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THE IMPACT OF NUMBER OF EXERCISE SESSIONS PER WEEK ON SOME PHYSICAL AND MOTOR FITNESS FACTORS IN GIRLS AGED 9 TO 11

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ABSTRACT

Introduction: In recent years, the mutual impacts of exercise sessions time and the number of sessions per week have been studied by researchers in health area and physical education teachers, in order to increase the level of physical fitness. Accordingly, the study was conducted to compare the effect of number of exercise sessions per week on some physical and motor fitness factors of elementary girls aged 9 to 11 in Beyza city.

Methods: for this purpose, 30 girls were divided into three experimental groups that each of them had 10 girls as follows: group 1 (average age: 10.20 Weight: 28.12 kg Height: 1.36 cm), group 2 (average age: 10, weight: 33.4, Height: 1.43 cm) group 3 (average age: 10.1, weight: 28.92, height: 1.38cm). One control group (average age: 10.31, weight: 27.82, height: 1.28 cm) was also used in this study which performed only physical routine exercises 2 days per week.

In addition to usual or routine physical exercises, experimental groups performed special physical and motor fitness exercises in days other than physical exercise days.

One-sessional exercise program included running at 80% HRmax, 12 minutes per week, in the two-sessional group, it included running with same intensity for 6 minutes, two sessions per week, and in the third group, it included running with same intensity for 4 minutes, three sessions per week for 8 weeks. In the experimental groups, in addition to running, physical fitness exercises, including agility, strength, and speed were implemented in the way that in all experimental groups, the amount and intensity of exercise were similar. 60-meter running test, 9

× 4 m running test, and vertical jump were used to measure the mentioned indicators in the same situation, before and after 8 weeks.

Results: Data analysis was conducted by using one-way variance analysis and covariance analysis was done by using t-dependent analysis method. At the significance level of ($p \leq 0/05$), analyses indicated that in all three experimental groups, the physical fitness indicators were improved. While, lower limb power and speed were improved significantly only in three-sessional group, and agility was improved in two-sessional and three-sessional groups ($p \leq 0/05$).

Conclusion: In general, performing all three exercise programs have had useful adaptations, and changing the number of exercise sessions affected only degree of their improvement. Regarding muscular power of legs and speed, the effect of change in number of sessions has likely more than total time of exercise of each week.

Keywords: frequency of exercise sessions, physical and motor fitness factors.

1. INTRODUCTION

Children mobility has reduced significantly in recent years. Nowadays, most children spend their leisure time in sedentary activities such as watching TV or playing computer games, and therefore they do not have good fitness. In addition, physical activity levels of children decline as they approach to puberty and adolescence stage. To resolve this problem, parents, teachers, politicians, health experts and other members of society should do their best to modify the children behaviors and habits and make compatible them the requirements of new era (Turabi 2013).Regular physical activities can be effective in reducing the heart disease, lowering the blood pressure, reducing the risk of colon cancer, contributing to the healthy bones, muscles and joints, and mental promoting and healthy living. On other hand, regular physical activities in childhood are associated with improvements in mental and physiological health(Harsha 1995, Biddle 2004, Cavill 2001 ,, P. 1386). It can be easily concluded that if the exercise is promoted and institutionalized in a society, it increases vitality and efficiency of society, reduces some social misdemeanors and disorders such as drug addiction (Turabi, 2013).Increasing development of sport sciences and modern findings and their application in development and improvement of physical and technical states of athletes have caused astounding boost in records and various sport movements performance. Accurate and realistic observation and investigation based on scientific principles in

various factors affecting the high physical, intellectual, emotional, physical performance have encouraged sport sciences to prioritize the base of research in all sport areas and put high emphasis on application side of research issues.

One of the important issues related to physical education and sport sciences, especially in the field of championship sport, is the issue of physical fitness in greater use of motor abilities and skills of athletes in various sports (Gaini 1382, Turabi 2013).Experts in exercise and sport physiology have tested numerous programs to determine the minimum and maximum stimuli affecting the progress of the athletes, because in addition to genetic factors, program and exercise methods play determining role in sport or exercise performance.

However, there is little information about the extent and severity of this type of exercise for the best performance in athletes. The effectiveness of physical exercises depends on intensity, time and frequency of exercises and ability of athlete. Therefore, many efforts have been made so that they can quantify the balance between exercises load and athlete tolerance in objective manner. Educators are trying to modify the essential factors to maximize optimal compatibility (Meckel, 2009).

To have a good level of fitness, the effect of one session of exercise per week is not sensible on some of the important factors of health, cardiovascular endurance and muscular endurance. Results of most studies and scientific reports and the opinion of most educators and sport experts suggest that at least three sessions per week must be considered so that they can be effective. Lack of specified planning for physical education classes in schools, presence of non-specialists managers on the one hand, other factors such as lack of financial resources and equipment on other, have caused that opportunities and facilities cannot be used optimally (Turabi 2013).

One of the factors affecting the performance of athletes is the number of exercise sessions per week, and researchers pay particular attention to mutual effects of time of exercise sessions and number of sessions (depending on the dose response) (Hill, 2003).To develop motor skills, physical and motor fitness factors such as speed, power, strength, agility, flexibility and endurance are required (Gaini 2003). This study aimed to investigate the impact of frequency of exercise sessions in week on motor and physical fitness factors in elementary girls aged 9 to 11 years in three

experimental groups by keeping the intensity and duration of exercise constant.

1-1. Effects of exercise frequency on health and physical fitness

Since 1970 to 1980, physical activities such as running 20 minutes steadily, 3 days a week were recommended. In 1990s, 30 minutes exercise with moderate intensity on most days of the week was recommended. In 2000s, at least 60 minutes of activity with moderate intensity per day was recommended (Lee, 2007).

1-2- Frequency of exercises

Exercise frequency is the number of exercise sessions in a given period (such as one week), depending on the state of exercise, type of exercise per session, recovery ability of people (Bird, 2005). The concept of amount is very important in medicine. In medical science, we start with the least amount of drug, but if it does no work, we increase its dose firstly. Physical activity is not as drug or medicine, but acts as it.

Physical activity causes many physiological changes in the body (often beneficial for health). It helps in preventing from progression of many chronic diseases and it is useful in many diseases such as heart disease, cancer and diabetes, physical activity along with drug use. Health experts such as doctors are encouraged to prescribe physical activity to promote health. While increased physical activity has effects such as musculoskeletal injuries and sudden death. Although, in contrast with drugs, the minimum and the maximum level of physical activity have not been specified so far. Educators and researchers are trying to manipulate the exercise variables such as intensity, frequency, amount of exercise in order to achieve a high level of muscular fitness.

Once per week exercise frequency is suggested for novice athletes. However, in competitive weight lifters, exercise frequency of 5 to 7 days per week is recommended to achieve maximum muscle size and strength (Bird, 2005).

Exercise frequency is the important variable in developing of any strength exercise program. Factors such as strength exercise experience of participants, exercise goals, exercise involvement, and developed exercise load are required. Without proper exercise frequency, it may be ineffective or harmful. In general, to gain power in children, 2 or 3 days exercise per week on non-consecutive days is recommended.

In a review paper in which they investigated the impact of resistance exercises on metabolic fitness of children and adolescents, Benson et al (2008) realized thatin half of

papers, resistance exercise has been used with exercise frequency of 3 days per week in children and adolescents (Benson, 2008).

Some young athletes may participate highly in preparatory activities more than 3 days in a week. Factors such exercise time, intensity of exercise, selection of exercise, intake food, sleep habits are considered as factors affecting the recovery ability of an individual and his adaptation with exercise. As exercise program advances, by increasing the exercise frequency, encouragement to the implementation of appropriate exercise technique and exercise habits with low-intensity during the week should not be set aside (Faigenbaum, 2009).

1-3-Effect of exercise frequency on muscle power

In developing an ideal plyometric exercise, amount and frequency of exercise are considered as very important parameters. Short-term plyometric exercise program with an average frequency and 840 jumps in two days per week have similar improvements in jump, but it has higher exercise efficiency compared with higher exercise frequency (4 days a week, 1680 jumps) (Devillareal2009).

In a review paper, it was found that there is a positive relationship between the frequency of sessions per week and plyometric exercises, but there no significant relationship was found between the number of exercise, jump height, number of iterations and the number of exercises per session.

In planning the ideal exercise program, the amount and frequency of exercise are important factors. Our investigation shows that 3 days of exercise per week less than 10 weeks are more effective than longer program. Furthermore, in agreement with previous research, exercise program with moderate frequency (2 days per week) creates similar improvements in power performance, but it has higher exercise efficiency thanhigh frequency exercise (4 days per week) (DeVillarreal 2010).

Frequency of moderate and low plyometric exercises give higher jump power and speed than high-frequency exercises. The effects of three different frequencies of plyometric exercise (1, 2 and 4 days per week) and its relationship with 3 amounts of plyometric exercise were examined on maximum power, vertical jump performance, and the ability to sprint at 42 students divided randomly into groups of 1 to 4, including:

Group 1: control, group 2: 10 people, 7 sessions of falling jump exercises, one day per week, 420 Jumps), Group 3: 12 people, 14 sessions, 2 days per week,840 jumps, Group 4: 9 people, 28 sessions, 4 days per week, 1680 jumps.

Protocol include falling jump from height of20, 40, and 60 cm. The power of maximum repetition, horizontal jump, and sprinting of 20 meters were assessed after 7 weeks of plyometric exercise. The results showed that short-term plyometric exercises with the moderate frequency create similar improvements in the jump performance, but it has higher exercise performance compared to high frequency exercise. These results also show that a minimum threshold of exercise amount does not have further advantage after that its amount increases. Therefore, results do not support this idea that its amount should be increased as far as possible

1-4- The effect of exercise frequency on agility

Hossein Pour et al (2009) investigated the efficiency of two exercise programs (one-session and two-session) on cardiovascular and musculoskeletal indicators of girls. Results indicated that in both groups these indicators improved, while agility time reduced significantly only in two-sessional group. It was observed that performing both exercise programs have useful compatibilities and change in the number of exercise sessions had impact only on their degree of improvement. However, as far as agility was concerned, the change in the number of exercise sessions was probably higher than total time of exercise. Eftekhari et al (2007) stated that attendance in summer exercise or sport classes (volleyball and basketball)by 13 years old teens had no significant effect on agility (Eftekhari 2007).

2- PROCEDURE

According to the object and purpose of the present study, this study is applied, and as it used human samples and did not control all factors, it is quasi-experimental. Additionally, as the researcher manipulates the independent variable to investigate its impact on following changes of dependent variable, it is prospective study. The research design is pretest and post-test type with three experimental groups and one control group.

2-1- Statistical population of study

Population of study included 9 to 11 years old elementary school girls of Beyza city. The sample of study was40 numbers of 9 to 11 years old elementary school girls selected randomly. The sampled population were matched by initial tests and measuring the height, weight, and sport experience of samples. The tests were taken on days other than exercise days and a questionnaire was distributed among participants to determine the general health status and consent of the parents of the participants in this study. Subjects were divided and assigned into one control group and three experimental groups

(group 1: 1 session per week, group 2: 2 sessions per week, group 3: 3 sessions per week).

All control and experimental groups performed similar physical exercise program (including warm-up, reviewing techniques and exercises specific for their sports specialty and cool down) for a period of 8 weeks. However, experimental groups performed the following exercise program in days other than physical exercises days, in addition to three sessions of exercise. It was attempted that the sessions of one-sessional group, two-sessional group, and three-sessional group to be equal.

2-2- Methods and measuring the sprinting:

Within the time in which 60 meters track is passed, test was implemented twice with 3 minutes of rest time and the best performance was recorded with accuracy of 0/01 seconds (faigenbaum, k2009). Athlete stands behind the line while one of his legs is in forth and the other leg is laid back. Then he passes the 60 m along the marked line by command of "go"

2-3-9 × 4 m running

This test was developed to measure the agility and speed. The test involves back and forth running on a track of 9×4 meters. At a distance of 9 meters, two small bags of sand are placed in which subjects are placed in the starting point and he starts to run with the maximum speed after hearing the "go" command (Ismaili, 1385). Running is started from the back of the starting line, then participant picks up the first part and puts it behind the starting line and he performs the second part in this way. Test is taken three times and the best performance is recorded (Weiss2010).

2-4- Vertical jump

Subject stands toward springboard from his side in a way his hand is placed at the top of the head and the other hand is placed next to the body. Then, subject gets up on his toes as much as possible and puts a mark on the ruler, and the height (height of athlete) is recorded. Then, subject greases his middle finger with chalk powder, and takes the squat position and jumps up as far as he can and marks the ruler with chalky his finger. Subject repeats this action 3 times and the best performance is recorded (Gharakhanlou 2011).

Then, he stands toward wall and hits tip of his fingers on a plate. After marking, subject jumps up by bending his knees and touches the topmost point of wall. This test is repeated three times by each subject and the best performance is recorded.

Table 1- exercise program of participants

groups Intervention protocol	Experimental one-sessional	Experimental Two-sessional	Experimental Three-sessional
Running on a flat surface at 80% HRR	12 minutes.	6 minutes.	4 minutes.
Exercises of the muscles of the legs power	3 repetitions * 10	3 repetitions * 10	3 repetitions * 10
Agility exercises (4 at 9 m running)	3 repetitions	2 repetitions	1 repetition

Before the start of exercises and end of week 8, some physical and motor fitness factors such as agility, speed and power of subjects were tested and dependent variables were examined between subjects.

Control group received no intervention and performed only routine physical exercises for 3 days a week.

3- RESULTS

Demographics characteristics of participants, including age, height and weight are shown in Table 2.

Descriptive statistics of the variables measured in this study in the experimental groups with frequency of 1, 2, 3 days per week and control group were shown in the tables 3-5 below.

Kolmogorov – Smirnov test

The default test of normal distribution of measured variables (Kolmogorov - Smirnov) shows that distribution of all data obtained from the groups in this study is normal, since the Kolmogorov-Smirnov test is not significant for sample distribution match normal distribution(0/05<p) in all cases. The results show that there is no significant difference between speed in experimental and control groups (1 day frequency in week) after 8 weeks of physical and motor fitness exercises. Additionally, there is no significant difference between speed in control group and the experimental groups (frequency of 2.3 days in weeks) after 8 weeks of physical and fitness exercises.

Figure 1 shows the mean of speed variable in control and experimental groups (frequency of 3, 2, 1 days per week) before and after 8 weeks of physical and motor fitness exercise.

To compare the speed in the experimental and control groups, covariance test was used. Test assuming that slopes are homogenous should be implemented before the implementation of covariance analysis. The mutual impact between speed of pre-test and studied groups was assessed in predicting the speed of post-test. A significant mutual impact suggests that differences based on speed of post-test among the groups change as a function of speed of pre-test.

If the mutual impact is significant, the results of covariance analysis are not significant and covariance analysis should not be implemented. Results show that the average speed in the studied groups is not significant by holding the pre-test constant, except in 3-

sessional group in which speed has been improved significantly.

The results show that there is a significant difference between the experimental and control groups in terms of agility (frequency of 3,2,1 days per week) after doing 8 weeks physical fitness exercises.

Figure 2- Mean of agility variable in the experimental and control groups (3,2,1 days a week frequency) before and after 8 weeks of doing physical fitness and motor exercises.

Comparison of agility variable among the groups showed statistically significant difference among four groups in pre- and post-test.

The results show that there is no significant difference between power in lower limbs in experimental and control groups (frequency of 1,2, 3 days per week) after 8 weeks of physical and motor fitness exercises.

Figure 3 shows the mean of lower limb power r in the experimental and control groups (frequency of 1,2, 3 days per week) before and after 8 weeks of physical fitness and motor exercises.

Comparison of lower limb power shows that there is significant difference among four groups in post-test.

The results of the follow-up tests show that there is significant difference between mean of lower limb power with the frequency of 3 days per week and control group.

Table 2: Demographic characteristics of participants

Variable- statistic / Group-test		age		height		weight	
		mean	SD	mean	SD	mean	SD
Experimental with one-day frequency per week	Pre-test	10.202	0.782	1.361	0.079	28.12	4.09
	Post-test			1.362	0.080	28.34	4.10
Experimental with two-day frequency per week	Pre-test	10	0.813	1.432	0.093	33.4	5.89
	Post-test			1.435	0.094	34.2	5.72
Experimental with three-day frequency per week	Pre-test	10.1	0.813	1.382	0.086	28.92	5.08
	Post-test			1.39	0.087	29.10	5.02
Control group	Pre-test	10.31	0.684	1.28	0.065	27.82	5.12
	Post-test			1.30	0.066	28.30	5.01

Table 3: Descriptive statistics of the variables measured in the agility test (two 9 × 4 m – s)

Variable- statistic variable	pre-test		Post-test	
	mean	SD	mean	SD
Experimental with one-day frequency per week	11.210	0.595	10.965	0.638
Experimental with two-day frequency per week	11.451	0.232	10.88	0.701
Experimental with three-day frequency per week	10.554	0.201	10.73	0685
Control group	11.410	0.482	10.99	0.621

Table 4: Descriptive statistics of the variables measured in the 60 m-s running test

Variable- statistic variable	pre-test		Post-test	
	mean	SD	mean	SD
Experimental with one-day frequency per week	10.281	0.707	10.062	0.925
Experimental with two-day frequency per week	9.912	0.886	9.337	0.821
Experimental with three-day frequency per week	9.941	0.694	8.89	0.779
Control group	10.453	0.795	10.052	0.918

Table 5: Descriptive statistics of the variables measured in vertical jump (cm)

Variable- statistic variable	pre-test		Post-test	
	mean	SD	mean	SD
Experimental with one-day frequency per week	24.213	5.553	26.511	4.881
Experimental with two-day frequency per week	23.712	4.967	27.423	3.893
Experimental with three-day frequency per week	23.945	5.043	31.134	4.557
Control group	25.712	5.124	26.256	4.781

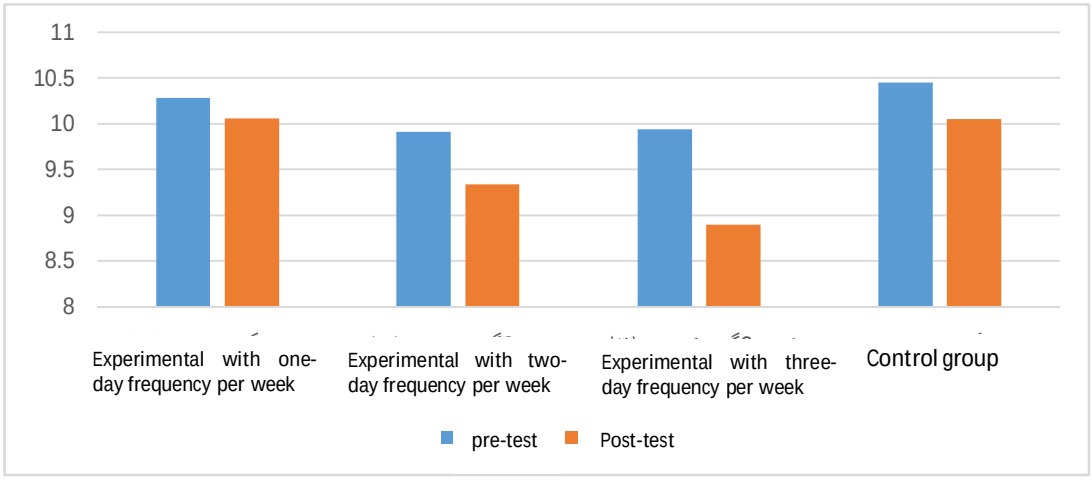

Figure 1- Mean of 60 meters per second running variable in the studied groups

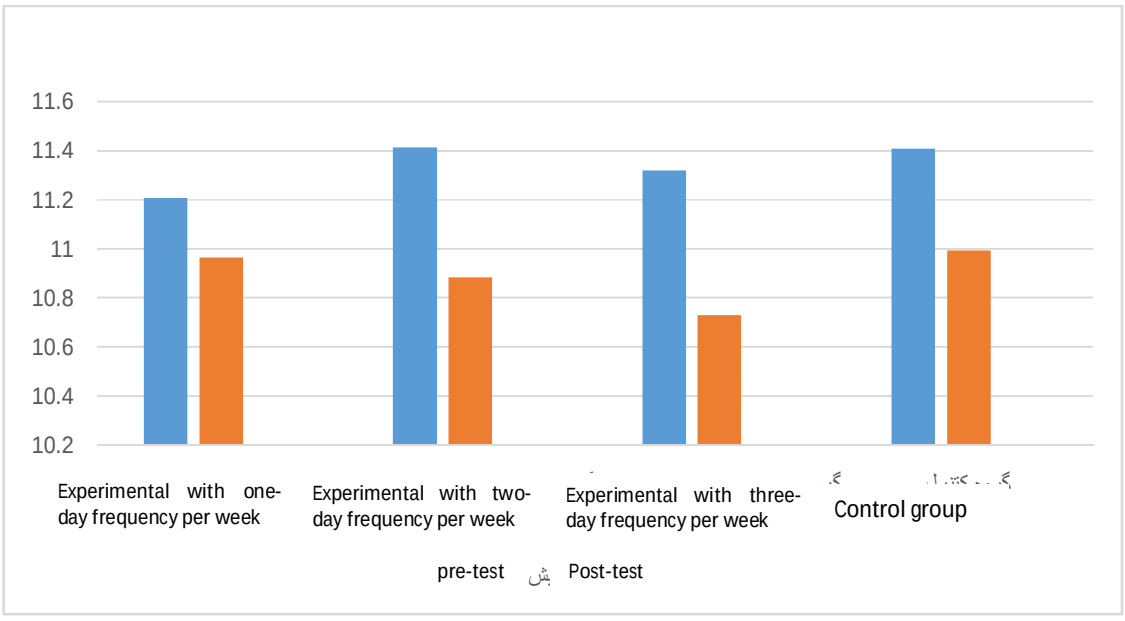

Figure 2-Mean of agility variable in the studied groups

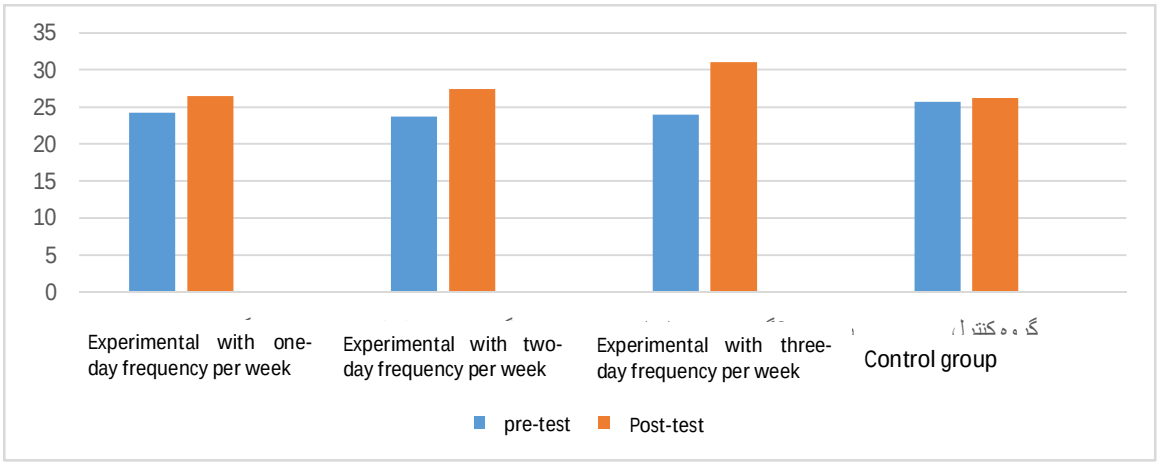

Figure 3 shows- the mean of vertical jump height variable in the studied groups

4. CONCLUSION

Based on the results of this study in which all of the physical variables were measured, it was observed that physical activity has been increased after 8 weeks of physical activity along with physical exercises. Based on results and conclusions of this study, it is recommended that frequency of exercise should be increased but its amount should be reduced in order to increase the muscular power. Most of the papers support the increased frequency of exercise to improve agility (Hosseinpur 2007), and the current study proved this fact, that may be due to the nature of sport field in all 4 groups. Bakir and Newton (2008) believe that increased agility and speed in changing the direction are associated with two factors of improved speed and strength of muscle contraction and increased coordination of the muscles and nerves (Baker, 2008).As ability is regarded as multi-lateral ability, much time and more sessions are required per week for its development. Based on the results and conclusion of the current research, the frequency of exercise should be increased to increase the speed.

The results showed that short-term plyometric exercises with the moderate frequency create similar improvementsin jump performance, but it has higher efficiency compared with higher frequency exercise. The results also show that a minimum threshold of exercise, after that its amount increased, is not followed by greater advantages. The results do not support this idea that it is better that its amount should be increased as far as possible (Turabi 2013).These results are consistent with the results of the current study that increase of 3 days per week exercise with lower exercise amount provides better results in improving the muscular power in the vertical jump.

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