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EFFECTIVENESS OF RESISTANCE TUBE TRAINING ON UPPER BODY POWER AND UPPER LIMB SKELETAL MUSCLE MASS AMONG MALE RECREATIONAL VOLLEYBALL PLAYERS

Sports Science

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ABSTRACT

Background: Volleyball players require neuromuscular co-ordination, speed, agility, strength and power. The game involves serves, spikes, blocks, dives. The spikes and serves require explosive movement of upper limbs. All these actions are to be manifested in shortest possible time. Here, strength and muscular power plays an important role in the game. **Aim:** To determine the effectiveness of resistance tube training on upper body power and upper limb skeletal muscle mass among male recreational volleyball players.

Objectives:

- To evaluate pre and post values of upper body power
- To evaluate the pre and post values of upper body skeletal muscle mass

Methodology: One group pre and post-test experimental study with 30 male recreational volleyball players between 18 to 26 years. **Outcome Measures:** Pre and post values of upper body power are measured using overhead medicine ball throw test and the pre and post values of upper body skeletal muscle mass measured using portable body composition analyzer. **Result:** There was a significant difference in the pre and post test values of upper body power and upper limb skeletal muscle mass. The mean value of pre test upper body power was 7.06 and mean value of post test is 7.78. The mean value of pre test upper limb skeletal muscle mass is 39.90 and mean value of post test is 41.24. **Conclusion:** This study concludes that properly designed eight weeks of resistance tube training can improve the upper body power and upper limb skeletal muscle mass.

KEYWORDS

resistance tubes, volleyball, muscle mass, power.

INTRODUCTION

Volleyball is a team sport played at all competitive levels[1]. It requires high level of technical and tactical skills[2]. During rallies, the players perform explosive movements such as spiking, blocking, and diving[4]. All these actions requires neuro-muscular co-ordination, speed, agility, strength and power[3]. Whereas, the spikes and serves require explosive movements of upper limbs[3]. All these actions are to be manifested in shortest possible time. Here, strength and muscular power plays an important role in the game[1].

Most of the movements of the upper limbs in the game are overhead movements like in spiking, serving, passing, setting and blocking. By combining a variety of resistance training and upper body plyometric exercises to strengthen and power the trunk and the chest/shoulder girdle area, one can improve their capacity to spike. Because of these demands, upper and lower body strength play a critical role in volleyball performance and injury prevention.[7]

To develop high-performing and robust volleyball athletes, strength and conditioning programs with progressively overloaded whole-body exercises and position-specific movements are recommended[4].

Overall the game requires high levels of technical skills as well as selected fitness and anthropometric parameters. Muscle mass aids to generate power. The anthropometric measures like lean body mass, skeletal muscle mass, bone density are of importance in volleyball players. Adequate muscle mass aid in generating muscular power for explosive movements. In recent years coaches and trainers have been focusing on strength and conditioning training. In order to increase muscular power and strength, individuals prefer to participate in traditional resistance training programs. Those programs are performed using gym equipment.

Resistance training has the potential to improve health and performance related parameters in sporting population[5]. Some of these resistance training modalities are designed to make these training techniques more accessible to potential users of different ages and in different settings[5]. These resistance training methods are cost-effective which may be similarly executed than traditional weights, machines or free weights[5].

Different studies have employed elastic bands in their intervention programs and have shown positive improvement in muscular strength, muscular power, body composition, balance and functional mobility[5]. However, there are few studies on the effects of elastic band training programs in sporting population[4]. The resistance tubes are similar to resistance bands in properties and differ in shape and size. They are easy to handle and use due the presence of handles, anchors and straps. Moreover, Treiber et al. found that college-level tennis players may benefit from resistance training with Thera-Band tubing and lightweight dumbbells in terms of strength and functional performance[6]. Furthermore, it is unclear whether strength improvements from general resistance training techniques translate to sport-specific performance, especially when it comes to volleyball skills like spike speed which required upper body power.

NEED OF THE STUDY

There are limited studies in regard to use of resistance tubing in sporting population and with the need to develop studies examining new and popular forms of exercises, this study has been chosen to evaluate the effectiveness of elastic tubing on upper body power and muscle mass among male recreational volleyball players.

MATERIALS

- Resistance tubes
- Medicine ball (3kg)
- Measuring tape
- Body composition analyzer

METHODS

Study design: One group pretest and post-test design

Study setting: SVIMS university

Sample size: 30

Sampling method: Purposive sampling

Inclusive criteria – Recreational volleyball players
Male
Age (18-26 years)

Exclusion – Females
Players who are participating simultaneously in two training programs
Players with recent injuries or fractures.

Procedure
30 male recreational volleyball players, who will meet the inclusion and exclusion criteria, will be recruited for the study. After explaining the procedure of the study in detail, written informed consents will be obtained from them. The is approved by Institutional Ethical Committee of Sri Venkateswara Institute of Medical Sciences SVIMS, Tirupati with IEC No.1467. Baseline measurements of upper body power and upper limb skeletal muscle mass of all players will be measured and recorded as pre-test data. They will be trained with resistance tubing exercise for a period of 8 weeks with 3 sessions per week. Then after the training program, measurements of upper body power and upper limb skeletal muscle mass will be recorded as post-test data.

Testing Protocol
Upper Body Power:
Upper body power is measured by overhead medicine ball throw. While standing, players hold a 3kg medicine ball in both hands in front of body with arms relaxed. The players are instructed to throw the ball over their heads as far as possible. Then the distance is measured from standing position. Three trails are performed with a rest of 1 minute in between and the best is taken.

UPPER LIMB SKELETAL MUSCLE MASS:
It is measured using portable body composition analyzer. The measurements are taken before and after the 8 weeks of training.

The portable body composition analyzer has a main unit and a display unit. The main unit has foot and heel electrodes and the power button. The display unit have grip electrodes, display and buttons. First the personal data like age, gender and height are fed into the display unit. Then ask the player to step on to the main unit and make sure heels and foot placed over the electrodes and weight evenly distributed. After measuring the weight, the subject is instructed to hold the grip electrodes of display unit with both hands and raise the display unit with elbows extended and shoulders flexed at 90 degrees. The measurement progresses and is shown in indicator. After completion, the measurement results are noted.

Exercise Protocol
The exercises are designed for upper limb muscle groups. The training will last for 8 weeks with 3 sessions per week. 1 Repetition Maximum will be calculated and 2-3 sets of 15 repetitions with 80% of 1 RM are trained. The training consisted of three parts warm up, resistance tube exercises and cool down exercises. The warm-up exercises include general jogging, neck, shoulder and arm drills. The resistance tubing exercise includes shoulder press, chest fly, triceps press, biceps curl, rhomboid squeeze, elbow kick, reverse flies, straight arm pull-downs, diagonal chop, upright row.

All the participants are instructed to have adequate water to ensure proper hydration during training and instructed to eat light meal before training and also to wear sports clothing for comfortable training.

The resistance tube exercises are,
Shoulder Press:
The player is instructed to stand with both feet on the center of the resistance tube, with hip width apart. Then instruct the player to bring handles of the resistance tube above shoulders so that elbows are bent 90 degrees, followed by pressing arms straight up, keeping shoulders down.

Chest Fly:
Firstly, attach the band to a door with a door anchor at chest level, then the player is instructed to grab the resistance tube with one hand and step away from the anchor point until he feels resistance. Then instructed to align the shoulders with the resistance tube path followed by, bring the arm inwards and focus on keeping the upper body straight. Then return slowly to the starting position.

Triceps Press:
The player is instructed to stand with one foot slightly in front of the other and place the center of the resistance tube under the back foot. Now the player is instructed to bring handles together straight up above the top of the head and slowly lower handles behind the back of the head until elbows are bent 90 degrees, keeping elbows close to the side of head. Then press hands back up overhead slowly.

Biceps Curl:
The player is instructed to stand with both feet on resistance tube holding handles long, next player sides with palms facing forward. Then the player is instructed to slowly curl hands up to shoulders, squeezing biceps and keeping elbows next to player sides. Following, slowly release arms back down to starting position.

Rhomboid Squeeze:
The player is instructed to sit on the floor with legs straight out in front. Then the player is instructed to hold the handles, place the center of the resistance tube around feet, then grab handles on each end inside and around each foot one more time to make a loop on each foot and sitting tall with abs tight and holding the handles in front with elbows bent. Now, instructed to pull the handles back and slowly release.

Elbow Kicks:
Begin with one leg slightly in front of the other. The player is instructed to stand on the end of the resistance tube with the front foot. Now the player is instructed to bend forward at the hips, by keeping his back straight. Then instruct him to grasp end of resistance tube with shoulder extended and elbow bent, pull the resistance tube backwards by extending elbow, by keeping his shoulder extended as well. Hold and slowly return.

Reverse Fly:
The player is instructed to stand on a resistance tube and hold a handle with each hand by his shins. Instruct the player to slightly bend his knees and lower his back so it is parallel to the floor. Now he instructed to raise the arms to the side as far as the player can go. Pause, then lower the resistance tube to starting position and repeat.

Straight Arm Pull-downs
The resistance tube is attached to a secure anchor point above the head level. Now, the player is instructed to stand facing the anchor point with the feet shoulder-width apart. Then he is instructed to hold the resistance tube with both hands, positioning the arms straight up above the head. Then instructed to keep his arms straight throughout the exercise and maintain a slight bend in the knees. Now, he is instructed to slowly pull the resistance tube down towards the hips, by keeping the arms straight and shoulder blades pulled back. Stop when the hands reaching hips and then slowly release back to the starting position.

Diagonal Chop:
Make sure that the player's front foot, back hip and back foot are in line. He is instructed the player to pull the resistance tube down towards the chest, after holding the tube at chest level for 2 seconds, push it towards the ground and away from the body by using the hands.

Upright Row:
The player is instructed to keep feet shoulder-width apart and place the center of the resistance tube under the feet. Grasp the tube with a overhand grip, with the hands slightly wider than shoulder-width part. The palms should be facing the body. He is instructed to keep the back straight, chest lifted and engage core muscles for stability. Now he is instructed to pull the tube straight up towards chin. Slowly lower the tube down to starting position.

- Each resistance tube exercises are given for 15 repetitions of 2 sets for 2 minutes with a rest of approximately 45 seconds.
- The total duration of resistance exercise session is approximately 30 minutes as each exercise takes approximately 2-2.5 minutes to complete 2 sets with 15 repetitions each with a gap of 30-45 sec between each exercise.

The Cool Down Exercises Are,
A typical cool down includes:
1. Light aerobic activity
2. Static stretching

Data Analysis And Results
The data was entered into Microsoft excel spreadsheet, tabulated and subjected into statistical analysis using SPSS software version 21.0.

All the descriptive statistical data were presented in the form of mean and standard deviation and graphically represented.

Table -1: PRE And POST Test Intervention Data Analysis Of Ball Throw Distance In Meters

Subjects (n=30)	Mean	SD	Mean Difference	T Value	T Critical Value	P Value
PRE	7.06	1.11	0.72300	14.137	3.659	.000
POST	7.78	1.25				

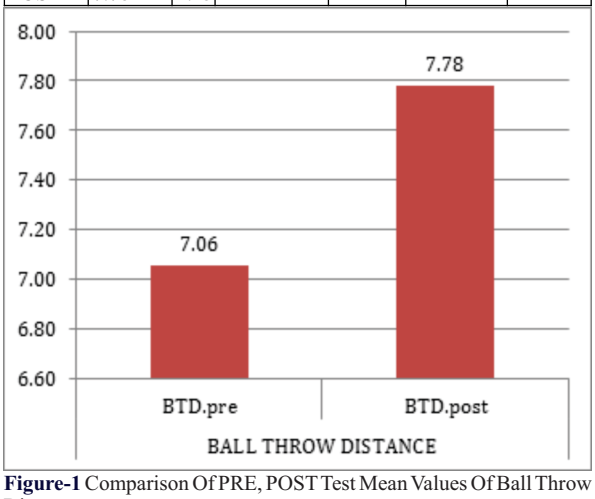

Figure-1 Comparison Of PRE, POST Test Mean Values Of Ball Throw Distance.

Table-2: PRE and POST Test Intervention Data Analysis Of Upper Limb Skeletal Muscle Mass In Percentage.

Subjects (n=30)	Mean	SD	Mean Difference	t Value	t Critical value	p Value
PRE	39.90	2.06	1.34000	11.338	3.659	.000
POST	41.24	2.26				

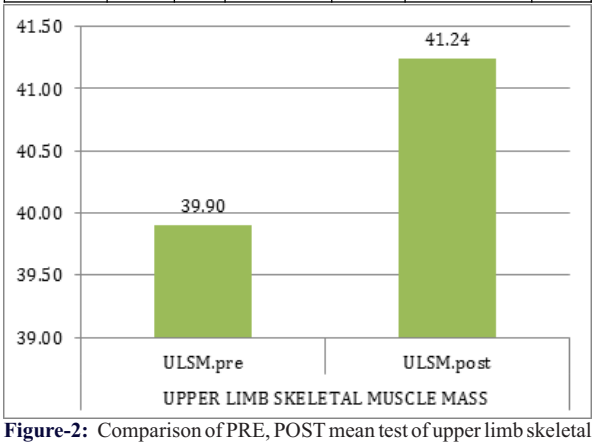

Figure-2: Comparison of PRE, POST mean test of upper limb skeletal muscle mass.

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RESULT

The study sample comprised 30 subjects, all the subjects underwent exercise protocol. The subjects were given resistance tubing exercise for a period of 8 weeks with 3 sessions per week. The pre and post treatment values were noted by measurements of upper body power and upper limb skeletal muscle mass.

The anthropometric measurements of subjects prior to the exercise protocol were collected with a mean value of age 21.67 years, height 169.5 cm, weight 65.657 kg, BMI 22.8867 kg/m^2.

The pre-test mean value of upper body power is 7.06 ± 1.11. The post-test mean value of upper body power with a mean of 7.78 ± 1.25.

The upper body power in the subjects, mean difference is 0.7230. The critical value is 3.659, t value of 14.137 with a p value of 0.000 considered extremely significant.

The pre-test mean value of upper limb skeletal muscle mass is 39.90 ± 2.06. The post-test mean value of upper limb skeletal muscle mass is 41.24 ± 2.26..

The skeletal muscle mass in subjects, mean difference is 1.34000. The critical value is 3.659, t value of 11.338 with a p value of 0.000 considered extremely significant.

DISCUSSION

The purpose of this study is to determine the effectiveness of resistance tube training on upper body power and upper limb skeletal muscle mass among male recreational volleyball players.

In this study, 30 male recreational volleyball players, who had met the inclusion and exclusion criteria, have been recruited for the study. After explaining the procedure of the study in detail, written informed consents have been obtained from them. Baseline measurements of upper body power and upper limb skeletal muscle mass of all players has been measured and recorded as pre-test data. They were trained with resistance tubing exercise for a period of 8 weeks with 3 sessions per week. Then after the training program, measurements of upper body power and upper limb skeletal muscle mass has been recorded as post-test data. The results has shown statistically significant changes among the subjects.

This study supported by Ani Agopyan, Nurper Ozbar, Seda Nur Ozdemir et al. showed that theraband training contributed development of the performance of spike speed mostly and CMJ height and peak power of lower extremities in young female volleyball players. Due to its effectiveness on muscular performance, the theraband training model can be recommended to the coaches and players in additional to the regular technical training.

This study shows similarities with previous studies by using resistance tube training on upper body power and upper skeletal muscle mass in volley ball players, it differentiates by focusing on male volley ball group.

The main finding of this study was that the 8-week of resistance training by resistance tube concurrent with the regular volleyball training have led to greater improvement of upper body power and upper limb skeletal muscle mass in young male volleyball players. To our knowledge, this is the first study to examine the use of resistance training with elastic bands exercises to investigate upper body power and upper limb skeletal muscle mass of young male volleyball players. The statistical significance in outcomes among the subjects may be due to increase in hypertrophy of the upper limb musculature which lead to recruitment of more muscle fibers which has shown improvement of upper body power. The significance of upper limb skeletal muscle mass percentage may be due to increased muscle bulk of upper limbs and reduced fat mass.

Limitations Of The Study

- Long term follow-up of upper body power and skeletal muscle mass could not be assessed.
- This study has been concluded on small sized sample only.
- Subjects activities can't be controlled.
- It is limited by the fact that daily activities of the subjects were not monitored which could have influenced.

Recommendations Of The Study

- A similar study may be extended with larger sample.
- Along with upper body power and skeletal muscle mass, other components in volleyball players can be done for further evaluation.
- Further studies may be extended with other sports.
- A similar study may be extended by controlling subjects activities.

CONCLUSION

Through the results, NULL HYPOTHESIS is rejected and ALTERNATIVE HYPOTHESIS is accepted. The eight weeks of supervised resistance tube training have effect on upper body power and upper limb skeletal muscle mass among male recreational volleyball players.

REFERENCES:

1. Marques MC, Van den Tillaar R, Gabbett TJ, Reis VM, González-Badillo JJ. Physical fitness qualities of professional volleyball players: determination of positional differences. The Journal of Strength & Conditioning Research. 2009 Jul 1;23(4):1106-11.
2. Agopyan A, Ozbar N, Ozdemir SN. Effects of 8-week Thera-Band training on spike speed, jump height and speed of upper limb performance of young female volleyball players. International Journal of Applied Exercise Physiology. 2018;7(1):63-76.
3. Anderson CE, Sforzo GA, Sigg JA. The effects of combining elastic and free weight resistance on strength and power in athletes. The Journal of Strength & Conditioning Research. 2008 Mar 1;22(2):567-74.
4. Colado JC, García-Massó X, Pellicer M, Alakhdar Y, Benavent J, Cabeza-Ruiz R. A

comparison of elastic tubing and isotonic resistance exercises. International journal of sports medicine. 2010 Nov;31(11):810-7.
5. Hammami R, Gene-Morales J, Abed F, Selmi MA, Moran J, Colado JC, Rebai HH. An eight-weeks resistance training programme with elastic band increases some performance-related parameters in pubertal male volleyball players. Biology of Sport. 2022 Jan 1;39(1):219-26.
6. Jakubiak, N., and Saunders, D.H. The feasibility and efficacy of elastic resistance training for improving the velocity of the Olympic Taekwondo turning kick. The Journal of Strength and Conditioning Research, 2008. 22(4): p. 1194-1197
7. Hedrick, A. Training for high level performance in women's collegiate volleyball: Part I training requirements. Strength and Conditioning Journal, 2007. 29(6): p. 50-53.