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Effect of TRX and Resistance Band Training with Bosu Ball on Developing Passing Skills and Certain Specific Physical Abilities in Junior Female Basketball

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Abstract: Background: Purpose: This research aimed to examine the effects of TRX and resistance band training, both incorporating the Bosu Ball, on developing passing skills and specific physical abilities in junior female basketball players.

Methods The study involved 25 basketball players under 16 from the Al-Arish Sports Club in North Sinai. A purposive sample of 12 players was divided into two experimental groups, each consisting of 6 players. A pilot study was also conducted to establish the validity of the tests. The first group trained with TRX and the Bosu Ball, while the second group used resistance bands with the Bosu Ball. The

results indicated statistically significant improvements in both groups. The TRX group showed greater improvements in passing skills and physical abilities, with higher percentages of improvement. The resistance band group also improved, but to a lesser extent, suggesting that the elasticity of resistance bands had a more limited impact when combined with the Bosu Ball. Both training methods effectively enhanced the targeted skills, but the TRX with Bosu Ball showed superior results.

In **conclusion**, while resistance bands are more effective without the Bosu Ball, TRX exercises on the Bosu Ball proved highly beneficial for developing the specific physical abilities of junior female basketball players.

Keywords: TRX, Bosu Ball, Resistance Band, basketball.

Introduction

Most sports scientists agree that physical attributes are one of the crucial factors underlying successful performance and the achievement of the highest levels in sports. The development and enhancement of these specific attributes are closely linked to the process of improving the fundamental motor skills associated with the sport, especially in cases where the essential physical attributes for that specific sport are lacking.

The TRX suspension training method has emerged as a prominent approach to physical fitness in recent years. This method emphasizes the use of the individual's entire body weight during training, in contrast to the use of traditional gym equipment.

According to Ripperto (2007), suspension training is simple but not easy; there is a significant difference between simple and easy. This distinction is evident like exercises, which are characterized by simplicity and can be progressively intensified from low to maximum difficulty. The goal is to enhance balance, flexibility, coordination, and muscular strength.

Li and Cao (2011) refer to suspension training as TRX, which stands for Total Body Resistance Exercise. This training method is suitable for both beginners and advanced athletes, allowing for a gradient of intensity through body positioning in relation to the suspension.

Koprince (2009) posits that training with modern equipment has become a fundamental aspect of physical preparation. It is now a requirement across various sports, whether individual or team based. This method effectively impacts the development of specific athletic capabilities. The emergence of TRX training introduces a fitness training framework that utilizes a system of ropes and straps, enabling athletes to train against their entire body weight.

Total body resistance exercises using the TRX suspension system are innovations in the field of sports training. These exercises enhance various types of strength, particularly explosive strength (muscular power) and strength endurance. Additionally, balance is a primary objective of total body resistance training with TRX, which also promotes flexibility in the body's joints.

Angus Gaedtke et al. (2015) describe TRX exercises as a form of functional training that activates core muscles and improves strength and balance. Charlie Fong (2015) emphasizes that total body resistance exercises focus on body weight to achieve significant gains quickly, concentrating on physical exertion without equipment. These exercises are categorized into four groups: balance exercises, squats, push-ups, and back exercises.

Zainab Omar (1990) asserts that auxiliary tools and devices are vital and effective in positively influencing training and enhancing its delivery. They stimulate the enthusiasm of practitioners and serve as an effective motivational tool.

Resistance bands have evolved in design and manufacturing techniques, garnering significant interest from coaches and athletes. They have become essential tools in sports training for various disciplines, positively influencing performance outcomes (8:76).

Robert Gimán (2013) notes that the use of resistance bands has recently expanded in youth sports, increasing muscular capacity and thereby enhancing performance levels and achieving positive results.

Dintiman Vital (2018) states that the objective of resistance band training is to increase muscle strength, protect muscles, and achieve balance among different muscle groups. It is considered a progressive and effective method for developing explosive strength and improving muscle speed.

The use of elastic resistance bands in education is crucial for simplifying motor performance. They can be adapted for movement direction due to their high degree of flexibility, making it easier to control the positioning of the bands.

Nevin Zidan (2014) highlights the importance of a well-planned basketball training process that integrates the core aspects of physical, skill-based, and tactical preparation (50:9).

Fundamental skills in any sport, whether individual or team-based, are the foundational elements upon which the sport is built. Mastery of these skills significantly depends on the learner's attainment of proficiency and success. Attention should be focused on the initial stages of learning, simplifying the challenges faced in these stages while following appropriate teaching steps to facilitate skill acquisition, progressing from simple to complex.

Passing is the most used method for advancing the ball on the court and is the quickest way to reach the opponent's basket. It also helps create gaps in the opposing team's defense that can be exploited to increase the attacking team's score. Conversely, if a weaker team excels in passing skills, it can retain possession of the ball for the legal duration (24 seconds), allowing it a chance to end the game with a narrow point margin, thus boosting the players' confidence in themselves and their teammates.

Mohamed Ismail (2003) states that passing ranks second in importance after shooting regarding its impact on performance outcomes in basketball.

Scientific advancement in the field of sports training, from the initial preparation of youth to their reaching high levels in international championships and Olympic Games, can only be achieved through sound scientific planning. This planning relies on the results of researchers, experts, and scientists specializing in various fields related to physical education and sports, benefiting from their insights to enhance and develop athletes' physical and technical abilities. The researcher believes that physical preparation in basketball is a vital aspect due to its effective impact on developing the various physical and motor capacities that underpin an athlete's ability to meet the requirements and duties of technical performance during training or competition in an integrated manner. Elevating the level of technical performance requires the formulation of structured training programs based on the latest theories in sports training.

Recently, many modern training methods have emerged to improve the physical capabilities of athletes across various sports, focusing on achieving maximum performance in the shortest possible time. This has had a significant effect on improving technical performance at the championship level. Among these training methods are TRX training, resistance band training, and training with the half-stability ball. The TRX system is widely used by athletes as a foundational preparation tool.

Resistance bands are considered one of the best sports tools for effectively building muscles and burning fat. Many regard them as superior to traditional weightlifting. Resistance bands are employed by stretching them in specific positions that require greater effort, contributing to fat loss and muscle building. The core idea behind resistance bands is to exert force against resistance, directly impacting muscle mass. Their use has become common across all age groups in recent times (107).

Mohamed Barqai and Ihab Al-Badawi (2007) indicate that rubber bands are among the types of training that help develop and enhance muscular capacity. They operate along the same movement path as skills, helping to activate a larger number of muscle fibers, and allowing performance at maximum speed from the start to the end of movement. The importance of rubber bands as resistance during performance lies in their similarity to the movement path of the skill, assisting in the recovery phase to complete the technical performance. The pulling technique relies on applying external force during speed training, where the athlete is pulled behind a car or motorcycle. Although this method is not as effective, it is preferred over running on an inclined surface, even though the athlete may feel muscle soreness for a day or two. Various methods are employed, including pulling the athlete with a rubber band. This method involves using a piece of rubber band measuring 20-25 meters, which is attached to a fixed point in front of the athlete, such as a goal post or any vertical post, allowing the athlete to maintain balance over about 20-30 meters. From this point, the athlete runs toward a fixed point at maximum speed, aided by the tension of the stretched band. This method is used at a frequency of 1-2 times per week during the season, and various techniques can be applied with this method, typically twice to three times per week at the beginning of the season and twice during the season.

Lee Brown (2007), Antia Bean (2008), Tomas Baechle, Wayne Westcott (2010), and Schoenfeld Brad (2010) agree that resistance bands are optimal for increasing strength and flexibility. Their use allows for creating resistance in all directions throughout the full range of motion. The presence of tension during training promotes balance and engages more muscle groups. There are also numerous auxiliary tools and devices that have recently emerged, which can be utilized to enhance the physical fitness components specific to skills. Each of these tools has its unique characteristics and effects. Auxiliary tools and devices are significant and effective in positively influencing training and its execution. They stimulate the enthusiasm of practitioners and serve as an effective motivational tool. From this perspective, the researcher will utilize a modern auxiliary tool, which is expected to enhance specific physical fitness levels, namely the Bosu Ball. The Bosu Ball is a training device invented by David Weck in 1999. The name "Bosu" is an abbreviation for "Both Sides Up," indicating that it can be used on both sides. Its commercial name is Dynamo. The Bosu Ball is a training device for balance, strength, power, and cardiovascular improvement. It consists of a half ball on a flat base measuring 55 cm, which can be used on either the rounded half or the flat surface, equipped with resistance ropes on both sides of its base, each measuring 60 cm. When fully stretched, the ropes reach a length of 120 cm and can support a weight of 7 kg (48).

Passing is the process of transferring the ball from an attacking player to another teammate. It is the quickest way to advance the ball and is the key to good gameplay. Proper use of passing has a significant impact on the flow of the game, and various types of passes exist, differing based on the ball's position relative to the body. Each type has a specific application in certain situations (68:14).

The researcher believes that the accuracy and strength of passing performance are linked to the experiences provided by modern tools and training methods, which directly facilitate its development. The diversity and novelty of these tools and training methods stimulate the learner's enthusiasm. Based on the importance of TRX training, resistance bands, and the Bosu Ball, as well as the researcher's experience as a coach for the youth team at Al-Arish Sports Club and theoretical readings, as well as the review of related studies and an exploratory study conducted by the researcher on a sample of four players after applying a set of tests (specific physical tests and skill tests), a decline in the passing performance level and some specific physical abilities linked to arm movements was observed. This prompted the researcher to investigate, as basketball competition requires players to possess various physical and skill abilities aligned with the nature of competitive processes, which increases the difficulty and pressure of competition. Notably, significant statistical differences were observed between the performance levels of distinguished players and those experiencing a decline in passing performance. Consequently, there is a pressing need to employ scientific methods to regulate training, emphasizing modern scientific approaches in training, which inspired the idea of this research.

MATERIALS AND METHODS

Study design and setting

The research population included female basketball players from North Sinai Governorate under 16 for the 2021/2022 season. The total number of players was 25, all of whom were members of Al-Arish Sports Club under the Boom Academy for basketball. The researcher purposively selected a sample of 12 players, representing 48% of the research population, to form the primary research sample. These players were divided into two experimental groups, each consisting of 6 players. Additionally, a pilot study was conducted on a separate sample of 4 players from the same population but outside the main research sample, representing 16% of the population, to establish the scientific validity of the tests under investigation.

Tools and devices used:

The researcher used the following tools and devices to measure the research variables :

- calibrated medical scale– for measuring body weight.
- Restameter – for measuring total body height.
- Half-ball device.
- Resistance bands:
 - Green: resistance (8-24 kg) (3.6 – 10.8 lbs).
 - Red: resistance (12-31 kg) (5.4 – 14.1 lbs).
- -6 TRX devices.
- -Basketball.
- Basketball court.
- Chalk.
- Tennis balls.
- Measuring tape.
- Stopwatch (1/100 seconds).
- Data and measurement recording form for the research sample

Physical tests:

- Vertical jump test (measuring leg muscular power).
- Torso rotation test (measuring torso and shoulder flexibility).
- Throwing and catching balls test (measuring eye-hand coordination).

- Shoulder mobility test (measuring the joints' and muscles' ability to reach maximum anatomical range).
- Core strength and stability test (measuring the strength and stability of the abdominal muscles).
- Y balance test (measuring balance).

Skillful tests:

- Passing strength test (measuring shoulder strength in long passes toward a target).
- Passing accuracy test (measuring chest passes directly toward a target).

Specifications of the training program :

- ▶program duration (8) weeks.
- ▶weekly training units. (3) units
- ▶Total of training units (90) units.

Statistical Treatments:

The researcher used the following statistical treatments by SPSS version 24:

- Mann-Whitney test.
- the simple correlation coefficient (r) for the stability of the selected variables under investigation
- t-test for comparing the means of values in the research sample
- and Wilcoxon test

Table 1. Statistical significance of differences using the Wilcoxon test between pre-test and post-test measurements for the first experimental group in the physical tests under investigation.

Statics Tests	Unit of Measurement	Number of Signs		Mean Ranks		Total ranks		Calculated z Value from Wilcoxon Test	Level of Statistical Significance
		-	+	-	+	-	+		
Ball Throwing and Catching	Meter	Zero	6	Zero	23.50	Zero	21.00	-2.22	0.02
Vertical jump	Cm	Zero	6	Zero	23.50	Zero	21.00	-2.20	0.03
Shoulder flexibility	Degree	Zero	6	Zero	23.50	Zero	21.00	-2.25	0.02
Core stability	Time	Zero	6	Zero	23.50	Zero	21.00	-2.20	0.03
Torso Rotation Test	Meter	Zero	6	Zero	23.50	Zero	21.00	-2.33	0.02
Y balance test	Right	Cm	Zero	Zero	23.50	Zero	21.00	-2.20	0.03
	Left	Cm	Zero	Zero	23.50	Zero	21.00	-2.20	0.03

It is evident from Table (1) that the calculated z-values obtained using the Wilcoxon test for the physical tests under investigation between the pre-test and post-test of the control group are all less than the tabulated z-value at a statistical significance level of (0.05). This indicates the presence of statistically significant differences in these tests between the pre-test and post-test of the control group, favoring the post-test results.

Figure 1: differences using the Wilcoxon test in the physical tests under investigation.

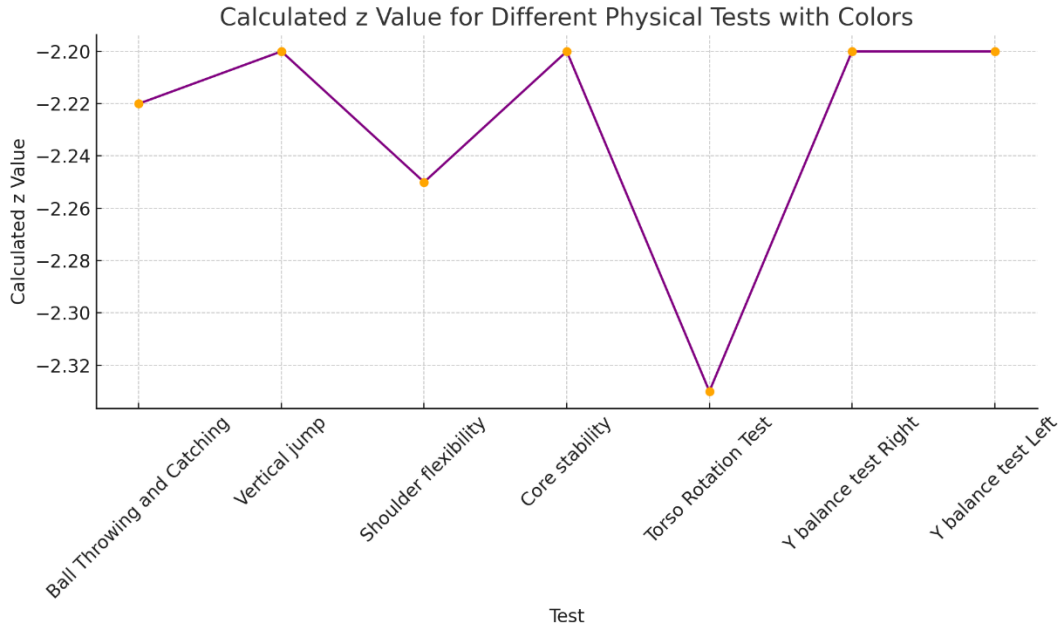
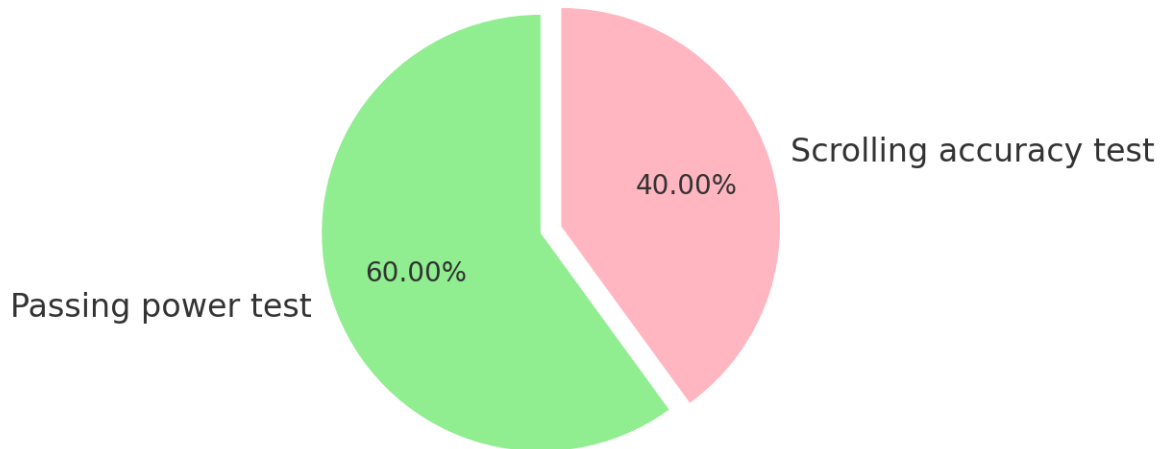


Table 2. Statistical significance of differences using the Wilcoxon test between the pre-test and post-test of the first experimental group in the skill tests under investigation.

Statics Tests	Unit of Measurement	Number of Signs		Mean Ranks		Total ranks		Calculated z Value from Wilcoxon Test	Level of Statistical Significance
		-	+	-	+	-	+		
Passing power test	Meter	Zero	6	Zero	33.50	Zero	21.00	-2.21	0.03
<i>Scrolling accuracy test (overlapping circles)</i>	Meter	Zero	6	Zero	33.50	Zero	21.00	-2.22	0.02

It is clear from Table (2) that the calculated z values using the Wilcoxon test for the skill tests under investigation between the pre-and post-measurements for the control group are all less than the tabulated z value at a statistical significance level of 0.05. This indicates the presence of statistically significant differences in these tests between the pre-and post-measurements for the control group in favor of the post-measurement. Figure2:differences using the Wilcoxon test in the skill tests under investigation.

Significance Levels for New Tests with Emphasis



Discussion.

The researcher attributes this to the use of modern training tools (TRX training and resistance bands on a Bosu ball) as innovative and non-traditional training aids that have sparked the interest and motivation of young athletes due to their enjoyable nature.

Additionally, Hamad Mufti (2007) emphasizes the importance of using resistance in developing elements of physical fitness. Studies have shown that resistance training based on scientific principles leads to improved physical, muscular, and motor fitness, particularly helping to prevent injuries. The body's vital systems' response to sports training is particularly important for coaches, as training programs are built on this basis. TRX training relies on gravity and body weight to develop strength, power, endurance, flexibility, balance, and power endurance. It can be used by everyone regardless of age or gender, allowing practitioners to perform hundreds of exercises to achieve various fitness goals. TRX can be adapted to individual user characteristics and relies on the abdominal, back, pelvic, and chest muscles. A weighted vest can also be added to increase body weight, which promotes muscle growth. This training method can elevate heart rates and burn more calories than traditional standing or seated workouts, thereby enhancing heart muscle strength and muscular endurance.

Furthermore, Milligan James (2014) states that resistance band training is one of the most effective methods for developing muscle strength, as it enhances muscle power. High-speed resistance band training increases both speed and strength, essential components for generating muscle power, which is a critical element of motor skills across various sports activities.

From Table (1), it is also evident that the calculated z values using the Wilcoxon test for the skill tests (passing accuracy and passing strength) were -2.21 and -2.22, respectively, for the pre-and post-measurements of the control group. All these values are less than the tabulated z value at a statistical significance level of 0.05, indicating the presence of statistically significant differences in these skill tests between the pre-and post-measurements in favor of the post-measurement for skill tests (passing strength and passing accuracy).

The researcher further attributes this improvement to the impact of TRX and resistance band training with the Bosu ball, which included various exercises utilizing body weight and adjusting the body's angle with the ground, thus increasing resistance capability and subsequently enhancing muscle workload, resulting in improved muscular efficiency and strengthening all muscle groups in the body, including the abdominal and back muscles responsible for maintaining spinal strength, flexibility, and body balance during static and

dynamic movements. These exercises not only achieve a balance between strength and flexibility but also enable individuals to move without falling.

The researcher correlates this advancement in physical abilities in the tests (ball throwing and catching, vertical jump, shoulder flexibility, abdominal muscle strength and stability, trunk rotation test, Y balance test for left and right) to the effect of the training methods that allowed multiple levels, thus providing the opportunity to focus on high-performance efficiency. This is evident in the improvement of the physical variables under investigation, in addition to the nature and variety of training types used, which were designed according to specific training principles to ensure that muscle fatigue did not occur. This also increases the strength of the lower back, abdominal, and pelvic muscles, providing a balanced strength foundation for the limbs, legs, and arms that can generate more power and speed. This ultimately leads to a more significant improvement in the physical tests under investigation.

Mascarin et al. (2017) argue that the use of resistance bands enhances arm muscular capacity and shooting speed, positively impacting energy, speed elements, and body mass resistance, affecting the working muscles, which in turn positively influences sports skills. This may be due to the use of auxiliary tools to develop physical capacities.

Both Sharon Hoger and Werner Hoger, along with Philip Pag and Todd Ellen Becker (2013), agree that resistance bands and TRX are effective tools for increasing muscle strength and improving functional abilities, aiding in rehabilitation from injuries. Resistance bands and TRX have become accessible tools for performing a wide variety of exercises targeting different muscle groups.

Based on the previous presentation and within the research objectives and hypotheses, along with the prior results, the first hypothesis has been validated, which states that "there are statistically significant differences between the means of pre- and post-measurements in favor of the first experimental group using TRX with the Bosu Ball for developing passing and some specific physical abilities for young female basketball players.

Conclusions.

According to the results of our article, The use of resistance bands yields better results without the Bosu Ball, as the elasticity of the bands, when used independently, provides the most effective outcome for improving the specific physical fitness components of junior female basketball players, Furthermore, the implementation of the training program using TRX exercises on the Bosu Ball has proven to be effective due to its impact on the specific physical fitness components of junior female basketball players.

References

1. Amr Hamza: The effect of core strength training with and without (suspension) on lipid peroxidation and lunge speed for young fencers, international scientific conference "perspectives in physical education and sport" 13th edition (2013).
2. Angus Gaedtke and Tobias morat: Trx suspension Training: A New Functional Training Approach for older Adults- Development, Training Approach for older Adults – Development, Training control and feasibility, Research Article, German sport university cologne, Germany (2015).
3. Borose baliat: The effect of trx training method on balance for Junior Basketball (2015).
4. Dais, E.: The Resistance-Band workout Deck-For women, (2008).
5. 57-Dintiman Vital:" Sport Speed", 2nd ed., human Kinetics, Publishers Champaign, Hilmair, (2018).
6. Dulceata, V.: TRX-Suspension Training –Simple, Fast and Efficient (2013).
7. Edward Dais, E.: "THE Resistance-Band Workout Deck-Fort Women", WCB Mc Grow-Hill, (2018).
8. James, S., M.: Resistance-Band work out A simple way to Tone and Strength your muscles Journal of Scientific Research, IssN:200-9211.2
9. 65-Jung- pan wang & Tung-Fu Huang &Hsiao- Lima&shih- Chieh Hung & Tain- Hsiang Chen & Chien-Lin Liu: Manipulation under anesthesia for frozen Shoulder in Patients with and without non-insulin dependent diabetes mellitus, (2010).
10. Lee E Brown: strength Training, National Strength and Conditioning Association, Human Kinetics publish, USA, (2007).

11. Mascarin,N.C,de Lira,C,A.B.,Vancini, R.L.,de Castro pochini,A.,da Silva,A.C.,& dos Santos Andrade. strength Training using Elastic Bands: Improvement of Muscle power and Throwing performance in young female Hand ball players. Journal of sport rehabilitation ,26(3),245-252, (2017).
12. Suk,m.h.,Kang,s.w.,&Shiny,y. The effect of combined resistance training with TRX on physical fitness and competition time in fin swimmer,2015.
13. SukhJivan Singh: Effect of TRX training module of legs strength and Endurance of Females,MR international Journal of applied health science ES,October 2015.
14. Tomas R.Baechle,Wayen L,Westcott:Fitness Professionals Guide to strength training older adults, second Edition,(2010)
15. Vyuziti TRX -Zavesneho: treninku u harace ledniho hokeje, Bakalarska prace,masarykova univerzita,Fakulta sportovnich studii, Brno,Lukas sla'ma
16. Westcott Wilmore W.:” Strength Fitness,Physiologies.Principles and training technique”,4th ed.W.m.C.Brown Communication, NC, Madison,2015
17. Willson JD Dougherty Cp, Ireland ML.Davis I.M,2005:Core Stability and its relationship to lower extremity function and injury.
18. Yalda ,M.&Khalid ,A.:The Effect of using Rubber Ropes to Improve Speed Strength for Upper Limbs and Achievement of Javelin Throw , The Swedish.