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**AN IMPACT OF KETTLEBELL EXERCISES VERSUS BATTLE ROPE  
EXERCISES ON GRIP STRENGTH IN RECREATIONAL TEN PIN  
BOWLERS: A COMPARATIVE STUDY**

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**ABSTRACT**

**Background:** Sport-specific training now requires strength and fitness, with equipment like battle ropes and kettlebells becoming more popular for improving strength, grip endurance, and coordination. These are particularly important for games like ten-pin bowling that need control of the upper limbs. Bowling is biomechanically demanding, while not high-intensity, needing steady grip strength and motor control for ball release and spin. Originating in the Netherlands in the 16th century, the sport depends on technique and accuracy. Despite its physical demands, little is known about how functional training techniques affect bowlers grip strength and performance, particularly when they are playing recreationally. Investigating this could enhance injury prevention and conditioning tailored to a particular sport.

**Methodology:** A comparative study was conducted among 30 recreational bowlers aged 19–45 years in Ahmedabad. Participants were divided into two groups: Group A (n=15) underwent kettlebell training 4 days/week for 8 week, and Group B (n=15) performed battle rope training 4 days/week for 8 week. Grip strength was measured using a handheld dynamometer before and after the intervention. Statistical analysis was performed using SPSS version 20.0, with significance set at p<0.05.

**Results:** Both groups demonstrated a statistically significant improvement in grip strength post-intervention, with intra-group changes observed using paired t-tests and inter-group comparisons made via independent t-tests.

**Conclusion:** The findings suggest that both kettlebell and battle rope exercises are effective in enhancing grip strength in recreational ten-pin bowlers, offering evidence-based recommendations for performance improvement.

**Keywords:** Kettle bell, Bettle Rope, Grip Strength, Hand held dynamometer

## INTRODUCTION

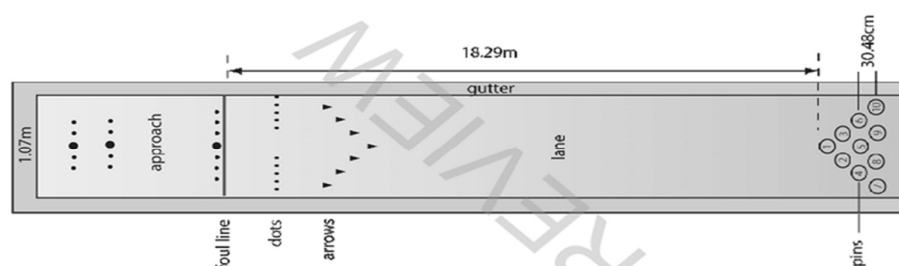
Around 3200 BC, the game of bowling was first played in Egypt. The origins of modern bowling can be traced to the Netherlands in the 16th century. Bowling was played as a pastime throughout those years, with the occasional competitive element fueled by financial wagers. The fact that kettlebell training is fundamentally functional that is, it uses a variety of muscle groups in these simple swinging or ballistic exercises contributes to its rising appeal. Ballistic force, which includes quick acceleration and deceleration, is necessary for kettlebell “swings”. The game of bowling was first played in Egypt. The origins of modern bowling can be traced to the Netherlands in the 16<sup>th</sup> century [1]. These methods need simultaneous core stability and induce both concentric and eccentric contraction [4]. A solid cast-iron sphere with a broad handle fastened to the top is called a kettlebell. Its form allows one to incorporate velocity, centrifugal force, and curvilinear movements into a circuit weight training session that works the entire body. The use of kettlebells has been linked to increases in

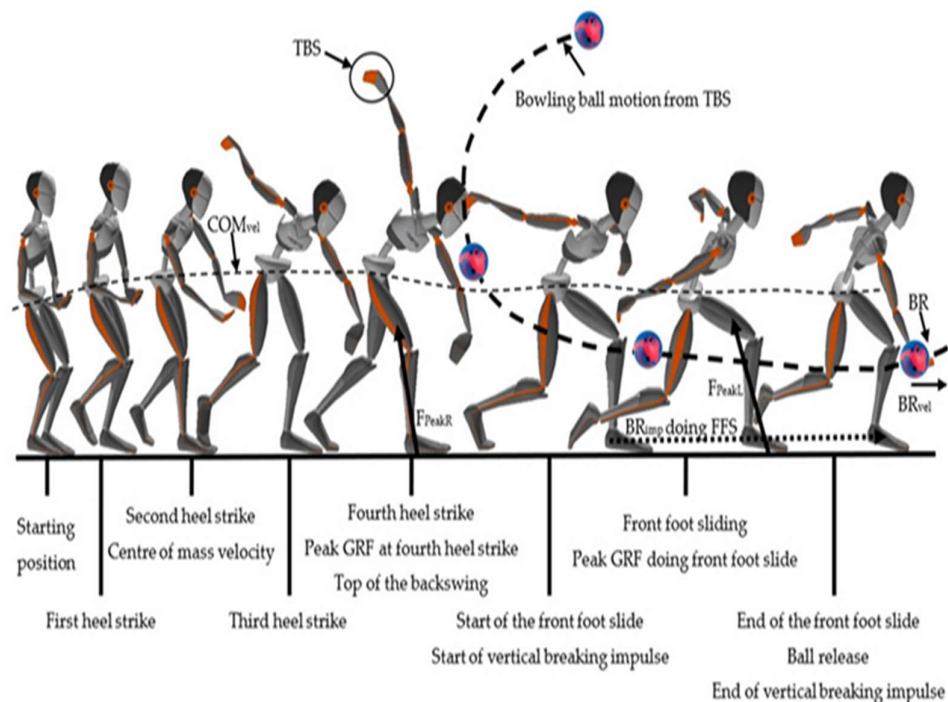
both aerobic and muscular fitness. Research on the effectiveness of kettlebell training is limited when compared to other popular resistance and aerobic training modalities and also research is required to substantiate the effects of this training modality on a number of fitness and performance components, as the use of kettlebells grows in a variety of contexts, such as commercial fitness and strength and conditioning. Thus, this review's goal is to provide an overview of how well kettlebell training works to improve muscular strength, power, endurance, and aerobic capacity. [5]. Kettlebells were first utilized in Russia in the early 1700s, but not to increase fitness, but rather as a counterweight for manufacturing scales [6].

Exercises using battle ropes are excellent for improving athletic performance, strengthening muscles, and improving cardiorespiratory fitness. Power, strength, flexibility, and endurance are all enhanced by rope exercise [7]. Over the past few years, battle rope (BR) training has grown in popularity workout training that works

several muscles at once will become more popular as a result of these changing workout format. Battle rope training is a high-intensity workout that involves using the upper body to undulate a rope. Elevated heart rate and energy expenditure per unit of time indicate that it provides a vigorous-intensity cardiovascular and metabolic stimulus. Ropes produce a dual-force dynamic effect that enhances and amplifies the physiological response of every human system by utilizing both the force of gravity and the force produced by rope waves. Because there is a permanent link between the two force producers and because the force can be as explosive or dynamic as the individual can produce, battle ropes reduce injuries while providing an uncapped opportunity to increase strength, power, endurance, and skill. Increasing strength, power, local muscular endurance, and agility are just a few of the training objectives that can be achieved using battling rope routines. It's a difficult method of aiming for decreased body fat and weight loss through

higher energy expenditure. In comparison to the energy expenditure observed during conventional resistance training, BR workouts are said to promote significant levels of energy expenditure. Additionally, raising cardiovascular demand may aid to enhance metabolic health and maximal aerobic capacity [12]. Increasing strength, power, local muscular endurance, and agility are just a few of the training objectives that can be achieved using battling rope routines. It's a difficult strategy to reduce body fat and lose weight by increasing energy expenditure. In contrast to the energy expenditure observed during conventional resistance training, BR workouts are said to induce significant levels of energy expenditure. Additionally, greater cardiovascular demand can be beneficial for enhancing metabolic health and maximal aerobic capacity [13]. Using fighting rope exercises as a metabolic training modality after a thorough resistance training session also known as a “metabolic finisher” is a popular strategy [14].





A comprehensive representation of a typical bowling ball delivery with right hand, demonstrating the sequence of events and important parameters throughout the process.

The precise effects on bowler's grip strength are yet unknown, kettlebell and battle rope workouts provide dynamic and functional training advantages. For recreational bowlers, the result might inform evidence-based training suggestions. The purpose of this study is to examine how well battle rope and kettlebell workouts enhance these important physical characteristics.

### OBJECTIVES

- To evaluate the effect of kettlebell exercise on hand grip strength in recreational ten-pin bowler.

- To evaluate the effect of battle rope exercise on hand grip strength in recreational ten-pin bowler.
- To compare the effect of kettlebell with battle rope on hand grip strength in recreational ten-pin bowler.

### METHODOLOGY

Source of data: Any bowling alley (bowling centre, bowling lounge or arena and historical club) in ahemdabad

Study design: A comparative study

Sample size: At 80% power analysis, the calculated sample size was (n=15) one group and (n=15) in second group, thus total 3 participants will be considered for both groups. Therefore, a total 32 participants will be considered for the present study to

over come the drop out effect. Group A (n=15) Group B (n=15)

Study duration: During academic

Duration of intervention: Kettlebell exercises 4 days/ week for 8 weeks and Battle rope exercises for 4 days/ week for 8 weeks

### **MATERIALS**

Pen, Pencil, Paper, Eraser, Kettlebell, Battle rope, Handheld dynamometer, Assessment sheet, Consent form, Patient information sheet, Time, Weight scale

### **INCLUSION CRITERIA [3, 5, 13, 6, 10, 11]**

1. Age from 19 to 45 years.
2. Both male and female.
3. Skilled and unskilled bowlers.
4. Participants should have engaged 3 times per week.
5. Willing to participate in exercise program.
6. Some prior experience with resistance training and to be at least recreationally active.
7. None of the participants had any history of injuries affecting their bowling performance one month prior to data collection.

### **EXCLUSION CRITERIA [9, 11, 12]**

1. Subject with de Quervain's tenosynovitis, tennis elbow, golfers elbow, carpal tunnel syndrome, trigger finger, injury related disorder.
2. Fracture of the ring finger, flexor tendon pulley injury, and palmar

fracture dislocation of the proximal interphalangeal joint of the middle finger in a bowler have also been reported chronic tendon irritations bowler's tendonitis or medial epicondylitis.

3. Congenital conditions, mechanical problems, or traumatic factors.

### **OUTCOME MEASURES**

Grip strength using handheld dynamometer<sup>(7)</sup> :Each participant was informed about the study methodology and written consent form was filled by all the participants and then detail assessment was taken the methodology was explained properly than was filled up by the participants and confidentiality of the data was assured.

### **STATISTICAL ANALYSIS**

- Normative data was found using Shapiro-Wilk test.
- Version 20.0 SPSS software was used analysis.  $P < 0.05$  considered significant for measurement.  $P > 0.05$  considered non significant.
- Value of confidence set at 95%
- If  $p < 0.05$  considered significant
- If  $p < 0.08$  highly significant.
- Paired t-test was used to find intra group difference
- Independent t-test was used to find inter group difference

Both the kettlebell and battle rope exercise groups showed a statistically significant

improvement in hand grip strength after 8 weeks of intervention. The intra-group comparison using paired t-tests indicated improvement within each group, while the inter-group comparison using independent t-tests showed that both exercise methods

were effective, with no significant difference between the two groups. This suggests that both kettlebell and battle rope training can be beneficial for enhancing grip strength in recreational ten-pin bowlers.

**RESULTS**

**Tests of Normality**

	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Pre Grip Strength	.135	30	.169	.958	30	.279
Post Grip Strength	.097	30	.200 <sup>*</sup>	.978	30	.781

\*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

So data is normally distributed

T test will be used

**Group Statistics**

	Group	N	Mean	Std. Deviation	Std. Error Mean
Pre Grip Strength	1	15	28.026667	2.9759672	.7683914
	2	15	26.186667	3.0675413	.7920358
Post Grip Strength	1	15	30.646667	3.1525198	.8139771
	2	15	30.206667	2.9783664	.7690109

**Unpaired T- Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Pre Grip Strength	Equal variances assumed	.050	.825	1.667	28	.107	1.8400000	1.1035153	-.4204486	4.1004486
	Equal variances not assumed			1.667	27.974	.107	1.8400000	1.1035153	-.4205421	4.1005421
Post Grip Strength	Equal variances assumed	.202	.657	.393	28	.697	.4400000	1.1197931	-1.8537921	2.7337921
	Equal variances not assumed			.393	27.910	.697	.4400000	1.1197931	-1.8541252	2.7341252

**Paired t test**

**1)Battle rope**

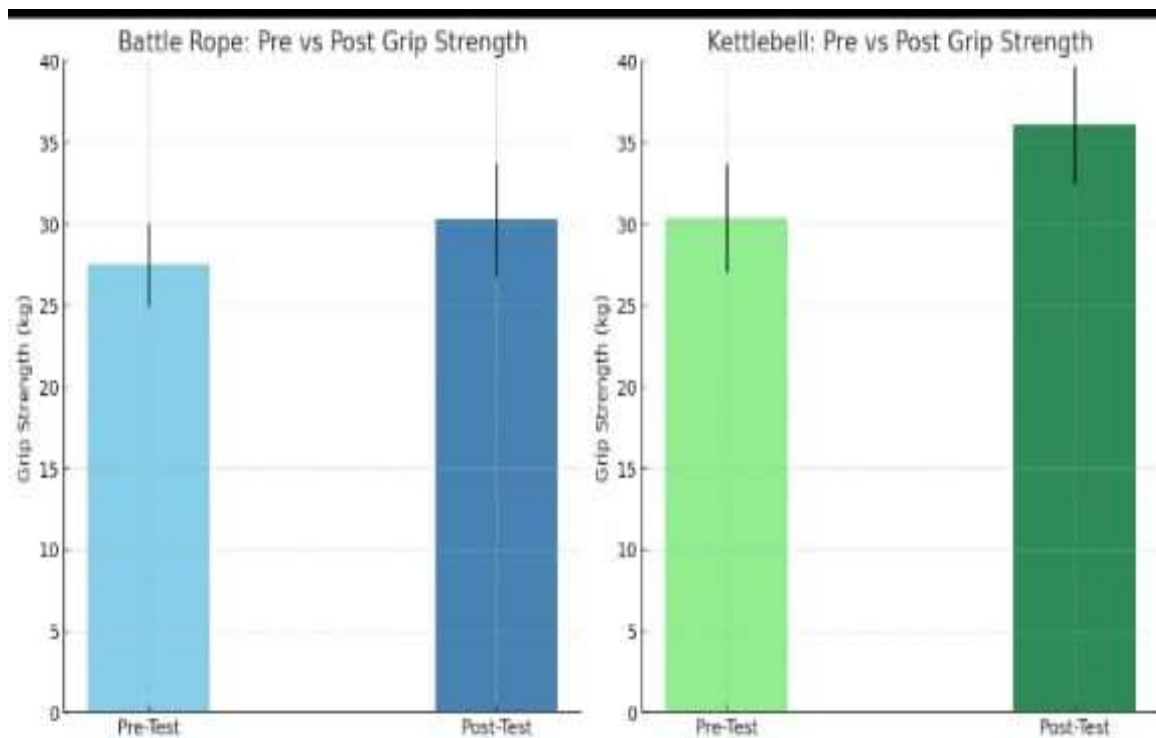
Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre Grip Strength (kg)	27.4640	15	2.53288	.65399
	Post Grip Strength (kg)	30.2480	15	3.47406	.89700

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre Test (kg) Post Test (kg)	-5.733	.458	.118	-5.987	-5.480	-48.511	14	.000

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre Grip Strength (kg) Post Grip Strength (kg)	-2.78400	2.18040	.56298	-3.99147	-1.57653	-4.945	14	.000

2) Kettle bell

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre Test (kg)	30.33	15	3.309	.854
	Post Test (kg)	36.07	15	3.615	.933



## DISCUSSION

The purpose of the current study was to assess and contrast how grip strength was affected by kettlebell and battle rope activities in recreational ten-pin bowlers. Post-intervention grip strength improvements were statistically significant for both exercise. The processes and potential causes of these observations are examined in this debate. Grip strength increased significantly with kettlebell training (mean increase of 5.73 kg), and this gain was statistically significant ( $p = 0.000$ ). The nature of kettlebell movements, which require extended isometric contractions of the hand and forearm muscles, is responsible for this development. Kettlebell swinging, pushing, and snatching movements necessitate dynamic stabilization, which improves muscle endurance and motor unit recruitment, especially in the forearm's flexor group. Additionally, the grip needed to hold and manage a moving kettlebell tests the neuromuscular system, enhancing reactive strength, hand coordination, and proprioceptive feedback. Increased grip capacity and functional endurance are the results of these elements taken together.

The grip strength of those in the battle rope group also significantly improved (mean increase of 2.78 kg,  $p = 0.000$ ). The majority of battle rope workouts are anaerobic, requiring quick, repetitive motions of the upper limbs that work the wrist, forearm,

shoulder, and core muscles. Over time, hand flexor activation and muscle endurance are increased by the gripping requirement for continuous rope slams or waves. Due to their high metabolic load, battle rope exercises improve the muscles vascularization and oxidative capability, which indirectly increases the grip muscles resistance to exhaustion. Though not as noticeable as with kettlebell training, this could account for the gains observed in this group. There was no statistically significant difference between the two groups after the intervention, despite the fact that both exercises considerably increased grip strength ( $p = 0.697$ ). The kettlebell group did, however, show a somewhat greater mean improvement, indicating that it might be slightly more successful. In kettlebell exercises, the combined eccentric-concentric loading patterns, kettlebell exercises extended time under tension and functional nature better mimic demands in real life and in particular sports. Ten-Pin bowling functional relevance in grip strength is essential for spin production, ball control, and injury avoidance. Exercises with kettlebells and battle ropes both encourage useful changes that can be applied to bowling biomechanics. Both regimens increased grip strength may result in better release timing, less fatigue across several games, and higher performance all around.

## CONCLUSION

The study aimed to assess the impact of kettlebell and battle rope exercises training on hand grip strength in ten-pin bowlers. The results from both sample groups indicate a statistically significant improvement in grip strength post-intervention.

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