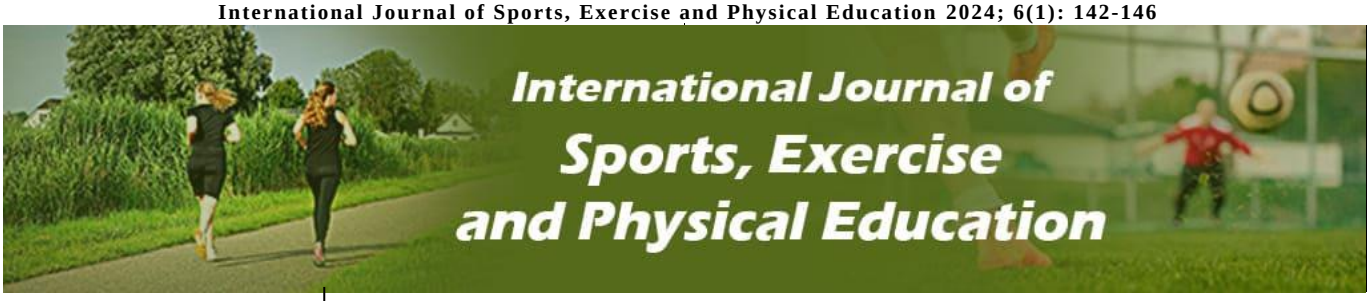

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Karrar Abdulla Mohsen
College of Physical Education and Sport Sciences, Wasit University, Iraq

Karrar Abdulkareem Khudhair
College of Physical Education and Sport Sciences, Wasit University, Iraq

Corresponding Author:
Karrar Abdulla Mohsen
College of Physical Education and Sport Sciences, Wasit University, Iraq

The effect of a rehabilitation curriculum according to some kinematic variables in developing the range of motion for people with shoulder joint injuries in the effectiveness of pushing weights for young people

Karrar Abdulla Mohsen and Karrar Abdulkareem Khudhair

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Abstract
In contrast to the body of an athlete who practices a sport, the integrated dynamic physique necessitates physical, anatomical, physiological, and mechanical efficiency in response to the features and requirements of the sporting event. Among the throwing sports in athletics, let's focus specifically on the weight-pushing competition, where athletes risk a variety of injuries. It will result in the loss of the dynamic relationship between its various parts in one area of their body. Regardless of the sport or activity, the research's issue was the prevalence of joint injuries, which impair movement and consequently cause a reduction in it. The researchers discovered that movement throwing in a weight-pushing competition is violent in order to accomplish the event's goal based on the mechanics and direction of performance. As a result, the body's joints may sustain a variety of injuries due to the intense effort. The purpose of the study is to determine the effectiveness of this approach and to develop a rehabilitation curriculum based on certain kinematic variables. The most significant findings. In conclusion the outcomes of the dimensional variables improved as a result of the rehabilitation strategy. Which is (bend, extension, dimensions, and muscle strength of the muscles working on the shoulder joint) a representation of the shoulder joint's range of motion.

Keywords: Kinematic variations, injuries, rehabilitation approach, weight pushing, range of motion

Introduction
In contrast to the body of an athlete who practices a sport, the integrated dynamic physique necessitates physical, anatomical, physiological, and mechanical efficiency in response to the features and requirements of the sporting event. Among the throwing sports in athletics, let's focus specifically on the weight-pushing competition, where athletes risk a variety of injuries. A portion of their body will experience a loss of the dynamic relationship between its various parts, which will result in a loss of motor momentum and energy and obstruct the natural flow of movement, ultimately leading to a performance weakness. Joint injuries, including those to the shoulder joint, are the most common injuries associated with high effort, poor physical fitness, and poor body structure (Knickham, 1980). One of the synovial joints with the greatest range of motion in multiple directions is the shoulder joint, and the stability of the ligaments, muscles, and capsule within the joint are all directly related to this range of motion. As a result, one of the most crucial strategies for curing cases of muscle dysfunction is through therapeutic exercise. Additionally, when performing exercises in accordance with the proper mechanical conditions for skill performance to develop muscle strength, joint flexibility, and the degree of nervous coordination to restore normal condition, joints should be considered in addition to understanding the body's movement (biomechanics). It should be noted, however, that therapeutic physical exercises and sports medical rehabilitation for pathological cases take place after the acute period has ended. due to discomfort (Mahmoud Badr Aql. 1989) [2]. Without a doubt, the causes of sports injuries vary based on the sport, whether it is team or individual. Additionally, they vary based on the type of game being played, the significance of competition, the player's physical prowess, improper or careless training, neglecting to warm up, and possibly incomplete training of all the muscle groups required for the performance, among other factors. In order to develop

muscular abilities, physical fitness, and harmonic movements, as well as the functional effectiveness of the body's systems, scientifically researched rehabilitation programs and extensive physical exercises are therefore required. Additionally, these must be continuously evaluated in order to create organized programs that serve the intended purpose and are necessary. Therefore, research is crucial to the development of a rehabilitation program based on certain kinematic variables and its impact on shoulder joint injuries in order to aid in the recovery of those injured in the efficient use of weight pushing in sports.

Research problem

Regardless of the sport or event, any injury to the shoulder joint will eventually result in injuries to the joint, which will affect its movement and cause a decline in movement. The throwing movement in the weight-pushing event is violent, according to the researchers' analysis of the performance's mechanics and direction. Joint injuries may result from exerting a great deal of effort to reach the event's goal. The researchers' experience in training and rehabilitating sports injuries led them to notice that injuries among shooters were common, particularly to the shoulder joint, which is essential for performing the activity. When something goes wrong, it's ignored. Treating it impairs joint mobility, reduces the shooter's aptitude and skill level, interferes with their training schedule, and creates issues during competition. Upon delineating the research problem, we discover a close relationship between kinematic variables and sports injury rehabilitation techniques. The two researchers chose to create a rehabilitation strategy based on certain kinematic variables and their observation of their impact on shoulder joint injury in order to address this issue. Considering expanding range of motion in accordance with appropriate performance mechanics in order to get back into competition as soon as possible.

The aim of the research is to create a rehabilitation curriculum based on a few kinematic variables.

Determining how the rehabilitation programme affects young people's ability to push weights by increasing their shoulder joint's range of motion.

Research hypotheses

For the research variables, there are statistically significant differences between the pre- and post-test results, favouring the post-tests.

Methods of Research

To fit the needs of the study, the researchers employed a single-group design in their experimental approach.

Community and sample research

Three players from Wait Governorate youth clubs made up the research sample, which was specifically selected from shooters with shoulder joint injuries and semi-acute conditions.

Devices and tools used in the research:

- Video camera type (CASIO-EX-FH20), multi-speed (30-1000) images/second, number (2).
- Medicine ball weighing (1-2) kg.
- Kennometer device.
- Legal weight ball number/2.
- Infrared device.
- Ultrasound device.
- Vibrating massage device.
- Goniometer device.

Measurements and tests employed in the study

Numerous variables and tests with various axes were chosen, such as joint range of motion measurements, physical examinations, and some kinematic variables. The tests with an 85% agreement rate were chosen after they were shown to a panel of knowledgeable and experienced experts.

These tests consist of

Initial/physical examinations: A test that uses the couteometer's installed degrees to measure the arm's range of motion (bend, extension, and dimensions) at the shoulder joint.

The second is the set of chosen kinematic variables and how they are measured.

In order to determine the kinematic variables for the efficacy of pushing the weight during the throwing stage, the video films were transformed into a calculator. The variables were selected with consideration for the objective in mind. The following variables were extracted that were appropriate for the research's form and subject:

The angle variables, measured in degrees, are first.

1. Shoulder joint angle: This is the angle formed by the line joining the elbow and shoulder joints and the hip and shoulder joints.
2. The torso inclination angle is the angle formed by the horizontal line that extends from the hip joint parallel to the ground and the line that connects the hip joint to the shoulder joint.

The following are the second/angular velocity variables (degrees/second):

1. Shoulder joint angular velocity: This is obtained by dividing the value of the angular movement of the shoulder joint by the duration of this movement. It was also obtained by determining the difference between the angles of contact and push to the ground in the front-hand jump skill, as well as the difference between the first and second shoulder angles at the maximum backward bend and the second at the moment of aiming or throwing. At the moment of this changeover in these phases.
2. The torso's inclination's angular velocity. It was extracted by determining the difference between the first hip angles at the vertical line and the second at the moment of aiming or throwing, as well as the difference between the two hip angles in the skill of the front hands jump. The value of the angular movement of the hip joint is then divided by the time of this movement. This change takes place in these phases.

Pre-tests

To perform the weight-pushing event, pre-physical testing as well as pre-video imaging were carried out. When doing the weight-pushing exercise, the researchers planned to examine a few kinematic aspects of the shoulder joint.On March 5, 2024, the performance was recorded at the Al-

Kardiyah shooting range in the Wasit Governorate for heavy throwers with injuries to their shoulder joints. A video camera of the CASIO-EX-FH20 type with various speeds (30-1000 images/second) was used for this. Prior to that, the filming locations were checked for integrity by placing signs at the start and finish of the movements. The camera's focal height was measured to be 1.5 metres above the ground, and the player's movement path's midpoint was 17.5 metres from the camera. The video camera was positioned on the right side of the shooter, perpendicular to the midpoint of the gunman's movement path, and the shooters were photographed.

Suggested programme for rehabilitation

A rehabilitation curriculum was created with the intention of strengthening the group of muscles that work on the shoulder joint, achieving balance between them, and lengthening the ligaments that are attached to the joint, which increases range of motion. This was done after reviewing numerous studies, research, and references pertaining to the research topic as well as the physical therapy and rehabilitation techniques used in treatment centres. The curriculum is implemented in three units per week, Sunday through Thursday, and spans six weeks with eighteen rehabilitation units. The rehabilitation unit takes forty to fifty minutes to complete, plus an additional ten minutes for warming up and getting ready. The rehabilitation unit employs a number of techniques, which are listed in the following order of application:

1. Making use of the following physical equipment-based rehabilitation techniques:

a. Use the infrared gadget for ten to fifteen minutes.
b. Spend five to ten minutes using the magnetic wave device (Ultra sauna).
c. Give the vibrating massager five to ten minutes of use.

2. Exercises for rehabilitation: For every device, the curriculum included resistance exercises with varying repetition counts, intensities, and rest intervals in addition to joint range-extension exercises. When grading the exercises from easy to difficult, the researchers considered the gradualness principle. For example, the number of repetitions increased from five in the first week to fifteen in the sixth. A series of exercises for strengthening the shoulder joint's muscles, such as raising and lowering poses, were also included in the rehabilitation regimen. As well as turning the arm. Following physical therapy devices, these exercises are administered (physiotherapy).

Post-tests

On October 11–11, 2024, the research sample was subjected to physical and post-skills tests, which were administered in the same manner as the pre-tests.

Statistical methods

- Arithmetic mean
- Standard deviation.
- Test for symmetrical specimens

Results and discussion

Presentation, analysis and discussion of physical variables

Table 1: shows the arithmetic means, standard deviations, and the calculated and tabulated T-value for the pre- and post-tests of the physical variables

Variables		Measuring unit	Pre-test		Post-test		Arithmetic mean of difference	Standard error of the mean difference	T value		Type sig
			Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation			Calculated	Tabulation	
Range of motion of the shoulder joint	Bend	Degree	112.2	2.26	143.6	5.18	31.03	7.37	7.283	0.018	Sig
	Dimensions	Degree	97.33	5.76	135.75	4.65	38.42	8.33	7.989	0.015	Sig
	Extension	Degree	30.80	3.97	38.10	9.10	7.29	5.13	2.461	0.133	Sig

Tabulation at degree of freedom (2) and below significance level (0.05)

From the above table, we can determine the degree of improvement in the values of significant and influential physical variables following the application of the rehabilitation approach. All of the arithmetic mean differences were found to be significant, and the researchers will provide the following explanations for these differences:

- **Determining the shoulder joint's range of motion during testing (bend):** Researchers believe that the user's rehabilitation programme, which incorporates a variety of rehabilitation techniques that increased muscle mass, is the reason for the test's notable difference between the pre- and post-test results. Ligaments and the flexibility (movement) of joints in all directions.
- **Determining the shoulder joint's range of motion during testing (dimensions):** The researchers credit the notable difference to the varied rehabilitation regimen, which incorporated a variety of physical techniques and frequent repetitions that enhanced the range of motion of the shoulder joint by fostering the development of muscular harmony in the surrounding muscles. When there is a dynamic similarity to the performance, there is a development in the bend test, which leads inevitably to a development in the dimensional test's range of motion. The two motions accomplish the movement and total control of the body by correctly stretching the ligaments (Wajih Mahjoub, 1989) [8].
- **Measuring range of motion (Extension):** The researchers credit the research sample's ability to apply exercises, which was positively reflected in the development of the muscle groups working in the extension and bend movements, as well as the accuracy of the rehabilitation curriculum's sections, which contain multiple physical methods, and the research sample's commitment to applying the curriculum's components in accordance with the requirements of distributing the training effort during the specified period of time. On the joints involved in these actions.

Presentation, analysis and discussion of kinematic variables

Table 2: shows the arithmetic means, standard deviations, and the calculated and tabulated T-value for the pre- and post-tests for the research sample.

Variable	Measuring unit	Pre-test		Post-test		Arithmetic mean of difference	Standard error of the mean difference	T value		Type sig
		Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation			Calculated	Tabulation	
Shoulder joint angle	degree	153.51	3.32	171.2	12.89	17.78	9.57	3.215	0.085	Sig
Angular velocity of the shoulder joint	degrees/s	537.7	21.22	570.8	28.52	33.06	12.5	4.55	0.45	Sig
Torso inclination angle	degree	37.90	3.62	86.57	3.41	12.66	6.34	3.46	0.074	Sig
Angular velocity of torso inclination	degrees/s	270.08	23.44	310.4	33.67	40.38	12.0	5.80	0.028	Sig

Tabulation at degree of freedom (2) and below significance level (0.05)

The rehabilitation programme, which consists of a variety of rehabilitation techniques and exercises administered in accordance with proper angles of movement, is credited by the researchers for the significant differences in the kinematic variables. This improved range of motion of the shoulder joint and increased flexibility of the surrounding muscles. As stated by Sumaya Khalil (1990), "it stimulates the muscles and increases their ability to contract, and it regulates blood circulation in the joints, tissues, and what surrounds them, and through it the range of motion of the joints increases." It is evident that this approach was appropriate for the physiological variables, including the muscle within the range of the shoulder joint. The rehabilitation programme also helps prevent muscle weakness and atrophy, develops muscular strength, and increases the flexibility of the joints and ligaments. Which resulted in the joint's wide range of motion and good muscle torque to flex the movement.

Additionally, the researchers show that the beneficial and efficient effects of the exercises performed by the sample members enhanced the muscular activity of the primary muscles involved in the affected arm's joints, as demonstrated by the movement of the elbow and shoulder girdle, and subsequently the arm overall. This enhanced the players' capacity to perceive movement and improved the angles of the involved body parts in a way that serves The main objective in sports that involve the ability to throw, push, or kick is confirmed by Talha Hossam El-Din (1993) [7] and Qais Ibrahim Al-Douri (1988) [5] to be the flow of arm movement with fast and precise movement performance, as well as increasing motor cohesion and coordination and its importance in transferring the amount of movement from the torso to the arms via the shoulder joint. The goal is to increase the angular velocity between the joints of the limb that is being used to attain speed in that movement. The mechanics of movement of these joints must be considered when selecting exercises for this kind of performance. The rehabilitation approach, which worked to develop the angles and angular velocities of the affected part of the body in the research sample, was intended to help the researchers achieve this goal.

Conclusions

First - The rehabilitation approach led to an improvement in the results of the dimensional variables, which represent the range of motion of the shoulder joint, as follows:

A. Bending
B. Extension
C. Dimensions
D. The muscular strength of the muscles working on the shoulder joint.

Second/The rehabilitation curriculum led to an improvement in the results of biomechanical variables, which include:

1. Shoulder joint angle.
2. Angular velocity of the shoulder joint.
3. The angle of inclination of the trunk.
4. Angular velocity of trunk inclination.

Recommendations

1. Emphasis on adopting the rehabilitation approach according to some kinematic variables because of its role in restoring the range of motion of the affected joint, as well as in improving performance.
2. Adopting other rehabilitative methods in treating and rehabilitating the shoulder joint and other variables, and selecting exercises for the rehabilitative curriculum in a way that is consistent with the level of injury and fitness of the injured person.
3. Using rehabilitation methods to treat and rehabilitate other joints of the body using the latest physical therapy devices.
4. Emphasizing the importance of imaging and analysis to identify and evaluate performance errors and diagnose deviations in the motor paths of the skills selected to treat them.
5. The need to emphasize the importance of the interrelation between therapeutic and rehabilitative exercises and the mechanical foundations and principles for correct performance according to the conditions of motor performance of the exercises.
6. Adopting the proposed rehabilitation curriculum in health centers and physical therapy centers.
7. Emphasizing the spread of health awareness among athletes by prompt review in the event of injury to prevent complications and speed up the return to normal.

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