

## The effect of axial stability exercises with dynamic contraction on the electrical activity of the rectus femoris muscles and the accuracy of shooting from a fixed position with a basketball

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### Abstract

The research aimed to prepare pivotal stability exercises with moving contraction for young basketball players, and to identify the effect of pivotal stability exercises with moving contraction on the electrical activity of the rectus femoris muscles of basketball players, and to identify the effect of pivotal stability exercises with moving contraction on the accuracy of shooting skill from a fixed position with a basketball. The boundaries of the research community were represented by young basketball players at Al-Karkh Sports Club, whose total number is (14) players, who are continuing their training for the sports season (2023/2024). The research sample was deliberately selected from them using the comprehensive enumeration method at a rate of (100%) of their original community. After determining the measurement tools, (24) training units were prepared for pivotal stability exercises with moving contraction, as they were applied over a period of (8) weeks at a rate of (3) training units per week, and the experiment was conducted during the special preparation period for the sports season (2023/2024), as the experiment began by applying the pre-tests on Sunday corresponding to the date (12/3/2023), and then applying these exercises to the experimental group players for the period from Monday corresponding to the date (12/4/2024) until Wednesday corresponding to the date (1/24/2024), and completing this experiment by applying the post-tests on Thursday corresponding to the date (1/25/2024), and the results were processed using the (SPSS) system to be the conclusions and recommendations that preparing the pivotal stability exercises with the moving contraction and applying them is suitable for young basketball players, and that applying

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them helps improve the level of the electrical signal (EMG) by increasing the level of the peak and decreasing the area, and helps improve the level of shooting accuracy from a fixed basketball for young basketball players, and it is necessary when preparing pivotal stability exercises with the moving contraction when training shooting accuracy from a fixed basketball to adopt the principle of experimentation in that the point of influence is on the leg muscles to increase the level of neuromuscular control for the stability of muscle contraction in the two thigh muscles, and it is necessary to take into account not to exaggerate in increasing the allocated time For core stability exercises in the main part of the training unit, take into account the balance of training with the other muscles of the body.

**Keywords:** axial stability exercises, dynamic contraction, electrical activity, fixed position, basketball

## Introduction

Exercises with moving contraction are exercises that target the coordination of the body's total muscles by placing the player in a position of moving balance, especially when the exercises focus on neuromuscular work. The (Spiral Line) muscles (spiral fascia) are necessary and important for young basketball players because of their association with maintaining posture and balance and increasing the effectiveness of the electrical signal to the muscles therefore to produce various capabilities, especially the skill of shooting from a standing position. Also, every training intensity and training load has repercussions represented by internal physiological reactions to meet the requirements of that load, and this requires studying it in the field in order to achieve the required improvements.

"The vestibular apparatus is the organ that detects the sensations of balance and consists of a group of bony tubes and chambers located in the petrous part of the petrous bone called (the bony labyrinth) within which there is a group of membranous tubes and chambers called (the membranous labyrinth) and this is the functional part of this apparatus, and there is a gelatinous spot in this apparatus that contains a number of small calcium carbonate crystals called (balance dust) and there are thousands of hair cells in the spot and the bases of these cells and their ends are intertwined with the sensory endings of the vestibular nerve, and other factors affecting balance: deep sensory receptors in the neck, and visual information." (Arthur & John 2020, p: 12)

"Exercises must take into account the rules of balance, whether in performance or stability, and support the improvement of balance by relying on increasing the activation of the widespread muscle sensors, because the vestibular system does not develop with training, as it is like a scale that informs the brain about the body's positions without issuing orders. This confirms that the role of the vestibular system is informative and not controlling, as is the prevailing idea, and it is possible to improve the effectiveness of its neurophysiological work, not develop. its structures." (Arthur, 2001, p: 151)

Also "worth noting that diversifying exercises and including different components of physical fitness in the training program can have a greater positive effect on the results." (Faigenbaum & Myer, 2016, p: 15)

Axial stability exercises also involve the brain's ability to regulate the signals and receptors of the nerve fibers that carry signals to the Spiral Line muscles and regulate them in the same muscles. These are also essential biochemical processes, and exercise training may improve that function." (Silva & Araujo, 2010, p: 339)

"Exercises targeting the Spiral Line muscles help strengthen and stretch the trunk in a way that suits the transfer of muscle power to the limbs. It is logical to train muscles in isolation, especially if the muscles of the largest part of the body are the back muscles, which require a focus that suits the goal and direction of the exercise." (McGill & Others, 2009, p: 121)

"The tools for axial stability exercises differ in terms of their material or their effect on body balance. They are of the following types: sponge tools, such as a thick, highly flexible mat that makes the individual feel that its flat surface is soft; rubber tools, which are in the form of figures that players walk on; large Chinese rubber balls filled with air; And solid plastic and wooden tools with a narrow base and a wide surface." (Frizzell & Dunn, 2015, p. 406)

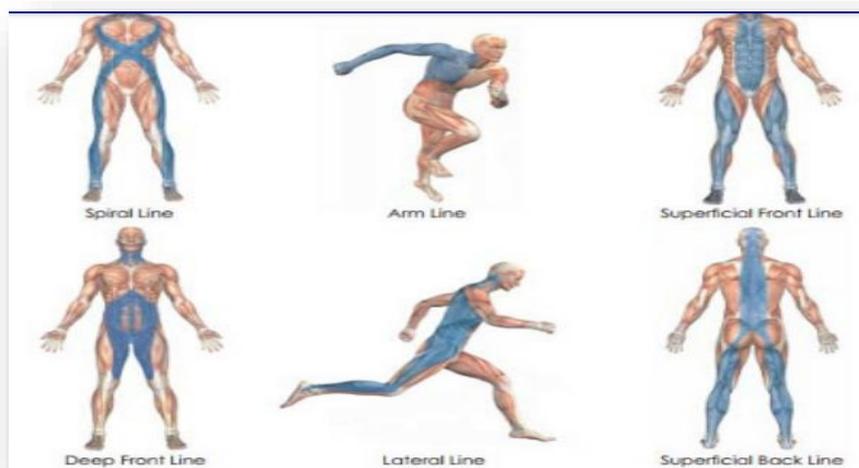


Figure (1) shows pictures of some models of the spiral line muscles.

Targeted by core stability exercises

Core stability exercises used to improve balance include tightrope walking, one-legged standing, tremor exercises, dynamic balance exercises, deep breathing exercises, and meditation. If you feel pain or fatigue, you should reduce the intensity or stop the exercise. (Amal, 2018, p. 13)

The researcher believes that according to the physiological principle that movement in skill performance in basketball depends on three types of contractile work, which are the active, the opposing and the fixing, as is known, it is possible to rely on this in supporting the principle of muscle synergy and the principle of transferring forces between parts of the body by means of training the large muscles and knowing its positive reflections on the contractile work of the smaller muscles, and here the coach must choose the appropriate training methods well in accordance with the Axial stability training in targeting the moving

muscle work to serve the fixed muscle work in the leg muscles that support the player's stability when performing spatial accuracy in scoring from a fixed position.

It is also required that “when using balance tools in exercises, we be careful not to exaggerate the disturbance of the balance base to the extent that it requires movements that exceed the individual's ability and level of muscle strength and his ability to react to the motor.” nerve to control the confusion of the posture, which in this case would cause more harm than benefit from using them.” (Cawley & Others, 2003, p. 553)

Although the subject seems to be related to the control of the path of the muscle group (Spiral Line) (spiral fascia) around the body to influence the muscle synergy to maintain the moving balance and be affected by it, which is known as "neuromuscular" control to balance the Earth's gravity during movement and rotation, as the importance of the inner ear enters into this according to its internal structure through a group of nerve sensors to determine the location of the body in relation to the Earth's gravity, where the balance nerve that comes out of the inner ear with the auditory nerve gives signals to the central nervous system to determine the location and adjust the position of the body while standing when not moving and the signals are equal, but in any simple movement, the signal of one side increases Compared to the other or during movement from front to back of the head in addition to the feeling of falling with a change in speed.” (Belkacem, 2017, p. 29)

“Muscular balance on both sides of the body is the actual basis for good posture, and it adjusts the shape of the body from its current position to the ideal position it should be in.” (Muhammad, 2020, p. 28)

The researcher believes that maintaining balance for a basketball player requires him to coordinate between the muscle contractions of the various muscles of the body and increase the neuromuscular control that ensures that he maintains his posture, especially during rotational movements and repeated quick jumps according to the needs of the competitive situation in the matches. This does not require strengthening the leg muscles and achieving the physiological responses in the electrical neuromuscular control in a manner that is consistent with achieving these goals.

As “researchers were able to obtain important physiological information and facts that contributed to the development of sports training.” (Omar, 2018, p. 10)

To elaborate on this, “after the signal arrives and acetylcholine is secreted, sodium ions are released and a potential difference occurs, which flows along the muscle fiber membrane in the same way that action potentials flow along the nerve cell membranes. At this moment, calcium ion stimulation begins to be released, which was stored in the network, and is released to the muscle fibers. Calcium ions work to generate attractive forces between actin and myosin filaments.” This leads to the formation of transverse bridges and then their sliding over each other. We notice that the membrane at this stage becomes highly permeable to sodium ions, allowing large numbers of them to flow into the axon and lose the state of polarization represented by an amount of (-90 millivolts) with a rapid rise in the voltage towards the positive direction, which is called depolarization. In fact, the membrane

action potential in large nerve fibers exceeds the zero limit and becomes slightly positive, but in some small fibers and in many neurons of the central nervous system, the voltage reaches the zero limit only and does not exceed the positive voltage. All this happens within a molecule of a thousandth of a second. After the membrane becomes highly permeable to sodium ions, which continues for a fraction of a thousandth of a second, the sodium channels begin to close and the potassium channels open more than their normal state, and then the rapid diffusion of potassium ions returns to the outside, which is called membrane repolarization (depolarization stage), as calcium ions are pumped back into the sarcoplasmic reticulum to begin the state of relaxation. (Gyton & Hall, 2020, p. 91)

“When the electrical charge reaches the cross-bridges in the myofibril, it activates the myosin heads to bind to actin, while the myosin heads change their activated arrangement, which removes them, which causes the heads to be pulled from the myofibril, thus passing towards the center of the sarcomere. This action represents the electrical strike of the cross-bridge cycle.” (Ryan, 2018, p:108)

can be summarized as follows: “Motor area in the brain = nerve impulse = anterior horn of the spinal cord = motor nerve source = motor nerve terminal plate = acetylcholine reactions = modification of the polarity of the muscle fiber membrane = generation of a positively charged electrical potential = interpenetration of fibers within the muscle fiber.” (Mohamed, 2000, p. 34)

The researcher believes that the basketball coach must have a broad knowledge of the mechanisms of muscle contraction to include increased neural control in muscle contractions for various exercises aimed at improving or increasing the peak of the electrical signal (EMG) according to the specificity of the contraction, meaning that he must be familiar with the physiological reactions to each exercise targeting the (Spiral Line) muscles (spiral fascia) when working to develop the contractile work of the leg muscles.

“Sports training is the result of that interconnected mixture of different sciences, and perhaps the reason is that this science aims to advance the development of human physical performance to achieve the highest athletic levels” (Wagdy, 2018, p. 5).

From the aforementioned literature applied on the correlation between the variables studied for both the training and physiological aspects in basketball within this training environment, through the researcher's academic work in the physiology of basketball training for this game and through repeated field visits to training for young players At Al-Karkh Sports Club for Basketball, she noticed that the player's focus on the skill of shooting from a fixed position when performing the free throw has a kind of instability in the leg muscles, which negatively affects his accuracy in directing the ball towards the board to achieve the point or enter it into the ring, thus affecting the team's result in losing balls and points, which this research sought to answer the following questions: □ Can axial stability exercises be applied? By moving contraction For young basketball players?

□ Can axial stability exercises affect By moving contraction In contractile work in youth basketball players?

□ Can axial stability exercises affect Moving in accuracy of shooting from a stationary basketball For young basketball players?

The aim of this research is to prepare axial stability exercises with moving contraction for young basketball players, and to identify the effect of axial stability exercises with moving contraction on the electrical activity of the rectus femoris muscles of basketball players, and to identify the effect of axial stability exercises with moving contraction on the accuracy of the skill of shooting from a standstill with a basketball, so that the research hypotheses are that there are statistically significant differences between the results of the pre- and post-tests of the experimental research group in measuring the peak and area of the electrical signal (EMG) of the rectus femoris muscles, there are statistically significant differences between the results of the pre- and post-tests of the experimental research group in the accuracy of the skill of shooting from a standstill with a basketball.

#### **Method and procedures:**

The problem of the current research imposed that the researcher adopts the experimental research method by designing an experimental group with tight control in the pre- and post-tests. The boundaries of the research community were represented by young basketball players in Al-Karkh Sports Club, whose total number is (14) players, who are continuing their training for the sports season (2023/2024). The research sample was deliberately selected from them using the comprehensive enumeration method at a rate of (100%) from their original community. To measure the peak and area of the electrical signal (EMG) of the rectus femoris muscles, I used the test ( Appendix 1) with a measurement unit of (millivolts/second), and to measure the accuracy of the skill of shooting from a standstill with a basketball, I used (Appendix 2) with a measurement unit of (degree).

The researcher prepared (24) training units for exercises. Axial stability with moving contraction, and it was applied at a rate of (3) units between one day and another per week, for a period of (8) training weeks, as follows:

□ These exercises were prepared after determining the type of muscular work of the rectus femoris muscles in the skill movements for the accuracy of the skill of shooting from a standstill with a basketball. High intensity training methods vary between plyometric training and ballistic training for young basketball players.

□ It included the use of specialized resistances for moving balance, in addition to light weights, in accordance with the amount of resistance required and the duration of movement for stability in the skill of shooting from a standstill with a basketball, and it is applied at the beginning of the main section of the training unit for a period of (20) minutes, Appendix (3), Appendix (4).

- The repetitions of these exercises in the training units are inversely proportional to the intensity of each exercise, depending on the diversity of the two methods of high-intensity interval training and repetitive training.
- The principle of alternation in muscle work and diversification in the type of exercises were taken into account, as well as the principles of gradualness and undulation in increasing the intensity and volume of the training load.
- It was considered that overload training should be applied in the application of exercises for the purpose of causing physiological responses in the cellular environment.
- The axial stability exercises with moving contraction were characterized by flexibility in implementation during the duration of the special preparation period to suit the level of the young basketball players in the club, their training age, and their level of experience (Appendix 3).
- High intensity training (85-100%), with rest periods between repetitions and sets within the training unit according to the phosphogynecological anaerobic system specifications.
- The intensity is determined by the formula: maximum number of repetitions  $\times$  required intensity.
- The rest period between repetitions was (15-45) seconds, between sets was (60-90) seconds, and between exercises was (2-5) minutes, which is consistent with the high intensity of the axial stability exercises with dynamic contraction.

The experiment was conducted during the special preparation period for the sports season (2023/2024), as the experiment began with the application of pre-tests on Sunday corresponding to the date (12/3/2023), and then the application of these exercises to the players of the experimental group for the period from Monday corresponding to the date (12/4/2024) until Wednesday corresponding to the date (1/24/2024), And the completion of this experiment by applying the post-tests on Thursday corresponding to the date (1/25/2024).

After the experiment was completed, the research results were processed using the Social Statistical Bag System. (SPSS) To calculate the percentage, mean, standard deviation, and t-test for correlated samples.

## Results and discussion

**Table1** for homogeneity of variance using Levene’s test for the experimental shows the results of the pre-tests research group

Dependent Variables Tests And the units of measurement for each of them			Sampl e numbe r	Arithm etic mean	Standa rd deviati on	Liven	(Sig)	Signifi cance
<b>EMG</b>	<b>Straight right thighs</b>	<b>The Summit</b>	14	650.21	30.108	0.501	0.257	<b>Not indicativ e</b>
		<b>Area</b>	14	0.446	0.031	0.237	0.605	<b>Not indicativ e</b>
	<b>straight left thighs</b>	<b>The Summit</b>	14	587.64	32.2	0.481	0.312	<b>Not indicativ e</b>
		<b>Area</b>	14	0.353	0.026	0.217	0.615	<b>Not indicativ e</b>
<b>Accuracy of shooting skill from a standstill</b>			14	12.71	1.978	0.557	0.211	<b>Not indicativ e</b>

Not significant if Sig (< )0.05 ) at significance level (0.05

**Table2** .Shows the results of the pre- and post-tests of the experimental research group

Test	comparison			Avera ge differ ence	deviat ion of differ ences	Value (T )	(Sig)	Significanc e	
	Test	Arithm etic mean	Standa rd deviati on						
<b>Straight thighs right</b>	<b>The Summit</b>	tribal	650.21	30.108	2,429	0,043	775	0.000	Dal
		After me	712.64	3.104					
	<b>Area</b>	tribal	0.446	0.031	072	032	367	0.000	Dal
		After me	0.374	0.004					
<b>straight thighs left</b>	<b>The Summit</b>	tribal	587.64	32.2	3.857	9,006	592	0.000	Dal
		After me	646.5	18,287					
	<b>Area</b>	tribal	0.353	0.026	029	025	337	0.000	Dal
		After me	0.324	0.018					
<b>Accuracy of shooting skill from a standstill</b>	tribal	12.71	1.978	714	939	239	0.000	Dal	
	After me	15.43	0.756						

-Degree of freedom (n) (1) ) level significance 0.05 ) significance of difference , (Sig (≥ ) 0.05

in both the experimental and control groups that young basketball players show ( improved their levels of Increased EMG peak The small area and the improvement in the accuracy level of the skill of shooting from a fixed position with a basketball in the results of the post-tests compared to what these results were in the pre-tests, (Khedir, 2018) and The researcher attributes the emergence of these results to the positive effect of the axial stability training by the moving contraction of the various muscle groups (Spiral Line) (spiral fascia) around the body and directing the effect of that work towards the rectus femoris muscles,(Mondher et al., 2023) which helped by developing synergy or muscle tension, in addition to adopting the principle of influencing the legs, considering that they carry the largest mass of the body (the muscles of the center and the upper limb and the body), (Kareem, 2023) as adopting the diversification in the use of moving balance tools and light resistances had a positive role in developing this type of muscle contraction and increasing the muscle's ability to produce muscle force (increasing the peak of the EMG signal) without fatigue by (the small area of the EMG signal), In addition to the good standardization of the training load for these exercises to suit the level of young players and their training age, (Easa et al., 2022) and the number of units per week, meaning that the results came to confirm that it is necessary to emphasize On the principle of including the muscles of the trunk and lower extremities when training young basketball players, and that training the thigh muscles alone is not sufficient to increase the player's control over his technical performance in achieving the accuracy of the skill of shooting from a standing position with a basketball. This confirms that “Core stability training with varied back muscle contractions is an important part of exercise to strengthen core muscles and maintain alignment and balance during daily and sporting activities. This type of training includes many exercises that target core muscles such as the abdominal, back and buttock muscles.” (Huxel Bliven & Anderson, 2013, p: 516)"In order to maintain axial stability in balance, the direction of the nerve impulses from the cerebral cortex is directed towards the muscles that increase the body's control over stability in abnormal conditions of balance. (Mousa & Kadhim, 2023) In fact, muscle tension continues to contract in some muscles to maintain balance or maintain posture without us feeling it unless we focus on it or increase this tension according to what is required to ensure the feeling of balance. Repetition with different positions using means of improving balance helps increase our ability to quickly take the position of balance if we encounter unstable conditions of posture " (Bronner & Ojofeitimi, 2013, p: 366) “Despite the complexity and intricacy of the processes involved in neuromuscular coordination, the human brain is able to easily integrate information coming from sensory organs, muscles and joints, thus providing a broad repertoire of adaptive behavior. In the field of sport, there is a need to understand and perceive the behavioral and neural mechanisms underlying performance and its improvement. (Jantzen

& Kelso, 2008, p. 79) “Training leads to physiological changes that include the body’s systems, and the level of athletic performance improves whenever these changes are positive, achieving physiological adaptation of the body’s systems and then physical load and skill performance.” (Adnan, 2010, p. 182) It is also “very important that these exercises are performed correctly and under the supervision of a qualified trainer to avoid injuries and ensure maximum benefit from them. (Abdulhussein et al., 2024) These exercises should also be included as part of a balanced training program that targets all aspects.” (Baker, 2017, p: 3) “Muscular balance on both sides of the body is the actual basis for good posture, and it adjusts the shape of the body from its current position to the ideal position it should be in.” (Muhammad, 2020, p. 28) also contributes to improving balance and mobility.” (Muhammad D., 2019, p. 8) Balance is also “vital to health and physical performance, as it is an important component of basic motor skills such as standing and walking, a key component of most sports activities that require standing or movement in a limited space, (Kadhim, 2024) and essential for daily living activities Such as climbing or lifting heavy weights.” (Kisner & Colby, 2020, p: 201) It also enhances overall strength and ability, and developing motor control helps improve accuracy and balance in performing exercises and sports movements directly related to technical performance and achievement. (Seitz & Other, 2022, p: 1119)

“Training that relies on the nervous system will be successful in improving speed, and training based on muscle strength and compound training will be successful in developing muscle capabilities and speed at the same time.” (Medhat, 2019, p. 188)

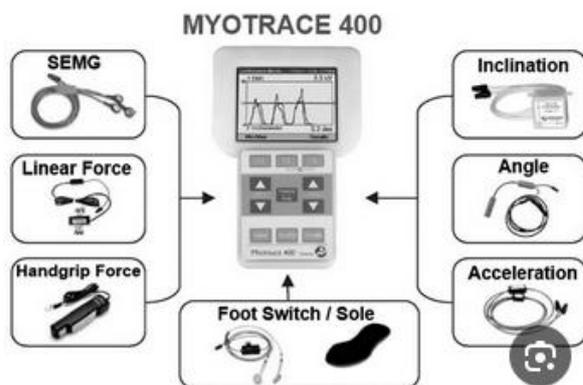
#### **Conclusions and recommendations:**

- 1- The preparation and application of dynamic contraction axial stability exercises is suitable for youth basketball players.
- 2- The application of axial stability exercises with moving contraction during the special preparation period helps improve the level of the electrical signal (EMG) by increasing the peak level and decreasing the area in youth basketball players.
- 3- Applying pivotal stability exercises with moving contraction during the special preparation period helps improve the level of shooting accuracy from stability in basketball for young basketball players.
- 4- When preparing axial stability exercises with moving contraction when training shooting accuracy from a fixed position with a basketball, it is necessary to adopt the principle of experimentation in that the point of impact is on the leg muscles to increase the level of neuromuscular control of muscle contraction stability in the thigh muscles.
- 5- It is necessary to take care not to overdo the time allocated to axial stability exercises in the main part of the training unit and to take care of the balance of training with the other muscles of the body.

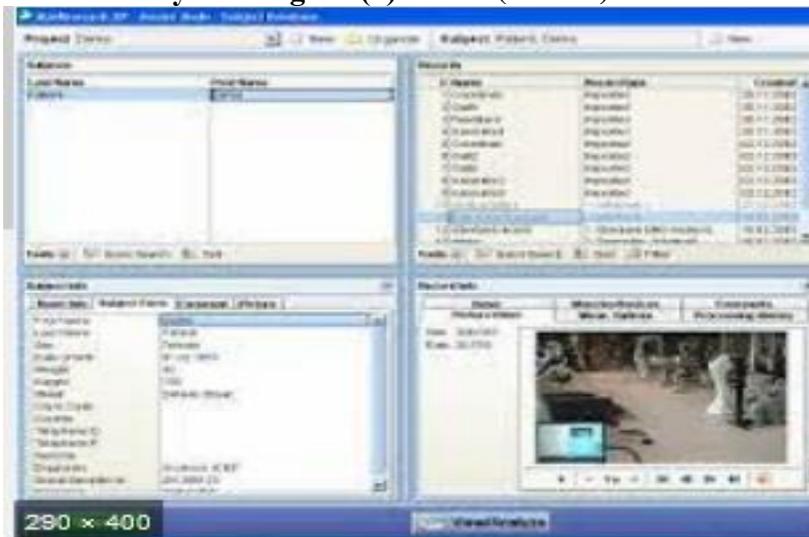
### Appendix (1)

explains the test of analyzing some variables of the electrical signal of the muscles: (Aid, 2010, p. 17)

This test was conducted by Device system (EMG) Type (MYOTRACE 400) American made with Bluetooth transmitter With eight sensors, (2) of which were used to measure the right rectus femoris and left rectus femoris muscles in this research, as shown in Figure (1), and to analyze the electrical signal using a program. (Myo Research XP 1.06.67) To process the device signal (EMG) for both the peak and the area as shown in Figure (2):



.the device system Figure (2) shows ( EMG )



. Figure ( 3 ) Shows the program window (Myo Research XP 1.06.67)

Appendix (2) explains the free throw skill accuracy test: (Louay, et al., 2010, p. 334)

.Objective of the test: To measure free throw accuracy

.Tools: Legal basketball board, legal basketball

Procedures and performance: The throw is taken from behind the free throw line and each examiner has twenty attempts. The examiner may perform the free throws using any shooting method, provided that the teams perform in groups of (5) throws each, divided into (4) four groups, each group (5) throws for each examiner, after which another

examiner performs the first group. This allows for performing some throws before performing as a trial, and so on with each group

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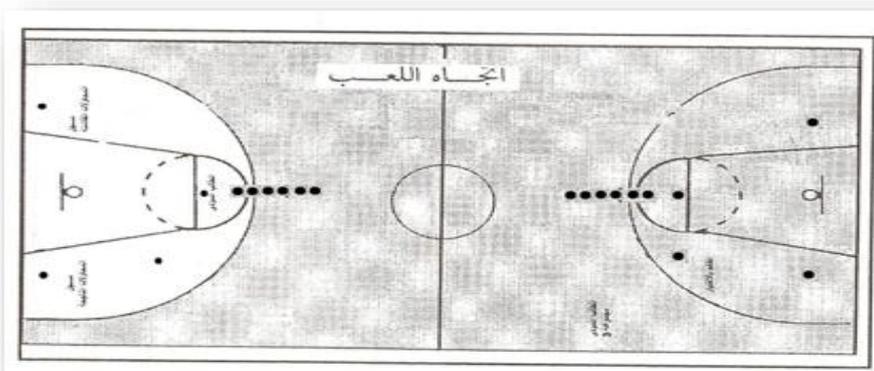
- 1- .Each tester has the right to perform twenty throws
- 2- .The shot must be made from behind the free throw line, as shown in Figure (12)

:Registration

One point is awarded for each correct shot made by the examiner (the ball entering the -1 basket), regardless of how it entered the basket. A (zero) is awarded if this is not .achieved, even if it touches the ring

.Each tester has twenty throws in the performance -2

.The maximum score for the test is (20) points -3



**.Figure (4) shows the free throw test image**

.Appendix (3) shows illustrative images of axial stability exercises with moving contraction



By moving contraction . exercises axial stability Appendix (4) shows examples of some

**Front Squats:** This exercise directly targets the anterior thigh muscles while enhancing axial stability.

- ✓ Stand straight with your feet shoulder-width apart.
- ✓ Hold the barbell forward at shoulder level, with your elbows facing forward.
- ✓ Slowly lower into a squat position, keeping your back straight and your chest lifted.
- ✓ Push through the heels to return to the starting position.

**Lunges:** Lunges strengthen the rectus femoris and axial stability muscles.

- ✓ Stand straight with your feet together.
- ✓ Take a big step forward with your right foot, lowering until your front knee forms a 90-degree angle.
- ✓ Keep your torso straight and your abdomen tight.
- ✓ Push off with the front heel to return to the starting position and repeat with the other foot

**Straight Leg Raises:** This exercise targets the rectus femoris and axial stability muscles at the same time.

- ✓ Lying on your back with your legs extended.
- ✓ Slowly raise one straight leg until it forms a 45-degree angle with the floor.
- ✓ Keep your abdomen tight and your back flat on the floor.
- ✓ Slowly lower the leg and repeat with the other leg.

**Box Step-Ups:** This exercise helps strengthen the thighs and improve axial stability and balance.

- ✓ Stand in front of a box or platform raised about knee height.
- ✓ Place your right foot on the box and press through your heel to lift your entire body up to the top of the box.
- ✓ Slowly lower your left foot to the floor and repeat with the other foot.

**Single-Leg Glute Bridge:** This exercise targets the gluteal muscles, but it also requires activation of the rectus femoris muscles and axial stability.

- ✓ Lie on your back with your knees bent and your feet flat on the floor.
- ✓ Lift one straight leg towards the ceiling.
- ✓ Press through the remaining heel to lift the hips off the floor until the body forms a straight line from shoulders to knees.
- ✓ Slowly lower your hips and repeat with the other leg.

**BicycleCrunches:** This exercise strengthens the rectus abdominis and quadriceps while enhancing axial stability.

- ✓ Lie on your back with your hands behind your head.
- ✓ Lift your shoulders off the floor, then pull one knee toward your chest while extending the other leg.
- ✓ Rotate the trunk so that the opposite elbow meets the knee pulled toward the chest.
- ✓ Switching sides sequentially as in riding a . bicycle

**Plank with LegLift:** This exercise improves axial stability and strengthens the thigh muscles.

- ✓ .A) Take a traditional plank position (body flat, resting on forearms and toes )
- ✓ Keeping your body straight and tight, slowly lift one leg off the ground.
- ✓ Hold this position for a few seconds, then lower the leg and repeat with the other leg.
- ✓ Make sure your hips remain stable and do not twist as you lift your leg.

**Dynamic Bridge Exercise:** This exercise strengthens the rectus femoris muscles while increasing the stability of the hips.

- ✓ Lie on your back with your knees bent and your feet flat on the floor.
- ✓ Raise your hips off the floor until your body forms a straight line from your shoulders to your knees.
- ✓ From this position, lift one foot off the ground and extend it straight forward.
- ✓ Hold this position for a few seconds, then return to the original position and repeat with the other leg.

**Dynamic Stretching:** These exercises help improve the flexibility of the rectus femoris muscles and prepare the body for physical activity.

- ✓ Stand straight and start stepping forward, raising your knee towards your chest.
- ✓ Grasp the knee with the hand and pull it towards the chest to stretch the rectus femoris.
- ✓ Step the leg forward and repeat the movement with the other leg.
- ✓ Keep moving , while maintaining balance and stability.

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