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Research Article

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The comparison between three methods of resistance exercises (elastic, weight machine & combination) on power, strength, the amount of jumping & flexibility among teenage volleyball players

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ABSTRACT

Muscle strength and explosive power are of the principal factors in the sports and development this factors invoices with proper resistance training, depending on the nature of the sport is highly regarded. The aim of the present study was to comparison of tree type of resistance training (elastic, weight machine and combined) on strength, power, vertical jump and flexibility of teenager volleyball. For this purpose, 33 teenager volleyball players with an average (age 16/4 ± 1/21 years, height 177/5 ± 2/4 cm and weight 67/3 ± 3/22 kg) were randomly selected and division in the three experimental groups (elastic (N=9), machine weights (N=9) and combined (N=9)) and a control group (N=6). All three experimental groups done resistance training 2 sessions of weeks, for 12 weeks with plan compiled but Control group continued to practice volleyball. Before and after training, pre-test and post-test of 1 RM per exercise (bench press, shoulder abduction , leg extension , leg curl and leg press), Anaerobic Wingate, vertical jump Sargent, the explosive power on the charts Louise and flexibility of subjects was performed. To analyze the data, descriptive statistics, ANOVA and LSD post hoc test was used. Analyze the data record significant increase in post-test data subjects, compared with pre-test them. The results showed that elastic resistance training, weights machines and combined can be to increase Muscle strength. The results also showed that weight machines and combined resistance training can be to increase muscle strength more than of elastic training. The vertical jump was significantly increased in all three experimental groups compared to the control group, but no significant difference between the experimental groups was seen in the vertical jump. Lewis charts the explosive power in all three groups increased, but this increase was significant only in the elastic resistance training. The peak power (W) and (W/Kg) and average power (W) and (W/Kg) increase, but this increase was not statistically significant. The results also showed that elastic resistance training can be to increase the explosive power more than of weight machines and combined resistance training. The flexibility of the trunk, there was no significant difference between experimental group and control group .Result of present study shown, when the goal of resistance training is increases muscle strength, combined of resistance training and when the aim of resistance training is to develop the power, use of elastic resistance training is a priority of the other two methods.

INTRODUCTION

By doing accurate studying on the different kinds of sport found that most of them need to skills & moves, special muscle power &skills (combination of power & speed). For example; jump shot basketball, ACE volleyball, hit head

, tennis, shooting drive, hop movement in four jump track in track & field& … need to the strength all physical factors, specially muscle strength & explosive power. In-doubtless, these are the most important in most of sport fields. So, body building is in the priority of coaches' planning to obtain success [1, 2]. Developing these factors are paid attention more by using appropriate resistance exercises depended to the nature of sport, as using different methods developing power is about 8-12 speeder than using existing skills in sport field [3]. In the recent decade are used different methods for muscle power & strength [1]. But there are so many literatures in about the role of exercising variables & kinds of strength exercising tools [4, 5]. Some of the studies were reported similar results in resistance exercising with elastic & free weights [6, 7] But some of them increasing muscle power & strength were reported different [8]. The researchers found that increasing the strength with weigh (lifting) accompanied by slowness of movement in resistance exercises. So maybe the athletes have fat without any speed movement to solve this problem using ballistic exercises (throwing), plyometric & elastic [1]. Also in the recent researches resulted that combination the elastic exercises with free weight & weight machines caused to increasing the power [8, 9]. Explosive power as a result of elastic & plyometric exercises is higher than resistance exercises with weights [10]. So regarding to the rear of studies & deficiencies of recent studies & the role of usage tools in resistance exercises, this research surveys on it by keeping some variables stable such as; Intensity, volume, contract type, type of movement, exercise time, the movements, periods of rest & the speed of movement & also studied which of used methods (elastic, weigh machines &combination) have more compatibilities with teenage volleyball players' power, strength, the amount of jumping & flexibility.

EXPERIMENTAL SECTION

Participated militants: 33 male teenage volleyball players & 33 teenage volleyball players with mean (age 16.4+/-1.21 years, height 177.5+/-2.4 Cm& weight 67.3+/-3.22 Kg) that their experiences were 6 months to 3 years & they are selected in sample way. Their personal characteristics are collected & recorded before beginning the research & then filled the Health & Consent forms of participating in research. Also they were familiar to correct techniques of movement & testing methods & exercises 12 weeks in body building clubs in Isfahan University.

Tests: the variables which surveyed consist of: muscles power (including two upper movements & three lower movements). Test 1RM, anaerobic capacity of lower limb was tested by Wingate test, the jump test by jump Sargent, explosive power & flexibility tested by Luis Chart, waist & hamstring flexibility was measured through test sit & brush. Also their weight & height were measured in the first course & last session (after 12 weeks).

The method of doing research: this research is semi-experience & the method of doing it field ones. The population included volleyball players in Isfahan Volleyball Association of area 4. They were 33 persons who had experiences 6 months to 3 years & they were selected voluntary& accepted as sample. All athletes were healthy (by filling Par-Q & You questionnaire) & have means of age 16.4+/-1.21 years, height 177.5+/-2.4 Cm & weight 67.3+/-3.22 Kg. they divided into the 3 experimental groups& 1experimental group (groups of elastic, weight machine &combination, each of this group included 9 persons &control group were 6 persons)

The researcher can do his works in collaboration with the University of Physical Education Department of the University gym. To familiarize participants with the exercises& tests before the start of the briefing was held. After this step, the pre-test was done for the strength of 1RM, flexibility, anaerobic Wingate & jump Sargent then three experimental groups exercised 12 weeks in 2 sessions in 60-75 minutes. Weight machine group exercised by using machines in gym & elastic group exercised by Thera Band &Thera Tube &combination group exercised cache (pesticide) connect to your device bodybuilding. At the beginning of each session 10 minutes warm up & then exercises for recovery in 7 minutes then did stretching exercises. The kind & discipline of doing it were similar in 3 experience-groups. The time of doing movements were 1-2 seconds for concentric & eccentric contraction. The break time was 1-1.5 minutes between each set & the rest time was 2 minutes between movements.

Elastic resistance exercising protocol: their exercising was begun with strong cache (pesticide) exercises that could do it 10-12 times, & then they continued in next sessions to 20 times. So increasing the traction of cache (pesticide) or using other cache (pesticide) s with high resistance to obtain 10-12 times. Doing this exercise would be continued in same routine to arrive 20 times for each movement. Cache (pesticide) resistance increased by increasing the tractions of it or replaced it with household higher resistance.

Weight machine resistance exercise protocol: their must do warm up as general & professional then selected the weights that could reputation 10-12 times. In the next sessions must be increased to 20 times & in the other sessions increased the weight in the 10-12 times. This group continued the same routine every time on every move so that the number of repeat participants scored 20 increased the weight machines.

Combination resistance exercise protocol: they did bench press, shoulder, front thigh, leg curl & leg press machine sits by the body that connects the cache (pesticide). The tractions were divided between cache (pesticide) & weight machine as subjects with stubble connection devices could only move half the number of repetitions to run when the cache (pesticide) was not connected to the device. Then the subjects continued their exercises to can do from 1 to 10 or 12 times & then to 20 times. After that they could increase the traction of cache (pesticide) & weight equally.

Method: the descriptive method was used for determining the mean, standard deviation, height, weight & age. For evaluating the nature of distribution of variables was used Kolmogorov-Smirnov test, why they had normal distribution was used Co-variance & LSD Post hoc tests for determining the groups differences. Also dependent T-parametric test was used for determining the changes in pre-test & posttest in each group. All of the statistics were done by SPSS 20 software & the p-value was considered as 0.05.

RESULTS

The results of research showed that the muscle power will be increased by doing elastic, weight machine & combination resistance exercises as the diagram 1-4 showed the amount of power in resistance exercising movements combined bench press, front thigh, leg curl & leg press have significant increase compared to the control group. There is significant relationship between the resistance exercising machine weights of muscle strength in the bench press movement, the front thigh leg press & chest press & leg press movements' elastic resistance exercising & the control group. The level of power in shoulder in control group had increased also there is not significant in it. The level of jumping of them were increased in three groups than control group but there was not different significant in amount of jumping in control &experimental groups (diagram5). There is no significant difference between bodies flexible among experimental groups. The explosive power increased among three experimental groups also it just significant in elastic resistance group (diagram 6), finally, at the peak anaerobic power & anaerobic power mean were not observed a significant difference between experimental groups & the control groups.

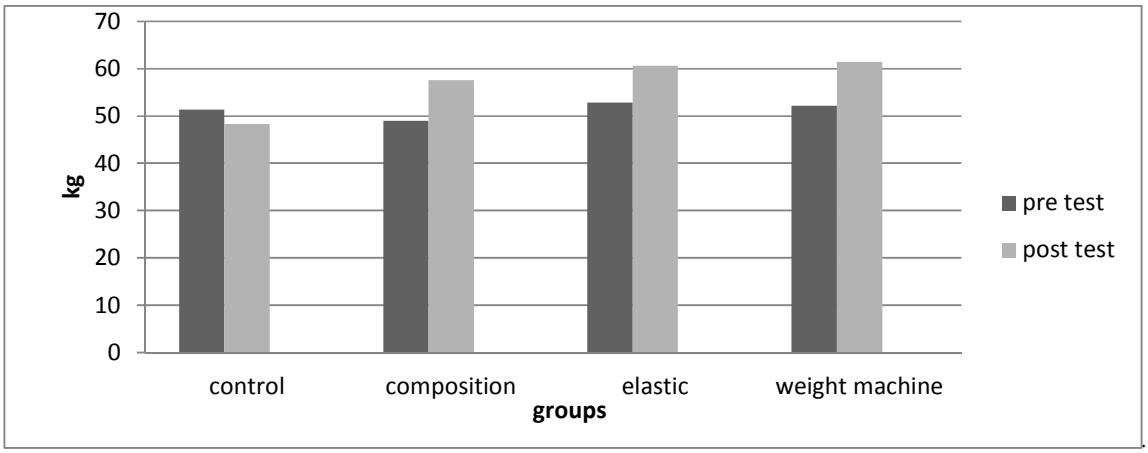

Diagram (1): the changes of bench press strength in control, composition, elastic & weight machine groups

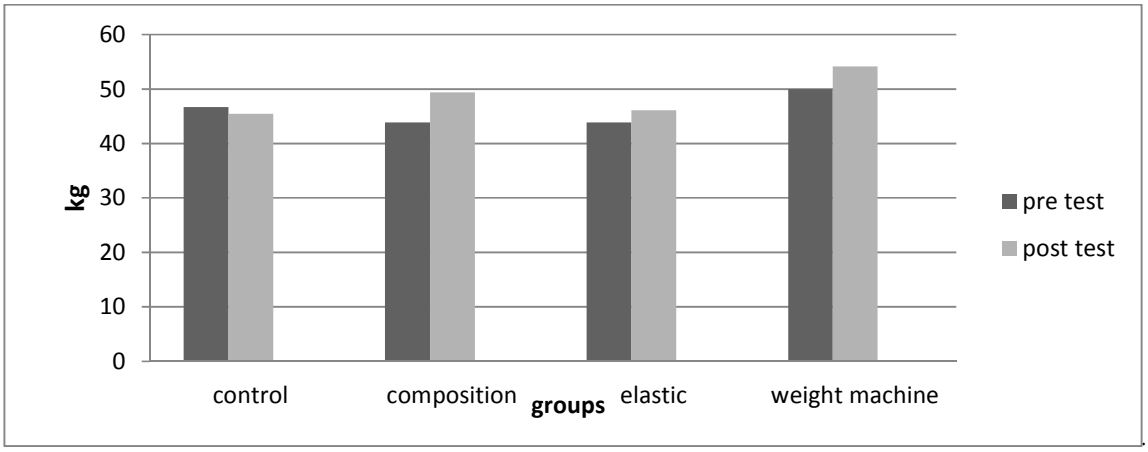

Diagram (2): the changes of front thigh strength in control, composition, elastic & weight machine groups

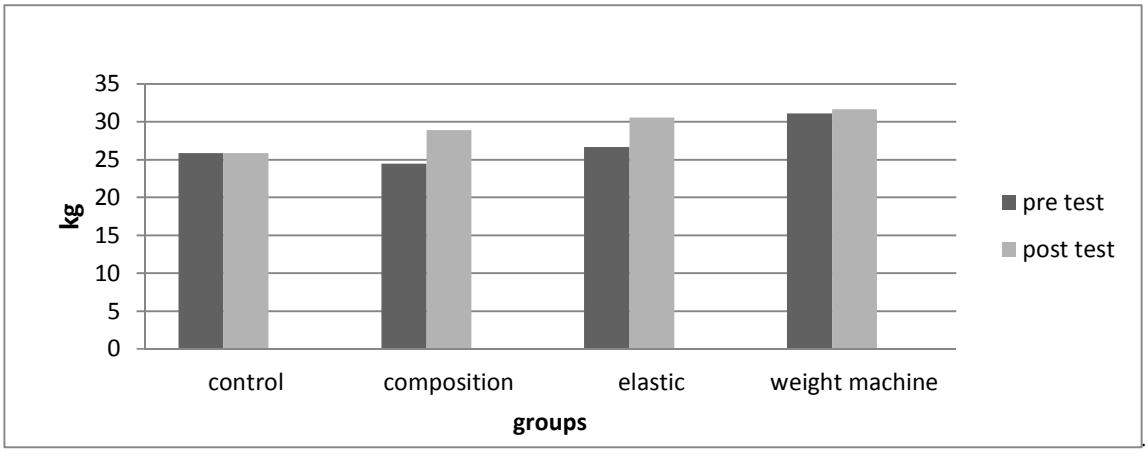

Diagram (3): the changes of hamstring strength in control, composition, elastic & weight machine groups

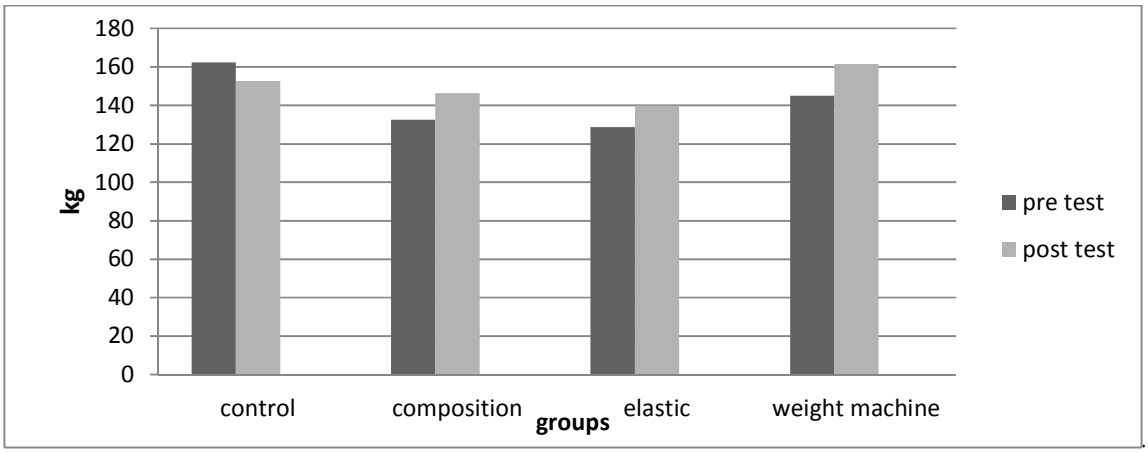

Diagram (4): the changes of leg press strength in control, composition, elastic & weight machine groups

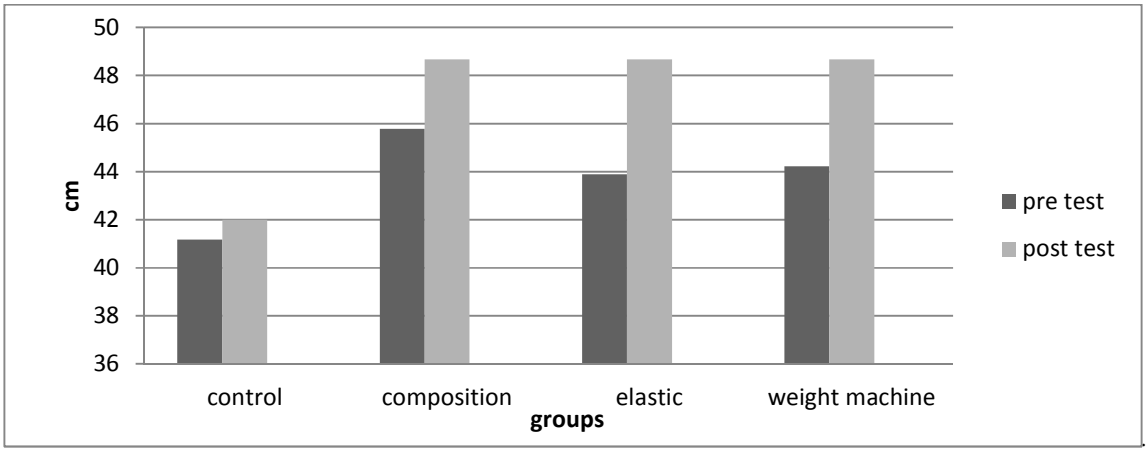

Diagram (5): the changes jump in control, composition, elastic & weight machine groups

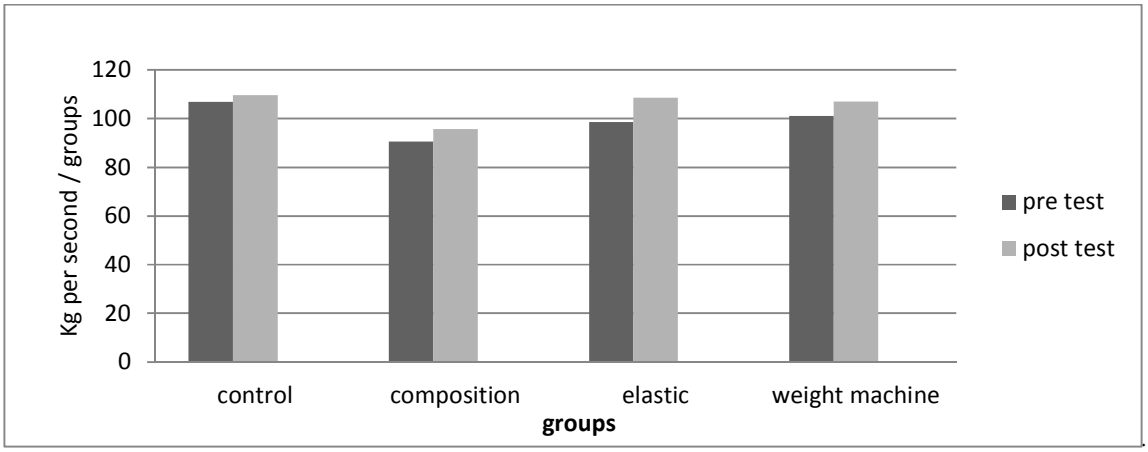

Diagram (6): the changes explosive power in control, composition, elastic & weight machine groups

DISCUSSION AND CONCLUSION

The results showed that 12 weeks resistance exercises had different effects on the muscles power, strength, jumping & flexible among teenage volleyball players. The findings showed that the effects of elastic, weight machine & combination the level of power were increased that is same as Colada & Triplet (2008), Lawrence & Wang (2010), Wallace et al (2006), Ghigiarelli et al (2006), Stevenson et al (2010), Shoepe et al (2011), Elviera et al (2013), Martins et al (2013), Thiebaud et al (2013), Paritsaeree et al (2014), Al-Shorbagy& Hafez Mahmud (2010) &Valkan et al (2011), Kalvandi et al (2011), Toloyee et al (2011) [11, 12, 13, 14, 15, 6, 16, 17, 18, 19, 20, 21, 10, 22].

It seems that the elastic exercises caused to force & increasing tension during forts by making increasing resistance & muscle fibers based on the angle of pull, as other factors such as muscle length & joint angle can be increased force production in the form of change. Must be paid attention that force production depends to the activation of motor units on motor units are recruited based on their size- the smaller & then larger motor units are called motor units, recent research, it seems that the development of tension throughout the exercise motion angle, causing more motor units recruitment & the ability to simultaneously activate the motor units as a result, power is muscle strengthening [10].

It seems that secondary or auxiliary elastic muscle exercises for balance & proper movement patterns are involved in muscle contraction & significantly reinforcing. Also, the length of cache (pesticide) increased ,the elastic exercise increases, the resistance increases as a result of this exercising method is likely to decline in other types of resistance

exercises, the necessary resistance movements covers parts of the terminal & can provide resistance to a particular angle useful.

But Han &Ricard (2011) studied on the 4 weeks effects of elastic resistance exercises on the level of strength & elastic ankle Overture reaction & found that there are not any significant differences in amount of power & reaction ankle inversion between the experimental & control groups [23]. Probably due to the time difference was very little exercise& it seems that the adaptations of muscle strength exercises in longer time (more than 4 weeks) are required. Meanwhile Jensen et al (2012) surveyed on the effects of hip adductor exercises using elastic resistance in football on the eccentric strength of adduction, strength adduction & abduction & eccentric power. After 8 weeks there was no significant difference on the strength of abduction & abduction eccentric power between the experimental group & the control group [24].

It seems that the difference among this results because of the method of exercises & the test kinds. Because muscle operated by contraction during the exercise of his powers better static power test shows that the contraction of muscle operated with the dynamic exercise, as well as muscle operated the dynamic exercises to test their strength better dynamic power & static power test shows [3].

In about the differences among the level of increasing the level of muscles strength & power in elastic, weight machine & combination resistance exercises showed that the increasing the power in combination resistance exercises is more than weight machine resistance exercises & it is more than elastic ones that it is same as Andersonet al (2008), Wallaceet al (2010), Colado& Triplet (2008), Stevenson et al (2010), Lopez et al (2014), Elvieraet al (2013), Paritsaereeet al (2014) &Kalvandi (2011) [8, 13, 11, 15, 25, 16, 19, 10].

Anderson et al (2008) compared two methods of resistance exercise with free weight & combination (elastic with free weight). The power & strength level of resistance in combination resistance; 20 percent of resistance was done by cache (pesticide). At the end of this research, the researchers found that the level of athletes' muscles power & strength in combination exercises were increased than free weight resistance exercises. Also the researchers found that the level of anaerobic power mean as results of combination exercises increased more than free weight, but there was no significant between two groups in the peak of anaerobic power [8].

Colado& Triplet (2008) compered the elastic & weight machine resistance exercises & the subjects did the muscle resistances. Finally they resulted that the number of repetitions in the squat & leg press exercises in both groups significantly increased but the increasing in weight machine was more than elastic group that not be significant.

Wallaceet al (2006), Paritsaereeet al (2014) founded that combination elastic & free weight caused to increase the power & strength [13, 19]. Also Stevenson et al (2010), Lopez et al (2014) stated that the combination of free weights & elastic resistance exercises are beneficial in terms of power & resistance & are divided at all levels of the evenly [15, 25]. In the other research that was done by Kalvandi et al (2011), they surveyed on the effects of elastic exercises, parametric & free weight resistance that found that the level of jumping because of elastic &plyometric was more than resistance exercise with free weight & the power in elastic & free weight resistance exercises was more than power in plyometric exercises [10].

One of the disadvantages of elastic resistance exercises weights or resistance machines, free weights versus resistance exercises is that the elastic resistance exercises only a certain amount of resistance can be established & to the extent that the cache (pesticide) would increase the amount or type of caching can cause resistance, overload may be necessary to improve the muscle, while the weight machines or free weights, resistance exercises, can easily increase the amount of resistance. Also can be focused on target or main muscle by weight machine & the involved muscle in the exercise of the muscles can avoided in secondary or other auxiliary. However, that elastic resistance exercises muscles in balance & help muscle contraction involved in this case at times when we want to strengthen a particular muscle is very important & disadvantages elastic exercise is taken into account. Perhaps due to the increase in weight compared to the elastic power machine in this case that it should be noted that the 1RM tests were performed by devices, that the weight machine group worked with it & the persons in this group were strengthen range of motion needed to accurately test, if strength test was performed by the number of reps to stretch the elastic Surely group showed better results at a the test.

A combination of resistance exercises is superior to other methods in this research because of the overlap of weight machine & elastic resistance exercises disadvantages. Increasing the time caused to disadvantages of the elastic exercise was overcome by the weight machine; also the control of muscles involved in exercises was carried out by the weight machine. Create an optimal range of motion & angles to making tension to end movements & the impact of motor units to contract by cache (pesticide) (pesticides).As a result of resistance exercises combined strength was better than the other two methods.

The recent results are not same as Shoepe et al (2010) in about 24 weeks combination resistance exercises (elastic & free weight) effects & just free weight in lifters. In this research there is no significant. It seems that using caches (pesticides) in resistance exercise is useful in the first steps that perhaps it is because of lack of increasing the amount of exercises [6].

The recent research showed that elastic resistance exercise caused to more explosive power than weight machine resistance exercise. These result research are same as Lawrence et al (2010), Valkan et al (2011), Aboodarda et al (2013), Kalvandi et al (2011) [12, 21, 27, 10]. It seems that the elastic resistance exercises, stretching reflections (due to stimulation of muscle spindles) that neuromuscular mechanisms involved in contraction of more motor units when performing plyometric exercises, the elastic exercise is considered as the main mechanism. The researchers considered that the activity of effects of elastic exercises depended to the to changes in the neuromuscular junction- an increase in this type of exercise shortens the time signaling electrical neuromuscular synapses and potential energy stored in the elastic components, and finally, rapid mobilization of muscle fibers and effective coordination within the muscle fibers are agonist and antagonist muscles. In other words, the pressure of foreign forces in these exercises is that your body will twitch muscle fibers used by cache (pesticides).The tension increased fiber length & thus stimulate the muscle spindles and dynamic response ultimately be issued. Then a series of nerve impulse sequence through afferent neurons with an alpha motor neuron synapsis formed a powerful impulse to the skeletal muscle fibers & cause contraction of returns and is overcome external forces. Also, elastic exercise appears to increase the rate of recruitment of motor units & increasing the number of motor units active at the same time, the power & force more powerful blast leads to rapid movements.

In this regard, Melchiorri et al. (2011) in their study stated that elastic resistance exercises neuromuscular activation and stimulation of motor units are faster than weight machine resistance exercises [27].

Also Aboodarda et al (2013) stated that stretch during the eccentric contraction caused to increase power generation & power in the concentric phase [26].

The results of this study showed that all three methods of resistance exercises (elastic, machine weights & combination) increases strength, power & flexibility of the trunk jump without impact on the teenage volleyball players. The results also showed that a combination of resistance exercises& weight machines, elastic exercise to increase the amount of muscle strength & exercise machines, weights & elastic resistance exercises combined to increase the explosive power would be more effective. That is why we have a combination of resistance exercises and weight machines, elastic exercise to develop strength and elastic exercise to resistance exercises to develop explosive power we recommend a combination of weight machines.

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