Proximus Journal of Sports Science and Physical Education
Volume 2, Issue 5, May, 2025
https://proximusjournal.com/index.php/PJSSPE
ISSN (E): 2942-9943

THE EFFECT OF SPECIAL EXERCISES ACCORDING TO SOME KINEMATIC VARIABLES ON INCREASING THE JERK FALL DISTANCE AND PERFORMING THE CLEAN AND JERK LIFT IN YOUNG WEIGHTLIFTERS

T.Dr. Wissam Aouni Saleh, College of Physical Education and Sports Sciences, Tikrit University, Iraq.
wissam.sport@tu.edu.iq
T.Dr. Wissam Mahdi Saleh, College of Physical Education and Sports Sciences, Tikrit University, Iraq.
wesam.mahdi@tu.edu.iq
T.Dr. Omar Awied Saleh, College of Physical Education and Sports Sciences, Tikrit University, Iraq.
omar.awied@tu.edu.iq

Abstract:
This study aims to:

- Design specific exercises and assess their effect on increasing the lifter's distance underweight and reducing the angular deviations of the working joints (ankle, knee, and hip) in the study sample.
- Examine the impact of the specific exercises on improving Clean Lift performance in the study sample.

The researchers hypothesized that:

- The specific exercises prepared by the researchers influence increasing the distance of the lifter under the weight and reducing the angular deviations of the joints (ankle, knee, and hip) in the study sample.
- The specific exercises prepared by the researchers affect the performance of the Clean Lift in the study sample.

The experimental method was used with two groups (experimental and control) and pre- and post-tests to suit the nature of the current research problem.

The study population was deliberately selected and consisted of thirty lifters from the National Center for Sports Talent Care in Baghdad. The sample was chosen intentionally, with participants aged between 12 and 15 years, who had completed a short training period of two years. They faced challenges in the movement path of the weight and the falling distance during the jerk. The final sample size consisted of six lifters, representing 20% of the total study population.

The researchers used the SPSS statistical program to process the data obtained from the pre- and post-tests applied to the study sample.

After analyzing the data, the researchers concluded the following:

- The specific exercises designed by the researchers had a positive impact on performance.

Based on these conclusions, the researchers recommend the following:

- Incorporating specific and varied exercises in training curricula and applying them to another sample.

Keywords : (Lifters, Kinematic, Clean lift, Talent, Impact)

1. Research Introduction

1.1 Introduction and Importance of Research

Sports training is considered one of the fundamental and essential factors that contribute to athletic achievement due to its significant and effective role in developing athletes from an early age until they reach the highest levels of performance. Most researchers and coaches place great emphasis on the initial stages of an athlete’s development, as this stage represents the starting point toward achieving the desired goals—namely, reaching elite levels and entering competitive arenas. Achieving this requires addressing several aspects, including overcoming the fear barrier associated with handling weights. This depends on specialized

Proximus Journal of Sports Science and Physical Education
Volume 2, Issue 5, May, 2025
https://proximusjournal.com/index.php/PJSSPE
ISSN (E): 2942-9943

training conditions, such as exercises designed by coaches using training aids that assist in enhancing athletes' performance levels and their ability to lift weights.

The training of weightlifters must be based on sound and precise scientific principles, where errors are minimized and clearly identified, with a strong focus on technical performance. This ensures that the bar path remains close to the imaginary vertical line passing through the center of gravity and reduces unnecessary height, which increases performance difficulty. Such training helps in establishing a proper movement trajectory for each lifter.

The significance of the current research lies in the use of specialized exercises designed according to specific kinematic variables that help reduce deviations and elevations that typically accompany technical performance in weightlifting. These exercises also aim to minimize joint angles at the ankle, knee, and hip, thus contributing to improved performance outcomes.

1.2 Research Problem

The current research problem revolves around the external form of the clean and jerk lift and the associated errors and difficulties, particularly in terms of the bar path and the angles of the ankle, knee, and hip joints. These issues prompted the researchers to design specific exercises aimed at reducing deviations and elevations in the technical execution of the lift, thereby improving overall performance.

1.3 Research Objectives

The research aims to:

- Develop specialized exercises and examine their effect on increasing the lifter's distance beneath the bar and reducing deviations in the working angles of the ankle, knee, and hip joints among the research sample.
- Investigate the impact of these specialized exercises on the performance of the clean and jerk lift among the research sample.

1.4 Research Hypotheses

The researchers hypothesize that:

- The specialized exercises designed by the researchers will increase the lifter's distance beneath the bar and reduce deviations in the working angles of the ankle, knee, and hip joints among the research sample.
- The specialized exercises designed by the researchers will positively affect the clean and jerk performance among the research sample.

1.5 Research Fields

1.5.1 Human Field: Lifters at the National Center for Sports Talent Development in Salah al-Din Governorate.

1.5.2 Spatial Field: Salah al-Din Al-Ayyubi Forum Hall.

1.5.3 Temporal Field: From December 25, 2024, to March 4, 2025.

Would you like help translating the next section or formatting this into a research paper template?

2. Research Methodology and Field Procedures

2.1 Research Methodology:

The researchers employed the experimental method using two groups—an experimental group and a control group—with both pre- and post-tests, as it is suitable for the nature of the current research problem.

2.2 Research Population and Sample:

The research population was deliberately selected and consisted of lifters from the National Center for Sports Talent Development in Salah al-Din Governorate, totaling (30) lifters. The research sample was also intentionally chosen and included lifters aged between (12–15) years who had completed a short training

Proximus Journal of Sports Science and Physical Education
Volume 2, Issue 5, May, 2025
https://proximusjournal.com/index.php/PJSSPE
ISSN (E): 2942-9943

period of two years. These individuals encountered various difficulties in executing the bar path and dropping underneath the bar during the jerk phase. The sample included (6) lifters, representing (20%) of the total research population.

2.3 Experimental Design of the Research Groups:

The researchers used an experimental design consisting of two groups—experimental and control—as illustrated in Figure (1).

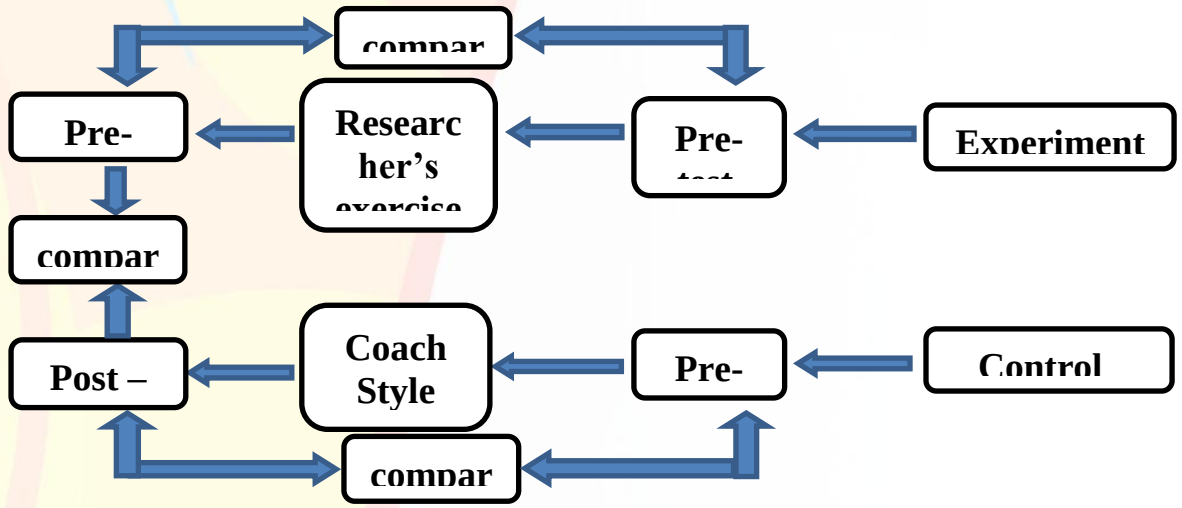

Figure (1): The Experimental Design of the Research

2.4 Tools, Instruments, and Equipment Used in Research:

- Arabic and foreign sources.
- Observation and experimentation.
- Measurement and testing.
- Data recording form.
- Weightlifting platform.
- Standard Olympic barbell.
- Weight plates of diverse sizes.
- Camera for recording the experiment.
- Laptop (DELL brand).

2.5 Research Variables:

The research variables were defined as the angles of the ankle, knee, and hip joints, in addition to the deviations and elevations accompanying the bar path during the lift and during the jerk phase, as well as the achievement in the clean and jerk lift.

2.6 Pilot Study:

The researchers conducted a pilot study on a sample of (3) lifters from the National Center for Sports Talent Development in Salah al-Din Governorate on Monday, December 25, 2024, at 3:00 PM in the Salah al-Din Al-Ayyubi Forum Hall. The purpose of the pilot study was to determine the time required to administer the test to the research sample, ensure the validity of the tools used, identify potential obstacles that might face the researchers during testing, and assess the readiness of the supporting work team.

2.7 Field Procedures

2.7.1 Pre-Test:

Proximus Journal of Sports Science and Physical Education
Volume 2, Issue 5, May, 2025
https://proximusjournal.com/index.php/PJSSPE
ISSN (E): 2942-9943

The researchers conducted the pre-test, which included the jerk and the performance in the clean and jerk lift. Both tests were recorded to determine the research variables related to the second phase of the clean and jerk (i.e., the jerk), using the motion analysis software *Kinovea*. High-speed video cameras were used to capture performance in the achievement test. One camera was placed three meters away and one meter high in front of the lifter, aimed at extracting performance-specific variables as well as joint working angles to evaluate technical execution. Additionally, two cameras were positioned on either side of the lifter (right and left), each at a 3-meter distance, to measure deviations of the barbell from the vertical line passing through the lifter's base of support. This procedure took place on Wednesday, December 28, 2024, at 3:00 PM in the Salah al-Din Al-Ayyubi Forum Hall. The researchers standardized all test-related conditions, including time, location, tools used, and method of implementation.

2.7.2 Exercises Used:

The researchers utilized a set of six exercises suitable for lifters to perform. These included:

1. Behind-the-neck jerk
2. Front jerk
3. Front press
4. Push press
5. Split jerk
6. Half dip

These exercises were distributed across three weekly training sessions with appropriate intensities. Each lifter performed the exercises individually under the supervision of the coach, based on the motion analysis data concerning elevations, deviations, and joint angles. Each lifter performed three of the specialized exercises during each training session to improve performance and elevate their technical level. The exercise program lasted for eight weeks, comprising a total of twenty-four training sessions. It began on Thursday, January 2, 2025, and ended on Thursday, March 2, 2025.

2.7.3 Post-Test:

After the coach completed the application of the training program for the experimental group, the researchers conducted the post-test on Tuesday, March 4, 2025, at 3:00 PM in the Salah al-Din Al-Ayyubi Forum Hall. The sample was granted a two-day rest period after the conclusion of the training program. The post-test was administered under the same conditions as the pre-test in terms of location, time, and tools used.

2.8 Statistical Means:

The researchers used statistical software (SPSS) to process the data obtained from the pre- and post-test applications.

3. Presentation and Discussion of Results

Table (1) Differences between pre-test and post-test results in the variables of **barbell elevation** and **barbell deviation**:

No.	Variable (Elevations & Deviations)	Unit	Athlete	Pre-Test	Post-Test	Difference
1	Distance of descent from highest point to lowest point in the preparation phase for the jerk (9)	cm	1st	15.588	12.454	3.134
			2nd	14.442	11.445	2.997
			3rd	15.244	11.998	3.226
2	Distance of push from the lowest point in preparation to the highest barbell height in the jerk (11)	cm	1st	55.636	45.322	10.314
			2nd	54.887	44.525	10.362
			3rd	54.253	43.889	10.364
3		cm	1st	3.221	3.101	0.120

Proximus Journal of Sports Science and Physical Education
Volume 2, Issue 5, May, 2025
https://proximusjournal.com/index.php/PJSSPE
ISSN (E): 2942-9943

	Distance of fall from highest barbell height at fixation point (12)		2nd	3.331	3.222	0.109
			3rd	3.121	3.101	0.020

Barbell Deviation

No.	Variable (Elevations & Deviations)	Unit	Athlete	Pre-Test	Post-Test	Difference
1	Barbell deviation at the lowest point in the preparation phase for the jerk (7)	cm	1st	5.978	3.002	2.976
			2nd	5.141	3.220	1.921
			3rd	4.889	3.001	1.888
2	Deviation at the highest barbell point during the jerk (9)	cm	1st	6.776	3.001	3.775
			2nd	6.220	3.110	3.110
			3rd	5.998	3.001	2.997
3	Deviation of barbell at fixation point from the split stance (11)	cm	1st	7.221	4.101	3.120
			2nd	7.001	4.550	2.451
			3rd	6.889	3.005	3.884

Table (2):It shows the differences between the results of the pre-test and post-test in ankle, knee, and hip angles.

Joint	Variable / Phase	Unit	Athlete	Pre-Test	Post-Test	Difference
Ankle angle	Flexion phase – Jerk preparation	Degrees	First	87	83	4
			Second	86	83	3
			Third	87	84	3
	Front knee – Jerk phase	Degrees	First	92	98	6
			Second	92	97	5
			Third	94	98	4
	Rear knee – Jerk phase	Degrees	First	80	70	10
			Second	82	75	7
			Third	80	73	7
Knee angle	Flexion phase – Jerk preparation	Degrees	First	130	120	10
			Second	132	126	6
			Third	135	127	8
	Front knee – Jerk phase	Degrees	First	130	110	20
			Second	133	115	18
			Third	132	115	17
	Rear knee – Jerk phase	Degrees	First	142	132	10
			Second	142	130	12
			Third	140	130	10
Hip angle	Flexion phase – Jerk preparation	Degrees	First	150	160	10
			Second	151	162	11
			Third	150	161	11
	Front knee – Jerk phase	Degrees	First	86	90	6
			Second	87	91	6

Proximus Journal of Sports Science and Physical Education
Volume 2, Issue 5, May, 2025
https://proximusjournal.com/index.php/PJSSPE
ISSN (E): 2942-9943

			Third	86	91	5
	Rear knee – Jerk phase	Degrees	First	86	90	6
			Second	97	91	6
			Third	86	91	5

From Table (1), it is evident that the height of the weight in the post-test was lower than in the pre-test. This indicates an improvement in the lifter's performance, as reflected by the increase in the falling distance of the weight. This improvement is attributed to the preparatory semi-squat position performed by the lifter during the applied exercises. There is a direct relationship between leg strength and the falling distance — the greater the leg strength of the lifter, the greater the falling distance beneath the weight.

As a result, the lifter can exert more force to lift the barbell upward without technical errors. The greater the lifter's strength, the more likely they are to avoid mistakes since the force generated exceeds the resistance. This allows the lifter to eliminate errors that may occur during performance — errors that both coaches and lifters always strive to avoid, as they can lead to a failed lift.

Therefore, developing strength through training and increasing leg strength significantly contributes to the lifter's success in executing the lift correctly. This conclusion was drawn by the researchers based on the results related to the height of the weight across the variables under study. As Al-Fadhli (2007) states: *"The lifter begins to produce greater force in the leg muscles in order to increase the acceleration of the weight as much as possible against the force of gravity."*[1]

The results of the deviations in Table (1) show that they were significantly lower in the post-test compared to the pre-test, which clearly enhanced the lifter's performance by avoiding technical errors and increasing the perfection of the performance. This indicates that the weight during the performance was very close to the imaginary vertical line passing through the lifter's center of gravity, which is an indicator of the lifter's improvement and high-performance capabilities. As the bar gets closer to the imaginary vertical line passing through the lifter's center of gravity, the performance becomes more ideal, requiring less effort and resulting in less energy and time consumption for better performance. The researchers attribute this development to the exercises used, as the intensity of these exercises exceeded 90%, with a focus on reducing the deviation angles in the performance and emphasizing the movement path of the bar to stay close to the imaginary vertical line. High-intensity training with a focus on optimal performance leads to rapid improvement in the lifter, which is what most coaches and lifters strive for. This was confirmed by (Al-Madhamgah, 2008) who stated, "The use of non-extreme training stimuli leads to a certain level of relative development."[2]

The researchers believe that as the intensity increases, it becomes harder to control the movement path of the weight. Therefore, the lifter should train to perform the ideal movement while gradually increasing the intensity until they reach high intensities with superior performance, to achieve the best performance at high intensity in the shortest time possible.

Table (2) shows that the joint angles in the ankle, knee, and hip were clearly smaller in the post-test compared to the pre-test. This resulted in increased flexion of the ankle, knee, and hip joints, leading to the lifter falling lower under the weight, thus optimizing the lifter's performance and increasing the fluidity. The researchers attribute this improvement to the exercises used, which enabled the lifters to perform smoothly

[1] Fadhli, Abdul Karim. *Applications of Biomechanics in Sports Training and Motor Performance* (Baghdad: Dar Al-Fikr and Al-Watha'iq, 2007), p. 171.
[2] Muhammad Reda Ibrahim Al-Madhamgah; *Field Application of Theories and Methods of Sports Training* (Baghdad, Al-Fadl Printing Office, 2008), p. 102.

Proximus Journal of Sports Science and Physical Education
Volume 2, Issue 5, May, 2025
https://proximusjournal.com/index.php/PJSSPE
ISSN (E): 2942-9943

and safely. The exercises included a suspended bar with side supports that prevented the bar from reaching the ground, and the movement path was close to the imaginary vertical line passing through the lifter's center of gravity. This helped the lifters perform better. Additionally, having weights on the opposite side helped the lifters perform the exercises easily, starting from a weight of "zero" and gradually increasing until they could lift larger weights, reaching the lifter's maximum capability. This helped them develop strength, perform correctly without technical errors, and enabled them to focus on pushing the bar with the weight without fear of making a technical mistake. This was confirmed by (Fadhli, 2007), who stated, "When the weight at the completion of the lift deviates from the line of gravity passing through the body's center, a torque is generated that leads to the lifter's imbalance and ultimately failure in performing the lift."[3]

Table (3) Shows the differences between the results of the pre-test and post-test for the clean and jerk test and the snatch lift performance.

Variable	Unit of Measurement	Player Rank	Pre-Test	Post-Test	Difference
1. **Clean and Jerk**	kg	First	70	80	10
		Second	72.5	80	7.75
		Third	70	77	7
2. **Snatch Lift**	kg	First	65	75	10
		Second	65	72	7
		Third	67.5	75	7.75

Table (3) shows a noticeable improvement in the performance of the clean and jerk, as well as the snatch lift, between the pre-test and post-test, favoring the post-test. Researchers attribute this development to the effectiveness of the exercises given to the lifters, which significantly contributed to the improvement of the clean and jerk and snatch lift performances. These exercises were characterized by a gradual increase in load intensity, with a focus on performance and the path of the bar during execution, which helped the lifters master the proper technique and reduce errors. This was achieved by focusing on the height of the weight drop, deviations, and the angles of the ankle, knee, and hip joints. All these factors played a prominent role in improving the performance level, which in turn reduces errors. Furthermore, the researchers gradually increased the intensity while improving the performance level until reaching the lifter's maximum weight capacity. This led to the lifters mastering the clean jerk and snatch lifts with high fluidity and without errors. Therefore, the lifters' performance improved significantly, approaching the ideal performance in a shorter time and with less effort. This aligns with what Hussein (1998) mentioned: "Muscular strength is a key element in improving performance in events that require overcoming significant resistance, such as weightlifting, wrestling, gymnastics, and athletics."[4]

4- Conclusions and Recommendations:

4-1 Conclusions:

The researchers concluded the following:

- The use of specific exercises designed by researchers had a positive impact on the level of performance.

4-2 Recommendations:

Based on the conclusions, the researchers recommend the following:

- The use of specific and varied exercises in training programs and their application on another sample.

[3] Sarih Abdul Karim Al-Fadhli; *The Source Previously Mentioned*, 2007, p. 157.
[4] **Qasem Hassan Hussein**; *Science of Sports Training at Different Ages*: (Egypt, Dar Al-Fikr Al-Arabi, 1998), p. 145.

Proximus Journal of Sports Science and Physical Education
Volume 2, Issue 5, May, 2025
https://proximusjournal.com/index.php/PJSSPE
ISSN (E): 2942-9943

References:

- **Sarih Abdul Karim Al-Fadhli**; *Applications of Biomechanics in Sports Training and Movement Performance*: (Baghdad, Dar Al-Fikr and Documents, 2007).
- **Abdul Moneim Hussein Saber Al-Dulaimi**; *The Effect of Training at Maximum and Supra-Maximum Intensities on Some Kinematic Variables of the Weight Movement Path in Developing Maximum Strength and Performance of the Snatch (Jerk) for Young Weightlifters*: (Unpublished PhD Thesis, University of Baghdad, 2009).
- **Qasem Hassan Hussein**; *Sports Training Science for Different Age Groups*: (Egypt, Dar Al-Fikr Al-Arabi, 1998).
- **Mohammad Reda Ibrahim Al-Madamgha**; *Field Application of Training Theories and Methods*: (Baghdad, Maktabat Al-Fadl for Printing, 2008).
- **Mufti Ibrahim Hamad**; *Modern Sports Training, 1st Edition*: (Cairo, Dar Al-Fikr Al-Arabi, 1991).

No.	Exercise Name	Notes
1	Front Jerk	These exercises were applied over a period of eight weeks, with the intensity ranging from (70% - 90%) to the athletes' maximum capacity. The goal was to focus on performance, stabilize good movement paths, and focus on research variables. The exercises started with an intensity of (70%) and gradually increased to (90%) once superior performance was ensured.
2	Front Press	
3	Bench Press	
4	Jerk with Legs Wide	
5	Half Deadlift	
6	Back Jerk	