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EFFECT OF STRENGTHENING AND ENDURING EXERCISES AND PARALLEL PRACTICES ON HEART FUNCTION OF WORKERS (PARS KHODRO)

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ABSTRACT

Efficiency and function of different systems of body can affect capability and ability of performing physical activities and sports. Hence, the aim by the present study is investigating effect of strengthening and enduring and parallel exercises on heartbeat and systolic blood pressure, diastolic blood pressure, and PR interval in workers of Pars Khodro Co Iran. In order to implement the study, 40 employees of Pars Khodro Co have been selected as sample systematically. The bases and criteria for selecting trials include having perfect cardiovascular health, having no disease and having no background of regular exercises. Sample individuals have been categorized randomly in 4 groups including control (10 persons); strengthening exercise (10 persons); enduring exercise (10 persons); and parallel exercises (10 persons). Practice plan of these groups was three times a week; measurement of variables was conducted before and after activity; heartbeat rate, PR interval and heart size were measured using electrocardiography and methods, and pressure was measured using manometer. Before measuring variables, height, weight, and fat rate of body were measured through estimating subcutaneous fat on three points including triceps, above iliac, and leg. According to obtained results from this study, it has been found that parallel exercises are more consistent with heartbeat of workers in Pars Khodro than strengthening and enduring exercises.

Keywords: Parallel Exercises, Strengthening Exercises, Enduring Exercises, Heart Function, Pars Khodro

INTRODUCTION

Using suitable methods of exercise in order to achieve desirable muscular energy, along with muscular strength, is so significant. Hence, sport experts have proposed parallel exercise as a new method, which can encompass a series of physical fitness factors. Parallel exercise refers to performing several kinds of exercise simultaneously (such as strengthening and enduring exercises). This kind of exercise, comparing to separate strengthening and enduring exercises, can improve body composition and cardiovascular health. On the other hand, function and efficiency of different systems of body can be effective in capability for performing exercises. Cardiovascular system is responsible for transmitting oxygen and food materials to different tissues and active organs and then returning waste materials excretory organs **[1]**. In fact, long-term and regular exercises can make some changes in body, which makes heart of sportsmen different from other people **[2]**. These structural changes in heart can improve its systolic and diastolic performance, which is different from pathology changes of heart **[3]**.

In general, effect of exercise on heart function is depended on type, intensity, and time of exercise, amount of primary physical fitness, inheritance, and gender **[4]**. In dynamic sport activities, systolic blood pressure would be enhanced considerably; although diastolic blood pressure would not be changed significantly. Continuity of activity in this kind of exercise, because of increase in returned blood volume, can enhance diastole volume of left ventricular (LV), which can result in enhancement of stroke volume and ejection fraction (EF) of unexercised heart. Reduction of heartbeat rate can be the most important operational adaptation that can be observed as a result of these types of sport **[5]**.

In strength exercises, because of breath trapping (Valsalva), venous blood return loss would be increased significantly. As a result, following physiology reaction of the circulatory system, heartbeat rate and mean blood pressure in artery would be increased. In such exercises, stroke volume and heart function would be lower than pattern of dynamic exercise. Hence, efficiency of cardiovascular system would be lowered **[6]**.

Effect of combining strength and endurance exercise on aerobic ability and short-term strength has been started for the first time in 1980 by Hixson, RosenCoter and Brown **[7]**. In addition, many recent studies have indicated that combination of strength and

endurance exercises can cause impairment in improving physical fitness factors **[8]**.

Balabins *et al* have also observed more improvement in strength and endurance as a result of performing combined exercises, compared to strength and endurance exercises. According to the mentioned and also due to limitation of studies in regard with heart adaptations with strength and endurance exercises of workers and limited studies in scope of parallel exercise on heart in this study, the aim is to investigate strength exercises and also endurance and parallel exercises in function of heart of workers in Pars Khodro Co **[9]**.

Heart is one of the strongest and one of the most important and vital organs of body, which its function and health would be improved similar to other organs through doing exercise. The less the muscle is used, the less its energy would become day by day and would be weakened, so that it would lose its efficiency completely.

All exercise forms such as strength and flexibility exercises may have not significant and positive effect on heart; although certainly they can affect other organs significantly. This can cause all organs being in good position; meaning that there would be no need for heart to do severe and hard activities and pumping blood and nutrition and it can perform its functions easily and with no pressure. As a result, heart would face less damage and fatigue. Therefore, exercise can enhance life quality and can also reduce probability of death risk.

Duration of exercise is depended on physical position of a person. Capability of performing sport activities is depended on function and efficiency of different systems of body. While doing exercise, blood flow would be go towards active muscles from skin, kidneys and viscera; resistance of environmental vessels would be reduced and difference of maximum and minimum blood pressure would be increased and as a result, number of breath taking times would be also increases. Doing exercise regularly and in programmed form can result in some changes between athletes and other people. In regard with the present study, the aim is to investigate effect of strength, endurance and parallel exercises on heart function of Pars Khodro Co in Iran.

RESEARCH LITERATURE

Ghahramanloo Ehsan *et al* (2007) has also conducted a study in order to compare effect of three types of strength, endurance and parallel exercises on bio-energetic features, maximum energy, and body combination of unexercised men. The aim by this study has been comparing effects of three kinds of strength, endurance and parallel exercises on

bioenergetics features, maximum energy, and body combination of unexercised students. 46 volunteer students for participating in this study with age range of 24.89±1.21 were divided randomly in 4 groups including strength (n=9); endurance (n=13); parallel (n=13); and control group (n=11). Strength exercise included performing exercises such as bench press, underarm and instep stretching, and Scott in 2 sessions and every session with 10 iterations and also 50% of an iteration of maximum, which reached to 3 sessions with 6 iterations and 80% of iteration for a maximum at the end of course. Strength exercise included running on treadmill for 16min with 65% of maximum heartbeat rate in the first week, which reached to 30min with 80% of maximum heartbeat rate at the end of course. Parallel exercise included complete performance of two strength and endurance exercise plans. All groups did exercise for 3 sessions a week for 8 weeks. According to obtained results from the present study, maximum increase in VO2max has been in strength group and the lowest rate has been observed in endurance group. Increase in VO2max has been significant in strength and endurance groups. Increase in anaerobic energy among three groups indicated no significant difference. Moreover, amount of increase in relative maximum energy of Scott and bench press exercises in strength group has been significantly different with endurance and parallel groups. According to obtained results from the study, it could be found that combination of strength and endurance exercise can improve VO2max and can't endanger maximum energy. In addition, parallel exercise can cause improvement of body combination of unexercised individuals, same as strength and endurance exercises **[10]**.

Hosseini Masomeh *et al* (2009) have conducted a study in order to investigate effect of strength and endurance and parallel exercises on heart function of university girls. For this purpose, 39 female non-athletic students with age range of 24±2.58 and height of 161±8.2cm and weight of 56.8±14.6kg with cardiovascular health were selected randomly and were categorized in 4 groups including control (n=9); strength (n=10); endurance (n=10); and parallel exercise group (n=10). Obtained results from the study indicated that reduction of heartbeat rate and systolic blood pressure, increase in PR and VO2max, and reduction of diastolic pressure in strength group was significant, which the differences became significant in intergroup comparison for 4 first variables. In strength group, heartbeat and systolic blood pressure indicated significant enhancement, which the

differences became significant in intergroup comparison. In parallel group, amount of VO2max had significant enhancement, which the difference was significant in intergroup comparison. Therefore, it could be found that doing strength exercises after endurance exercises can cause emergence of a combination of resulted adaptations from strength and endurance exercises in reversing and omitting some unwanted effects of endurance exercises on heart **[11]**.

Gaeini *et al* (2010) have conducted a study in order to investigate effect of 8 weeks alternative aerobic exercise and a period without exercise on structure and performance of LV. At the present study, 10 male non-athlete students were selected voluntarily and participated in 8-week exercise program, with 3 days per week with intensity of maximum heartbeat rate to 70%. Echocardiography method was applied after 8 weeks alternative exercise and a significant difference was observed among ventricular wall thickness, shortening fraction and injection fraction, compared to time before exercise. Finally, it could be found that 8 weeks aerobic exercise and a week without exercise can affect function and structure of LV of non-athlete healthy men **[12]**.

Arazi *et al* (2012) have conducted a study in order to compare effect of a period of combined exercises (aerobic-strength) and aerobic exercises on maximum consumption, lipid profile, blood sugar and blood pressure of middle age men with risky cardiovascular factors. At this study, 29 volunteer men with no exercise were participated with age range of 36-56. Trials were divided to three groups randomly including aerobic, combined, and control groups. Obtained results from the stud indicated that although every one of these exercises has its own advantages, both types of exercises can reduce dangerous factors of cardiovascular diseases in inactive men **[13]**.

Garza *et al* (2013) has investigated effects of strength and endurance exercises on improvement after myocardial infraction (MI). At this study, effects of strength and endurance exercises on myocardium and modifying it after MI were investigated in Texas University. Therefore high rate of PV was increased and inflammation of LV was also increased. However, evidences indicated that strength exercises after MI have positive effects on patients. On the contrary, endurance exercises have no significant effect on PV through increasing myocardial hypertrophy. Hence, at the first effects of endurance exercises was investigated, contrary to strength exercises on function of myocardium. Obtained results from the study indicate that endurance exercises are more

useful than strength exercises in heart performance after MI **[14]**.

Alex *et al* (2013) have investigated also effects of strength and aerobic exercises on sympathetic performance of cardiac vessels in healthy adults. At this study, it was mentioned that sports can have protective effects on heart; although mechanisms of the effects are not recognized generally. Previously, it has been proved that aerobic exercises don't decrease rest of heartbeat, but also they can enhance cardiac regulations. Obtained results from the study indicated that aerobic exercises have no effect on heart indices (PEP and LFBVP) while resting time. The results have also indicated that in young and healthy people, protective effects of aerobic exercises have not been same as changes in sympathetic activities while resting time **[15]**.

Research hypotheses

1. Endurance exercises have significant effect on reducing heartbeat of Pars Khodro Company's Workers
2. Endurance exercises have significant effect on reducing systolic blood pressure of Pars Khodro Company's Workers
3. Endurance exercises have significant effect on reducing diastolic blood pressure of Pars Khodro Company's Workers
4. Endurance exercises have significant effect on PR interval of Pars Khodro Company's Workers

METHODOLOGY

In fact, basis of every science is method of recognizing it and value and credit of every science is based on methodology applied in it. Selecting methodology is depended on goals and nature of topic and also executive facilities of the study. Therefore, one can make decision about assessment of a study, when nature, subject, goals, and range of the study are determined. In other words, the aim by choosing methodology is to make clear that what method and approach is more careful and easy for achieving answer of research questions **(Aghajani Ali-Akbar Afroozi, 2011)**.

In order to achieve research objective, which is effect of strength, endurance, and parallel exercises on heart function of workers **(Pars Khodro Co)**, 40 employees were selected systematically as research sample. The criteria for selecting trials included having perfect cardiovascular health, having no disease and having no background of regular exercise. The individuals were categorized randomly in 4 groups including control (10 persons); strength exercise (10 persons); endurance exercise (10 persons); and parallel exercises (10 persons). Program of exercise

for the groups was three days a week. Measurement of variables was conducted before and after activity; heartbeat rate, PR interval and heart size were measured using electrocardiography and methods, and pressure was measured using manometer. Before measuring variables, height, weight, and fat rate of body were measured through measuring subcutaneous fat in three points of triceps, above iliac and leg.

Testing hypothesis

Hypothesis 1: Endurance exercises have significant effect on reducing heartbeat of Pars Khodro Company's Workers

H0: Endurance exercises have no significant effect on reducing heartbeat of Pars Khodro Company's Workers

H1: Endurance exercises have significant effect on reducing heartbeat of Pars Khodro Company's Workers

In this hypothesis, post-test changes should be investigated, compared to pre-test in endurance exercise group using t-statistics. Then, these values should be compared due to difference or lack of difference between mean scores of groups.

In **Table 1**, mean values of post-test and pre-test for heartbeat rate in endurance exercise group have been compared. Accordingly, due to t-value and also observed p-value lower than 0.05 ($p<0.05$), it could be found that there is significant difference between mean value of post-test and pre-test for heartbeat rate of workers in endurance exercise group. However, it doesn't mean confirmation of the hypothesis, but also through doing endurance exercises, heartbeat has not been decreased, but it has been increased.

Hypothesis 2: Endurance exercises have significant effect on reducing systolic blood pressure of Pars Khodro Company's Workers

H0: Endurance exercises have no significant effect on reducing systolic blood pressure of Pars Khodro Company's Workers

H1: Endurance exercises have significant effect on reducing systolic blood pressure of Pars Khodro Company's Workers

In this hypothesis, post-test changes should be investigated, compared to pre-test in endurance exercise group using t-statistics. Then, these values should be compared due to difference or lack of difference between mean scores of groups.

In **Table 2**, mean values of post-test and pre-test for systolic blood pressure in endurance exercise group have been compared. Accordingly, due to t-value and also observed p-value lower than 0.01 ($p<0.01$), it could be found that there is significant difference between mean value of post-test and pre-test

for systolic blood pressure of workers in endurance exercise group. However, it doesn't mean confirmation of the hypothesis, but also through doing endurance exercises, systolic blood pressure has not been decreased, but it has been increased.

Hypothesis 3: Endurance exercises have significant effect on reducing diastolic blood pressure of Pars Khodro Company's Workers

H0: Endurance exercises have no significant effect on reducing diastolic blood pressure of Pars Khodro Company's Workers.

H1: Endurance exercises have significant effect on reducing diastolic blood pressure of Pars Khodro Company's Workers.

In this hypothesis, post-test changes should be investigated, compared to pre-test in endurance exercise group using t-statistics. Then, these values should be compared due to difference or lack of difference between mean scores of groups.

In **Table 3**, mean values of post-test and pre-test for diastolic blood pressure in endurance exercise group have been compared. Accordingly, due to t-value and also observed p-value lower than 0.05 ($p<0.05$), it could be found that there is significant difference between mean value of post-test and pre-test for diastolic blood pressure of workers in endurance exercise group. However, it doesn't mean confirmation of the hypothesis, but also through doing endurance exercises, diastolic blood pressure has not been decreased, but it has been increased.

Hypothesis 4: Endurance exercises have significant effect on PR interval of Pars Khodro Company's Workers

H0: Endurance exercises have no significant effect on PR interval of Pars Khodro Company's Workers

H1: Endurance exercises have significant effect on PR interval of Pars Khodro Company's Workers.

In this hypothesis, post-test changes should be investigated, compared to pre-test in endurance exercise group using t-statistics. Then, these values should be compared due to difference or lack of difference between mean scores of groups. In **Table 4**, mean values of post-test and pre-test for PR interval in endurance exercise group have been compared. Accordingly, due to t-value and also observed p-value lower than 0.05 ($p<0.05$), it could be found that there is significant difference between mean value of post-test and pre-test for PR interval of workers in endurance exercise group. Obtained results in the table indicate that doing endurance exercises has decreased PR interval in workers.

Table 1: comparing mean value between poet-test and pre-test for heartbeat rate in endurance exercise group

Endurance Exercises			
items	**t**	**df**	**p-value**
heartbeat rate of workers (endurance group)	**-2.759**	**9**	**0.013**

Group		Mean	Standard deviation
Heart rate	Pre-test	81.100	7.18
	Post-test	88.500	4.50

Table 2: comparing mean value between poet-test and pre-test for systolic blood pressure in endurance exercise group

endurance exercises			
items	**t**	**df**	**p-value**
systolic blood pressure of workers (endurance group)	**-9.095**	**9**	**0.000**

Group		Mean	Standard deviation
Systolic blood pressure	Pre-test	92.5000	3.02765
	Post-test	101.8000	1.13529

Table 3: comparing mean value between poet-test and pre-test for systolic blood pressure in endurance exercise group

endurance exercises			
items	**t**	**df**	**p-value**
diastolic blood pressure of workers (endurance group)	**-1.467**	**9**	**0.160**

Group		Mean	Standard deviation
Diastolic blood pressure	Pre-test	74.6600	5.11473
	Post-test	77.0900	1.12294

Table 4: comparing mean value between poet-test and pre-test for systolic blood pressure in endurance exercise group

endurance exercises			
items	**t**	**df**	**p-value**
PR interval of workers (endurance group)	**-5.164**	**9**	**0.000**

Group		Mean	Standard deviation
PR interval	Pre-test	0.151600	0.0038060
	Post-test	0.143300	0.0033680

DISCUSSION AND CONCLUSION

In every study, researcher tends to find answers of research questions. Hence, all obtained results would be investigated in form of conclusion and suitable answers would be derived from the results. At the present study, criterion of statistical population was related to workers, which 40 persons from employees of Pars Khodro Company were selected purposefully as research sample.

According to obtained results from the study, it could be found that there is a significant difference between pre-test and post-test mean values of workers' heartbeat rate in endurance exercise group and heartbeat of exercising workers has been increased using endurance exercise

program (p-value<0.05). There is a significant difference between mean values of post test ad pre test for systolic blood pressure of workers in endurance exercise group and systolic blood pressure would be enhanced significantly using endurance course (p-value<0.01). There is a significant difference between mean values of post-test and pre-test for diastolic blood pressure of workers in endurance group and diastolic blood pressure of workers in endurance group has been increased through using endurance program (p-value<0.05). There is a significant difference between mean values of post-test and pre-test for PR of workers in endurance exercise group and PR interval has been increased after using endurance exercise (p-value<0.01). Finally, it could be found that endurance exercises have no significant effect on reducing heartbeat rate of Pars Khodro workers. Endurance exercises have no significant effect on reducing systolic blood pressure of Pars Khodro workers. Endurance exercises have no significant effect on reducing diastolic blood pressure of workers and finally, endurance exercises have no significant effect on PR interval of Pars Khodro workers.

SUGGESTIONS

Doing exercise can provide a type of adaptation in heart, which is different from pathologic adaptations and can improve myocardial function. Myocardial system is formed of blood, heart, and some vessels that pump blood to all parts and organs of body. Heart is a biologic pump, which produces required pressure for moving blood in vessels. Hence, human life is depended on its constant and effective function. According to obtained results from the present study, it was found that parallel exercises have more adaptation with heart function, comparing to endurance exercises and they have no significant different with strength exercises. As workers stay main part of their time in their workplace and have no enough time for doing exercises out of work times, it would be better to provide required fields and conditions for them to do exercise, especially parallel exercises in workplace weekly, in order to improve their health and myocardial function.

REFERENCES

[1] T. D. A. G. A. D. V. R. Roberges Robert and Scott O Roberts, "basic principles of exercise physiology," vol. 1, 2005.

[2] D. V. PL, S. MM, V. M. NL, Duursma SA and V. HJ, "functional-task exercise versus resistance strength exercise to improve daily function in older women: a randomized controlled trial," J AM Geriatrsoc, vol. 1, no. 53 (1), pp. 2-10, 2005.

[3] F. K. T. A. S. Always, "cardiovascular and muscular ada[tations to combined endurance and atrength training in elederly women," pp. 259-267, 1998.

[4] A. M. K. W. G. E. L. M. R.,. H. A. V. H. K. E. R. S. E. V. A. J. a. P. L. Hakkinen K, "neuromascular adaptations during concurrent strength and andurance training versus strength training," European Journal of Aplied Physiology, no. 89 (1), pp. 42-52, 2003.

[5] J. A. I. B. Lang Deau, "electrocardiographic finding in athletes," Can J Cardiol, no. 17(6), pp. 650-659, 2001.

[6] S. S. Makan J, G. W. S. Firooz and P. Jackson, "physiological upper limits of venticular cavity size in highly trained adolescent athletes' heart," no. 91, pp. 495-499, 2005.

[7] G. Ehsan and A. A. H. a. G. reza, "comparing effect of three kinds of strength, endurace, and parallel exercises on bioenergic features, maximum strength and body energy on unexercised men," Journal of Olympic, pp. 44-75, 2007.

[8] F. N. S. N. C. A. Vinereanu D, R. S. Michael and a. G. Alan, "left ventricular long-axis diastolic function is argumented in the hearts of endurance-trained compared with strength-trained athletes," Clin sci, no. 103, pp. 249-257, 2002.

[9] C. P. M. M. M. V. P. B. Balabinis C.P, "early phase changes by concurrent endurance and strength training," no. 17(2), pp. 393-401, 2003.

[10] E. E. A. Ghahramanloo, "comparng effect of three types of endurance, strength and parallel exercises on bio-energetic features, maximum energy, and body comination of unexercised men," Journal of Olympic, vol. 15, no. 4, p. 40, 2007.

[11] E. A. Hosseini Masoumeh, "effect of endurance and strength and parallel exercises on heart function of female univrsity students," Journal of Olympic, vol. 18, 2009.

[12] K. f. M. J. A. S. N. L. Gaeini Abbasali, "effect of 8 weeks alternative aerobic exercise and a period without exercise on structure and performance of LV," Journal of Medical Researches of Zahedan, pp. 34-38, 2010.

[13] J. A. A. A. E. Arazi Hamid, "comparing effect of a course of combined exercises (aerobic and strength aerobic) on maximum consumed oxygen, lipid profile, blood sugar, and blood pressure of middle age men with risky cardiovascular factors," Scientific Journal of Shahid Sadughi University Yazd Unit, vol. 20, pp. 627-638, 2012.

[14] M. W. E. Z. J. Garza, "effects of strength vs. endurance exercise on myocardial function and remodeling (1154.8)," The FASEB Journal, vol. 28, 2013.

[15] L. M. S. P. M. P. B. E. M. M. A. S. R. Alex C, "aerobic exercise and strength training effects on cardiovascular sympathetic function in healthy adults: a randomized controlled trial," Psychosomatic Medicine, pp. 375-381, 2013.