Short Communication

Effect of battle rope training on functional movements in young adults**Muthukumaran Jothilingam¹, Roobha S.², R. Revathi³ N. Paarthipan⁴, S. Saravan Kumar⁵**¹Associate Professor, ^{2,3}BPT Intern, ⁴Professor, ⁵Assistant Professor, Saveetha College of Physiotherapy, ⁴Professor Department of Radiology, Saveetha Medical College and Hospital, Saveetha Institute of Medical and Technical Sciences, Chennai, India*(Received: April 2020**Revised: October 2020**Accepted: November 2020)*Corresponding author: **Muthukumaran Jothilingam**. Email: muthukumaranjothilingam3@gmail.com**ABSTRACT**

Introduction and Aim: The battle rope exercise had obtained highest peak and mean VO₂, highest energy expenditure and highest exercise heart rate than other exercises. There is no related evidence for Battle rope exercises by screening functional movement. The aim of the study was to determine the effect of battle rope training on functional movement screening.

Methodology: According to inclusion and exclusion criteria 30 subjects were selected. They were explained about the safety and simplicity of the procedure and by the lottery system they were divided into two groups with 15 subjects in each group. Each subject has undergone pre-test and post-test measurement of functional movement screening (FMS). Group A participants did regular set of floor exercises like pelvic bridging, bird dog exercise, cat and camel exercise for 4 weeks. Group B participants did pelvic bridging, bird dog exercise, cat and camel exercise and battle rope training for 4 weeks. The data collected and tabulated, were statistically analysed. Functional movements: 7 patterns of functional movements include deep squat, hurdle step, inline lunge, rotary stability, active straight leg raise, shoulder mobility, and trunk stability push-up.

Results: The result of this study were statistically significant in FMS pretest and posttest with the p values ($p < 0.0001$). Between the posttest mean and standard deviation of FMS of both group A and group B are 14.53(2.78), and 15.43 (2.60) respectively. And there was a significant difference among the values ($p > 0.0001$).

Conclusion: This study concludes that battle rope training is better than traditional floor exercises in improving functional movements among young adults because of its simulation of functional movement patterns.

Keywords: Functional movements; battle rope; functional training

INTRODUCTION

The battle rope exercise achieved the highest peak and mean VO₂, highest energy expenditure and highest exercise heart rate when compared to the other exercises in the study (1). Battle rope training is an endurance-type exercises and used as a training tool for football players, mixed martial artists (MMA), and other athletes. Battle rope workouts the muscles in abdomen, lower back, and gluteus and include movements such as jumps, lunges, and squats. There is no related evidence for battle rope exercises by screening functional movement. Here, this research is about functional screening movement by using battle rope exercises. The more movements that contains (such as side to side, up and down, or in circles), the more different muscles and increase shoulder mobility and range of motion (2). The functional movement screening (FMS) was officially introduced in 1998 by Gray Cook and Lee Burton to rate and rank movement pattern. The FMS is a series of 7 movements patterns that require a balance of mobility and stability (3). Poor FMS performance was associated with a higher risk of injuries; it displayed low sensitivity (4). The FMS generates a numeric score based on performance attributes during seven dynamic tasks; this score is purported to reflect

prospective injury risk (5). The FMS may be able to identify highly active individuals with an elevated risk of injury. Further studies of the FMS are needed on other physically active populations. The sorts of injuries varied between the studies reviewed and it remains to be seen whether FMS scores are more determinative of specific types of injuries (e.g. lower vs. upper extremity, knee vs. hip, etc. (6). The movement screen is comprised of 3 functional movement patterns, 2 positions that test mobility, and 2 movement patterns that test core stability. This research measuring the functional movement screening by using functional movement scoring sheet and each component test score on an ordinal scale (0-3) (3). The research is based on assessment of 7 functional movement pattern, by establishing relationship between floor movement exercise (pelvic bridging, bird-dog exercise, cat and camel exercise) and floor movement exercise along with battle rope training. Pelvic Bridging exercise, a closed chain weight-bearing exercise, is an exercise which increases muscular strength of the hip extensors and promotes trunk stability increases the activities of trunk stabilization muscles such as the internal oblique, external oblique, and erector spinae muscles (7). FMS include assessment of stability and mobility within the kinetic chain of full body movements.

identification of body asymmetries, and recognition of overall poor quality movement patterns (8). Battle Rope training increase strength, endurance, and provide potent metabolic and cardiovascular responses. The “core” is also referred to as the lumbopelvic-hip complex. Major core muscles are pelvic floor muscle, transverse abdominis, multifidus, external and internal obliques, rectus abdominis, erector spinae especially the longissimus thoracis and the diaphragm (9). The core is used to stabilize the thorax and the pelvis during dynamic movement. Stability, in this context, should be considered as an ability to control the position and movement of the core. Thus, if an individual has greater core stability, they have a greater level of control over the position and movement. Core stability exercises are implemented according to the theoretical framework that dysfunction in core musculature is related to musculoskeletal injury. Development of prevention programs must first identify specific risk factors and deficits (10). Battle rope provide a form of non-impact weight resistance exercise through various wave pattern and it creates to vectors of force direction one direction of force pulling away from the individual, as well as downward force from the pull of gravity on the weight of the ropes and it causes multiple contractions to muscle group and provide dynamic balance and stabilization of the individual (11). Another direction of force move in either direction from left, the right or from front or behind and provide balance and asymmetrical stabilization. Core stability is highly dependent on tension development in lumbar muscles. Both wave movement can be used to provide moderate to high levels of muscle activity in the abdominal, internal and external oblique and erector spine.

METHODOLOGY

Total of 30 young adults were selected according to inclusion and exclusion criteria and informed consent was obtained from the participants. It was explained about safety and simplicity of the procedure and all 30 participants were selected using convenient sampling technique. Subjects were allocated in two groups as A and B based on lot system. In group A,

Table1: Pre-test and post-test values of FMS in group A

Group A (Experimental group)	Mean	Standard Deviation	T- Value	P-Value
Pre-test	14.10	2.47	3.26	0.002
Post-test	14.53	2.60	3.26	0.002

RESULTS

The pre-test and post-test values of FMS in group A subjects. In group A (experimental group) FMS pretest mean value is 14.10, SD 2.47 and post-test mean value is 14.53, SD 2.60, pre and post-test t value is 3.26 and $p > 0.0001$, statistically not significant. The pre-test and post-test values of FMS in group B subjects. In group A (control group) FMS

participants was doing regular set of floor exercise like pelvic bridging, bird dog, cat and camel for 4 weeks. In group B, participants were doing pelvic bridging, bird dog, cat and camel and battle rope training for 4 weeks. The outcome measures is functional movements. The data collected and tabulated, were statistically analysed. Floor Exercises: pelvic bridging: pelvic bridging exercise, a closed chain weight-bearing exercise, which increases muscular strength of the hip extensors and promotes trunk stability, increases the activities of trunk stabilization muscles such as the internal oblique, external oblique, and erector spine muscles (12). Bird-dog Exercise: the bird dog exercise is a core exercise that focused on lower back strength and balance (13). Cat and camel exercise: the cat and camel exercise that stretches and strengthens the muscles that stabilize the spine. Battle rope training: wave: participants were asked to tuck their elbows into sides and alternate pumping of arms up and down in a squatting position, creating alternate waves in the rope. To perform a difficult task, switch to a double wave, where the arms move in tandem. Alternating waves: handle the rope in a firm grip and by tucking the tummy with the flailing your arms up and down, tuck your elbow into your sides in a squatting position. In and out of the waves: start with the rope handles in front and create horizontal waves with the rope, take one direction and then immediately take the other in a squatting position. Subjects in both groups underwent functional movement screening which involves 7 patterns of functional movements include deep squat, hurdle step, inline lunge, quadruped rotary stability, active straight leg raise, shoulder mobility, and trunk stability push-up.

Statistical analysis

The collected data was tabulated and analyzed using descriptive and inferential statistics. To all parameters mean and standard deviation (SD) was used. Paired t-test was used to analyze significant changes between pre and posttest measurements. P value < 0.05 was considered as statistically significant.

pretest mean value is 14.10, SD 2.47 and post-test mean value is 15.43, SD 2.78, pre and posttest t value is 2.196 and $p > 0.0001$, statistically not significant. The post-test values of FMS in group A and group B subjects. In group A (experimental group) mean value is 14.53, SD 2.78, group B mean value is 15.43, SD 2.60, pre and post-test t value is 3.26 and $p > 0.0001$, statistically not significant.

Table 2: Pre-test and post-test values of FMS in group B

Group B (Control Group)	Mean	Standard Deviation	T-Value	P-Value
Pre-test	14.10	2.47	2.196	0.036
Post-test	15.43	2.78	2.196	0.036

Table 3: Post-test values of FMS between group A and group B

Group (Post Test)	Mean	Standard Deviation	T-Value	P-Value
Group A	14.53	2.60	1.29	0.199
Group B	15.43	2.78	1.29	0.199

DISCUSSION

Functional movements like squat, lunge, push, pull, bend and lift plays vital role in sports performance and conditioning, almost all the conditioning programs based on these functional movements. We have many sports conditioning implements and its influence on various effects yet to be explored. Battle rope is one of the conditioning tools often categorized as strongman's exercise. Though it has occupied significant level in sports rehabilitation and conditioning field its effect on various physiological parameters remains uncertain. This study shows almost no significant improvement on functional movements especially on squats, and pushups and it could be because as those movements are often simulates our day today activities. There are a number of studies about FMS. However there is no study about the effect of battle rope training along with pelvic floor exercises to analyse Functional Movement Screening. Therefore the aim of our study was to demonstrate FMS for both battle rope and pelvic floor exercises. Ratamess *et al.*, stated that Battle Rope provide non-impact weight resistance exercise through various wave patterns, results in stabilizing and mobilizing the hip and shoulder joint concerning with functional movement activities (6). Deuster *et al.*, (12) aimed to reveal the functional ability of functional movement screening (FMS). The types of injuries varied between the reviewed studies, and it remains to be seen if FMS scores are more predictive of particular types of injuries (e.g. lower vs upper extremity, knee vs. hip, etc.). Authors of the reviewed studies stated that individuals who scored below 14 had a higher prevalence of injury. Bodden *et al.*, (13) stated that FMS can identify movement dysfunctions and, furthermore, the fact that issues can be increased through a standardized intervention program could benefit MMA coaches, thus providing a potential to adjust and implement new additions to skills training. Comparing with other studies as author's view we concluded that there is no evidence to access FMS with battle rope training along with floor exercises coordinately stabilize the core muscles. FMS require a balance of mobility and stability. The FMS has already been demonstrated by many researchers, this is the only study to analyses

FMS with the battle rope training and floor exercise. Battle rope training mimics deep squat and in line lunge movement patterns.

CONCLUSION

This study concludes that battle rope training is better than traditional floor exercises in improving functional movements among young adults because of its simulation of functional movement patterns.

CONFLICT OF INTEREST

Authors declare no conflict of interest.

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