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Original article

EFFECTS OF BATTLE ROPE EXERCISES ON POWER AND LEAPING ABILITY IN RHYTHMIC GYMNASTICSFOR FEMALE COLLEGE STUDENTS

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Abstract

*Purpose***.** Battle Ropes is currently one of the most complete training modalities within CrossFit or functional training and that it is causing real rage around the world. With this new technique the player will practically exercise the body completely: arms, shoulders, back, abdominals and, to a lesser extent, the lower train. The purpose of this study was to investigate the effects of battle rope exercises on power and leaping ability in rhythmic gymnastics for female college students.

Methods. Thirty college students were randomly allocated to receive either a 10-weeks intervention of the of battle ropes exercises (n = 15) and a control group receiving 10-weeks of normal training only (n = 15). The data collected before and after the program for the two groups.

Results. Statistical analyses showed that:

- Significant Difference between the pre and posttests for experimental group in Vertical jump, hand Grip Strength (right-lift), Softball throw test and Performance level of Leaping ability for posttest to the experimental group.
- Significant Difference between the pre and posttests for control group in Performance level of Leaping ability for posttest to the control group.
- Significant Difference between the experimental group and control group in Vertical jump, hand Grip Strength (right-lift), Softball throw test and Performance level of Leaping ability for posttest to the experimental group.

Conclusions. Under the conditions of our study, battle ropes training to 10 weeks resulted in an increase in power and leaping ability for female college students. These results must be considered by coaches and teachers in order to better understand and implicated of these concepts for technical effects of training.

*Key words***:** Battle ropes, Power, leaping ability, Rhythmic Gymnastics.

Introduction.

Rhythmic gymnastics is a high leap demanding sport (M.R. Hutchinson, et al., 1998). Leaps are fundamental human movements that require power and complex motor coordination of both upper and lower body segment (B.M. Ashby &J.H. Heegaard, 2002). Rhythmic gymnastics leaps performance always followed by a requisite manipulation (ball, rope, hoop, clubs, ribbon), and that manipulation is referred to requisite throws or passing through it. Above the requisites, swing of arm plays an important role, which was reported in certain studies, at least when speaking about vertical jump (Ashby & Heegaard, 2002). According to (M. Horvatin-Fučkar, 2005), the rhythm is also important for the harmonious execution of various complex movements.

Battle ropes training has become very popular due to its benefits in the body. The battle ropes help to have a high intensity and full-body workout that causes the muscles to move in different ways.

Rope training is one of the activities performed by people doing CrossFit. The battle rope is named for the literal translation of the English name of the equipment used during the exercise and is becoming increasingly popular due to the wide effects it provides. (K. Kramer, et al. 2015)

It is a training material that is frequently used in sports centers or gyms, especially in personal and functional training centers, CrossFit box and that consists of vigorously undulating a rope with the upper body, it has become a training option Popular cardiovascular fitness centers and athletic performance improvement facilities. The following are a series of scientific evidences on the effects on the organism derived from the use of this material. (P. J. Marín, et al. 2015).

A new form of training has reached the gym rooms. This is the battle rope training and represents an ideal option for those who are looking for a full, dynamic and explosive body training. (K. Kramer, et al. 2015)

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Certainly, the battle ropes are large and heavy, which adds resistance to working the muscles like never; Among its benefits strengthen the abs, arms and shoulders, in addition to getting a full body workout at once.

Battle rope training activates all muscle groups simultaneously and allows freedom of movement. In fact, if you want a conditioning of the upper body, the battle ropes are the best tool. Discover some exercises below. (P. J. Marín, et al. 2015).

The battle rope has its origin in John Brookfield, founder and creator of the Battling Ropes training system. John also holds multiple world records of strength and endurance, being a leader in the world of strength and fitness for many years.

The battle rope is a training method that is based on using large diameter ropes, specifically there are 38 mm and 50 mm ropes, with specific lengths of 9 m, 12 m and 15 m that are characterized by being heavy. (C. McAuslan, 2013).

There are plenty of exercises to do with the battle ropes, but in general the ends of the ropes are held with the hands and the arms are moved to draw waves or circles. In this way, both muscle strength-resistance and cardiovascular resistance are trained.

Exercise with battle ropes is considered a total fat-eater. With a routine of 10 to 15 minutes at high intensity we will achieve a great work of arms and forearms, since the large diameter of the rope needs a strong grip and the movements of the arms impact on the biceps. (C. McAuslan, 2013).

Our goal with the battle rope is to increase the speed of movement of the rope more and more, to increase the production of force.

The rope (battle rope) is the differentiating element in this type of training; It has a usual thickness of 38mm in diameter, and a length that ranges between 10 and 20 meters. Longer length, greater weight and more difficulty, but it is better to make an extra effort reducing the time of the session at the beginning, than buying a shorter one that gives less room to make the waves.

Battle rope as a sports practice is a powerful combination of three exercises: strength, cardio and muscular endurance. And it is that the battle rope not only serves to exercise the arms, shoulders and back, but that the lower part of the trunk can also be trained. For example, the stabilizers of the core require effort to keep the torso upright compensating the load of the rope in front of us and that is also moving all the time. (J. Calatayud, et al. 2015).

Another feature is that it is a very simple, affordable and portable type of training, which is indicated for both indoor (such as gyms, training rooms, etc.) and abroad. We only need a large flat space with some element as a fixed point, such as a lamppost, a pole or a tree, to pass the rope around as an anchor point. With this we will be ready to start exercising!

(N. A. Ratamess, et al. 2015) indicated that Battle ropes are the ultimate tool for the most complete body training for fitness and cross training lovers. Some of its multiple benefits are:

- Improvement of cardiovascular health
- Improves tone and helps gain muscle mass
- Strengthens the main muscles
- Eliminate and burn large amounts of calories and fat
- Provides a full body workout
- Highly dynamic training
- Effective and varied thanks to the unlimited exercise modalities
- Suitable for both professionals and beginners
- Enter in the most fun way
- It can be used both indoors and outdoors

Battle ropes are a wonderful tool that have gained a lot of popularity in recent years in gyms around the world. If you are interested in getting the most out of them, this is your post. (C. J. Fountaine, & B. J. Schmidt, 2015).

As its name indicates are strings made of a resistant and at the same time flexible material. They are designed to allow you to train many muscles throughout your body, mainly: the arms, shoulders, abdomen, buttocks and back.

Battle ropes have two characteristics that are fundamental when classifying them: length and thickness. Starting from this, we find two key groups that will help determine what type of rope is ideal according to your level of experience. These are:

Short and thin rope: This battle rope has a high level of flexibility due to its short length (between six and ten meters) and it is much easier to handle due to its lighter weight. Also, the thickness is also not very noticeable, and this, added to the above, allows the movement of the exercise to become less demanding. By these characteristics, this type is the one suggested for beginners.

Long thick rope: This second type of rope has a lower flexibility than the previous one. It has a longer length (between 12 and 15 meters) and a much greater thickness. Because of these factors, their weight is also higher. This is the type of rope used by more advanced athletes. (N. A. Ratamess, et al. 2015)

(P. J. Marín, et al. 2015) indicated that this form consists of making undulating movements with them,

during which all your muscles will begin to work. It is important that you keep in mind the following tips:

- Keep abdomen tight all the time
- move shoulders and keep arms relaxed
- Make short but fast movements

In turn, these products will allow you to improve your mental condition, since they require a lot of concentration and determination. It is a form of training so demanding, that at the end of each session you will have bigger muscles and a stronger mind.

The purpose of this study was to investigate the effects of battle rope exercises on power and leaping ability in rhythmic gymnastics for female college students.

Material and Methods

Experimental Approach to the Problem

Experimentaland controlgroups performed a pre and post - training designed intervention in Softball throw test, Handgrip Strength (lift), Handgrip Strength (right) and performance level of leapstest. The experimental group (EG) (15female college students) trained 1 hour per day 3 times a week on battle ropes exercises for ten weeks. The control group (15female college students) continued their normal training, while the experimental group completed Bulgarian bag exercises program to see whether this type of training modality would have a positive or negative or no effect on physical variables and performance level of leaps among female college students.

Samples

Thirtycollege studentswere randomly allocated to receive either a10-weeks intervention of the of battle ropes exercises (n = 15) and a control group receiving 10-weeks of normal training only (n = 15). The data collected before and after the program for the two groups.

Testing Procedures

Subjects were assessed before and after eight weeks of Bulgarian Bagtraining program all measurements were taken one week before and after training at the same time of day. Tests followed a general warm-up that consisted of running, calisthenics, and stretching.

Hand Grip Strength Test

The purpose of this test is to measure the maximum isometric strength of the hand and forearm muscles.

The subject holds the dynamometer in the hand to be tested, with the arm at right angles and the elbow by the side of the body. The handle of the dynamometer is adjusted if required - the base should rest on first metacarpal (the heel of the palm), while the handle should rest on middle of four fingers. When ready the subject squeezes the dynamometer with maximum isometric effort, which is maintained for about 5 seconds. No other body movement is allowed. The subject should be strongly encouraged to give a maximum effort.

Verticaljump test

The vertical jump test measures the difference between the height of the athlete with the hand stretched upwards (feet on the ground) and the height that can be reached with said hand after jumping.

The subject Place on the side of the wall and under the meter that you have previously placed vertically. Measure without jumping: At the beginning of the test keep your feet flat on the floor and stretch your arm up as high as possible. Record the distance reached (remember to have the feet completely flat on the ground).

Measure after the jump: Spread approximately 1-2 spans from the wall. Bend your legs slightly and jump up as high as possible. Touch the wall at the highest point of the jump. The chalk-painted heart finger will have left a mark on the wall. Record the height reached.

The subject can perform the test up to three times.

Softball throw test.

The softball throw is a track and field event used as a substitute for more technical throwing events in competitions involving Youth, Paralympic, Special Olympics and senior competitors.

The general rules for the softball throw parallel those of the javelin throw when conducted in a formal environment. However, the implement being thrown is a standard softball, which resembles the size of a standard shot put but is considerably lighter.

Leapingability test.

- Sissone – leap (SL): where the gymnast takes off from two feet and jumps up in split position with the back leg higher than the front.
- Split Leap Forward (SLF): leap where the gymnast takes off from one foot with one leg horizontally to the front and the other to the back.

The researcher measurement the Leapheight and ground reaction time and transfer these measurements to degrees.

Statistical analysis

All statistical analyses calculated by the SPSS statistical package. The results reported as means and standard deviations (SD). Differences between two groups reported as mean difference.Confidence intervals (meandiff ± 95% CI). Student's t-test for independent samples used to determine the

differences in fitness parameters between the two groups. The $p<0.05$ was considered as statistically significant.

Results.

Table 1. Anthropometric Characteristics and ageof the groups (Mean ± SD)

Group	N	Age [years]	Weight [kg]	Height [cm]
Experimental	15	19.47 ± 0.4	69 ± 3.9	170 ± 4.77
Control	15	20.29 ± 0.6	70 ± 4.1	169 ± 5.56

Table 1 shows the Anthropometric Characteristics and age of the subjects. There were no significant differences observed in the different groups.

Table 2. Mean ± SD and "T" Test between the pre and posttests for experimental group in hand Grip Strength, Standing Long Jump Test, Softball throw testand shot speed.

Variables	Experimental group		Sign.
	Before	After	
Vertical jump	27.00±1.45	31.25 ±2.05	S
Softball throw test	39.19±1.04	42.65 ±1.46	S
Handgrip Strength (lift)	25.00±1.45	27.25 ±2.05	S
Handgrip Strength (right)	29.70±2.56	34.20 ±3.67	S
Performance level of Leapingability	3.19±0.89	6.35 ±0.97	S

Table 2 shows that:

- Significant Difference between the pre and posttests for experimental group in Vertical jump, hand Grip Strength (right-lift), Softball throw test and Performance level of Leaping ability for posttest to the experimental group.

Table 3. Mean ± SD and "T" Test between the pre and posttests for control group in hand Grip Strength, Standing Long Jump Test, Softball throw test and shot speed

Variables	Control group		Sign.
	Before	After	
Vertical jump	26.71 ±2.48	27.12 ±2.15	NS
Softball throw test	39.53 ±1.04	41.21 ±1.11	NS
Handgrip Strength (lift)	25.71 ±2.48	27.12 ±2.15	NS
Handgrip Strength (right)	30.70 ±3.18	31.05 ±3.49	NS
Performance level of Leaping ability	3.37 ±0.88	4.67 ±0.73	S

Table 3 shows that:

- No Significant Difference between the pre and posttests for control group in Vertical jump, hand Grip Strength (right-lift), Softball throw test
- Significant Difference between the pre and posttests for control group in Performance level of Leaping ability for posttest to the control group.

Table 4. Mean ± SD and "T" Test between the two Groups (experimental and control) in hand Grip Strength, Standing Long Jump Test, Softball throw test and shot speed

Variables	Experimental group	Control group	Sign.
	After	After	
Vertical jump	31.25 ±2.05	27.12 ±2.15	S
Softball throw test	42.65 ±1.46	41.21 ±1.11	S
Handgrip Strength (lift)	27.25 ±2.05	27.12 ±2.15	S
Handgrip Strength (right)	34.20 ±3.67	31.05 ±3.49	S
Performance level of Leaping ability	6.35 ±0.97	4.67 ±0.73	S

Table 4 shows that:

- Significant Difference between the experimental group and control group in Vertical jump,hand Grip Strength (right-lift), Softball throw test and Performance level of Leaping abilityfor posttest to the experimental group.

Discussion.

This study assessed the effects of ten weeks Battle ropestraining program, on power and leaping ability in rhythmic gymnastics for female college students.Experimental results indicated that all variables significantly increased in the experimental group only after the Battle ropes training program.

The rope training is a high intensity functional training, very typical of CrossFit, based on the overall movement of the body using a battle rope hooked to the wall or other elements such as bars, trees, or columns. The athlete has both ends of the battle rope and, from there, he will perform a session chaining different exercises while producing waves with the rope.(P. J. Marín, et al. 2015).

It is a very entertaining physical activity, since many exercises can be mixed in a short time, being difficult to fall into the routine. In addition, it is possible to work all the muscle groups with a good succession of variants, and the fact of not moving the legs of the floor in many of the exercises eliminates the impact on the joints, which makes it an acceptable training for those with problems in the joints of the lower train.

The posture control always is basic in the exercise routines with the battle ropes to achieve more efficient movements and decrease the possibility of suffering injuries. The initial position in most exercises involves keeping your back straight with the body slightly tilted forward, with your legs slightly bent open at hip height, and keeping your eyes straight ahead.(J. Calatayud, et al. 2015).

The technique to catch the combat ropes at the right distance is to leave them on the ground stretched and catch them there by the end of the marimba. Given that they are hooked to a structure at approximate waist height, there will always be room to make waves.

Each wave that is created with the rope from the upper part of the body has an impact and must be sustained throughout the body, passing from the upper body through the abdomen to the lower part. In this way, joint stability is stimulated throughout the body.

The researcher used the same protocol of (N. A. Ratamess, et al. 2015) which consisted of 8 series of 30-second intervals (15 seconds of one-arm waves and 15 seconds of double-arm waves) using either a rest interval duration of 1 minute or 2 minutes. A metronome was used to standardize the repetition number / frequency for each exercise, that is, 15 waves for each arm for single arm waves and 15 repetitions for double arm waves. The average oxygen consumption values for the entire protocol were significantly higher during the 1-minute rest protocol than in the 2 minutes, and the values in men were 11.1% (1-minute rest) and 13.5% (2 minutes resting) taller than women, respectively. The energy expenditure values were significantly higher during the 1-minute rest protocol than in the 2-minute rest protocol in men and women with statistically higher values in men than women. Blood lactate mean ventilation per minute and heart rate were significantly higher during the 1-minute rest protocol than in the 2-minute protocol, and these data were significantly higher in men compared to women. These data demonstrate that the battle rope exercise poses a significant cardiovascular and metabolic stimulus, with the greater mean effects with the use of a short rest interval.

(P. J. Marín, et al. 2015) indicated that including the battle rope in training sessions seems to be a good choice to improve the physical condition, both cardiovascular and muscular endurance, being able to perform this exercise unilaterally or bilaterally, adding vibration or HIIT version.

These results constant with (P. J. Marín, et al. 2015; J. Calatayud, et al. 2015; N. A. Ratamess, et al. 2015).

Conclusion

- The Battle ropesis an extremely effective training tool for female handball players.
- Safety is key when training with the Battle ropes.
- Manipulating the variables in programming is the ultimate key to success in creating programs that are within your client's ability range and challenging enough to elicit the desired training effect you are looking for.

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