



## Original Article

### Title:

# The Effect of Training Using TRX Ropes on Some Physical Variables of Female Wrestlers

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### Abstract

The research aims to design a training program using TRX ropes and know its effect on some physical variables represented for female wrestlers. The authors hypothesize that there are statistically significant differences between the mean of the pre- and post-measurements of the experimental group in some of the represented physical variables level favor of the post-measurement of female wrestlers. The participants were 18 wrestlers registered in the Egyptian Wrestling Federation for season 2021-2022 at Kafr Al-Maslaha Club in Shebin Al-Kom Menoufia Governorate. Then a group of (16) wrestlers aged between 15-17 years was selected in a deliberate way from the wrestlers of Kafr Al-Maslaha Club in Shebin Al-Kom, Menoufia Governorate. Where the group was divided into two groups; the experimental group of (8) wrestlers, while the exploratory group was (8) wrestlers, they were chosen from the research community. The results showed that using TRX affected positively the studied physical variables.

### Keywords :

*Wrestling , Ropes, TRX.*

### Introduction

The world is now witnessing a tremendous revolution in technology and broad scientific progress, which has flooded various areas of life in general, and the sports field in particular, considering that sport is one of the factors that express the extent of progress of countries, as this appears in the results achieved by athletes in various sports, and development is an essential feature of human life, which depends on its advancement on benefiting from various branches of science and employing it for the benefit of human society.



Essam Abdel Khaleq (2009) indicates that sports training is one of the most important things that affect the improvement of motor performance, where the possibility of the player's access to higher levels becomes better if it is possible to predict the extent to which the impact of training and practice processes on the development of his own abilities in an effective way that enables the player to achieve continuous progress. (Abdel Khaleq, 2009)

Ashraf Hafez and Nabil El-Shorbagy (2010) mention that women's and freestyle wrestling is a basic type of wrestling that are listed in the International Wrestling Federation. Fila as the Roman wrestling law is applied to it, but it allows playing on the legs, arms and head and is not allowed to strangle, bite or hold the opposite of the joint. (El-Shorbagy, 2010)

Mohammed Reda Al-Ruby (2005) believes that wrestling is one of the strongest sports and the special physical training is mainly directed towards increasing muscular strength, endurance, flexibility, speed and improving the technique and that the wrestler can implement most of the offensive and defensive movements and counterattack through using effectively types of muscular strength against his competitor. (Al-Ruby, 2005)

Mohammed Sobhi Hassanein (2001) indicates that physical performance is the healthy state of the individual in terms of his physical and organic composition that enables him to use his body skillfully in aspects of activity. (Hassanein,2001)

Wesley and others (2015) report that a recent exercise known as Total Body Resistance Exercise (TRX) has recently appeared in various forms, which was the basic of hundreds of years in the combat units of the Roman army, the movements of the ancient Chinese acrobatic (gymnastics), evolved its use in the century (19) to be used in expeditions and mountaineering in combat training, and recently explains the boom in the physical and skill level of gymnasts. The experiences of previous generations are illustrated by using ropes for training resistance against the body weight and arose total body resistance training. TD after graduating from the University of California in 1987, he spent 14 years as commander of the Naval Special Forces seal, and during his career he was looking for a way to maintain physical fitness for the large number of joint military operations and the diversity of their places without the need for traditional tools to carry with him. Finally, the answer was found in Attachment Drills (TRX) where two strips of parachute straps were placed with rubber boat , to become eventually the TRX. Soon after there was an increasing growth of the exercises used on that tool. (Wesley, 2015)

Ahmed Mahmoud Ibrahim (2011) mentions that Training with TRX Ropes is a set of sports exercises aimed at strengthening muscle mass in general and depends on the resistance of weights through strong belts, and these exercises strengthen the upper and lower muscles of the body, muscles of the arms and legs, in addition to the muscles of the back and abdomen. These exercises are equivalent in strength to running and cycling exercises. (Ibrahim,2011)



Lukas Slama (2011) points out that soldiers called it a "tool" and in an attempt to make adjustments in order to fit all the different body weights. they tried to find a point to tie it to doors, water tanks or jeeps. (Slama, 2011)

Martin Hajnovic (2014) and Martin Tuma (2014) explained that several years later it has become a TRX tool is an essential tool in training the armed forces and fitness centers, and these exercises quickly became the cornerstone of sports programs. It was used by hundreds of professional athletes in football, baseball, basketball, hockey, martial arts, triathlon, golf, tennis, swimming, ice skating, sailing, motorcycles and other sports, and were used in high schools throughout the United States as a basis for fitness training. (Hajnovic,2014;Tuma, 2014)

Miranda (2010) points out that the tool used in the TRX training system consists of two nylon straps that do not have any percentage of adjustable rubber (in terms of length) with padded handles and foot straps attached to each bar, and attached to the upper tie point and weighs (890 g). Its advantages are allowing practice for the largest number of comprehensive diverse exercises for whole body much more than traditional exercises. Because of its light weight and small size, it could be taken anywhere. It can stand alone for increasing the strength and trains small and large muscles for all age groups, genders, athletes and non-athletes, and can also develop elements of general fitness and special sports skills. (Miranda,2010)

TRX training is based on body weight gravity resistance to develop ability, flexibility and balance. It can be used for everyone without distinction in age or gender to enable its practitioners to perform hundreds of exercises to reach any fitness goal. It can be used in a variety of ways, and can be adjusted according to the user's characteristics. The performance depends on the muscles of the abdomen, back, pelvis and chest. A weight jacket can also be added to increase body weight for increasing muscle size. It can also increase heart rate and burn calories higher than standing and sitting during traditional exercises and thus increases the strength of the heart muscle and increases muscular endurance. ( Yniguez K,2010)

Through the author's experience as a wrestler, as well as observing the international and Olympic championships. I noticed wrstlers' failure, their inability to continue performing the skill and continue attacking with the same intensity and speed during the compate, which has an effective role in all competitions, while the performance requires certain specifications, accurate technique, motor capabilities and special requirements. Wrestling requires continuous offensive performance to achieve victory over the opponent, and thus the intensity of performance is high and accompanied by great effort on the body systems during the compate, which leads the inability to continue performing with the same efficiency physically, skillfully and tactically.

Scientific and technological methods have been adopted to train wreslters with new training programs to keep pace with global progress. The authors used to try modern training methods to training total body resistance as (TRX). There were few studies that use total



resistance training for the body (TRX) for female wrestling, so The authors saw the importance of doing this study as an attempt to address the short comings in training programs, which lack a scientific basis and modern training methods, and also correct the course of the training process and conducting a training program to develop special physical abilities, which helps wrestlers to improve their skills, physical and tactical performance and reach performance effectiveness for winning the compat.

### **Research objective:**

The authors aim to design a training program using TRX ropes and study its effect on some physical variables (maximum strength of the legs, maximum strength of the back, maximum strength of the arms, muscular ability of the legs, muscular ability of the arms, strength endurance, special agility, flexibility) for female wrestlers.

### **Research hypotheses:**

There are statistical significane differences between the mean of the pre- and post measurements of the experimental group of some physical variables (the maximum strength of the legs, the maximum strength of the back, the maximum strength of the arms, the muscular ability of the legs, the muscular ability of the arms, force endurance, special agility, flexibility) in favor of the post-measurement of female wrestlers.

### **Material and Methods**

#### **Methodology**

The authors used the experimental method with an experimental design of one group because it is appropriate to the nature of the research.

#### **Community**

All 18 wrestlers registered in the Egyptian Wrestling Federation for the 2021-2022 season at Kafr Al-Maslaha Club in Shebin Al-Kom, Menoufia Governorate.

#### **Participants**

The participants were selected in a deliberate way from the wrestlers of Kafr Al-Maslaha Club in Shebin Al-Kom, Menoufia Governorate, aged between 15-17 years, and their number is (16) wrestlers, where the strength of the basic sample of the research is (8) wrestlers representing the experimental sample, while the exploratory study was conducted on (8) wrestlers from the rest community.



**Table No. (1) Characteristics of the research community and the experimental group**

M	Statement	Number of wrestlers	Percentage
1	Study Community	16 wrestlers	100.00%
2	Experimental Group	8 Wrestlers	50%
4	Exploratory Groups	8 Wrestlers	50%

### Terms of selecting the participants

1. The wrestlers must be registered in the Egyptian Wrestling Federation.
2. The wrestlers' training experience should be minimum 4 years.
3. The age of the wrestlers should be between 15-17 years .
4. The participants wrestlers should have the desire to participate in the study.
5. The wrestlers should train regulary in the training program according to the system that set by the club's management.

### Charachteristics of the experimental group:

The moderation of the distribution of the members of the experimental group according to the stdied variables is illustrated in table (2), which showsalso the Skewnesss of the experimental group ranged between (-2.23: 0.32) in the growth variables. They were confined between (-3, +3), which indicates that they are located within the normal distription curve, and thus the group is normaly distributed, which indicates the homogeneity of the group members.

**Table (2) Statistical description of the experimental group (n=8)**

Variables	Unit	mean	Median	Standard deviation	Skewness	
Growth rates	Length	Cm	161.25	161.00	3.37	0.22
	Weight	kg	66.00	65.50	4.56	0.32
	Chronological age	year	15.62	16.00	0.51	- 2.23
	Training Age	year	3.87	4.00	0.83	- 0.46

Table (3) shows the Skewnesss of the studied physical variables of the experimental group ranged between (-1.2: 0.62). They were confined between (-3, +3), which indicates that they are located under the normal curve, and thus the group is normaly distributed, which indicates the homogeneity of the group.



**Table (3) homogeneity of the experimental group in the studied physical variables (n=8)**

Variables	unit	mean	Median	Standard deviation	Skewness	
Physical tests	Maximum strength of the muscles of the legs	kg	75.62	76.00	4.27	- 0.26
	Maximum strength of the back muscles	kg	63.37	63.50	2.26	- 0.17
	Maximum strength of the arms	R	0.87	1.00	0.64	- 0.60
	Muscular ability of the legs	m	1.26	1.26	0.04	0.00
	Muscular ability of the arms	m	2.91	2.97	0.15	- 1.2
	Bearing force	R	13.50	14.00	1.30	- 1.15
	Special Agility	Sec.	14.97	14.94	0.61	0.14
	Flexibility	Cm	51.00	50.50	2.39	0.62

**Data collection:**

1. Expert survey form to determine the studied physical variables and the most appropriate ways to measure these variables.
2. Questionnaire for the opinion of experts in determining the studied variables of the training program used in the research.
3. Data registration form for each wrestlers.
4. Physical measurements form.

**Tools and devices:**

1. Height and weight measurement device.
2. Stopwatch.
3. Medicine balls .
4. Wrestling signs and mates.
5. Training tools (cones, collars, training ladder, .... etc.)
6. Resistance tensioners (Rubber Rops).
7. Measure Tape.
8. Dynamometer to measure the strength of the muscles of the legs.



### **Tests and Measurements:**

The authors measured the heights and weights of the participants. They conducted physical tests of the studied variables:

1. The maximum strength of the muscles of the legs using the dynamometer (kg). (Radwan,2001)
2. The maximum strength of the back muscles using the dynamometer (kg). (Radwan,2001)
3. The maximum strength of the muscles of the arms through the test of maximum repetition on the pullpool device (repetition). (Ali,2019)
4. Muscular ability of the legs using the wide jump test of stability (meters). (Radwan,2001)
5. Muscular ability of the arms through the test of pushing a medicine ball 3 kg (meter). (Emara, Mostafa,2009)
6. Force tolerance by testing the maximum repetition of oblique prostration from standing (repetition). (Radwan,2001)
7. Special agility through the performance test of the bridge skill and disposal (seconds). (Emara, Mostafa,2009)
8. Flexibility through the bridge test to measure the flexibility of the spine (centimeters). (Emara, Mostafa,2009)

### **Pilot Study:**

The pilot study was conducted on Saturday, 7/8/2021, and the re-tested were on Saturday, 14/8/2021, in order to ensure the validity and stability of the tests, on a group of (8) wrestlers aged between 15-17 years from the original community and outside the experimental group. They were divided into two equal groups, one of which is a distinguish group and the other is nondistinguish, each group was (4) wrestlers, and these studies aimed to test the validity and reliability of the tests, and ensure the process of carrying out the program.

### **Test Validity**

In order to test the Validity of the tests, The authors calculated the differences between a distinguish group and the other non-distinguish measurements of the physical variables tests of total (8) wrestlers into two groups ( the pilot groups).

Table (4) shows that there are statistical significance differences between the distinguish and non-distinguish group in the studied physical variables in favor of the distinguish group, which gives a direct indication of the validity of these tests.



**Table (4) The significance differences between the average scores of the two groups Distinguish and non-distinguish in the studied physical tests (n1=n2=4)**

physical variables	Unit	Distinguish		non-distinguish		Z value	Eta (2)	Significance	
		Average Ranks	Total Ranks	Average Ranks	Total Ranks				
Physical tests	Maximum strength of the muscles of the legs	kg	6.50	26.00	2.50	10.00	2.31	0.82	0.02
	Maximum strength of the back muscles	Kg	6.50	26.00	2.50	10.00	2.30	0.81	0.02
	Maximum strength of the arms	R	6.50	26.00	2.50	10.00	2.35	0.83	0.01
	Muscular ability of the legs	M	6.50	26.00	2.50	10.00	2.30	0.81	0.02
	Muscular ability of the arms	M	6.50	26.00	2.50	10.00	2.42	0.86	0.01
	Bearing force	R	6.50	26.00	2.50	10.00	2.39	0.84	0.01
	Special Agility	Sec.	2.50	10.00	6.50	26.00	2.32	0.82	0.02
	Flexibility	Cm	2.50	10.00	6.50	26.00	2.32	0.82	0.02

\* Tabular value (Z) at a significant level (0.05) = 1.96

### Tests Stability

the correlation coefficients between the test and re-test were calculated to find the stability, as the test was applied on Saturday 7/8/2021 on the pilot groups, then the re-Test on Saturday 14/8/2021; with an interval of one week.

Table (5) shows that there is a statistical significance correlation between the test and re-test in the studied physical variables, as the calculated value of (r) is greater than the tabular value of (r) at a significant level of 0.05, which indicates the stability of those tests.



**Table (5) Correlation coefficients between Test and re-Test for tests in question (n=8)**

Physical Variables	units	Test		Re-Test		Value (r)	
		M	SD	M	SD		
tests	Maximum strength of the muscles of the legs	kg	71.87	2.69	72.50	2.32	0.876
	Maximum strength of the back muscles	kg	61.87	2.47	62.25	2.18	0.899
	Maximum strength of the arms	R	0.50	0.53	0.75	0.46	0.877
	Muscular ability of the legs	M	1.20	0.04	1.21	0.05	0.982
	Muscular ability of the arms	M	2.98	0.08	3.10	0.16	0.875
	Bearing force	R	13.25	1.03	13.62	0.74	0.853
	Special Agility	Sec.	14.50	0.40	14.42	0.40	0.969
	Flexibility	Cm	52.50	1.85	52.00	1.92	0.944

\*Tabular value of (r) at (0.05) = 0.829

### Main study

Pre-measurements were conducted for the members of the Participants on Wednesday and Thursday, 18-19/8/2021.

The training program durate 12 weeks, with 5 training sessions per week, from Saturday 21/8/2021 to Thursday 11/11/2021.

Post measurements were carries out by the Participants with the same conditions of thepre-measurement tools on Saturday and Sunday 13-14/11/2021.

### Statistical calculations

The authors collected the results accurately, organized and processed them statistically using the SPSS statistical packages program for social sciences, using the following scientific coefficients:

- Descriptive statistics (mean, median, standard deviation, mode)
- Spearman's correlation coefficient.
- Wilkeson test for significance of differences.



- Improvement rate.
- Calculate effect size for Wilcoxon's alternative nonparametric t-test for correlated samples  
=  $z / \sqrt{n}$  Effect = (weak from (0.1: 0.3) moderate from (0.3: 0.5) – great (greater than 0.5).

## Results

There are statistical significance differences in Wilkesson's test of the experimental group between the pre- and post-measurements in the studied physical measurements in favor of the post-measurement, where the calculated **Z** value was greater than its tabular value at a significant level (0.05), which indicates the improvement of the post-measurement in the studied physical variables. (**Table 6**).

**Table 6 The significance of Wilkeson test between the pre- and post-measurements of the studied physical measurements (n=8)**

physical variables	Unit	Direction	Nr	Average Ranks	Total Ranks	Z value	Eta(2)	Effect size
Maximum strength of the muscles of the legs	kg	-	0	0.00	0.00	2.53*	0.9	Large
		+	8	4.50	36.00			
		=	0					
Maximum strength of the back muscles	kg	-	0	0.00	0.00	2.53*	0.9	Large
		+	8	4.50	36.00			
		=	0					
Maximum strength of the arms	R	-	0	0.00	0.00	2.71*	1.0	small
		+	8	4.50	36.00			
		=	0					
Muscular ability of the legs	M	-	0	0.00	0.00	2.52*	0.9	Large
		+	8	4.50	36.00			
		=	0					
Muscular ability of the arms	M	-	0	0.00	0.00	2.53*	0.9	Large
		+	8	4.50	36.00			
		=	0					
Bearing force	R	-	0	0.00	0.00	2.45*	0.9	Large
		+	7	4.00	28.00			
		=	1					
Special Agility	Sec.	-	8	4.50	36.00	2.52*	0.9	Large
		+	0	0.00	0.00			
		=	0					
Flexibility	Cm	-	8	4.50	36.00	2.55*	1.0	small
		+	0	0.00	0.00			
		=	0					

\* The value of (Z) at 0.05 = 1.96



The percentage of improvement rates between the pre- and post-measurements of the studied physical measurements ranged between 13.22 and 71.

**Table (7) Percentage of improvement rates between the Pre and Post measurements test of the studied physical variables (n=8)**

physical variables	Unit	Pre-measurement		Post measurement		Difference between the two averages	Improvement Rate%
		M	SD	M	SD		
Maximum strength of the muscles of the legs	kg	75.62	4.27	85.62	1.92	10.00	13.22
Maximum strength of the back muscles	kg	63.37	2.26	73.37	2.61	10.00	15.78
Maximum strength of the arms	R	0.87	0.64	3.00	0.75	2.13	71.00
Muscular ability of the legs	m	1.26	0.04	1.53	0.08	0.27	21.42
Muscular ability of the arms	m	2.91	0.15	4.04	0.15	1.13	38.83
Bearing force	R	13.50	1.30	16.87	2.23	3.37	24.96
Special Agility	Sec.	14.97	0.61	12.68	0.41	- 2.29	15.29
Flexibility	Cm	51.00	2.39	40.37	0.91	10.63	20.84

## Discussion

Discussing the results of the study hypothesis, which states that " *there are statistical significance differences between the average of the pre- and post-measurements of the studied physical variables, which represented in (the maximum strength of the legs, the maximum strength of the back, the maximum strength of the arms, the muscular ability of the legs, the muscular ability of the arms, force endurance, special agility, flexibility) in favor of the dimensional measurement of the experimental group*"

Table (6) shows that there are statistically significant differences for Wilkxon's test of the experimental group between the pre- and post-measurements in the studied physical measurements in favor of the post-measurement, where the calculated Z value was greater than its tabular value, which is 1.96 at a significant level (0.05), which indicates the improvement of the mentioned physical variables .

Table (7) also shows that the percentage of improvement rates between the pre- and post-measurements of the experimental group in the studied physical measurements ranged between



71.00 as the largest value of the maximum strength of the arms, and 13.22 as the smallest value of the maximum strength of the two legs.

The authors attribute this improvement of those physical variables to the proposed training program using the total resistance device of the body TRX, where the training program was codified according to the scientific foundations and the program included many exercises that are performed using the attachment tool TRX. This improved the physical variables, and this was clear in muscular strength, muscular ability, agility and flexibility variables with varying rates of improvement.

This is consistent with the results of Dalia Radwan Labib's study (2014), which confirmed that the use of TRX effect to improving muscular ability and flexibility. (Labib's,2014)

It is also consistent with the results of the study of Maryam Mustafa Mohamed (2015), which confirmed that the use of the TRX as a suspended training device led to the improvement the muscular ability of the arms and legs. (Mohamed,2015)

The study of Samah Mohamed Abdel Moaty (2016) results indicated that attachment training using TRX led to improving the physical abilities and skills of swimmers. (Abdel Moaty,2016)

It also agreed with the results of Sukhjivan Singh's (2015) study, which indicated that TRX training improved the fitness elements of strength, flexibility, ability, balance and agility. (Singh's,2015)

This is result agreed with the studies' results of Abdul Aziz Musaad Mahmoud (2021), Bader Dhiman Khalid (2020), Majid Yaqoub Yousef (2020), Noura Mesbah Mohammed (2020), Farida Essam El-Din Ibrahim (2020), Aya El-Sayed Radwan (2019), Mustafa Ismail Ibrahim (2019), Mahmoud Mukhtar El-Sayed (2019), Mahmoud Mohamed Ali (2019), Mahrous Mohamed Qandil et all (2016), Mohamed Mahdi Mohamed (2015), Mahmoud Elsayed Bayoumi (2010), Gilmez, Irfan , Gulmez (2016), Bruce Balint et al. (2015 ) (24), Angus Gaedtke et all (2015), Vojtech Dvorak (2014), Martin Tuma (2014), Jordi Martinize et all (2012), Martin Hajnovic (2010) .

The training program using TRX improved the maximum strength of the legs, the maximum strength of the back, the maximum strength of the arms, the muscular ability of the legs, the muscular ability of the arms, force tolerance, special agility, flexibility of the female wrestlers.

### **Conclusion(s)**

According to the objectives and nature of the research and the limits of the Participants and the method used, and from the data collected and the results of the statistical analysis, it could be concluded that:



- 1) **TRX** training improved the physical variables of the female wrestlers.
- 2) The rates of improvement of the studied physical supports the hypotheses of the great benefits of TRX on improving the physical variables of the female wrestlers specially the maximum strength of the arms.

### **Recommendations:**

According to the carried out procedures in this study and within the limits of the selected Participants and based on the previous results and conclusions, **It is recommended to:**

1. Use the proposed **TRX** training program to improve the physical abilities of female wrestlers.
2. Use **TRX** training as a training trend to improve the muscular strength, muscular ability and flexibility.
3. Conduct more seminars and academic workshops to know the modern training methods in the sports field.
4. Conduct more studies on different age stages.
5. Conduct more studies on various sports activities.

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