ORIGINAL ARTICLE

An investigation on the effect of strength and endurance training on depression, anxiety, and C-reactive protein's inflammatory biomarker changes

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Introduction: This study is performed to investigate the effect of strength and endurance training on the levels of depression, anxiety, and C-reactive proteins inflammatory biomarker changes. **Materials and Methods:** The research method was experimental, and the statistical population is formed of 300 volunteer male students. After the pre-test, 120 subjects with notable depression and anxiety levels obtained from Beacke and Ketel's questionnaires were selected and randomly divided into two groups of strength and endurance, each containing 60 subjects, and then, again into two groups of experimental and control, each with 30 subjects. All 120 subjects were blood-sampled in the first stage to determine CRP concentration. After 20 sessions of strength and endurance exercises again depression, anxiety, and C-reactive proteins testes were used for both control and experimental groups. Ultimately, the obtained data were analyzed by using *t*-test in dependent and independent groups and covariance analysis in $P \leq 0.05$ level. **Results:** The results showed that the average of age is 25.1 ± 3.2, average of weight is 70.4 ± 8.4 and average of height is 169.8 ± 12.1, in the subjects. Also, the strength and endurance training had reduced the anxiety by 27% ($P = .0001$), depression by 37% ($P = .0001$) and C-reactive proteins by 20% ($P = 0.0001$), in the subjects. **Discussion:** Regarding the different effects of training types on research variables, the results showed that the endurance training has a greater effect in reducing the depression, and strength training, in blood C-reactive proteins reduction, Although, no significant difference was observed between anxiety-reducing effects of strength and endurance training.

Key words: Anxiety, C-reactive protein, depression, strength and endurance training

INTRODUCTION

The percent epoch is called the stress and psychological pressure age.[1] The results of various researches showed that psychosomatic diseases such as depression and anxiety have a deep effect on personal and social performance and grounds for many physical diseases such as cardiovascular ones. Unfortunately, today in the world, attention to psychological health in families and families and sureties is not as important as physical health, Unaware of the fact that the origin of many physical diseases is in psychological injuries.[2,3]

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Most psychologic health professionals believe that all anxiety disorders refer to damaging experiences or previous pressures in life, which are unconsciously oppressed and turned into anxiety. Studies in recent decades concerning the prevalence of this disease show that more that 27% of those referring to psychiatrists are affected by various degrees of anxiety.[4] The intensity is worrisome when crating disorder in normal life, which is usually together with physical symptoms.[5,6]

Another prevalent psychological disorder is depression, which is created by disorders in temper, emotions and reduced biologic force. Negative feelings and helplessness, disoperation and loneliness, feeling of inviolability, guilt, and sorrow in the face, and isolation are obvious symptoms.[7,8] The research shows that one in the in the society suffers from depression and women are affected as twice as men.[4] Civet the provolone of depression and anxiety in various societies. Numerous researches are performed in treating these diseases and in addition to medication, psychiatry, shock-treatment and cognitive

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cures, the exercise therapy have been mentioned as an effective technique. Exercise therapy is a novel treatment which increasingly, and relying on the researchers' conclusions, has drawn public attention and the depressed and anxious patients with negative and despairing mentality toward other treatments. Studies show that the continuous and regular exercising followed by sweating and an increase in the heartbeat could control the blood pressure and emits tranquilizing and pain-relieving hormones such as Endorphin and Encephalin which cause a better reaction in individuals' neural system in critical conditions and anxieties. Experience brights horizons in their release from psychologic stress relying upon this therapy. The fact that exercise has an important and effective role in curing depression and anxiety is supported by using exercise as a supplement with other cures is far more effective.[9,10] Of course further studies should be carried out to be concise about the effects of endurance and strength exercises in reducing the depression and anxiety disorders and also in planning an effective sport-therapy protocol.

Another variable in the research is C-reactive protein or CRP, a member of proteins family, generated protein or CRP, a member of proteins family, generated following inflammation processes. Following any inflammation, infection and texture irritation, it may increase by l000 times in blood; therefore its measurement has a special value in diagnosis, confirmation and treatment of various diseases such as infection, trauma and inflammation in endothelial cells of coronaries.[7,11] This protein is quickly disappeared in blood after the inflammatory response has subsided.

The research shows significant relation between intense depression and anxiety and increased amount of CRP in men's and women's blood.[12,13] Also, significant relation was observed between the increase level of this protein and cardio as cular and brain strokes.[14] Toker and Shiron[15] indicated the relation the relation between depression and anxiety, and CRP, but that differed is each sex. the research conducted by Wiles jus approved the relationship between acute depression with CPR decrease in men[16] on the other hand Douglas and Taylor believe that there is weak relation between depression and anxiety with CPR decrease and CPR is an only indirect and moderato parameter to cause coroner vessels diseases.[12]

On the other hand, the importance of physical activity, as a supplementary part of daily life is becoming more obvious and scientific evidence indicate health. Benefits of exercise.[17] The research has shown that physical activity with appropriate frequency, intensity and duration is effective in enhancing the physical and mental health levels.[18] Physical activity, in addition to creating physical fitness and developing motive skills, prevents many diseases such as cardiovascular, hypertension, fatness, arthritis, anxiety, depression to occur.[19,20] The psychologists of a depressed person, is that of emptiness and worthlessness and by creating self-rehabilitation and returning self-confidence by exercise, while eliminating negative feelings and creating a "one can change" and "one can be positive and live positively" approach, pave the ground for positive feelings. Through exercise, one feels able to control his/her life even in the hardest situations; his/her life.[1,4] In this realm, Philips supports the effect of aerobic and non-aerobic exercises on the reduction of youth depression but illness depression in middle age and after are not under the effect of sport exercises.[9] Research show an inverse relation between fitness level and CRP levels in adult's blood, which means that increasing the fitness, the CRP in blood decreases.[14]

The bottom-line is that depression and anxiety are among that most prevalent psychological disease with considerable role in cardiovascular disorders. Given the significant relation between anxiety, depression and cardiovascular diseases and CRP concentration in blood; and given the effect of fitness levels in reducing CRP, the efforts of the researchers forward finding suitable solutions to prevent and cure cardiovascular diseases through controlling psychosomatic disorders such as anxiety and depression, have led to presenting numerous clinical and medicinal methods but less attention with these variables at the same time. Therefore, given the confirmed effects of physical activity in physical and psychological health in individuals in different ages[6,21-24] the authors are going to study the effect of two physical activity types namely, strength and endurance training, on the changes in the levels of depression, anxiety and blood CRP concentration as an indicator of inflammation in cardiovascular system of young men. The previous studies have not examined the effects of physical activity, psychological disease and physiological changes, simultaneously. Therefore, the aim of our study is to investigate the effect of strength and endurance training on the levels of depression, anxiety, and C-reactive proteins inflammatory biomarker changes.

MATERIALS AND METHODS

This experimental investing at ion is performed through comparison of research variables and aiming at studying the effect of strength and endurance training on depression, anxiety and C-reactive protein's inflammation biomarker.

In order to choose this study statistical population, there was a call in Azad university physical education organization among male volunteer students. Then 300 volunteer students between 20 to 30 years old were selected in 2011. The statistical population includes 300 young men between 20 to 30 years old, and after depression and anxiety test, a sample of 120 of them with notable depression and anxiety level were

selected and randomly divided into two groups of strength and endurance training, each included 60 subjects, and any of these groups too, were divided into groups of 30, one control and one experimental group. In this research, in addition to blood samples, Beacke questionnaire was used to determine the depression and kettle questionnaire, to determine the anxiety levels. To be assured in content narration in the questionnaires, experts' ideas on the issue were applied. After applying all suggested ideas, the Cronbach Alpha test was performed to determine the questionnaires'' internal reliability and the obtained values on the Beacke questionnaire (.74) and Kettle questionnaire (.89) verified the internal correlation. The achieved reliability in this research is in consistent with the values written in the Chegunian (2002) research for Beackes' depression questionnaire (0.78) and for Kettles' anxiety questionnaire (0.82) [Table 1].

After selecting sample groups and performing pre-tests, the experimental groups did strength and endurance training during 20 sessions, 1.5 h each for l0 weeks (two sessions/week) separately. The specific exercises for the strength group included short-distance sprint running, strength (power) work- outs, and working with equipment, and the specific exercises for the endurance group included aerobic warm-up and at least, 1200_m running at the beginning and by 2500_m gradually to the end of period. After performing the exercises and ending the activity period, the tests for all subjects in both control and experimental groups. In order to analyze the research findings, because of natural distribution and consistent variance of variables, the dependent *t*-test was used to compare the pretest and after test averages in each group, and the independent *t*-test, to compare pretest and after test averages between two groups, and covariance analysis, to study the real effect of in dependent variable. The significance level for all tests was considered as $P \leq 0.05$. All the statistical analysis has been accomplished by SPSS/13 software.

RESULTS

Based on the finding in Table 2, observed F in alpha level of 0.05, Concerning the effect of strength and endurance physical activates on the depression levels of the subjects, has been significant in both control and test groups. The obtained factor shows that the depression level of subjects has reduced by ~ 37% under the in fluency of strength and endurance exercises.

Based on findings in Table 3, the deserved F concerning the effect of strength and endurance physical exercises in control and test groups on the anxiety levels in subjects, has been significant in the level of $\alpha = 0.0.5$. The obtained factor shows that the strength and endurance training has had an effect of about 27% in reducing the subjects' anxiety.

Based on findings in Table 4, the observed F concerning the effect of strength and endurance exercises on the subjects' blood CRP levels was significant in both control and test groups in $\alpha = 0.0.5$ level.

In other words, given the obtained factor, the CRP levels in subjects' blood have reduced by about 20% under the influence of the performed exercises.

Based on findings in Table 5, the significance of obtained concerning the differences in the effects of exercise type on the subjects' depression has more effect in reducing the depression than strength training.

Table 1: Demographic date

	N	M	SD
Age	120	25.1	3.2
Weight	120	70.3	8.4
Height	120	169.8	12.1

Table 2: Covariance analysis for depression in control and experimental groups in strength and endurance exercises

	d.f	F	Sig	Eta factor
Strength and endurance exercises	1	4.24	0.042	0.036
Control and experimental groups	1	67.63	0.000	0.37
Interaction of exercise type and groups	1	0.059	0.809	0.001

Table 3: Covariance analysis of anxiety in control and test (experimental) groups over strength and endurance exercises

	d.f	F	Sig	Eta factor
Strength and endurance exercises	1	0.019	0.891	0.000
Control and experimental groups	1	43.83	0.000	0.276
Exercise type and groups	1	0.245	0.622	0.002

Table 4: Covariance analysis of CRP for control and test groups in strength and endurance training

	d.f	F	Sig	Eta factor
Strength and endurance exercises	1	4.632	0.033	0.039
Control and experimental groups	1	28.952	0.000	0.201
Exercise type and groups	1	0.175	0.676	0.002

Table 5: The effect of exercise type on depression, anxiety and CRP levels of experiment groups

Variables	Exercise type	Tests		*P*
		Pretest mean	Post test mean	
Depression	Strength	11.53	8.56	0.042
	Endurance	9.76	6.73	
Anxiety	Strength	33.96	31.50	0.891
	Endurance	34.74	30.20	
C-Reactive protein	Strength	1.56	0.084	0.033
	Endurance	1.73	1.67	

Also, insignificance of obtained *P* for anxiety indicates the indifference of exercise type's effect on this variable.

For CRP, too, the significance of obtained *P*, indicates higher effectiveness of strength exercises in reducing this variable.

DISCUSSION AND CONCLUSION

Based on research results about 50% of statistical population suffered from different degrees of depression and anxiety, from among which, 120 persons with medium depression and anxiety levels were selected to form control and anxiety levels were selected to form control and experimental groups the pre-test results in both control and experimental groups showed that the subjects' depression level was 10.75 by average [Table 2] and their anxiety level, 35.5 [Table 3], which after strength and endurance exercises, in the second test, these values reduced to 7.54 for depression and 29.66 for anxiety in experiment groups. These results support the idea that physical strength and endurance exercise has reduced the subjects' depression and anxiety.

These results are consistent with those obtained by Stewart and Boomsma and De Moor and Phillips, based on the effect of physical exercise on reduction of psychological disorder such as depression and anxiety,[25] there was no agreement on the amount of its effects though. De Moor and Boomsma believe that acute cases of anxiety and depression are less affected by physical exercises'. Also, Wiles and Haase showed that considerable physical activity has positive effect on the individuals' psychological health.[16]

Physical activity, in addition to modifying hormonal mechanisms, with desirable psychological effects such as increased self-confidence, improved self-respect, enhanced environmental and social interactions, reduced focus on negative mental occupations and replacement of undesirable behaviors with an active and dynamic life style, lead to elevated levels of psychological health.[17,26] It seems that the specific age conditions of the young research population and their mental preoccupations for ambiguous situations of education, job, marriage, etc are among the emergence factors of depression and anxiety in the research population and anxiety in the research population and participating in continuous activates, has led to reduced depression and anxiety in the subjects by creating desirable behavioral habits and psychological effects.

Other findings in covariance analysis showed that 37% of the depression level of the subjects had reduced following strength and endurance training [Table 2], which is consistent with De Moor and Philips' results based on the effect of continuous physical activity in leisure time on reduced depression a higher effect of endurance training on depression decrease.[9,25] It is worth mentioning that similar researches concerning the effect of training type on depression the effect of training type on depression the effect of training type on depression levels have been less performed.

Also the results of covariance analysis showed that because of strength and endurance training, about 27% of subjects' depression has decreased. Although, a significant difference was not achieved between the effects of physical activity types of strength and endurance exercises. Some other previous studies results on the different effects of the exercise type were in agreement with the results of this part of the study,[18,26] which seems that this lack of agreement was because of the statistical population, the exercise type or the testes' physical and mental conditions.

Other findings showed that blood CRP levels in control and test groups were about 20% higher than normal. The value obtained in the first test for all groups was 1.25 by average and in the second test, 1.001 for test groups [Table 5]. These findings emphasize the fact that continuous training can considerably lower the blood CRP as an in Flomaton biomarker. These findings are consistent with the results of Toker, Askari and Stewart.[14,15,17]

Also, the covariance analysis results regarding the effect of strength and endurance exoduses on the subjects' blood CRP showed that blood CRP, as an important indicator of cardiac veins inflammation,[27] has reduced by about 20% and the strength training had a higher effect in this reduction. However, Douglass and Taylor believed that CPR only was an intermediate and direct factor in the appearance of coronal diseases. These results are consistent with Askari and - Danesh based on the effect of physical activity in reduction of CRP.[14,23,24] Though in these researches, no indication was made to the effect of training type on the reduction of this biomarker. In general, one may conclude that, beside other treatments, Continuous and planned exercise may be used as an effective and complementary treatment to prevent and cure psychological disorders such as depression and anxiety, as well as cardiovascular diseases. Though, further research is needed to establish the effects of exercise types on reduction of psychological disorders and cardiovascular diseases.

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