



# The Contribution of Battle Rope Exercise to the Technical Dimensions of Court Tennis Student Athletes of Universitas Negeri Medan

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**Abstract.** The purpose of this study was to determine the impact or contribution of functional training using a battle rope on the technical abilities of Sports Science Faculty (FIK) Universitas Negeri Medan (UNIMED) tennis student-athletes. This research is a quantitative method with an experimental approach. Data were collected using Hewitt's Tennis Achievement Test method. The data were analyzed using paired samples t-test with a significance level of  $p < 0.05$ . The results were obtained a significance value of serve, forehand, and backhand respectively (0.702, 0.146, and 0.078) greater than the  $\alpha$ -value of 0.05. Thus, the three results do not have significant differences in the pre-test and post-test data for all stroke techniques. Although the results of the data analysis show statistically that there is no contribution of battle rope exercise to the technical dimension of court tennis players, the muscular work system while executing the shots will have an indirect effect. Further research is then needed on aspects of sport physiology and mechanics, as both will provide direct benefits from battle rope exercise.

**Keywords:** battle rope, court tennis game, student-athlete, court tennis basic strokes

## 1 Introduction

The low level of technical ability in field tennis student-athletes (1) of the Faculty of Sports Science (FIK) of Universitas Negeri Medan (UNIMED) was obtained through observations and pre-research tests. Essential techniques, such as serve, forehand, and backhand strokes, are absolute things that must be mastered to be applied in the game pattern (2). In completing each rally in a court tennis game, especially for women, a player makes at least one to three strokes and some players need more than three strokes (3). In addition, the results of another study conducted on PON (National Sports Event of Indonesia) athletes in one of the provinces on the island of Sumatra were at a moderate level or had not yet achieved "Good" or "Excellent" results overall (4).

To solve this problem, researchers tried to examine functional exercises. This exercise is focused on improving simple and complex basic movement patterns (5). The periodization process should be the basis for creating an exercise program so that the right dose of exercise will stimulate both the psychology and physiology of the athlete and produce positive responses and adaptations (6). Functional training has various forms from using to without using the tools. Rope training is one form of functional exercise that has been popular in recent years.

There are several forms of movement that can be performed through the use of battle ropes. However, the researchers chose several movements that resemble the basic techniques of court tennis, including the bilateral waves section, namely double arm waves; bilateral slams section, namely double arm slams; unilateral waves section, namely double arm alternating waves and single arm waves; and bilateral circles section, namely double outside circles and double inside circles (7). One study revealed that functional training is more effective in improving court tennis strokes ability compared to traditional training or only technique training (8). Thus, functional training through the use of battle rope media makes it possible to get an increase in stroke ability in FIK UNIMED tennis student-athletes. Therefore, the purpose of this study was to determine the impact or contribution of functional training using a battle rope on the technical abilities of FIK UNIMED tennis student-athletes.

## 2 Method

This research is a quantitative method with an experimental approach, while the research design is a pre-post-test equivalent group. Then, the purposive sampling technique was used to determine the number of samples. Sample considerations or requirements could be stated as follows, (1) be active as a court tennis student-athlete of FIK UNIMED, (2) be max. B category for the technique test, (3) take the initial and final tests, and (4) follow the treatment for four weeks. Data were taken using Hewitt's Tennis Achievement Test method. Furthermore, the stages of data analysis were stated as follows, (1) normality test using Q-Q plot, (2) homogeneity test using Levene test, and (3) hypothesis test using paired sample t-test with a significance level of  $p < 0.05$ . These stages were tested using SPSS version 16.0.

### 3 Results

Table 1. Descriptive Statistics of Pre-and-Post Court Tennis Strokes Test

		Pre-Test of Service Stroke	Post Test of Service Stroke	Pre-Test of Fore-hand Stroke	Post Test of Fore-hand Stroke	Pre-Test of Back-hand Stroke	Post Test of Back-hand Stroke
N	Valid	13	13	13	13	13	13
	Missing	0	0	0	0	0	0
Mean		12.77	11.92	12.00	18.08	13.23	19.23
Std. Error of Mean		2.196	1.195	2.248	3.770	2.887	2.849
Median		10.00	12.00	10.00	15.00	10.00	17.00
Mode		10 <sup>a</sup>	9 <sup>a</sup>	2 <sup>a</sup>	12	6	16 <sup>a</sup>
Std. Deviation		7.918	4.310	8.103	13.592	10.410	10.273
Variance		62.692	18.577	65.667	184.744	108.359	105.526
Range		27	14	27	48	36	36

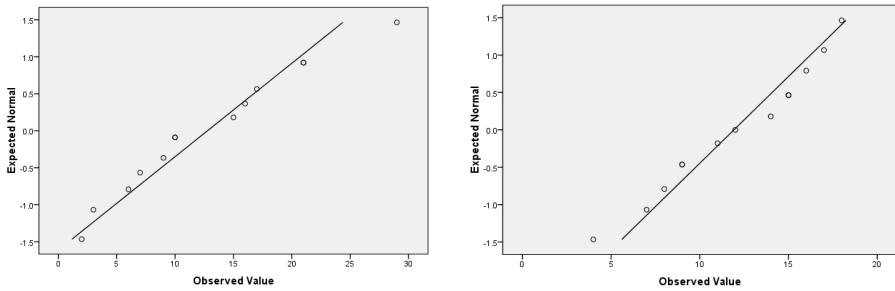


Figure 1. Normality Test of Pre-and-Post Service Stroke Test

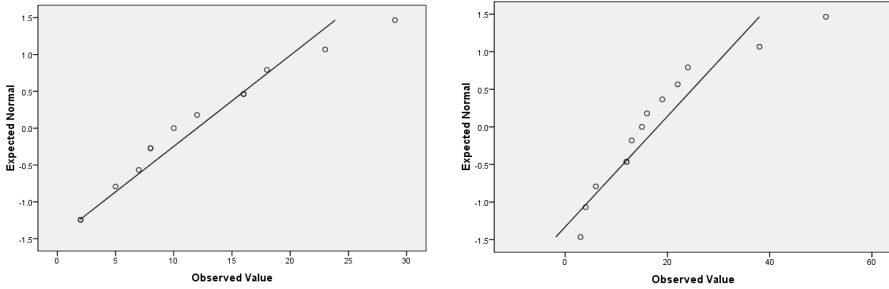


Figure 2. Normality Test of Pre-and-Post Forehand Stroke Test

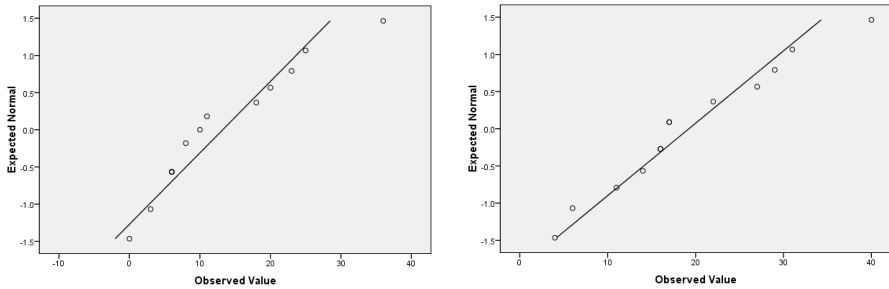


Figure 3. Normality Test Result of Pre-and-Post Backhand Stroke Test

The total of all research data has a normal distribution in the pre- and post-test results in each part of the stroke techniques. These can be seen in Figure 1 until Figure 3 where the points in the picture gather or close together towards a straight line. In addition, the picture on the left side is the normality test result of the pre-test and the right side is the normality test result of the post-test.

Table 2. Homogeneity Test of Pre-and-Post Court Tennis Strokes Test

F	df1	df2	Sig.
1.968	5	72	.094

Dependent Variable: Pre and Post Test of All Court Tennis Strokes.

Then, the result of the homogeneity test (Table 2) was obtained homogeneous data from all groups of pre-test and post-test data for the serve, forehand, and backhand strokes. This is based on the significance value (sig.) 0.094 greater than the  $\alpha$ -value of 0.05. Furthermore, the results of the paired sample t-test (Table 3) were obtained a

significance value (sig. 2-tailed) in Pair 1 to Pair 3 respectively (0.702, 0.146, and 0.078) greater than the  $\alpha$ -value of 0.05. Thus, the three results do not have significant differences in the pre- and post test data of all stroke techniques. Based on these results and statements, functional training through the battle rope media does not impact or contribute to the ability of stroke techniques in FIK UNIMED student-athletes.

Table 3. Paired Sample T-Test Result of Pre-and-Post Court Tennis Strokes Test

	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 of Service Stroke - Post Test of Service Stroke	.846	7.777	2.157	-3.853	5.545	.392	12	.702	
Pair 2 Pre-Test of Forehand Stroke - Post Test of Forehand Stroke	6.077	14.104	3.912	-14.600	2.446	1.554	12	.146	
Pair 3 Pre-Test of Backhand Stroke - Post Test of Backhand Stroke	6.000	11.210	3.109	-12.774	.774	1.930	12	.078	

## 4 Discussion

In order to improve the technical skills of athletes, there are various methods, programs and training media. These things are variations of training that need to be used not only to improve the skills, but also to increase the motivation and to avoid the boredom or tedium of the athletes during the training. One way to make training more interesting for athletes is to use rope media as a training medium (9).

During the unilateral and bilateral movements of the battle rope exercise, several muscles are contracted. These include the anterior and posterior deltoids, pectoralis major, coracobrachialis, latissimus dorsi, teres major, obliques, and others (7) (10). In addition, almost all upper body muscles (deltoid, coracobrachialis, pectoralis major, latissimus dorsi, etc.), except the elbow flexor, are involved in the execution of various court tennis strokes (11). Thus, the muscles that contract during a battle rope exercise are similar to the muscles that contract during a tennis stroke.

The required characteristics for court tennis players, both male and female, are those who can play more than 0.5 – 1 hour of the entire rally (physical performance should be more focused for adult athletes) and hit 2 – 5 strokes (hitting ability should be more focused for youth athletes) (12) (13). Through battle rope exercise, tennis players can benefit from improved physical performance (14). In addition, the short rest periods during matches (based on ITF rules) (13) put tremendous pressure on athletes both aerobically and anaerobically from a physical standpoint (15).

In addition to the physical aspects, the technical aspects, especially the force that the player exerts, are important for mastering and even winning matches. The force released when swinging the racket affects the speed of the swing (15). The speed of the racket swing also affects the speed at which the ball slides into the opponent's area. It is possible to train racket swing speed by using a battle rope, as long as the form of movement is (almost) similar.

## 5 Conclusion

Although statistically the results of the data analysis show that there is no contribution of functional battle rope exercise on the technical dimension of court tennis players, the muscle work system when performing the shots will have an indirect effect. Further research is then needed on aspects of sports physiology and mechanics, as both will provide direct benefits from battle rope exercise. Consideration of the selection of movement types in battle rope exercise needs to be an area of attention for researchers to match the movements in the game of court tennis.

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