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The effect of special exercises to evaluate the path of gravity and learn to lift weights for students of physical education and sports sciences

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Abstract

This research aims to study the effect of special exercises on evaluating the path of gravity and learning the movement of the jirk in weightlifting among students of physical education and sports sciences. The research focused on developing students' performance through special exercises based on corrective exercises aimed at improving balance, motor control during the implementation of the gear, the results showed a significant improvement in motor performance after applying special exercises, as the success rate in the implementation of the gear increased, the failure rates decreased, and the working angle of the main joints improved (Ankle, knee, hip), which helped reduce motor deviations. In addition, the analysis confirmed that the modified training staff used in the research contributed to increasing students' confidence and improving their technical abilities, based on these results.

Keywords: Motor education, jirk.

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1. Introduction

Weightlifting is one of the oldest sports in the world, and competition in it occupies a prominent place among the various countries of the world in the Olympic Games, so countries are working to promote this sport to reach the highest levels and to reach the best level of achievement in order to be able to obtain the largest number of medals, as it indicates that weightlifting is one of the traditional sports that you find in most societies of the world with their different cultures, It is a sport of strength and self-assertion, and it is in itself one of the objective measures of general physical fitness in general and muscular strength in particular [1].

Weightlifting is a sport that requires high coordination between muscular strength, balance, and motor control to ensure correct performance and reduce the risk of injuries. Among the basic movements in weightlifting, the Jerk movement, which requires a great ability to control the trajectory of gravity during lifting, requires the development of special training programs to improve this skill. Straightening the path of gravity during lifting is one of the key factors to ensure optimal performance, as any deviation in the track may negatively affect The athlete's ability to balance and successfully complete the lift [2].

The importance of the research is to study the effect of special exercises designed to evaluate the path of gravity during the implementation of the movement of the gear, in order to improve technical performance and increase the efficiency of students of physical education and sports sciences in the implementation of this skill effectively and safely. This study highlights the importance of correcting motor errors and improving balance through specialized exercises targeting stability muscles and fine motor coordination.

1.1. Search problem

Many physical education and sports science students face difficulties in carrying out the jirk movement, as this is due to the deviation of the gravity path during lifting, which leads to loss of balance and failure of the attempt. Poor control of the gravity path may be the result of lack of muscle strength, poor motor coordination, or lack of proper training techniques. Although traditional exercises focus on improving strength and overall fitness. Therefore, the problem of research arises in the need for special exercises aimed at correcting the course of gravity during the implementation of the gear, which contributes to improving performance and developing students' skills. From here, the research seeks to analyze the impact of these exercises on the level of motor performance and technical efficiency in weightlifting, which helps in providing scientific solutions for the development of sports training in this field.

1.2. Research Objectives

The research aims to:

1. Design and implement a set of special exercises aimed at evaluating the path of gravity during the implementation of the movement of the jerk in weightlifting for students of the first stage in the Faculty of Physical Education and Sports Sciences.
2. Determine the impact of these exercises on improving the motor and mechanical performance of physical education and sports science students.
3. Determine the effect of special exercises on reducing common mistakes that lead to loss of balance or failure to properly perform the jirk.

1.3. Research hypotheses

1. Exercises affect the increase in the distance below the weight and reduce the deviations and working angles of the joint (ankle - knee - pelvis) in the research sample.
2. Exercises affect the achievement of the nitre lift in the research sample.

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1.4. Research Areas

Timeline: From (22/12/2024 to 6/2/2025)
Spatial field: Kinetic Education Hall at Diyala University / College of Physical Education and Sports Sciences.
Human field: Students of physical education, Diyala University, first stage.

1.5. Define terms

Jerk: It is one of the legal lifts in weightlifting, in which the bar is raised in two movements, the first from the lifting box to the chest and the second jerk from the chest to the maximum extension of the arms, which is perpendicular above the head [3].

2. Theoretical study and previous studies

2.1. Theoretical studies

The mechanism of technical performance of the second section of the netter lift (Jerk):
The second part of the lifting of the netter called (Jirk), which is the process of lifting the weight from the chest to the top by extending the arms upwards, which carries the weight in a sequential process consisting of several stages.

Stages of performance of the second section of the Jerk lift [4].
The technical performance of the Netter Department consists of several sequential stages, which are as follows:

1. The stage of standing and fixing the weight on the chest (on the collarbones and shoulder muscles) and the hands holding the weight is called the primary standing stage.
2. The stage of bending the knees downwards.
3. The stage of extending the knees upwards (stretch).
4. The stage of extending the arms upwards to the level of the forehead.
5. The stage of falling under the weight and opening the legs in front and back and complement of the arms high straight.
6. The stage of pulling the front legs first and then the rear second straight and waiting for the referee's signal to lower the weight.

2.2. Previous studies

First: Faleh Hashem Finjan study / University of Baghdad - College of Physical Education and Sports Sciences ((The effectiveness of a program for mental visualization in psychological fluency and the level of transmission skill The effect of special exercises and an auxiliary device according to some kinematic variables to increase the distance of the fall of the jirk and the achievement of raising the netter among young lifters)).

The study aimed to modify the training device and prepare special exercises to increase the falling distance during the performance of the second section of the nitre lift (Aljirk) by working to reduce the angles of work in the ankle, knee and hip joint, as reducing these angles during performance makes an increase in the fall of the body below the weight when performing the jirk, which makes it easier for the weightlifter to accomplish the lift with the least effort, relying on the muscles of the legs mainly, as well as modifying the kinetic path of transport and development of achievement The research sample consisted of One of the players of the National Center for the Care of Sports Talent in Baghdad with ages (12-15) years As for the research methodology, the researcher used the experimental approach with one group with a pre- and post-test, as the researcher applied the exercises individually to the research sample according to the possibility and specifications of the performance of each player, as well as statistical treatments were also individual for each weightlifter in order to accurately know the extent to which the lifters were affected by the exercises and the device used, as the researcher

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concluded that working on the modified device was of great benefit in Achieving the objectives of the research as well as the safety factor that encouraged the lifters to train with high weights and perform credit.

Second: Study of Muhammad Ihsan Attia / Benha University - Faculty of Physical Education for Boys ((The effect of a proposed training program to improve the percentage of correct attempts and the digital level (kidnapping - jirk) for lifters)).

The research aims to prepare a proposed training program and find out its impact on improving the percentage of correct attempts and the digital level of lifters. The researcher used the experimental method, and the research sample was selected in a deliberate way from the junior weightlifting players under 20 years old in Sharkia Governorate and registered in the Egyptian Weightlifting Federation for the sports season 2019/2020, and the sample size was (14) players, divided as follows (5) players for the experimental group and (5) players as a control group and (4) Players are the strength of the survey sample The results of the research showed that the proposed program led to a statistically significant improvement in the physical variables under research, and the digital level of the lifts of kidnapping Klin and looking), and the percentage of correct attempts of the lifters of the study sample and that the traditional program led to a statistically significant improvement in the physical variables under research and the digital level of the lifts of kidnapping Clean and looking). The traditional program did not lead to a statistically significant improvement in the percentage of correct attempts of the lifters of the study sample.

2.3. Research Methodology and Field Procedures

The researcher used the experimental method with one experimental group with pre-test and post-test appropriate to the nature of the research problem.

2.4. Research community and sample

The researcher determined the research community in a deliberate way, students of the first stage, Diyala University / College of Physical Education and Sports Sciences, consisting of (30) students, and then the researcher deliberately selected the research sample and they are ages (20) (22) years who finished a simple period of learning and faced some difficulties in performance in terms of the kinetic path of the weight and falling below the weight during the jirk, as their number reached (3) students, i.e. (10%)

2.5. Means, devices and tools used in research

1. Arab and foreign sources and references.
2. Observation and experimentation.
3. Testing and measurement.
4. Form for recording and unloading data.
5. Calculator for laptops, CDs.
6. A special bench for weightlifting.
7. Legal iron bar, tablets of different weights (10-20 kg).
8. Canon camera at a speed of 50 images per second.

2.6. Devices used in the research

1. An educational device forthe rate of increase of the distance of falling under the weight during the performance of the gear.
2. Cameras.
3. Computer laptop (HP) analysis software.

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2.7. Search Procedures

Selection of research variables: The research variables were determined by the researcher, represented by the angles of the ankle joint - knee joint - hip joint, heights and deviations that accompany the kinetic path of gravity during the lift, as well as the jirk test and the achievement of the nitre lift.

2.8. Modified device used

Kinetic educational device The goal of the idea of modifying it is to develop the effectiveness of weightlifting through several points that we mention in succession, starting with the development of the second section of the netter lift (Aljirk), which includes gradually reducing the weight of the bar by placing weights on the opposite side of the bar tied by the wire, as it is a coin similar to the balance and thus controlling the weight raised, as the researcher can put any weight less than the weight of the legal bar according to the ability of the learner As it can be placed (20 kg) becomes the weight of the bar (0) as well as can put (10) kg) becomes the weight of the bar also (10) kg) because the weight of the bar (20) kg subtracts from it (10) kg) on the other side becomes the weight raised (10) kg), which makes the novice weightlifter perform the second section of the lift with a greater falling distance without any fear of the weight raised or any difficulty because the bar is suspended by wires and this type of kinetic education gives high confidence when the weightlifter to perform the jerk and it takes into account All the lengths of the lifters because the sling can be installed at different heights.

2.9. Exploratory experiment

The researcher, accompanied by the work team, conducted the exploratory experiment on Sunday 22/12/2024 to ensure that the exercises can be applied to the modified device, as well as the time taken to conduct tests, photography, camera locations, install the device in the appropriate place, and try applying it to the research sample.

The researcher conducted the pre-test of the jerk and the achievement of the nitre lift, as the two tests were photographed in order to determine the research variables in the second section of the nitre lift (Aljirk) during the analysis using the Kenovia program for kinetic analysis, as the researcher used high-speed video cameras to film the achievement test, where a camera is placed in front of the student at a distance of (3 / m) with a height of (1 / m) through which the researcher aims to extract some variables for performance in addition to the angles of muscular work is from During which the evaluation of the technical performance In addition, the researcher used two cameras on the right and left sides at a distance of (3 / m) from each side, through which he extracted the deviations in the column of gravity from the vertical line passing through the student's base of support.

2.10. Exercises used in the research

The researcher resorted to adopting a set of exercises that can be performed on the device and the number (6) exercises, namely (Jerk back - Jirk front - Bryce Jirk open legs - Dabni half) These exercises were divided into three training units per week within the vocabulary of the trainer's curriculum and stresses the occasion that education is carried out individually for each student according to the data contained in the kinetic analysis of heights, deviations and angles, as the student performs in each educational unit Three exercises for the art of performance are applied to the device as shown in a figure in order to reach students to an advanced level through which performance and achievement are developed The exercises lasted eight weeks by three units per week, where the number of educational units reached (24) units, after the completion of the educational units The researcher conducted the post-test represented by the jirk test and achievement, and then the variables were extracted through imaging and under the same conditions in which the researcher conducted the test Al-Baadi on 8/2/2025 and using the same number of cameras to maintain accuracy in extracting search variables.

3. Analysis of results

3.1. Presentation and discussion of results:

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Table (1) shows the differences between the results of the pre-test and the post-test in the variable of gravity height

troupes	altitude		Sequence of players	Unit of measurement	Altitude and deviation variables	table
	Go away	southern				
3.134	12.454	15.588	The first	poison	Landing distance from the highest point to the lowest point in the preparation stage of the jerk 9	1
2.997	11.445	14.442	Second	poison		
3.226	11.998	15.224	Third	poison		
10.314	45.322	55.636	The first	poison	Thrust distance from the lowest point in the standby position to the highest gravity height in the jirk 11	2
10.362	44.525	54.887	Second	poison		
10.364	43.889	54.253	Third	poison		
0.12	3.101	3.221	The first	poison	Falling distance from the highest height of gravity at the fixing point 12	3
0.109	3.222	3.331	Second	poison		
0.02	3.101	3.121	Third	poison		

Through Table (1) we note in the variable height of gravity was less in the post-test and this indicates that there was an increase in the distance of falling to the student through the exercises used on the device represented by the half and the preparatory Dabny as the greater the distance of falling below the weight was the largest role on the student's legs , which helps him more strongly in raising the iron to the top using the strength of the two legs as well as getting rid of the technical error that the trainers have long suffered fromIn addition, there is a development in the muscles of the legs that increased the possibility of students in these variables, as it confirms [8] that weakness in any muscle group during the stages of pushing up will lead to the student not achieving the appropriate position and thus will not be able to use his full strength to implement the movement of pushing up correctly and effectively. The weightlifter begins to produce more force in the muscles of the legs to accelerate as much gravity as possible against gravity [9].

Table (2) shows the differences between the results of the pre-test and the post-test in the weight deviation variable.

t	Variables of deviations	Unit of measurement	Sequence of players	deviation		troupes
				southern	Go away	
1	Gravity deviation at the lowest point in the preparation stage of the jerk 7	poison	The first	5.978	3.002	2.976
		poison	Second	5.141	3.220	1.921
		poison	Third	4.889	3.001	1.888
2		poison	The first	6.776	3.001	3.775

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	The deviation of the highest point of gravity in the stage of the jirk 9	poison	Second	6.220	3.110	3.11
		poison	Third	5.998	3.001	2.997
3	Gravity deviation at the fixing point from the opening position of the feet 11	poison	The first	7.221	4.101	3.12
		poison	Second	7.001	4.550	2.451
		poison	Third	6.889	3.005	3.884

Through Table (2) we find that the deviations decreased significantly, which led to the appearance of performance in a distinctive way closer to the ideal in terms of approaching the imaginary line perpendicular to the center of gravity of the weightlifter, as the more the bar is close to this line, there is a shortcut in the effort exerted as well as it is less time, and therefore the result is positive, and the researcher attributes this development to the exercises used on the modified device, which did not exceed the intensity of (90%) in order to focus on the kinetic path For the bar because training is strictly without the maximum focus on the art of performance leads to the relative development of the trainees.[10] The use of educational stimuli below the maximum in training leads to a level of relative development. In the same resource for education below the maximum through the education of less than the maximum can achieve stability in the level without the fall of a maximum physical burden on the athlete " The researcher sees the closer the educational stress towards the maximum whenever there is difficulty in controlling the kinetic path of gravity so education must be done Concentrated according to the ideal path of weight and for a certain period until the weightlifter reaches good performance and even ideal after which the coach resorts to the use of high educational stresses. 11 Iceberg

Table (3) shows the differences between the pre-test and the post-test in the ankle, knee and hip angles

t	Angle variables	Unit of measurement	Sequence of players	Ankle angle		troupes	Knee angle		troupes	Hip angle		troupes
				southern	Go away		southern	Go away		southern	Go away	
1	Preliminary bending stage of the jerk	degree	The first	87	83	4	130	120	10	150	160	10
			Second	86	83	3	132	126	6	151	162	11
			Third	87	84	3	135	127	8	150	161	11
2	Anterior knee in the jirk		The first	92	98	6	130	110	20	86	90	6
			Second	92	97	5	133	105	18	87	91	6
			Third	94	98	4	132	105	17	86	91	5
1	Posterior knee in the jirk		The first	80	70	10	142	132	10	86	90	6
			Second	82	75	7	142	130	12	97	91	6
			Third	80	73	7	140	130	10	86	91	5

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Through Table (3) we find the angles of work in the ankle, knee and hip joint were less and significantly, which led to an increase in the process of bending these joints and thus there was an increase in the fall of the student below the weight, which enabled him to complete the lift smoothly and the researcher attributes this result to the effectiveness of the exercises using the device that enabled students to perform safely in terms of the fall of the bar in any moment of performance because the bar is suspended by a wire with side straps that indicate the arrival of The bar to the ground, which helped the students to perform high, as well as the presence of weights on the other side, helped the students to perform and apply exercises from the weight (0) to the weights of the larger, taking advantage of the property provided by the device by placing weights on the other side of the bar, i.e. the mechanism of work is similar to the scale, but from the mechanical point of view, the farther the weight is from the student's center of gravity, the more difficult it is to accomplish the lift [9] The distance of gravity when the lift is completed from the gravitational line passing in the center of the body generates a torque that leads to the student's imbalance and then his failure to perform the lift that increasing the falling distance makes the weight closer to the student and this concept agrees that the approach of the portable weight as close as possible to the body reduces its negative impact on the muscles of the body and facilitates its carrying[9].

Table (4) shows the differences between the pre-test and the post-test for the jerk test and the achievement of the nitre lift

t	Achievement variables	Unit of measurement	Sequence of players	deviation		troupes
				southern	Go away	
1	Jerk	kg	The first	70	80	10
		kg	Second	72.5	80	7.75
		kg	Third	70	77	7
2	Achievement of raising the netter	kg	The first	65	75	10
		kg	Second	65	72	7
		kg	Third	67.5	75	7.75

Through Table (4) we find a development in (Aljirk) as well as the lift of the nitre between the pre- and post-test and in favor of the post-test of the experimental group and the researcher attributes the reason for this development to the effectiveness of the exercises that contributed effectively to the development of the performance of the jerk and the lifting of the netter and this is consistent with what Qasim Hassan Hussein said that muscle strength is a key element to improve the level in events that require overcoming great resistance as in weightlifting, wrestling, gymnastics and strength games [12]In addition, the effectiveness of the modified device used in the jirk, which works mainly to straighten the lift and try to avoid deviations that may occur in the path of gravity during performance and increase the falling distance, as through the curve of the kinetic path of the column of gravity, we can judge the extent to which the weightlifter mastered the art of performance in a scientific manner and the extent of the impact of the exercises performed by the student to develop the art of his performance [8]. From the above, it is clear to us that the achievement may come as a result of the development of muscle strength as a result of weight training, as well as the development of variables for the art of performance such as the kinetic path, deviation and working angles of the joints (ankle - knee hip).

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4. Conclusions and recommendations

4.1. Conclusions

1. The results of the research showed that special exercises designed to straighten the path of gravity during the implementation of the jirk led to a significant improvement in motor performance, as it helped to increase the success rate in the implementation of the lift and reduce the rate of errors during performance.
2. The modified training staff used in the research contributed to improving students' motor control, as it provided a safe training environment that enabled them to focus on correcting motor errors and enhancing confidence during lifting.
3. The analyses showed that the exercises improved the working angles of the main joints (ankle, knee, hip), reducing motor deviations and increasing the efficiency of technical performance in weightlifting.
4. The study confirmed that the adoption of corrective exercises in training programs helps to improve the overall performance of athletes, which indicates the need to integrate these exercises into the educational curricula for training students of physical education and sports sciences.

4.2. Recommendations

The researcher recommends the inclusion of special exercises used in the research within the training programs for students of physical education and sports sciences, due to their effectiveness in improving the motor and mechanical performance of the movement of the jirk.

1. Assistive training devices should be continuously developed and updated to improve the training environment and increase the efficiency of motor learning, which contributes to raising the level of performance of beginner and professional athletes.
2. Additional studies are recommended to measure the impact of other training methods on the development of motor skills in weightlifting, especially with regard to techniques for balance control and injury reduction during execution.

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