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Original article

Effect of variable resistance training on certain physical variables and spike performance for female volleyball players

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Abstract

Purpose. Variable resistance training (VRT) has become a great way to modify strength training planning since a relatively short time ago. It consists of adding a variable load (elastic bands or chains) that increase or decrease with a direct proportion to the range during exercise. This decreases the load on the joint at critical points, decreasing the risk of injury. The aim of this study was to investigate effectiveness of Variable resistance training on certain physical variables and spike performance for female volleyball players.

Methods. Twenty-two female players were randomly distributed into two groups. Experimental group (n = 12) practiced 10-weeks Variable resistance training (bands and chain), and the control group practiced 10-weeks of traditional volleyball training only (n = 10). The data collected before - after the training programs for the two groups.

Results. Statistical analyses showed that:

- Significant Difference between the experimental group and control group in Medicine ball throw, Countermovement jump, Dynamometer of leg Strength, Dynamometer of back Strength and Accuracy of spike for posttest to the experimental group.

Conclusions. Under the conditions of our article, the researcher conclusion that ten weeks of Variable resistance training contributed to improving Medicine ball throw, Countermovement jump, Dynamometer of leg Strength, Dynamometer of back Strength and Accuracy of spike performance in volleyball.

Key words: Variable Resistance Training, Power, Spike, Volleyball.

Introduction

The Egyptian Volleyball League was started by the Egyptian Volleyball Federation, which was established in 1949. The Egyptian Federation hosted the World Championship for Volleyball U-18 Women in Egypt in 2019. The Egyptian League is considered one of the strongest competitions in Africa.

Dai Luong Cao (2010) points out that "each progress in performance level is accompanied by more effective, demanding and sophisticated training, routine volleyball practice is not enough because it does not make the player perfect, since the player can train a lot, but if you don't do it with quality and at the right intensity, will be wasting the time." (Martha, et al. 2016)

It can be affirmed that the muscular work that is carried out within the practice of Volleyball is of variable intensity, where the periods of considerable muscular activity alternate with periods of relative relaxation. This requires:

- A high coordination of movements, since almost all of them are carried out in an agile way.
- Resistance to jumping, to be able to withstand the high jumping loads to which athletes are subjected during a match.
- A high development and resistance of power, especially in the legs and arms.

At present, several studies treat the preparation of muscular strength in different ways, but all agree that strength training as a main part of the preparation of high-performance athletes, with the use of the necessary means to guarantee its development. (Volpicella, 1992)

Volleyball is a modality that within its preparation works strength with the aim of strengthening the muscle groups that are involved, mainly, in the spike.

Observations to the training and the competitions of the volleyball players have shown limitations in the power to perform the jumps, insufficient speed and effectiveness in the execution of spikes and their influence on the result of the game because the fundamental objective of this is to obtain points ". of the limitations to maintain the resistance to the jump and the speed of the shot during a set of continuous actions and in a determined time. (Markus, et al 2013)

The Spike or attack is the most complex element of volleyball, since both technical and tactical problems must be solved in the air. It can be compared to shooting on goal in soccer or shooting on basket in basketball. In the Spike all the offensive

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action of the team is concentrated, its objective being to achieve the goal or recover the ball. The shot has to be powerful and aimed at the area that creates the most problems for the opposing team. (Martha, et al. 2016) (Volpicella, 1992)

Strength is the quality by which muscle is able to overcome or sustain resistance. There are different methods could use in resistance training: Free Weights, Elastic Bands, Machines, Body Weight, etc.

One of these methods is Variable resistance training which include a series of eccentric pulleys or levers whose objective is to modify the load along the range of motion. (Anderson, et al. 2008)

Variable resistance training (VRT) has become a great way to modify strength training planning since a relatively short time ago. It consists of adding a variable load (elastic bands or chains) that increase or decrease with a direct proportion to the range during exercise. This decreases the load on the joint at critical points, decreasing the risk of injury. (Markus, et al 2013)

(Amr Hamza. 2013) indicated that variable training method has many advantages as efficient at isolating specific muscle groups. safer than free loads. easy to modify the loads and therefore allow to shorten the training times. in addition, it offers the exact amount of exercise that any muscle group requires.

The aim of this study was to investigate effectiveness of Variable resistance training on certain physical variables and spike performance for female volleyball players.

Material and Methods

Experimental Approach to the Problem

Control and experimental groups performed a pre - post tests in dynamometer of legs & back Strength, medicine ball throw (2 kg), counter jump, and spike test in different positions. The experimental group (EG) trained 90 minutes per day 3 times a week on Variable resistance training for ten weeks. The control group continued in their normal training.

Methods

Twenty-two female players were randomly distributed into two groups. Experimental group (n = 12) practiced 10-weeks Variable resistance training (bands and chain), and the control group practiced 10-weeks of traditional volleyball training only (n = 10). The data collected before - after the training programs for the two groups.

Testing Procedures

Subjects were assessed before and after ten weeks of Variable resistance exercises (bands and chain), all tests during two days before and after program. Before all tests the sample performed general warm-up that consisted of jogging and active stretching.

Countermovement jump test

The main purpose is to measure the explosive strength of the lower limb muscles.

Starting position: the student will stand laterally next to the wall, approximately 20 cm. The trunk should be straight, the arms should be lowered along the body and the legs should be extended. The feet parallel to the wall, with an approximate opening of up to the width of the shoulders.

Execution: at the controller's signal, the performer will be able to bend the trunk, flex the legs several times (without taking the feet off the ground), and swing arms to perform an explosive upward jumping movement. During the flight phase, he should extend his trunk and arm closest to the wall as far as possible, marking on the board, with the middle finger impregnated with magnesia, as high as possible.

The number of centimeters that exists between the two marks made by the subject will be measured.

The body cannot be rotated during the performance.

Medicine ball throw test

The main objective is to measure or assess the explosive strength of the extensor muscles of the upper limb, trunk and lower limb.

Starting position: the player will stand, behind the throwing line, with his feet shoulder-width apart. The body will be disposed towards the throwing direction, and the ball will be held symmetrically with both hands.

Execution: at the controller's signal, the student will raise, with both hands, the ball above and behind the head, simultaneously extending the trunk, flexing arms and legs, raising heels, but without taking off the toe of the ball. ground. From here, he will perform an explosive forward throwing movement, in order to move the mobile as far as possible.

The shot will be measured from the boundary line to the point where the ball falls, and the best of two shots will be scored, recording the distance reached in centimeters. During the throw, the hands act symmetrically and simultaneously above the head, and the thrower cannot move beyond the throwing line.

Dynamometer of back Strength test

The main objective is to measure the muscular power (static force) of the back muscles.

To carry it out, the subject will stand on a bench, to which an extension dynamometer will be attached. The performer will stand with the legs straight and open to the width of the shoulders, and will lean the trunk slightly forward, while grasping, with both hands, a handle that connects it with the dynamometer through a chain.

The measurement of the chain must be adequate so that the subject keeps the legs and arms extended at all times, so that the effort can only be made with the extension of the trunk muscles.

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Execution: at the signal of the controller, the performer must extend his back, pulling the dynamometer with the maximum possible force.

Dynamometer of legs Strength test

Its purpose is to measure the power of the leg muscles.

Description: the subject will stand on firm ground, to which an extension dynamometer will be attached. The performer will remain with the legs semi-flexed and open to the width of the shoulders, the trunk (the back) being completely straight, while grasping, with both hands, a handle that connects with the dynamometer through of a string.

The measurement of the chain must be adequate so that the subject keeps his back and arms extended at all times, so that an effort can only be made with the extension of the leg muscles.

Execution: at the signal of the controller, the performer will perform a powerful leg extension by stretching the dynamometer with the maximum possible power. The force will be exerted while the subject tries to stretch the legs.

Accuracy of spike test.

- The researcher used battery to measure the accuracy of spike.
- Accuracy of spike from position (6) to position (1) from the other court
- Accuracy of spike from position (2) to position (5) from the other court
- Accuracy of spike from position (3) to position (6) from the other court
- Accuracy of spike from position (1) to position (5) from the other court

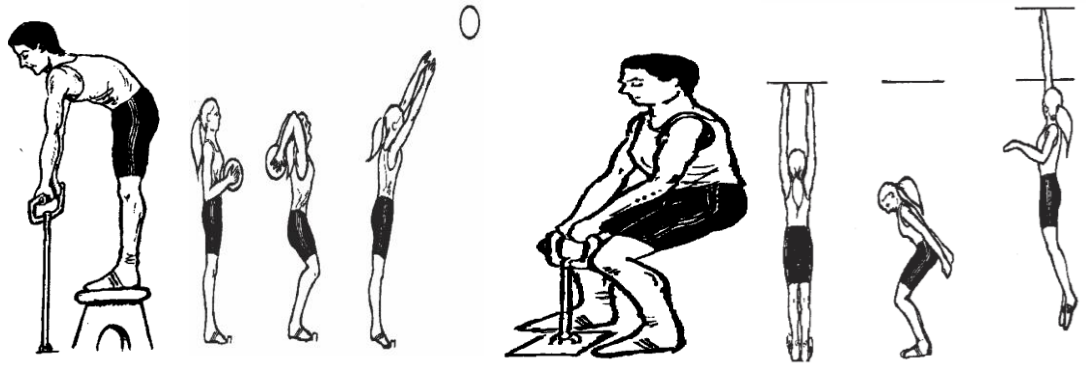

Fig. 1 show the tests

Statistical analysis

The researcher used SPSS statistical package version 24. T

- Means
- standard deviations (SD).
- Student's t-test
- Confidence intervals (± 95%).

Results.

Table 1. Characteristics of groups (Mean ± SD)

Group	N	Age [years]	Weight [kg]	Height [cm]
Experimental	12	19.12 ± 0.6	79 ± 4.8	176 ± 3.77
Control	10	20.09 ± 0.9	74 ± 4.4	175 ± 3.56

Table 1 shows characteristics of groups. There were no significant differences were observed in the variables between the two groups.

Table 2. Differences significant between the posttests for the two Groups (experimental and control)

Variables	Experimental group	Control group	Sign.
	After	After	
Medicine ball throw	5.40 ±0.22	5.11 ±0.23	S
Countermovement jump	43.70 ±2.92	40.18 ±2.75	S
Dynamometer of leg Strength	85.35 ±3.08	80.15 ±3.11	S
Dynamometer of back Strength	74.27 ±2.89	71.53 ±2.93	S
Accuracy of spike	7.42 ±0.64	7.00 ±0.09	S

Table 2 shows that:

- Significant Difference between the experimental group and control group in Medicine ball throw, Countermovement jump, Dynamometer of leg Strength, Dynamometer of back Strength and Accuracy of spike for posttest to the experimental group.

Discussion.

This study assessed the effects of ten weeks of Variable resistance training on Medicine ball throw, Countermovement jump, Dynamometer of leg Strength, Dynamometer of back Strength and Accuracy of spike, the experimental results indicated

that all variables were significantly changing to the experimental group.

The researcher attributes this to the nature of Variable resistance training.

In this regard, Amr Hamza (2013) The effectiveness of the shot will determine the success of the offense and the possibility of getting points, several studies determine that 60% of the points obtained in a volleyball match is through the shot, with number of jumps is 1802 in a volleyball match, 35% are performed by reminted technique.

The researcher used sub-maximum loads of 70% to 80%, thus achieving a good speed in the execution of each exercise. With concentrated on the muscles which used in vertical jump

In this regard, Amr Hamza (2013) indicated that the muscles which used in vertical jumping are.

- Buttocks 30%
- Thighs 25%
- Quadriceps 15%
- Foot extenders 15%
- Back waist, scapula, humeral, pectorals, biceps, deltoid 10%
- Other stabilizers or insurers 5%

This result is confirmed by Elif Turgut, et al (2019) that the Training with elastic resistances only demonstrates significant results in improving strength in athletes and not in sedentary or poorly trained people (2,9). This is due to the instability component of elastic resistance throughout the range of motion (ROM), which can lead to an increased risk of injury in poorly trained individuals, when high loads are used.

Amr Hamza (2020) asserts that the Combined elastic resistance training with free-weights work increases short-term performance adaptations in experienced athletes.

This is confirmed by (Markus, et al 2013) that the spike consists of two moments: the jump and the hit; where the jump aims to reach the maximum height of the center of gravity allowing to overcome the blocking of the adversary, and the blow whose purpose is to achieve the greatest amount of force, speed and precision to reduce the response time of the adversary. In the phase of the jump, it is observed that the body tends to bend forward at the waist, in such a way that applying the biomechanical laws to this movement it is affirmed that the finisher does not manage to hit the ball with its maximum force, because when there is hip flexion the biokinetic chain does not manage to activate all its levers, and according to Newton's second law the acceleration acquired by a body is proportional to the force applied to it. that is, in the spike the player must remain with his body immobile during the impact.

Jalil Ataee, et al. (2014) indicated that Variable resistance training is a technique method that improve power gains beyond those achieved by traditional weightlifting or free weights.

(Reeser, 2017) concluded that the improvement for young individuals in 1RM can be seen after 8 weeks of elastic squat training. This improvement in strength was not accompanied by an increase in the capillarization of the fibers or in the size of these in a cross-section, so it can be thought that this improvement comes more from a neural adaptation. On the other hand, this improvement in 1MR. compared to free weight training did not mean an increase in repetitions with 60% of their 1MR.

It has been shown to improve maximum strength in the bench press (Anderson, et al. 2008; David et al. 2011; Jalil Ataee, et al. 2014) and squat after a strength training program with elastic resistance combined with free weight, versus training with free weight alone.

The results of the study agree with the study of (Anderson, et al. 2008; Markus, et al 2013; Jalil Ataee, et al. 2014) in the Variable resistance training contributed to the improvement the physical variables which related spike skill in volleyball.

The results also agree with the study of (Ziv & Lidor, 2010) where the results revealed that the performance of the volleyball player depends on the development of the level of physical abilities, especially muscular ability.

Conclusions

Under the conditions of our article, the researcher conclusion that ten weeks of Variable resistance training contributed to improving Medicine ball throw, Countermovement jump, Dynamometer of leg Strength, Dynamometer of back Strength and Accuracy of spike performance in volleyball.

References

Markus D J, Emil S, Christoffer H A, Per A, Lars L A, 2013, Muscle activity during leg strengthening exercise using free weights and elastic resistance: effects of ballistic VS controlled contractions, Hum Mov Sci. Feb;32(1):65-78.

Ziv G, Lidor R, 2010, Vertical jump in female and male volleyball players: a review of observational and experimental studies. Scand J Med Sci Sports; 20: 556–567

Anderson CE, Sforzo, GA, and Sigg, JA, 2008, The effects of the combination of elastic and free weight resistance on strength and power in athletes. J Strength Cond Res 22: 567-574.

Wagner RM, Marisete PS, Martim B, Juscelino CB, Leonardo RD, Romulo MCF, Ana Clara B-R, and Ricardo Jacó de Oliveira, 2015, Effects of short-term elastic resistance training on muscle mass and strength in untrained older adults: a randomized clinical trial. BMC geriatrics, vol. 15, no 1, p. 99.

David MB, Matthew DM, Jacob EB, Chul-Ho Kim, Keisuke I, Edward JR, Mathew VB, Ellen L

Glickman, 2011, The effects of combined elastic-and free-weight tension vs. free-weight tension on one-repetition maximum strength in the bench press. The Journal of Strength & Conditioning Research, vol. 25, no 2, p. 459-463.

Jalil A, Majid SK, Richard BK and Li Zuo, 2014, Effectiveness of accommodation and constant resistance training on maximal strength and power in trained athletes, PeerJ. 2: e441.

Martha Y, Salazar-O, José A, Tamayo-Soler, 2016, The muscle force in volleyball atlhetics ecoliers of EIDE, OLIMPIA. Revista de la Facultad de Cultura Física de la Universidad de Granma, Vol.13 No.39.

Volpicella G, 1992, curso de voleibol. editorial de vecchi, s.a.

Reeser JC, 2017, Looking ahead: the future of volleyball sports medicine and science. In: Reeser, JC, Bahr, R (eds) Handbook of sports medicine and science: volleyball. 2nd ed. Hoboken: John Wiley & Sons, pp.221–223.

Amr H, 2013, Effects of circular strength training system on bone mineral density and kicks performance for young soccer players, issue 2 supplement- volume xiii, Ovidius university annals, series physical education and sport science, movement and health, p. 137.

Amr H, 2013, The effects of core strength training (with and without suspension) on lipid peroxidation and lunge speed for young fencers, issue 2 supplement- volume xiii, Ovidius university annals, series physical education and sport science, movement and health, p. 129.