



Effect of battle ropes training on certain physical variables and tennis serve speed for volleyball players

YAKOUT Zedan¹, LARION Alin², POPA Corina³

Abstract

Purpose. Battle rope is usually used in CrossFit and all kinds of functional training since, thanks to it, resistance and muscles are improved. A HIIT that includes exercises with this battle rope is an excellent high-resistance workout. By maneuvering battle ropes in a variety of linear and circular movements, the idea is to increase the heart rate. HIIT-style regimens that focus on improving power, explosiveness, and aerobic endurance are where the battle ropes really shine; they are an essential part of the recipe for creating a calorie expenditure that will cause body fat to melt at record speed. The aim of this study was to explore the effect of battle ropes training on certain physical variables and speed of tennis serve for volleyball players.

Methods. The research sample was chosen in a deliberate way from volleyball players in the Desouq Youth Center in Kafr El-Sheikh Governorate, and the strength of the actual research sample was (10) volleyball players. The data collected before - after the training programs for the two groups.

Results. Statistical analyses showed that:

- Significant Difference between the Pre- Posttests for the experimental Group in (Medicine ball throw, Vertical jump, Dynamometer of back Strength, Serve speed (m/s) for posttest.
- No - Significant Difference between the Pre- Posttests for the experimental Group in (Dynamometer of leg Strength, Dynamometer of grip Strength (right -left).

Conclusions. Under the conditions of article, that eight weeks of battle ropes training contributed to improving Medicine ball throw, vertical jump, Dynamometer of back Strength, and tennis serve velocity in volleyball.

Key words: Battle Ropes, Power, Tennis Serve in Volleyball.

Introduction

Volleyball is a sport where two teams face each other on a pitch separated by a central net, trying to pass the ball over the net to the ground of the opposing field. Each team has a limited number of touches to return the ball to the opposite field. Usually, the ball is hit with hands and arms, but also with any other part of the body according to the game situations. Each of the players must rotate their positions as they get points.

Contemporary volleyball has undergone multiple changes to make it more attractive and this has caused important variations in the way players prepare; as well as the tactical system to be used. In this sense, in that sense the development of explosive strength in arms and legs is an element within this discipline of vital importance for it, which has been assumed by most of the teams of this discipline.

Tennis serve owes its name to its similarity with the arm movement that a tennis player has when making the ball give a racket. It is carried out by

throwing the ball at a moderate height to later be hit on the back face, by the usually open hand of the player. It is one of the techniques of volleyball and is commonly also called a high serve because the ball is thrown into the air and hit high. In fact, this player can get points by performing a good service from his serve position, surprising opponents with his technique.

The jump in volleyball is an importance element and is present in almost all the actions of the game, whether in attack, in the jump pass, in defense through blocking and in the offensive jump serve. For that, it is necessary to improve jumping speed and power, Cujilema, A. & Patricio, F. (2017), define jumping ability in volleyball as the ability to explosively manifest muscular effort to perform an effective action without support in the air, that is, jumping ability is a quality complex composed of strength, speed, and skill.

Amr hamza (2012) Jumping is a physical activity that is characterized by short muscular efforts, explosive in nature and has many styles, where technique becomes important.

¹Faculty of Physical Education, Kafr El-Sheikh University, Egypt

²Faculty of Physical Education, Ovidius University of Constanta, Romania

³School Petre Ispirescu Constanta, Romania

E-mail: amr297@aswu.edu.eg

Received 21.11.2021 / Accepted 11.01. 2022

Development of muscular strength has always been worked mainly by the influence of the weights. It is no less true that to develop strength in the different muscular planes, the use of weights is among the most effective, not to be absolute. The truth is, that with the passage of time a concept that is based mainly on the use of jumping, in its various forms, for the development of strength and preferably jumping in volleyball players has become fashionable. It is so-called battle ropes.

The one who had the idea of practicing exercises with ropes was John Brookfield. This type of ropes is characterized by being heavy, long and, above all, thick. The number of exercises you can practice with it is huge and varied. Burpees, ironing, squats, everything is possible with a battle rope.

Amr Hamza (2020) points out that John Brookfield, multiple world record holder in various strength and endurance activities, devised this method, applying combat ropes to NFL players, and players struggled to maintain a steady pace after two minutes of performance. He suggested that this was due to their lack of a certain type of endurance that could only be accessed using combat ropes, which quickly became a popular method among players.

Battle rope is usually used in CrossFit and all kinds of functional training since, thanks to it, resistance and muscles are improved. A HIIT that includes exercises with this battle rope is an excellent high-resistance workout

By maneuvering battle ropes in a variety of linear and circular movements, the idea is to increase the heart rate. HIIT-style regimens that focus on improving power, explosiveness, and aerobic endurance are where the battle ropes really shine; they are an essential part of the recipe for creating a calorie expenditure that will cause body fat to melt at record speed.

Marcelino, et al. (2008) that all volleyball skills are interrelated, except serving. Because every movement action is affected by a previous action, and all previous actions in volleyball affect subsequent actions.

The researcher believes that serving in volleyball is one of the most important offensive skills in volleyball, as it is distinguished from the rest of the offensive skills in that it is possible to obtain a direct point through it. At least it is difficult for him in the process of receiving to send, and therefore the chances of success of the attack based on reception decrease, so the ball is returned easily to the sending team, which provides him with the opportunity to build a strong counterattack from which the team gets a point.

Some coaches believe that the best sports training in volleyball is the functional exercises for volleyball, because they contain multiple stability that simulate plyometric exercises, while others see the need to apply basic and complementary exercises using innovative tools that improve physical abilities that contribute to improving basic skills, based on the training principle that strong muscles must be fast muscles.

So, the aim of this study was to explore the effect of battle ropes training on certain physical variables and speed of tennis serve for volleyball players.

Methods

The research sample was chosen in a deliberate way from volleyball players in the Desouq Youth Center in Kafr El-Sheikh Governorate, and the strength of the actual research sample was (10) volleyball players. The data collected before - after the training programs for the two groups.

Tools and devices used:

The researcher used the following tools and devices to measure the research variables:

- Calibrated medical scale - for measuring body weight.
- Stadiometer device - to measure the height of the body from the ground.
- Battle ropes 20 m long, 1.5 cm in diameter, and weighs 9, 11, 16 kg.
- Volleyball court.
- form for recording data and measurements of the research sample.

skill test:

Measurement of the speed of the tennis serve.

The researcher measured the serve speed according to the following steps:

- The skill was photographed using a camera (video camera) with a frequency of 50 frame/seconds.
- The camera installed outside the playing court and along the center line so that the two service areas of both courts appear clearly.
- Determining a fixed frame for the camera by placing indicative marks (with known limits) and then translating them on the scale.
- The resulting movie has been processed by Windows Movie Maker, which converts it into a set of sequential still images using the computer.
- The first image that represents the moment the ball is out of the hand of the player (the sender) has been determined and its time is determined, which is the starting time.

- The last picture, which represents the arrival of the ball to the opponent's court, was determined, and its time was determined, which is considered the end time.
- By subtracting the starting time from the ending time, the total time that the ball took during the performance of the skill is produced.
- Measuring the covered distance by locating both the moment of hitting the ball by the hitting hand and the moment of the sent ball touching the opposing team's ground, then translating it by means of the scale on the paper (transparent) on the screen of the Mentor.
- Calculating the speed of the sent ball: Since the distance between the execution line and the touching line is known, then the serve speed can be calculated by dividing the covered distance by the sent ball and the time taken by the sent ball.

Specifications of the training program:

- ▶ The duration of the program is (8) weeks.

Results

Table 1. Characteristics of groups (Mean ± SD)

Group	N	Age [years]	Weight [kg]	Height [cm]
Experimental	10	20.18 ± 0.5	78 ± 3.75	178 ± 3.77

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

Table 2. Differences significant between the Pre- Posttests for the experimental Group

Variables	Experimental group		Sign.
	Before	After	
Medicine ball throw	6.35 ± 0.41	6.74 ± 0.39	S
Vertical jump	45.11 ± 3.15	47.05 ± 3.24	S
Dynamometer of leg Strength	92.85 ± 4.12	94.62 ± 4.52	NS
Dynamometer of back Strength	80.00 ± 3.84	85.53 ± 3.75	S
Dynamometer of grip Strength (left)	19.90 ± 1.67	22.55 ± 2.11	NS
Dynamometer of grip Strength (right)	80.00 ± 3.84	85.53 ± 3.75	NS
Serve speed (m/s)	10.50 ± 0.99	12.00 ± 1.02	S

Table 2 shows that:

- Significant Difference between the Pre- Posttests for the experimental Group in (Medicine ball throw, Vertical jump, Dynamometer of back Strength, Serve speed (m/s) for posttest.
- No - Significant Difference between the Pre- Posttests for the experimental Group in (Dynamometer of leg Strength, Dynamometer of grip Strength (right -left).

Discussion.

The researcher attributes the occurrence of these changes to the good planning of the combat ropes program and the legalization of training loads in a scientific manner appropriate to the age and training stage of the research sample with the aim of developing endurance of muscular capacity. The

- ▶ Number of weekly training units. (3) units
- ▶ Total number of training units (24) units.

Training method used.

- The researcher used the high-intensity periodic pregnancy method, in the Tabata style.
- The scientific bases of the training program using the high-intensity periodic load method:
- Determine the maximum repetition of 20 seconds for each of the selected exercises.
- Determine the intensity of the exercises from (70-90%) of the maximum repetitions of each exercise.
- Rest periods between sets 10 sec.

Statistical Treatments:

The researcher used the following statistical treatments by SPSS version 22:

- Mean
- standard deviation
- skewness module
- percentages of change
- T. test

researcher focused on the muscle groups working during the skillful performance and the accuracy of the selection of combat ropes exercises, as this led to the improvement of the physical and skill variables under study.

Colin McAuslan (2013) notes that combat ropes, sometimes called heavy battles, are a recent training trend, widely used in gyms, where athletes can move muscles in new ways and means.

According to Calatayud, et al. (2015) that combat ropes training is a dynamic, ever-changing, and diverse form of movement, where the ropes can be hit, or pulled, but among the most popular exercises are the undulating movements, which cause the ropes to move in the form of waves.

Fontaine & Schmidt, (2015) add that part of the popularity of the combat rope is that it allows freedom of movement in many directions. The more movements used (from side to side, from top to bottom, or in circles), the more different muscle groups are involved and the range of motion of the joints improves.

Amr Hamza (2020) believes that combat rope training includes the entire body, where the neuromuscular system is trained to use force that starts from the center and extends through the extremities (arms and legs), and increases energy production during performance, in addition to that it can be practiced with high interval training. HIIT or Tabata intensity with the goal of developing muscular endurance, improving cardiorespiratory fitness and burning fat.

Nejić, et al. (2010) that the vertical jump is one of the most important decisive factors that are directly related to achieving maximum results in volleyball. Therefore, 50% of the total training process should be devoted to exercising and developing this ability.

Muthukumaran Jothilingam (2020) confirms that combat rope exercises are among the functional exercises that contribute to the improvement of functional movements of young people.

This is confirmed by Amr Hamza (2020) that functional training focuses largely on movement and then the muscle, by performing exercises with the aim of improving the motor pathways of performance, followed by an improvement in the muscle groups related to the form of movement, but in small proportions.

In addition, the nature of the combat rope is characterized by freedom of movement and its possession of many diverse forms of training for all parts of the body, and this is confirmed by Calatayud, et al. (2015) that combat ropes are an ever-changing and dynamic form of movement, where ropes can be whipped, hit, or pulled, in addition to the undulating movements that cause the ropes to move in the form of waves. This is confirmed by Fontaine & Schmidt, (2015) that the popularity of combat ropes is attributed to their allowing freedom of movement in many directions. The more movements you include (such as from side to side, top to bottom, or in circles), the more different muscles you work and the greater your joints' range of motion.

Amr Hamza (2020) confirms that the combat ropes work to pull the player's center of gravity out and continue to make him use the center's muscles to control balance during the exercise movement, relying on body weight as resistance through a wide range of

movements to develop appropriate and balanced athletic performance. In general, all exercises that promote the goal of pain-free movement and stability of the center can be considered functional training.

The physical component is one of the pillars of training that depends on the player's development, and it is one of the important foundations that share with motor skills in the formation of players from a physical point of view.

This is confirmed by Kovjanić (2014) (19) that the success in performing volleyball skills requires the development of physical components that contribute to their optimal performance.

The results of the study agree with that of Sýkora Jozef, et al. (2018), Kavikumar & Arumugam (2020) that combat rope training contributes to improved endurance.

With the study of Muhannad Muhammad (2018) that the training program exercises using Tabata exercises under study led to the improvement of all research variables.

The researcher believes that the relationship between the performance of the skill of serving from the top and the endurance of the ability of the arms and legs, is a close relationship that must be taken into account when preparing the players, and that there is no separation between the skill and physical preparation, but on the contrary, the physical elements must be developed in accordance with the requirements of skillful performance, as this achieves success in the training process and thus raises the level of the players. When young people possess the physical abilities to a high degree, they can perform all skills well.

The researcher attributes an improvement in the speed and accuracy of transmission directing from above for the experimental group over the control group to the application of the Tabata combat ropes training, a form of interval training that falls under the umbrella of high intensity interval training HIIT.

Carl Foster, et al. adds. (2015) show that Tabata training is more time-efficient than other traditional training models.

Olson (2013) notes that recent studies of the physiological responses to different protocols of high-intensity interval training have shown that Tabata training is a successful training alternative to traditional aerobic training regimens despite the significantly reduced volume of training.

The results of the study agree with the study of Hossam Ezz Al-Rijal (2012) in that the proposed training program has a positive effect on the maximal muscular ability of the arms and legs, and on the

performance level of the crushing serve skill (the speed of the sent ball - the accuracy of directing the ball) among volleyball juniors under 18 years old.

The study results agree with those of Colin McAuslan (2013), Calatayud, et al. (2015) that combat rope training contributes to the improvement of special physical variables.

The results of the study agree with that of Muhammed Saeed Alsafi (2018), Kavikumar & Arumugam (2020) Marina Veličković, et al. (2017) that the improvement of special physical variables contributes to an improvement in the level of skill performance.

Conclusions

Under the conditions of article, that eight weeks of battle ropes training contributed to improving Medicine ball throw, vertical jump, Dynamometer of back Strength, and tennis serve velocity in volleyball.

References.

- Ali M, 1999, Volleyball, history, education, training, analysis, law, 1st edition, Dar Al-Fikr Al-Arabi, Cairo. (Arabic)
- Amr H, 2020, Functional training in the sports field (Fascia training), Dar Al-Fikr Al-Arabi, Cairo. (Arabic)
- Brewer W, Kovacs R, Hogan K, Felder D, Mitchell H, 2017, Metabolic Responses to a Battling Rope Protocol Performed in the Seated or Stance Positions, *J Strength Cond Res*;32(12):3319-3325.
- Calatayud J, Martin F, Colado JC, Beni´tez JC, Jakobsen MD, Andersen LL, 2015, Muscle activity during unilateral vs. bilateral battle rope exercises. *J Strength Cond Res* 29: 2854–2859.
- Carl F, Farland CV, Guidotti F, Harbin M, Roberts B, Schutte, Porcari JP, 2015, The effects of high intensity interval training vs steady state training on aerobic and anaerobic capacity. *Journal of sports science & medicine*, 14(4), 47.
- Carlos Gilberto de Freitas-Junior, Pedro PP, Leonardo de SF, Alessandro José da Silva, Manoel da Cunha Costa, Dalton Roberto Alves Araújo de Lima-Junior and Tony Meireles Santos, 2020, Reliability of the High-speed Camera-based System (HSC-Kinovea) for lower-limb explosive strength endurance assessment in athletes, *Journal of Physical Education* 32(1).
- Chen W, Wu H, Lo S, Chen H, Yang W, Huang Cf, Liu C, 2017, Eight-week battle rope training improves multiple physical fitness dimensions and shooting accuracy in collegiate basketball players. *J Strength Cond Res*, Volume 32 - Issue 10 - p 2715–2724.
- Colin M, 2013, Physiological Responses to a Battling Rope High Intensity Interval Training Protocol, electronic Theses and Dissertations. 4853, University of Windsor.
- Fontaine C, Schmidt B, 2015, Metabolic cost of rope training. *J. Strength Cond Res* 29: 889–893.
- He L, 2016, Technical Teaching and Training of Volleyball, 6th International Conference on Electronic, Mechanical, Information and Management, 243-245.
- Hossam Ezz Al-Rijal, 2012, The effect of ballistic training to develop the maximum muscular ability on the speed and accuracy of directing the ball in the crushing serve of volleyball players, *Sports - Science and Arts*, Volume (41), Faculty of Physical Education for Girls, Helwan University. (Arabic)
- Issam H, Mohamed B, 1997, Sports Training "Foundations - Concepts - Directions", Mansha'at Al Maaref, Alexandria. (Arabic)
- Janković V, Janković G, & Đurković T, 2003, Specific physical preparation of top volleyball players. In D. Milanović (Ed.), *Proceedings of the International Symposium. Conditioning of athletes*. (pp. 229-237), Zagreb: Faculty of Kinesiology.
- Jefferson EH, Leonardo GSN, Miguel de A, César Augusto D, 2007, Assessment of explosive strength-endurance in volleyball players through vertical jumping test, *Rev Bras Med Esporte*, Vol. 13, Nº 3 .160-163.
- Kavikumar R, Arumugam S, 2020, Effect of Battle Rope Training on Arm Strength and Hand Explosive Power among Basketball Players, *Journal of Information and Computational Science* 10(9):402-408.
- Kovijanić B, 2014, Physical preparation of volleyball players, University of Belgrade, Faculty of Sport and Physical Education.
- Marcelino R, Mesquita I, Afonso J, 2008, The weight of terminal actions in Volleyball. Contributions of the spike, serve and block for the teams' rankings in the World League 2005. *International Journal of Performance Analysis in Sport*, 8(2), 1-7.
- Marina V, Ivana B, Dragana B, 2017, The effects of programmed training on development of explosive strength in female volleyball players, *Physical Education and Sport* Vol. 15, No 3, pp. 493 – 499.



- Montoro-Escaño J, Hernández-Mendo A, 2014, Incidencia del nivel de competición en el rendimiento del bloqueo en voleibol femenino [Impact on competition level performance block female volleyball]. RICYDE, Revista Internacional de Ciencias del Deporte 36, 144–155.
- Muhannad M, 2018, The effect of using Tabatha exercises on some special physical variables and the performance level of the transmission skill of volleyball players, Assiut Journal of Physical Education Sciences and Arts, Issue (47), Part (4), Faculty of Physical Education, Assiut University.
- Muthukumaran J, Roobha S, Revathi R, Paarthipan N, Saravan SK, 2020, Effect of battle rope training on functional movements in young adults, BIOMEDICINE-40(4).
- Nejić D, Herodek K., Živković M., Protić N, 2010, The development of explosive strength in volleyball . In Stanković R. (Ed.), Proceedings of the XIV International Scientific Conference - "FIS Communications 2010 in Sports, Physical Education and Recreation " (pp. 276-285) Niš: Faculty of Sport and Physical Education, University of Nis.
- Olson M, 2013, Tabata interval exercise: Energy expenditure and post-exercise responses. Med Sci Sports Exerc, 45, S420
- Sýkora J, David B, Pupiš M, Pavlović R, 2018, Is there any connection between endurance, explosive strength and speed performance? Journal of Physical Education and Sport (JPES), 18 Supplement issue 1, Art 49, pp. 363 – 365.