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The effect of some corrective exercises on the course of body angles while performing the forward jump movement on the floor movement's mat

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Abstract
The purpose of this paper is to preparing a training program according to biomechanical variables (body angles) to correct the work of the body angles while performing the forward hand jump movement on the floor movement mat device, and identify the effect of the training program prepared according to biomechanical variables (body angles) while performing the forward hand jump movement on the floor movement machine. The researcher used the experimental method. The research sample consisted of (6) young players from the Iraqi artistic gymnastics team who were (13-15) years old. One of the most important results reached by the researcher is that: Adopting a training program prepared according to some biomechanical variables works to correct the course of the body angles for forward jumping movements, and adopting a training program prepared according to some biomechanical variables that works to correct the path of the body's inclination angle at the moment of jumping for forward jump movements. One of the most important recommendations recommended by the researchers is that: Necessity of adopting a training program prepared according to some biomechanical variables in the forward jumping movements of gymnasts, and disseminate this type of training program to trainers.

Keywords: Corrective exercises, forward jump, movement's mat

Introduction
The development that occurred in artistic gymnastics equipment for men through performance forced trainers and those in charge of planning and building programs to become familiar with the aspects of the speed of the learning process and training for various movements, especially movements with demands and high degrees of difficulty, and to pay attention to the variables affecting kinetic performance, both kinematic and kinetic. The floor movement mat device is one of the basic devices among the six devices in artistic gymnastics for men, and it is one of the devices in which performance has increased significantly.
The kinetic chain is distinguished by its beauty and difficulty, as well as the link between this movements with another movement that differs in its degree of difficulty. Those who follow the sport of gymnastics show us how these movements are characterized by high speed and complexity, and therefore they fall under the great influence of biomechanical variables that negatively or positively affect achievement. Identifying these variables correctly leads to identifying the variables that are appropriate for achieving kinetic performance correctly (Rashid, Ahmed, & Raheem, 2022) [8] (Hashem, Al Edhary, Radhi, & Hmeid, 2022) [5]. The importance of the study emerged from a correct and sound attempt to use some exercises based on biomechanical variables that contribute to the development of some biomechanical variables for the forward hand jump movements on the floor movement mat.

Research problem
The forward jumping movements of artistic gymnastics for men and women are included in many movements that are more difficult on the floor movement mat device, and through the researcher's contact and closeness to the sport and the specialists, he noticed that there is a deficiency in achieving the requirements for the angles of the movements of most of the forward jumps, especially the forward hand jump in its full form, the matter Which generated a question that led to the movement having to be analyzed to determine the variables

associated with the work during the performance of the movement, especially the angles of the body while performing the forward hand jump movement, and to prepare a corrective program consisting of exercises prepared according to the biomechanical variables in order to develop the work of the body angles in the correct form during the performance of the movement.

Research objective

- Preparing a training program according to biomechanical variables (body angles) to correct the work of the body angles while performing the forward hand jump movement on the floor movement mat device
- Identify the effect of the training program prepared according to biomechanical variables (body angles) while performing the forward hand jump movement on the floor movement machine.

Research hypotheses

- There are statistically significant differences in improving the functioning of some biomechanical variables (body angles) using a training program prepared according to the biomechanical variables between the pre- and post-tests, and in favor of the post-test for the research experimental group.

Research fields

- **Human field:** The Iraqi artistic gymnastics team (youth), aged between (13-15) and numbering (6) players.
- **Time field:** (1/10/2022) to (1/6/2023).
- **Spatial field:** Martyr Samir Khammas Hall for Artistic Gymnastics.

Definition of terms

Training program prepared according to biomechanical variables

Training the research sample with exercises prepared according to the work of the body's angles for the purpose of correcting the path of the body parts while performing the forward hand jump movement and thus improving the technical performance of the movement in a correct and acceptable manner and rising to obtain a high score in the evaluation.

Research methodology and field procedures

Research Methodology

The researcher used the experimental method, which is "based on direct and realistic dealing with various phenomena, and is based on two basic pillars: observation and experiment of all kinds" (Abdel Muti Muhammad Assaf and others. 2002) [1]. Experiment is "observation of the phenomenon under controlled conditions, by controlling all the basic variables and factors except one variable" (Hassan Ahmed Al-Shafi'i, Susan Ahmed Ali. 1999) [2] (Rashid *et al*., 2022) [8] the researcher followed the experimental method with one group, which is appropriate to the nature of the research problem

Community and sample research

The research sample consisted of (6) young players from the Iraqi artistic gymnastics team who were (13-15) years old.

Pre-test

After the data that the researcher obtained from the exploratory experiment, he distributed the work team and places to place the cameras. The main experiment was conducted on February 19, 2023 at exactly four o'clock. After conducting the general and private warm-up process, each learner was given an attempt to perform the skill, which was approved. The fast video camera (120 p/s) was set up on a tripod, and the appropriate dimensions for the location of the camera were determined at a place located perpendicular to the middle of the spatial plane of the player's movement. It was filmed at a distance of (8) meters from the performance field.

Analytical imaging

The filming process was carried out using a Casio video camera (120 images / second), which was placed on a large tripod at a height of (120 cm) from the center of the lens to the ground. The distance between the center and the middle of the mat was (8 meters) and formed perpendicular to the line of movement so that it completely covers the depiction of the movement of the front hands jumping. The drawing scale was placed in the photographic sector with a known drawing scale of size (1 m), and the movement was recorded from the moment the hands touched the ground (landing) to the feet touching the ground (rising).

Biomechanical variables and method to study and analyze them

The researcher chose the bio-kinematic variables that are specific and common to the activities of jumping movements on the ground movements, which are:

1. The angle of inclination of the body at the moment of jumping
2. Hip angle
3. Shoulder angle

Normal distribution

Table 1: Shows the normal distribution

No.	Variables	Mean	Median	Std. Deviations	Skewness
1.	Angle of inclination of the body at the moment of jump	19.5	19.5	1.048	0.000
2.	Hip angle	175.166	175.5	2.482	0.871
3.	Shoulder angle	152.66	152.5	1.366	0.889

It is clear from Table (1) that the skewness coefficient for all values is less than ±1, this indicates that they are distributed moderately, and this means that all members of the research community are homogeneous.

Training program

1. The researcher prepared a training program prepared according to some biomechanical variables to correct the trajectory of the body angles for forward jumping movements.
2. The researcher relied on biomechanical exercises in order to increase the torque of the weight for forward jumping movements by pushing the body members forward during the movements.
3. Use photography and analysis to provide feedback and give directions.
4. The training period ranged from 10/8/2022 until 12/9/2022.

Post-test

The post-test and filming of the research experiment took place at exactly four o'clock on the date (19/5/2023) in the Martyr Samir Khammas Artistic Gymnastics Hall in the same manner and procedures.

Statistical processors

The researcher used statistical questions through the statistical package (SPSS), statistical packages for social systems, and using the relevant statistical laws (Radhi and Obaid 2020) [7]:

- Arithmetic mean
- Standard deviation
- Skewness coefficient
- Median
- T-test for the significance of the differences between the means for the related samples

Results and Discussion

Presentation and analysis of the results of the biomechanical variables and performance angles of the experimental group and discussion

Table 2: Shows the arithmetic means, standard deviations, differences, and t-value calculated for the experimental group in the research in the pre- and post-tests

Variables	Measuring unit	Pre-test		Post-test		Arithmetic mean of difference	Standard deviation of differences	T value calculated	Level Sig	Type Sig
		Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation					
Angle of inclination of the body at the moment of jump	Degree	19.5	1.048	16.5	1.048	3.0	0.894	8.216	0.000	Sig
Hip angle	Degree	175.16	2.483	170.5	1.870	4.66	1.632	7.00	0.001	Sig
Shoulder angle	Degree	152.66	1.366	155.33	1.211	2.666	0.816	8.000	0.000	Sig

At degrees of freedom (5) and error level (0.05)

Discussing the results of the differences between the pre- and post-tests

The results of the biomechanical variables of the experimental group's performance angles (body inclination angle at the moment of jumping, hip angle, and shoulder angle) for forward jumping movements on the floor mat show that there are significant differences between the pre- and post-tests, and in favor of the post-test. The biomechanical variables of performance angles are related to the position of the body at the moment of leaning and pushing, which helps the player to perform rotation and roll. The researcher believes that the reason for this development in these biomechanical variables (the angle of inclination of the body at the moment of jumping, the angle of the hip, and the angle of the shoulder) is due to the effectiveness of the proposed exercises according to the mechanical properties. Which works to increase the force causing rotation according to the law of moments by increasing the torque of the weight, and here (Haider Nawar Hussein 2012) confirms, "The diagnosis of mechanical considerations is based on the fact that movement is based on the amount of force causing it according to the law of continuity, and knowing the basic considerations helps to understand the motion paths." The correct, effective and effective method for performance comes from biomechanical principles. There is a direct relationship to the angles taken by the learner's body at the moments of support, propulsion, and achievement. The smaller the horizontal distance between the point of support and the column descending from the center of gravity of the body, there is a reduction in the torque of the weight as a force hindering the movement, and the angle of advancement has a direct relationship. "By achieving" (Haider Nawar Hussein) (Idrees, Yasir, & Rashied, 2022) [6]. Therefore, it is obvious that there would be an improvement in (the angle of inclination of the body at the moment of jumping, the angle of the hip, and the angle of the shoulder) for the experimental group due to the exposure of the members of the experimental groups to the training programs prepared by the researcher, which sparked a new condition for the work of the kinetic system and the creation of new adaptations through correct use. For the angles and ranges of movement of the joints, therefore, there was an improvement in the level of biomechanical variables, and this is what was confirmed by "through the correct use of the laws of movement during performance, which leads to improving the speed of performance (Rashied, 2024) [9]. Therefore, the results obtained by the experimental groups were intuitive.

Conclusions and Recommendations

Conclusions

1. Adopting a training program prepared according to some biomechanical variables works to correct the course of the body angles for forward jumping movements
2. Adopting a training program prepared according to some biomechanical variables that works to correct the path of the body's inclination angle at the moment of jumping for forward jump movements.
3. Adopting a training program prepared according to some biomechanical variables that works to correct the path of the hip angle at the moment of jumping for forward jump movements.
4. Adopting a training program prepared according to some biomechanical variables that works to correct the path of the shoulder angle at the moment of jumping for forward jump movements.

Recommendations

1. Necessity of adopting a training program prepared according to some biomechanical variables in the forward jumping movements of gymnasts
2. Disseminate this type of training program to trainers.
3. Conduct similar studies (rotation and ascension movements) to measure other variables.
4. Conducting development courses for this type of training programs for trainers.

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Appendices

Appendix (1)

Explains the exercises used through body mechanics in the training program

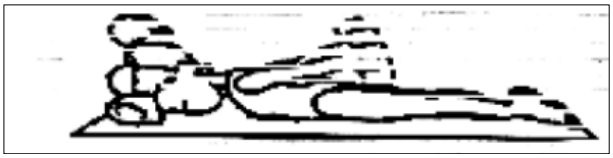
First: exercises to strengthen the shoulder joint.

Include resistance exercises for the scapula from the prone position

1. Raising / lowering.
2. Deportation/annexation.
3. Rotate up/down.

First exercise: extending the shoulder from prone

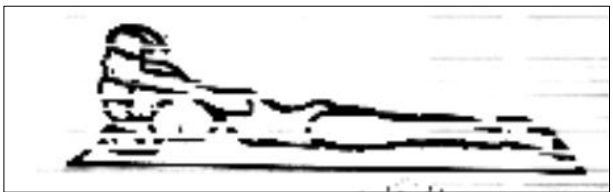
We take a prone position with our face facing the ground, with our arms out to the side, and a weight of approximately half a kilogram placed in each hand. The arms are raised up for a distance of (15-20 cm) with the thumb pointing down. Maintain this position for (5 seconds) and then the arms are slowly lowered down.



Second exercise: shoulder flexion

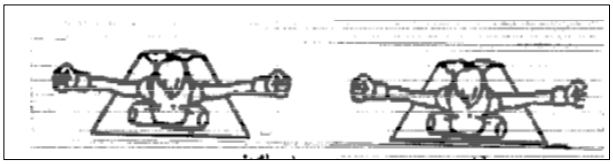
Take a prone position with your face facing the floor, with your arms above your head at an angle (30 degrees above your head).

A weight of approximately (half a kilogram) is placed in each hand, and the arms are raised up a distance of (15-20 cm) with the thumbs pointing upwards.



Third exercise: prone from the bird

Lie face down with your arms out to the side with your thumbs facing up, and place a weight (half a kilogram) in each hand. Then raise your arms by (15-20 cm) and maintain this position for (5 seconds), then lower your arms down slowly.

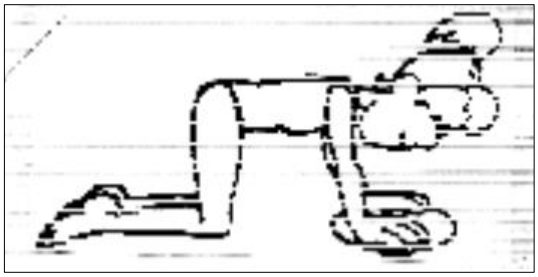


Second: Kinesthetic exercises for the upper extremities.

It contains hand push-up exercises on the floor, ranging from easiest to most difficult. Each exercise is performed for fifteen seconds and incrementally until the duration of the exercise reaches one minute. There is another series of exercises with a round, movable board that resembles a disc, as it rises from the middle in order to move in a circular manner. It is called (the rotating board). The hands are placed on it to rotate it once clockwise and once counterclockwise, while maintaining the straightness of the elbow joints. The movement begins from the shoulder joint and performs the exercise in each direction, clockwise and counterclockwise

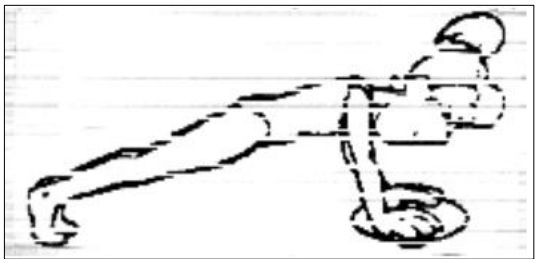
Fourth exercise: Rotate the board from a sitting position on the knees

From a sitting position on your knees, balance the upper body on the rotating board, making the shoulder joint, elbow, and wrist in one line above the rotating board, and the opening of the hands is equal to the width of the shoulder. Then begin rotating the board with your shoulders clockwise and then counterclockwise, making sure that the circular edge of the plate touches the ground during rotation, as shown in the figure



Fifth exercise: rotating the board and doing hand push-ups

From the front leaning position on the circular board, the upper body is balanced on the board, making the shoulder, elbow and wrist joints in one straight line and the arm openings equal to shoulder width.

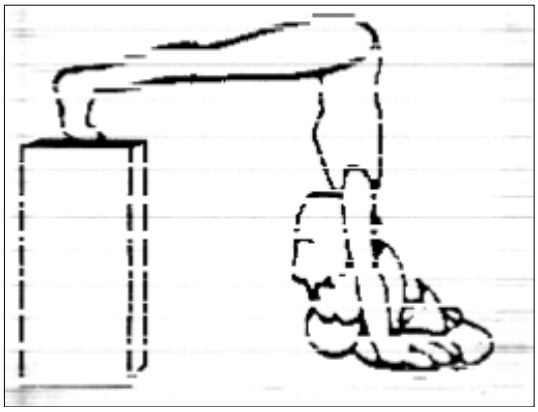


Sixth exercise: Rotating the board and doing hand push-ups by raising the legs

From the front leaning position on the circular board with the legs placed high, balance the upper body on the rotating board while also keeping the shoulder, elbow and wrist joints straight and opening the arms shoulder-width apart. The exercise is performed by bending and extending the arms while maintaining the leg position.

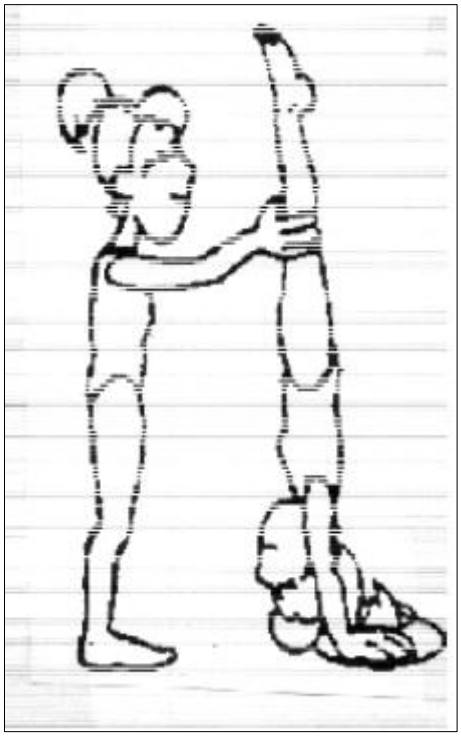
Seventh exercise

After the shoulder, elbow, and wrist joints are straight above the rotation board, the board is rotated with the shoulders clockwise and counterclockwise, making sure that the board touches the ground during the rotation process, and the gap between the arms is shoulder width.



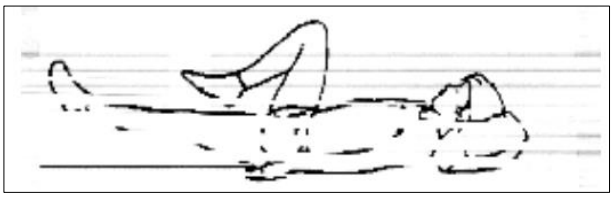
Eighth exercise

Handstand on the rotating board. Take the handstand position with the body balanced on the rotating board, with the shoulder joint, elbow, and wrist in one straight line and above the rotating board, with the gap between the arms equal to or slightly larger than shoulder width. Rotate the board with the shoulders toward clockwise and counterclockwise.



Ninth exercise

Pelvic equalization exercise with one leg raised a distance of 2.5 cm. The exercise begins by bending the knee joint and extending the leg so that the foot is 2.5 cm high from the ground and maintaining this position for 5 seconds. The exercise is repeated with the other leg while pulling the ribs inward while pressing the vertebrae of the cage. Thorax toward the floor, arms aside, and then the shoulder blades rotate upward, pressing the arms and shoulder toward the floor.

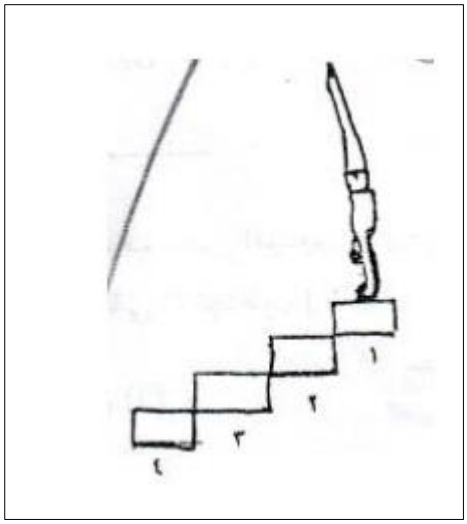


Tenth exercise

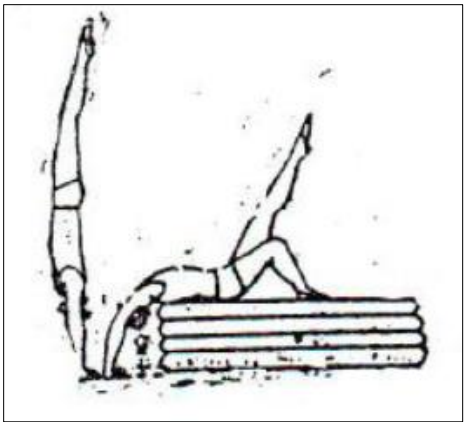
Place 3 foam mattresses with a height of 7 cm. Sponge mattress and place the mattresses on
The ground and landing with both feet on it.

Eleven exercise

Stand on your hands on a ladder with heights ranging from 8 to 20 cm, then go down
Ladder by standing on hands



Twelve exercise
Stand half-squat on 5 mats, then stand on your hands



Appendix (2)
Training unit model
First week
Unit duration: 60 minutes
Day and date

Unit	Sets	Repetitions	Rest between Sets	Rest between one repetition and another	Exercise
first	3	5	2 minute	30 second	1.2.12.7
second	3	5	2 minute	30 second	3.4.11.6
Third	3	5	2 minute	30 second	8.9.10.5