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The effect of jump-rope training on the physical fitness of 9 to 10 years old female students

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ABSTRACT

The main aim of this study is to find the effect of jump-rope training on the physical fitness of 9 to 10 years old female students. Considering the mentioned objective, 20 volunteered female students of Jahrom are selected as cases for this study and they are randomly divided into training group and controlling group. The first group, participated in jump-rope training three sessions per week. This training process continued 15 weeks, while; the latter group did not participate in any exercise programs and continued with their daily activities. Some factors related to the physical fitness, such as balance, speed, and agility of the participants are assessed before and after the training process. Data analysis is performed by using dependent and independent t-test. The results have demonstrated that the balance, agility, and power of the training group is increased ($p<0.05$), however; similar results are not achieved for speed ($p>0.05$). The results have proven that jump-rope training increases the physical fitness of 9 to 10 years old female students. However, speed seem to be a heritable trait and did not change after the training process.

Key words: Jump-rope, physical fitness, power, balance, agility

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INTRODUCTION

Jump-roping is a low-cost physical activity, thus; its impact on the physical fitness is being studied by various researchers. Jump-roping involves the muscles in arms and legs, and it also improves cardiovascular function and metabolism. Rope is a portable tool and jump-roping require minimum space. On the other hand, jump-roping is incredibly cheap compared to the other sports (1).In an earlier research the effect of jump-rope training on children with mental and visual disorders is being studied. The results have illustrated that jump-roping improves their balance significantly (2,3,4). Current researches have also suggested that by administering an effective physical activity including jump-roping, an improvement in physical fitness will be experienced (4, 5, 6, 7, 8, 9).

Partavi et al in 2013 claimed that 7 weeks of jump-roping workout for 15 to 50 minutes a day and 3 days per week significantly improves agility of the teenage boys (17/3%). This study has proven that 7 weeks of jump-roping workout is an effective way for improving agility of the young boys. In addition, the results have demonstrated a non-significant improvement in the speed performance with a rate of 0.29 percent (50 meters running speed). Generally speaking, few researches have studied the effect of jump-roping on speed (1).

The results of a study which is conducted by Chao-Chien and Yi-Chun in 2012 have shown that 12 weeks of jump-roping workout did not affect the BMI of students with mental disorders; however, it had a noticeable positive impact on their agility (10).

Chao and Shih have studied the effect of jump-rope training on the physical fitness of students with visual impairment in 2010. The results have proven that jump-rope training had a positive impact on the agility of the test group (11).

Chen et al. have examined the effect of jump-roping on children with slight mental disorders and concluded that jump-roping has a noticeable positive effect on their balance (2). Furthermore, Tsai in 2009 has studied the effect of jump-roping on children who suffer from blurred vision and reported a significant improvement of balance (3).Yeh (2007) has examined the impact of jump-roping on children with mental retardation and found an improvement in their balance (4).

Although there exist various researches which have studied the effect of jump-rope training on physical fitness, especially its impact on agility (1,12), none of these studied are conducted in Iran and this gap exists among the current literatures.

The life quality of residents and the level of enforcement can be enhanced by developing the physical fitness of each community. The importance of this subject can be fully comprehend when it is considered that students are the future of each community and can develop it from various aspects.

When people are asked about the reasons that they do not participate in any sporting activities, most of them complain about not having enough money and time. If physical fitness could be enhanced by jump-roping, time and costs would not cause any problems. Jump-roping does not require travelling between home and sport clubs. Additionally, much time for exercise is not needed, similar to jogging, jump-roping does not ask for great spaces and can be performed with minimum costs and only a rope.

Therefore, the aim of this study is to find the effect of 15 weeks of jump-rope training on the physical fitness of 9 to 10 years old female students.

MATERIALS AND METHODS

In order to gather the required data, 20 female students between 9 to 10 years old of Jahrom are selected. After calls in all elementary schools of Jahrom, some families have accepted to participate in the study. The selected cases are divided into two groups (10 for each) which are training and controlling groups.

All selected subjects had a complete physical health. After selecting the participants, informed consent was obtained from their parents. The demographic characteristics of the subjects are presented in Table 1. The results of t-test have shown that the two groups have homogeneous age, height, body mass and body mass index (BMI).

Table 1. Demographic characteristics of subjects

P-value	t	Control	Exercise	Variable
0.759	0.309	9.55±0.510	9.50±0.512	Age (years)
0.783	0.277	141.05±5.17	140.35±3.66	Height (cm)
0.55	0.57	35.20±2.97	34.90±2.55	Mass (kg)
0.192	1.329	18.02±0.53	17.63±0.56	BMI (kg/ m)

Data collection method

The participants were informed related to the process of collecting data one week prior to the training. In this session, beside informing the participants of the training process, their demographic characteristics were measured. Additionally, 48 hours prior to the training sessions, physical fitness tests are conducted from both training and controlling groups and their scores are recorded.

The training group participated in the jump-rope training for 15 weeks, while the controlling group did not participate in any regular exercise and only performed their daily activities.

After 15 weeks, the resting process is being planned considering the distance between the first day of testing and exercises (48 hours), the last test is performed similar to the first one which was conducted prior to the training. Both training and controlling groups participated in physical fitness tests and the scores are recorded. Balance is being analyzed by one leg balance test, while agility is studied by two 9 × 4 Illinois test, and speed by 50 meters running test. Finally, power is being measured by the Sargent jumping test.

Exercise program

The training group performed 15 weeks of jump-rope workout for three sessions a week (totally 45 sessions). At the beginning of each session, the participants performed warm-up, stretching, upper and lower body exercises which are suitable for their age for 10 minutes. Finally, to prevent damages, cooling exercises are performed for 5 minutes. The Schedule of trainings from the first to fifteenth weeks are shown in Table 2.

Table 2: A woman from week one to week training program rope XV

Jump-roping	The rest	Repeat	Time of day	Week
15 seconds	45 seconds	8times	2 minutes	1 & 2
15 seconds	15 seconds	12 times	3 minutes	3&4
30 seconds	15 seconds	8 times	4 Minutes	5 & 6
1 minute	30 seconds	7 times	7minutes	7 & 8
5 minute	1 minute	2 times	10Minutes	9 & 10
3 minute	1 minute	5 times	15Minutes	11 & 12
6minute	1 minute	3 times	18Minutes	13 & 14
8 minute	2 minutes	3 times	24Minutes	15

Statistical methods

The value of each studied variable is being described by analyzing their standard deviation. In this study, in order to evaluate normal distribution and to use parametric or non-parametric tests, Smirnov - Kolmogorov test is being applied. Since the data have a normal distribution to compare changes in the training and controlling groups, independent it is used. Additionally, for in-group evaluations, dependent t is applied. For all statistical tests, the significance level was considered equal to o.o5. The statistical software SPSS version 16 was used for statistical calculations.

RESULTS

The values of studied variables with average and standard deviation are illustrated in table 3.

Table 3. Mean and standard deviation values

Changes	After practice	Before practice	Group	Variable,
-2.02±2.14	32.70±2.35	34.90±2.55	Practicing	Body mass (kg)
-0.10±0.87	35.20±2.97	35.30±3.05	Control	
-1.09±1.06	16.54±0.89	17.63±0.56	Practicing	(kg/ m) BMI
-0.24±0.57	17/77 ± 0/71	18.02±0.53	Control	
1.60±1.26	8.30±1.94	6.70±2.90	Practicing	Balance (scores one foot) practiced
0±0.47	6±3.36	6±3.65	control	
-1.80±.54	18.50±1.35	20.30±2,35	practicing	(Agility (scores of both agility Illinois
0.1±1.10	20.40±2.22	20.30±2.66	control	
0.02±0.113	9.02±1.11	9±1.15	practicing	Speed (running time 50 m)
0.08±0.42	9.17±0.97	9.07±1.01	control	
7.30±4.08	22.20±5.07	14.90±2.84	practicing	(Power (Sargent jump test scores
0±1.054	13.70±2.71	13.70±2.90	control	

** Significant at P≤0.05.*

Table 5. Results of t-test for comparison between groups of variables

p	df	t	group	
0.75	18	0.31	Practice	
0.52	18	2.08	control	Body mass
* 0.010	18	2.86	changes	
0.13	18	1.56	Practice	
* 0.003	18	3.41	control	BMI
* 0.041	18	2.20	changes	
0.64	18	0.47	Practice	
0.07	18	1.87	control	Balance
*0.001	18	3.74	changes	
0.74	18	0.001	Practice	
* 0.03	18	2.31	control	Agility
* 0.005	18	3.16	changes	
0.88	18	0.14	Practice	
0.75	18	0.32	control	Speed
0.67	18	0.42	changes	
0.36	18	0.93	Practice	
* 0.001	18	4.67	control	Power
*0.001	18	5.47	changes	

** Significant at P≤0.05.*

Paired t-test results for the in-group study variables are presented in Table 4. The results of t-test to compare groups of variables are presented in Table 5.

According to the obtained results, body mass and BMI of the training group decreased noticeably (P <0.05). However, these factors did not have any significant change for the controlling group (P> 0.05). The comparison of the decrease of body mass and BMI between two groups was significant (P <0.05).

Balance, agility and power of the training group had a noticeable growth (P <0.05), while these factors did not change for the controlling group (P> 0.05). Additionally, the increase of balance, agility and power of the training group were significant compared to the controlling group (P <0.05). Speed, however, did not face a noticeable change (P> 0.05).

DISCUSSION

Based on the findings of this study, 15 weeks of jump-rope training improves the balance of 9 to 10 years old female students up to %23.88. This study also confirms the findings of Chen et al in 2010 related to the positive impact of jump-roping on the balance of children with slight mental disorders (2). In this respect, Tsai in 2009 has studied the effect of jump-roping on children who suffer from blurred vision and reported that jump-roping significantly improves balance (3). Furthermore, Yeh in 2007 has analyzed the impact of jump-roping on children with mental retardation and reported a significant improvement in their balance (4).

Nicholson in 2005 has also studied jump-roping workout. The study was conducted with 256 participants who were 5 to 14 years old. The process of jump-rope training lasted 24 weeks. The results have proven that jump-roping is not only fun but also reduces the risk of obesity, diabetes and depression and improves balance (13). The jump-roping exercises may lead into better focus on the performed tasks (14). However, the effect of jump-roping on this factor is not evaluated in any research and requires further studies. If physical exercise could reduce the variability in the use of motion units (15), increase plasticity of the motion (16) or help to use muscles to perform activities (17), it would also improve balance.

Obtained results from the jump-rope training in this study may be also caused by one or more of these factors. Recent studies suggest that dynamic exercises are closely linked with the increase of cortical excitability of the spinal. Neural adaptation seems to be involved in this case (18,19,20).

Based on the findings of this study, 15 weeks of jump-rope training improves the agility of 9 to 10 years old female students up to %25.71. Similar to this study, Partavi in 2013 have illustrated that 7 weeks of jump-roping, 15 to 50 minutes a day and three sessions per week, significantly increases the agility of teenage boys (%3.17). The results have proven that jump-roping is an effective way of increasing the agility of teenage boys (1).

On the other hand, Chao Chen and Yi Chun in 2012 have demonstrated that 12 weeks of jump-roping does not affect the BMI of the students with mental disorders, however; the results have shown a noticeable improvement of agility. Nicholson in 2005 has also studied jump-roping workout. The study was conducted with 256 participants who are 5 to 14 years old. The process of jump-rope training lasted 24 weeks. The results have proven that jump-roping is not only fun but also reduces the risk of obesity, diabetes and depression and improves balance (13). Marilyn Jane Wilson has conducted a study related to the development of jump-rope workout in elementary schools in 2004. The results have shown that jump-roping is a suitable exercise to improve agility and coordination (21).

Jump-roping involves continuous jumps and rapid reactions. A moment of neglect can cause the cumbersome of the rope. In this respect, rapid reactions to the rope can increase agility. Furthermore, better function of the sympathetic nervous system may occur as a result of jump-rope workouts.

Based on the findings of this study, 15 weeks of jump-rope training improves the power of 9 to 10 years old female students up to %99.48. Makaruk in 2013 has analyzed the effect of continuous jumps of jump-roping during warm-up on the jumping ability of men. A group of 12 men in a national level participated in this study. The jumping ability and power of the participants from 5 alternatives were measured. Three different warm-up protocols which were three days apart from each other are used. The first one consisted of common jumping exercises. The second one was jump-roping, while the last one was controlled and involved common warm-up exercises (jogging and stretching).

Jump-roping had a significant positive impact on the length of jumps compared to the common protocols. The difference between the peak of power or the height of jumps was not significant. This study also illustrated that common protocol and jump-roping improve the peak of power and the height of jumping.

Makaruk in 2013 implies that warm-up exercises, involving jump-roping, have greater impact on the length of jumps compared to the common jumping protocols, and the common jumping protocol and jump-roping provide same increase in vertical jumps (12).

When power enhances, strength should also increase. Jump-rope exercises may cause muscle protein degradation, as a result of increased strikes and resistance. However, this process also causes a potential of increase of muscle sizes and power. With the increase of power, when speed stays still, the strength also improves.

It should be noted that, jump-roping is a jumping exercise and it is highly similar to the Plyometric Exercises. Similar to the Plyometric exercises, jump-roping also have two levels of extrovert contraction and rapid introvert contraction. During the extrovert contraction, when the Quadriceps and twin muscles are stretched, the elastic components are also stretched. Thus, part of the energy is stored in the form of elastic potential energy. During the introvert contraction, this energy releases and results in the increase of power and the speed of movement. An increase in the mentioned factors also causes the improvement of strength. Additionally, the nervous coordination that occurs as a result of power exercises, such as Plyometric and jump-roping (the stretching reflex of muscle spindles), results in the increase of power (22).

Generally, it can be concluded that, an improvement of muscle strength, jumping performance, and running at high speed, are linked with two qualities of the muscles. First, strong muscular tension prior to the contraction which results in tensile reaction to activate the introvert muscle contraction.

The reactionary nature of the muscle fibers, saves energy during activities. Determining the effect of these factors is a difficult task (23). Improvement in tests, can occur as a result of increased excitability and neuromuscular performance of the twitch motion components. These exercises stimulate muscle spindles and improve muscular power.

In fact, power is used in jumps and throws. These exercises also improve power. Power is the most important factor in the success of an athlete.

According to the findings of this study, 15 weeks of jump-roping did not results in a significant change in the speed of 9 to 10 years old female students. Similar to this study, Portavi et al. in 2013 have found that 7 weeks of jump-roping 15 to 50 minutes daily and three days per week, caused a non-significant change in speed up to %0.29. This factor is measured by 50 meters running test after 7 weeks of jump-roping. The results are in line with what is achieved in the current research.

There exist few researches related to the effect of jump-roping on speed (1). The percentage of muscle fibers (slow-twitch and fast-twitch), determine the speed of an individual. While the percentage of muscle fibers are determined during the first years of life or even prior to birth. The genes that are inherited from parents are determining the percentage of muscle fibers. Therefore, speed seem to be a heritable trait. Although it may be increased by some exercises, this change is not noticeable. This fact can be the result of a slight change in the speed of the students after jump-rope training.

CONCLUSION

According to the obtained results, it is concluded that, jump-rope training increases some factors of physical fitness for 9 to 10 years old female students. Balance, agility and strength increased, while speed remained approximately unchanged. Generally speaking, the physical fitness has improved, however; speed did not change because it is a heritable trait.

REFERENCES

[1] Partavi. Sadi *Sport Science* 6 (**2013**) 2: 40-43.
[2] Chen, H. M. (**2010**). The Effects of rope skipping on health-related physical fitness in student with mild intellectual disability: A case study. /Unpublished Master's Thesis/. Taipei: National Taiwan Normal Un.
[3] Tsai, Y. H. (**2009**). Effect of rope jumping training on the health related physical fitness of students with amblyopia. Unpublished Master's Thesis. Taipei: National Taiwan Normal University.

[4] Yeh, H. C. (**2007**). The role of vision in rope skipping training for balance development in the mental retardation. Unpublished Master's Thesis/. Taipei: National Taiwan Normal University.
[5] Feng, T. C. (**2007**). The influence of rope skipping on health related physical fitness of junior high school students-A case study of huei-long elementary and junior high school. Unpublished Master's Thesis. Taipei: Fu Jen Catholic University.
[6] Lee, F. C. (**2010**). The effects of forty-weeks jumping rope exercise intervention on physical fitness of elementary school students. /Unpublished Master's Thesis/.Pingtung: National Pingtung Un. of Education.
[7] Shen, C. K., & Huang, J.S. (**2000**). *Physical Education Journal*, 31, 81-90.
[8] So, L. S. & Lin, M.Z. (**2001**). *Chia Nan Annual Bulletin*, 27, 195-202.
[9] Wu, C. K. (**2002**). The influence of different kinds of exercise on cardiopulmonary function of junior high girl students. Unpublished Master's Thesis/. Taipei: National Taiwan Sport University.
[10] Chen, Chao-Chien, Lin, Yi-Chun. (**2012**). *The Journal of Human Resource and Adult Learning*, Vol. 8, Num. 1.
[11] Chao, Ch. Ch., Shih, Y. L.(**2010**). The impact of rope jumping exercise on physical fitness of visually impaired students. Department of Physical Education, Asia University, 500, Lioufeng Road, Wufeng.
[12] Makaruk Hubert. *Pol. J. Sport Tourism* **2013**, 20, 200-204.
[13] Nicklson, MS. (**2005**). *Florida Public Health Review*, 20**0**5, 2: 60-62.
[14] Lindenberger U, Marsiske M, Baltes B. *Psychol& Aging*, **2000**; 15: 417-436.
[15] Kornatz K W, Christou E A, Enoka RM. *J Appl Physiol*, **2005**; 98: 2072-2080.
[16] KarniA, Meyer G, Jezzard P, Adams MM, Turner R, Ungerleider LG. *Nature*, **1995**; 377: 155-158.
[17] Carrol TJ, Barry B, Riek S, Carson R G. *Proc Biol Sci*, **2001a**; 268: 221-227.
[18] Jensen J L, Marstrand PC, Nielsen JB. *J Appl Physiol*, **2005**;99: 1558-1568.
[19] De Vreede PL, Samson M M, Van Meeteren NL, Duursma SA, Verhaar HJ. *J Am Geriatr Soc*, **2005**; 53: 2-10.
[20] Manini, T., Marko, M., Vav Arnam, T., Cook, S., Fernhall, B., Burke, J., Ploutz-Snyder, L. *J Gerontol*, **2007**; 62A(6): 616-623.
[21] Wilson, M. (**2004**). *Florida Public Health Review*, **2004**, 1: 59-62.
[22] Hamza Daneshmandi , impact on you plyometric exercise anaerobic son Karan Zhymynastyk 13 to 14 years old, light peak, Issue III, 1385 pages 63 to 69
[23] Borkowski, J. *Abstracted in athletic training*. 25(2) **1990**.p. 122 .