Decrement of fasting blood sugar concentration in pretest and posttest of trained (p=0.002**) and untrained groups were significant (p=0.006**). The results of this study indicated that one-session graded exercise test (Bruce treadmill test) program were significantly decreased fasting blood glucose levels and corrected the pattern of diabetes in trained and untrained sedentary females. The results demonstrate an acute blood glucose reducing effect of one-session Graded Exercise Test (Bruce treadmill test) program as an intense training in trained and untrained women and of a magnitude similar to that obtained by others, even after one-session or a long period of exercise training.

Key word: Bruce treadmill test, Fasting Blood Sugar, Training, Woman, Diabetes.

INTRODUCTION

Exercise training plays a crucial role in the prevention and treatment of several chronic diseases, including glucose intolerance states, type 2 diabetes (Carpenter et al., 2007; Cox et al., 1999; Della et al., 1993) and diabetes related diseases (Dela et al., 1994; Della et al., 1995). Moreover, it has been demonstrated that exercise training improves the quality of life in the general population ( Ebeling et al., 1993). Recent clinical trials and prospective studies have highlighted the importance of physical activity and exercise trainings (Boule et al., 2001; Carpenter et al., 2007; Cox et al., 1999; Della et al., 1993) or combined physical activity and dietary lifestyle modifications (Dela et al., 1994; Della et al., 1995; Ebeling et al., 1993) in decrement of blood glucose and the prevention of diabetes. Exercise training studies have demonstrated improvements in blood glucose metabolism in a variety of groups (Fauci et al., 2008; Fritz et al., 2006; Helnrich et al., 1991; Hughes et al., 1993; Ivy et al., 1992; Kern and Wells, 1990). Several studies performed in subgroups ranging from diabetes to trained athletes have suggested that physical activity and exercise trainings leads to improvements in blood glucose metabolism and glucose decrement that return to pre training levels and the effects of exercise trainings on blood glucose (Knowler et al., 2002; Poirier et al., 2002; Praet and Van Loon, 2007). The time course for the changes in blood glucose has important practical implications in terms of prescribing an optimal exercise frequency and intensity. Furthermore, the effects of exercise training on blood glucose may be
In addition, low glucose levels have been involved only 40% physical, performed using SPSS respectively. The normality of distribution and homogeneity of variances tested with Kolmogorov-Smirnov test was used for comparing of FBS means between the trained and untrained groups. The FBS statistically one session intense training as an intense training program as an intense training session program as an intense training. Therefore, the method can be utilized, especially by passive patients. Patients performing one-session program as an intense training, who are aroused more by daily activities (Dela et al., 1994). On the other hand, the method involves nearly 100% of body muscles (Dela et al., 1994), while regular aerobic exercise methods involve only 40-60% of them. Comparing how long term aerobic exercise and one-session graded exercise test (Bruce treadmill test) program as an intense training affect glycemic short- (fasting glucose level of blood) and long term (glycosylated hemoglobin) indices, the present study intended to know whether one-session graded exercise test (Bruce treadmill test) program as an intense training can be considered as a modern measure to control glycaemia effectively, even as a more effective method in comparison to aerobic exercise. Therefore, the purpose of this study was to examine the acute effects of a one-session Graded Exercise Test (Bruce treadmill test) program as an intense training on Fasting Blood Sugar while considering the potentially confounding effects of sex, race, age, and BMI as well as changes in training status and physical fitness levels.

**METHODS**

Fifteen young (18–25 years) trained women, recruited by the department of exercise physiology, and fifteen young (18–25 years) sedentary untrained controls women matched for age and body mass index (BMI), recruited from a research center (Faculty of Physical Education and Sports Sciences, Tehran), were enrolled in the study. Face-to-face interview and personal-medical questionnaires were used to choose 30 women as subjects of the study. Before signing letters of consent, the subjects were given necessary information about the study and possible risks orally and in writing. The subjects were promised that their information would be kept confidentially and they were allowed to change their mind about participating in the study whenever they intended. All of the above-motioned steps were verified by Ethical Committee of University. It is noteworthy that the total subjects have not been smoking and sedentary untrained have not been participating in regular exercise programs. Trained women participating in the study had training experiences for a total of 2 years. Total subjects have not been undetectable acute and chronic diseases levels and good glycemic control, as determined by fasting blood sugar. Subjects with familial or personal history related to diabetes were excluded. Body Mass Index (BMI) of the subjects was measured via dividing weight (kg) by the square of height (m). In order to evaluate halting levels of glucose, 53C blood was drawn from anti-cubital vein in a time less than 1 min following bandaging with tourniquet in a sitting position after 12 hours of fasting in the beginning of the trial (pre-test) and at the end of the one-session graded exercise test (Bruce treadmill test) program (post-test). All samples in the pre-test were drawn at 8 A.M. the subjects were asked to avoid any physical activity during 24 hours before blood drawing except for daily routine activities. Concentrations of glucose were measured through GOD Photometric Method (using glucose kit made by Pars Azmoon Company-Iran with internal measurement degree of 1.28 and sensitivity of 5 mg/dl) respectively. All subjects in two groups performed one-session graded exercise test (Bruce treadmill test) program. In order to determine whether there were any statistically significant differences in the FBS of subjects during training program, a two-tailed independent samples t test was used for comparing of FBS means between the trained and untrained groups. The FBS means in pretest and posttest of each group compared with a two-tailed paired samples t test. The normality of the distribution and homogeneity of variances tested with Kolmogorov–Smirnov and Levene’s tests, respectively. Significance level was considered to be p<0.05 for all tests. All the statistical analyses were performed using SPSS-19 Software.
RESULTS

Mean and Standard Deviation (M ± SD) of the fasting blood sugar in trained and untrained groups presented in table 1. Mean differences of fasting blood sugar concentration (Trained: 99.53±16.31 vs. Untrained: 101.53±17.23 mg.dl⁻¹) between groups in pretest were not significant (t(28)=0.58, p=0.566). Mean differences of fasting blood sugar concentration (Trained: 85.47±4.81 vs. Untrained: 86.47±4.63 mg.dl⁻¹) between groups in posttest were not significant (t(28)=0.45, p=0.650). Decrement of fasting blood sugar concentration in pretest (99.53±16.31 mg.dl⁻¹) and posttest (85.47±4.81 mg.dl⁻¹) of trained group were significant (t(14)=3.77, p=0.002**). Decrement of serum concentration of fasting blood sugar in pretest (101.53±17.23 mg.dl⁻¹) and posttest (86.47±4.63 mg.dl⁻¹) of untrained group were significant (t(14)=3.26, p=0.006**). Mean differences of fasting blood sugar concentration reduction in pretest and posttest (Trained: 14.07±4.47 vs. Untrained: 15.07±17.89 mg.dl⁻¹) between groups were not significant (t(28)=0.168, p=0.868).

Table 1. Mean and Standard Deviation (M ± SD) of the fasting blood sugar in trained and untrained groups.

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean ± SD</th>
<th>n</th>
<th>Independent sample t test</th>
<th>Mean Diff</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trained</td>
<td>99.53±16.31</td>
<td>15</td>
<td></td>
<td>-14.07</td>
<td>3.77</td>
</tr>
<tr>
<td>Pre</td>
<td>85.47±4.81</td>
<td></td>
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<tr>
<td>Post</td>
<td>86.47±4.63</td>
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<td>Paired sample t test</td>
<td>t(28)=0.58</td>
<td>.58</td>
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DISCUSSION

The results of this study indicated that one-session graded exercise test (Bruce treadmill test) program were significantly decreased fasting blood glucose levels and corrected the pattern of diabetes in trained and untrained sedentary females. The results of previous studies indicated that increment of physical activity levels and exercise training modified blood glucose and diabetes risk factors and decrement of blood glucose and diabetes morbidity and mortality. These results indicated that long-term physical activity and exercise training have beneficial effects on fasting blood sugar concentration (Cox et al., 1999; Dela et al., 1993; Dela et al., 1994; Della et al., 1995; Ebeling et al., 1993; Fauci et al., 2008; Fritz et al., 2006; Helmrich et al., 1991; Ivy et al., 1992; Kern and Wells, 1990; Knowler et al., 2002; Snowling and Hopkins, 2006; Tseng et al., 2005). Decrement of fasting blood glucose concentration in trained and untrained sedentary females in this study resulted from graded exercise test (Bruce treadmill test) program. Decrement of fasting blood glucose in this study resulted from blood glucose utilization increase-induced anaerobic training. On the other hand, aerobic exercise and anaerobic training increased insulin sensitivity and muscle glucose intake and decrease insulin resistance; which led to increase in muscle glucose metabolism and decrease in serum glucose levels. One-session graded exercise test program as an intense training in trained and untrained women diminished fasting glucose significantly. The decrease of fasting glucose in trained and untrained women might be associated with glucose uptake by active muscles in absence of insulin (Hughes et al., 1993). The increasing procedure of glucose uptake by skeletal muscle in non-diabetics women during physical activity continues until more than 48 hours only after 1 exercise session. The response has been known as a consequence of increasing sensitivity to insulin and also endogenic influence of GLUT4 carriers rise on sarcolemma of muscle filaments (Ivy et al., 1992). The endogenic effect in skeletal muscle can be attributed to glycogen synthesis in muscle which can continue for more than 5 hours. Increasing sensitivity to insulin caused by physical exercise is higher when muscle mass is more engaged in the exercise.

Nevertheless, when provided amateur individuals (e.g. the subjects of the present study) experience eccentric muscle contraction (e.g. running), muscle injury can be inevitable which might bring about temporary decrease in insulin level. The popular long-term influence of physical exercise on environmental glucose consumption and sensitivity to insulin is associated with stimulatory modus operandi induced by insulin. Therefore, physical activity can practically mitigate low glucose consumption caused by low insulin (Ivy et al., 1992). On the other hand, the significant variation in fasting glucose during the assays in both groups may be ascribed to possible agitation during sampling which causes secretion of a lot of epinephrine. The hormone strives against insulin and hinders secretion of insulin and leads to secretion of glucagon which elevates blood sugar (Kern and Wells, 1990). One-session Graded Exercise Test (Bruce treadmill test) program as an intense training in trained and untrained women in the present study affected glycaemia control efficiently. Muscle contraction can be claimed to possess a pseudo-insulin effect and to transmit a lot of glucose into the cell as energy fuel. Furthermore, it permits muscle filaments to have a low concentration of glycogen for a rather long time. On the other hand, after completion of physical exercise, muscle cells figure on restoring glycogen reserves. Therefore, blood glucose concentration is low for a few hours after physical activity (Vancea et al., 2009) and accordingly, glycosylation possibility of hemoglobin decreases. The present study faced with some limitations such as incomplete control over nutrition of the subjects, daily lifestyle, and repetitious blood samplings. However, the present study can be complimented due to its in-vivo performance. Uniqueness of the present study is in
comparing the effects of One-session graded exercise test (Bruce treadmill test) program as an intense training in trained and untrained women on blood sugar. However, more studies should be performed to elucidate the effects of the methods.

CONCLUSION

The results demonstrate an acute blood glucose reducing effect of one-session Graded Exercise Test (Bruce treadmill test) program as an intense training in trained and untrained women and of a magnitude similar to that obtained by others, even after one-session or a long period of exercise training.

REFERENCES


