xIlkogretim Online - Elementary Education Online,2021; Vol 20 (Issue 2): pp.1308-1313
http://ilkogretim-online.org
doi: 10.17051/ilkonline.2021.02.150

COMPARISON OF EFFECTS OF KETTLEBELL AND BATTLE ROPE HIGH-INTENSITY INTERVAL TRAINING (HIIT) PROTOCOLS ON EXPLOSIVE POWER

Ismat Ullah, Ph.D Scholor Sports Sciences & Physical Education, Faculty of Allied Health Sciences, The University of Lahore, mahrismat@gmail.com
Dr. Mohibullah Khan Marwat, Professor, Department of Sports Sciences & Physical Education, Faculty of Allied Health Sciences, The University of Lahore, imohibullah.khan@ed.uol.edu.pk
Muhammad Shah, Lecturer, Department of Physical Education and Sports, Abdul Wali Khan University Mardan (KPK), muhammadshah@awkum.edu.pk
Fozia Tabassum, Assistant professor, Health & Physical Education, Higher Education Department Punjab, fouziajamshaid17@gmail.com
Sofia Saba, Bio-Chemistry Teacher at Bahria Foundation College, Bhara Kahu, Islamabad, sufyan123khan@gmail.com
Samera Saman, M.Phil Scholar, Department of Sports Sciences & Physical Education, The University of Lahore, samerasaman83@gmail.com

Abstract- This analysis aimed to see if using a kettlebell and a battle rope protocol could improve explosive power. The study's second goal was to see if there were any differences in explosive power changes between the kettlebell and battle rope training. To investigate explosive power improvement to a 12 week Battle Rope training and kettle Bell training, 60 men amateur players (21.66 ±1.71 yr) trained 2x/week for three months. 1:2 work to rest ratio (25 seconds work and 50 seconds rest) training method was used. The kettlebell was 12 kg and 18 kg and the battle rope was 30 feet in length and 1.5 inches in diameter. All subjects were divided in 3 groups equally and tested befre and after 12 weeks of training. Results showed significant improvement in explosive power with both kettlebell (13.73±2.22 ver. 21.31±1.71) and battle rope (13.95±2.03 ver. 18.90±1.08) training. The comparison showed that the kettlebell group more significantly improved than the battle rope and control group. The findings of this study show that kettlebell and battle rope training will help increase explosive strength. Kettlebell training has a larger impact on explosive power than battle rope training.

Keywords: **KettelBell, BattleRope, Explosive Power, High-intensity Interval Training HIIT**

I. INTRODUCTION

Traditional strength training techniques include body weight training and formal weight lifting. In the past few decades High-intensity interval training (HIIT) has become more common in exercise programmes. Previous researches have concentrated on muscle strength and endurance training as strength training has become more prominent. Battle ropes (BR) and kettlebells (KB) are two fitness modalities that have been found to induce high physiological demands, such as a rapid increase in heart rate and a large amount of energy consumption.

For the past few time, KB training has returned to the field. Many people in the fitness industry are benefiting from the KB training and BR training. The best advantage of KB training and BR training is that for a small amount of money and in a very small space it provides huge benefits. You train greatly and with absolute satisfaction when you know that you will not get injured and getting a lot of benefits. In modern day world where the whole world is moving very fast and everyones‘s trying to catch up with the unavoidable situations, elite and professional players are playing more leagues and tournaments, it becomes difficult to spare a time for training and physical fitness. But to keep going and working hard fitness training becomes a necessity rather than contingency. Hence the search for easy fitness techniques always remains on top. KB training and BR training technique is easy and safe to train but the benefits are also huge, you can use all your body muscles and improve all the necessary fitness components well with this KB and BR training.

Explosive power is the major fitness component about all games which every player want to on this and want to improve. The weight of a KB is spread outside the middle of your hand when being used, unlike conventional dumbbells and most other resistance training devices. The round shape and handle allow you to take your motions with dumbbells and free-weights to another level that is not possible. It is possible to rotate, force, drag, and swing kettle bells. Because of the shape of the KB and the irregular weight delivery, through the whole exercise, your body will work to maintain and counterbalance, so your

heart will also get a killer workout. KB weights usually vary from about 9 pounds to 106 pounds. You will note that in small steps, as is required for dumbbells and free-weights, there is less need to constantly add more KB weights. And after you have moved to heavy KBs with any of the other movements, the KB fitness technique helps you to easily make bigger jumps between sizes and proceed using the smaller weights by integrating more demanding exercises with them.

BR is a combination of running, jumping, and other exercises that necessitate proper leg coordination. Ropes are notable because they provide a dual-force dynamic effect that combines gravity and the force produced by rope waves to intensify and enhance all of the physiological responses of the human system. Since each person's force output is minimal, the dual-force effect and contralateral movement typical to rope use will speed up adaptation in the body while reducing injuries. It would be difficult to sustain an injury if we cannot generate enough force to lift ourselves off the ground, or if our nervous growth prevents us from executing sufficient timing and spacing to lift ourselves off the ground.

The opportunity to dial in the preparation is increasingly evolving as sports science, testing, methodologies, and equipment change, allowing athletes greater power over how they progress forward to the next stage. KB training and BR training is becoming more common as an alternative method to musculoskeletal fitness training.

II. LITRATURE REVIEW

Muscle ability, flexibility, and/or aerobic ability have all been measured in previous studies on KB and BR fitness. Lake and Lauder discovered that KB has high mechanical demands and increased explosive ability to match the increased demands exerted on the body in an all-male sample. In addition to research demonstrating that KB training improves strength, Falatic et al. performed a study that showed improvements in aerobic ability as determined by a VO2Max test, which confirmed the use of KB as a successful mode of training. The ability to generate power, which is described as the product of force and velocity, is arguably the most important trait expected of athletes in a variety of sports. In explosive motions like climbing, kicking, and sprinting, the ability to generate force rapidly is crucial. KB swing training has previously been shown to increase rapid lower body force development, but not as much as conventional weightlifting movements (Lake & Lauder, 2012; Otto et al., 2012)

John Brookfield invented and designed the BR System. John holds several world records and is the author of the best-selling book Mastery of Hand Strength. Battle ropes are a common high-intensity interval training (HIIT) technique for improving an athlete's strength, agility, explosiveness, and anaerobic and aerobic endurance. BR, also known as hard rope exercise, has many advantages to the entire body. The best thing about working out with the BR is that the exercises can be adjusted to suit exercisers of all fitness levels, from gripping the rope in both hands and using just one end to incorporating more advanced motions that include lower body movements as well as upper body work. BR, which have a larger circumference and heavier weight, are a modern method of practising using ropes. BR exercise, which entails undulating a rope with one's upper body, is becoming more common as a physically challenging sport (Fountaine,at. Al) The critically praised BR are one of the most basic forms of fitness. This high-powered rope has swept the elite fitness scene, gaining popularity in the military and most combat/contact sports (MMA, wrestling, football) (Andy Rivandeneira, 2014).
For those looking for absolute, dynamic and explosive body preparation, battle rope training is an excellent choice. (K. Kramer, et al. 2015) A complete fateater is known to be battle rope exercise. A effective mix of three exercises is battle rope as a sports practice: strength, cardio and muscular endurance. And the battle rope not only helps to exercise the arms, shoulders and back, but it is also possible to practice the lower portion of the trunk. The central stabilizers, for instance, take work to hold the torso upright to compensate for the rope load in front of us and it moves all the time as well. (J. Calatayud, et al.). (N. A. Ratamess, et al. 2015) suggested that the perfect instrument for the most full body conditioning for lovers of exercise and cross training is Battle ropes.
Just a few studies have looked at the physiological impact of kettlebell workouts and training (Farrar,Hulsey, Jay). Any research has focused on the muscle activation and load of a single kettlebell exercise, but these studies are few in number (Lake & Lauder, 2012). Lake and Lauder looked at the mechanical demands of performing the kettlebell swing exercise (2012). Land reaction forces were measured for the swing, back squat, and jump squat exercises. From the field reaction forces, they were able to measure peak and mean strengths, net impulse, and peak and mean strength. Peak and mean energy were found to be higher for back and jump squats, while peak and mean power were higher for the kettlebell swing exercise. These findings mean that kettlebell training can result in overall strength gains

(Lake & Lauder, Kettlebell swing training improves maximal and explosive strength, 2012). McGill and Marshall looked at the impact of a kettlebell workout on the muscular system and came up with comparable results. They looked at ground response forces as well as muscular contractions of the low back extensors and gluteal muscles. During the kettlebell swing workout, they found that the "hip-hinge" movement enhances the low back and gluteal power. The gluteal muscles contracted at about 80% of their maximum voluntary contractions, while the low back extensor muscles contracted at about 50% of their maximum voluntary contractions (McGill & Marshall, 2012).

Recent BR research has mostly concentrated on metabolic costs and their impact on heart rate reaction and energy consumption (Fountaine at al . 2015). As opposed to conventional resistance and body weight workouts, one study found rope training to have the highest acute metabolic and heart rate response (Ratamess at al 2015), while another identified the aerobic and anaerobic components that make up total energy output (Lake, at al. 2012). There is a scarcity of data on the effect of KB and BR on explosive strength preparation, as well as how the two training approaches contribute to exercise success. As a result, the aim of this research was to compare the results of a high-intensity workout programme using KB to a programme using BR.

III. METHODS

This study was the experimental research study and the randomized control trials (RCT) sampling technique was used. This study was based on a pre-post assessment using healthy amateur players of different games. The study was conducted at I-8 Active Gym at I.8 Markaz Islamabad Pakistan. The duration of this study was 12 weeks and training was conducted twice a week. Total of 24 sessions held in the whole study of 45 +-10 minutes.

Participants

For this study, 60 volunteer amateur players were recruited who had not sustained the neuromuscular injury in the 6 months before the study The mean age of the study n=60 participants was 21.66 ±1.71. The mean weight and height were 62.55±4.04 kg and 5.78±0.14 feet respectively. All participants were in the normal BMI range (20.11±0.62). 60 players were randomly distributed into three group's e.g. experimental groups and control group. The experimental procedures used in this study were approved by the Board of studies, Project Evaluation Committee (PEC), Institution Review Board (IRB), and BASR of the university of Lahore, Pakistan.

Testing Procedures

The first experimental group trained with the Kettle Bell training program whereas the second experimental group trained with Battling Rope training protocol, and the third was the control group. However, pre-test data of all three groups were recorded on a proper sheet developed for the same purpose. On the first visit, the researcher collected baseline data using the Sargent Jump Test or The vertical jump test, which measured explosive power. The Sargent Jump Test was developed by Dudley Allen Sargent (1849 – 1924). This measure is used to monitor the progress of an athlete's lower limb explosive power. Subjects were assessed before and after 12 weeks. 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.

Training protocols

1:2 work to rest ratio training plan was used 25 seconds was training time and 50 seconds was rest time with the same exercise. Between the sets when switching exercises there was 2 min rest.

Table 1: Kettlebell Exercises Protocol

EXERCISES	SET	EXERCISES TIME PER SET (SEC)	REST TIME PER SET (SEC)
Kettlebell deadlift	5	25	50
Two handed kettle bell swing	5	25	50
Kettlebell clean	5	25	50
One arm kettlebell snatch	5	25	50
front squat with jump	5	25	50

Weight for kettlebell was 12 kg for first 4 weeks and for next 8 weeks players used 18 kg kettlebell.

Table 2: Battle Rope Exercises Protocol

Exercises	Set	Exercises time per set (sec)	Rest time per set (sec)
Doubled Rope alternative Waves	5	25	50
Power Slams	5	25	50
Doubled Rope Outside, Inside Circles	5	25	50
Split Full Body Circles (alternating clockwise and counter-clockwise)	5	25	50
Split alternative Waves	5	25	50

Battle Rope was 30 feet long 1.5 inches in diameter.

Statistical Analysis

All statistical analyses were calculated by the SPSS statistical package. The results were reported as means and standard deviations (SD). Differences between the three groups were reported as mean differences. The $p<0.05$ was considered statistically significant.

IV. Results

Kettlebell Workout Program

After three months pre-post analysis of kattlebell training the significant improvement was observed in explosive power (EP) (13.73±2.22 ver. 21.31±1.71, MD=7.57, *p<0.001*, d=4.79) (Table 3)

Table.3 With-In Group Changes in Kattlebell Workout

		Mean/M	SD/IQR	MR	MD/Z*	p-value	Cohen's d/r
Explosive Power	Pre	13.73	2.22	-	7.57	.000***	4.79
	Post	21.31	1.71	-			

Significance Level: p<0.05, p<0.01**, p<0.001***.*

Battle Rope Training Program

In battle rope training group explosive power (13.95±2.03 ver. 18.90±1.08, MD=4.95, p<0.001, d=3.73) improve significantly with large effect size after Three months training. (Table 4)

Table.4 With-In Group Changes in Battle Rope Training Program

		Mean/M	SD/IQR	MR	MD/Z*	p-value	Cohen's d/r
Explosive Power	Pre	13.95	2.03	-	4.95	.000***	3.73
	Post	18.90	1.08	-			

Significance Level: p<0.05, p<0.01**, p<0.001***.*

Control Group

While observing the changes in control group, There was no significant improvement in explosive power (p=0.17) after three months. (Table 5)

Table.5 With-In Group Changes in Control Group

		Mean/M	SD/IQR	MR	MD/Z	p-value	Cohen's d/r
Explosive Power	Pre	14.11	2.17	-	.05	.179	0.31
	Post	14.06	2.11	-			

Significance Level: p<0.05, p<0.01**, p<0.001***.*

Comparison between Groups

The one way ANOVA showed significant difference in explosive power {F(df)=93.64 (2,56), p<0.001, np^2 =.770} with large effect size. Anove homogeneity of variance was not assumed, the Games Howell Post-

hoc Test showed that kattlebell group more significantly improved than the battle ($p<0.001$) and control group ($p<0.001$). (Table 6)

Table 6: Comparison among groups

		Kattle bell group		Battle group		Control group		F(df)	p-value	np^2
		Mean	Std	Mean	Std	Mean	Std			
Explosive Power	Pre	13.73	2.22	13.95	2.03	14.11	2.17	-	-	-
	Post	21.31	1.71	18.90	1.08	14.06	2.11	93.644 (2,56)	.000***	.770

Significance Level: p<0.05, p<0.01**, p<0.001***.*

V. Discussion

The primery aim of this study was to see whether using a Kettlebell and a battle rope protocol could boost explosive strength. The study's second target was to see whether there were any variations between kettlebell and battle rope training in terms of explosive strength improvements. However kattlebell training following given protocol improved explosive power (13.73±2.22 ver. 21.31±1.71). Moreover battle rope training also improved explosive power (13.95±2.03 ver. 18.90±1.08). our investigation reveals this information that kettlebell training and battlerope training both have positive impact on explosive power moveover kattlebell has greater significant results then battlerope.

Lake, JP, and Lauder (2012) tested these observations by recording the results of a 12-minute kettlebell swing workout done twice a week for six weeks on healthy men. The findings showed that kettlebell swing training offers a suitable training trigger for improving explosive ability.

At the end of their 10 week training session, Manocchia et al. (2013) did not find vertical jump efficiency changes because the burden included in the training programme was not vertical jump unique. Melissa A. (2016) did resesrch and tested 25 recreational players and found that the lack of similarity between the kettlebell swing and vertical jump indicates the kettlebell swing may not be an appropriate training methd for eliciting improvements in vertical jump performance at the 20% bdy weight load examined in this study.

K. Mohan, at el (2016) researched 32 students of diffrents colleges teams at salem district in the state of Tamil Nadu, India. With the age between 18 to 26 and altlest 3 years training age with volleyball. These players participate 3 days in a week for 8 weeks with battle rope exercises. He found significient improvement in explosive power. Chen, at al (2018) trained 30 collegate basketball players and trainind them 3 time in a week for 8 weeks with battlerope training. He found significinet improvement (2.6%) in explosive power. Babu Antony, et al (2015) opined that 8 weeks battle rope training significant improve on explosive power.

In this study the sample involved was ameture athletes, and there are possible chance these variables could vary in other populations differently.

VI. Conculsion

The popularity of battle rope exercises among players is growing. It's used to achieve a variety of objectives, such as increased explosive strength. The findings of this study could aid strength and conditioning coaches in designing fitness training workouts that achieve optimal performance. KB and BR both HIIT protocols are good for explosive power improvement. Following a KB HIIT programme is more beneficial for enhancing explosive strength on the battle rope, according to our results. KB and BR trainings can be a healthy and convenient fitness modalities that adds value to a athlets workout. KB and BR when used properly, can aid in fat loss and the development of muscular strength, muscular endurance, and cardiorespiratory endurance.

References

1. Andy Rivandeneira, Battle Ropes and More..Equipment Review (2014).
2. Bobu Antony, Uma Maheswri, M., & Palanisamy, A. (2015). Effect of Battle rope training on selected physicaland physiological variables among college level Athletes, International Journal of Applied Research, 1(8): 403-406.

3. Calatayud, J., Martin, F., Colado, J. C., Benítez, J. C., Jakobsen, M. D., & Andersen, L. L. (2015). Muscle activity during unilateral vs. bilateral battle rope exercises. The Journal of Strength & Conditioning Research, 29(10), 2854-2859.
4. Falatic, J.A., Plato, P.A., Holder, C., Finch, D., Han, K., and Cisar, C.J. (published online ahead of print 2015) Effects of kettlebell training on aerobic capacity. Journal of Strength and Conditioning Research doi: 10.1519/JSC.0000000000000845.
5. Fountaine, C.J., and Schmidt, B.J., (published online ahead of print 2015) Metabolic cost of rope training. Journal of Strength and Conditioning Research doi: 10.1519/JSC.0b013e3182a35da8. (Fountaine at al . 2015)
6. K. Mohan, C. Kaba Rosario (2016) Influence Of Battle Rope High Intensity Interval Training On Selected Physical And Performance Variables Among Volleyball Players, International Journal of Multidisciplinary Research Review, Vol.1, Issue - 18, Aug-2016.
7. KRAMER, K., KRUCHTEN, B., HAHN, C., JANOT, J., FLECK, S., & BRAUN, S. (2015). The effects of kettlebells versus battle ropes on upper and lower body anaerobic power in recreationally active college students. J Undergrad Kinesiol Res.
8. Lake, J.P., and Lauder, M.A. (2012) Kettlebell swing training improves maximal and explosive strength. Journal of Strength and Conditioning Research 26, 2228-2233.
9. Melissa a. Mache, Chengtu Hsieh 2016 A Temporal And Kinetic Comparison Of The Kettlebell Swing And Maximal Vertical Jump 34th International Conference On Biomachinic On Sports ,Tsukba, Japan, July 18-22, 2016
10. Monacchia, P., Spierer, D.K., Lufkin, A.K.S., Minichiello, J., & Caster, J. (2013). Transference of kettlebell training to strength, power, and endurance. Joumal of Strengfh and Condifion Research, 27,477-484
11. Otto III, W. H., Coburn, J. W., Brown, L. E., & Spiering, B. A. (2012). Effects of weightlifting vs. kettlebell training on vertical jump, strength, and body composition. *The Journal of Strength & Conditioning Research*, *26*(5), 1199-1202.
12. Ratamess, N.A., Rosenberg, J.G., Klei, S.M., Dougherty, B.R., Kang, J.E., Smith, C.D., Ross, R.D., and Faigenbaum, A.D. (2015) Comparison of the acute metabolic responses to traditional resistance, body-weight, and battling rope exercises. Journal of Strength and Conditioning Research 29, 47-57.
13. Wei-Han Chen, Huey-June Wu, Shin-Liang Lo, Hui Chen, Wen-Wen Yang, Chen-Fu Huang, Chiang Liu (2018) Eight-Week Battle Rope Training Improves Multiple Physical Fitness Dimensions And Shooting Accuracy In Collegiate Basketball Players The Journal of Strength and Conditioning Research · May 2018