

Strength Training and Snatch Performance Among Young Weightlifters : Latihan Kekuatan dan Kinerja Angkatan Snatch pada Atlet Angkat Besi Muda

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Background: Developing lower-limb and trunk strength is essential for improving technical performance in Olympic weightlifting. Specific Background: Core stability and leg power directly affect barbell trajectory and lifting speed during the snatch movement. Knowledge Gap: Few studies have quantitatively examined the relationship between strength training variables and mechanical parameters (H1 and D1) in young athletes. Aims: This study aimed to determine the role of basic strength training in improving snatch speed and completion performance among junior weightlifters. Results: Findings revealed significant improvements in H1, D1, and snatch velocity after the training program compared with the control group. Novelty: The study provides new empirical evidence linking fundamental strength development to biomechanical efficiency in youth lifting. Implications: Results recommend incorporating structured core and leg strength programs into early-stage weightlifting training curricula.

Highlights:

- Basic strength training improves snatch velocity and control.
- Core and leg muscles enhance biomechanical stability.
- Structured training benefits young weightlifters' performance.

Keyword:

Strength Training, Weightlifting, Biomechanics, Youth Athletes, Snatch Technique

Introduction

Many countries around the world place great importance on sports, making them a priority in order to achieve sporting accomplishments and raise the country's profile in international forums. Development in sports is evidence of a country's prosperity and progress. Weightlifting is one of the Olympic sports, with practitioners and followers in many countries, characterized by great strength, willpower, and determination in lifting heavy weights and breaking records. Weightlifting is a competition consisting of two events: the snatch and the clean and jerk. Both events rely heavily on strength and skill performance. Therefore, coaches work to develop starting power, which is responsible for recruiting the largest possible number of motor units instantly at the start of the movement from zero, such as the start of the lift in the snatch or the clean and jerk in weightlifting, or the moment of starting from the starting position in the 100m race. This includes strength training, as well as performance, by improving the bar's movement path in terms of height, deviation, and speed.[1]

Focusing on the muscles working in lifting the bar, especially the muscles (legs and trunk) responsible for lifting the bar from the drum to the top, this matter requires mobilizing the greatest possible amount of strength in the leg and trunk muscles to lift the bar, since the weight is in a state of rest and needs a great force to change its state from rest to movement, as stated in Newton's first law: "Everybody seeks to continue in its state of rest or movement unless acted upon by another force to change its state".[2] Therefore, the researcher believes that the problem of the research is based on the lack of interest or lack of great focus by the trainers in the stage of removing the weight from the drum (the first pull) in providing intensive training for the leg and back muscles working in this stage, as well as for the correct technique in lifting the weight. The researcher sees great importance for this stage (the stage of removing the weight) because the success of the lift depends on it to a large extent, since "the more the force exerted, the more the amount of movement increases, especially transitional movements, while in circular movements it depends on the distance of the point of influence of the force from the axis of rotation".[7] From here it becomes clear The importance of this study is to examine the extent to which the

development of maximum strength in the leg and back muscles affects the speed of snatching through deflection and elevation at this stage, given its positive impact on the success of the snatch and achieving high scores in local and international competitions and championships.

Purpose of the Study:

1. To identify the differences between the control and experimental groups in the pre- and post-tests in the variables (H1, D1), snatch speed, and snatch completion.
2. To identify the differences between the control and experimental groups in the post-tests in the variables (H1, D1), snatch speed, and snatch completion.

Method

The researcher used the experimental design using the two equivalent groups method with pre- and post-measurement. The research community was determined as the weightlifting quadrupeds of Al-Rafidain Sports Club in Al-Qadisiyah Governorate for youth weightlifting, numbering (12) weightlifters, aged under (17) years. The mean of their calculated weights and their deviations was (70.05 ± 15.2), while their biological ages were (15.6 ± 1.34). The sample was divided into two control groups (6) weightlifters and an experimental group (6) weightlifters after equivalence was achieved for the two research groups, the control and the experimental, in the study variables, as in Table (1). The value of (sig) showed that it was greater than (0.05), which indicates that the two groups were equivalent in the research variables.

Table 1. shows the equivalence of the two groups in the dependent variables.

Variables	Units	Control		Experimental		(T) value	Sig. value
		Mean	SD	Mean	SD		
H1	Cm	49.167	1.472	50.167	1.941	1.006	0.338
D1	Cm	4.500	0.548	3.833	0.753	1.754	0.110
Gravity speed	M/S	0.183	0.024	0.178	0.025	0.353	0.731
Achievement	Kg	74.833	5.154	75.833	4.916	0.344	0.738

Study variables:

1. H1: The vertical distance, representing the height of the weight's deepest deflection toward the weightlifter from the (imaginary) gravity line during the first pull .[4]
2. D1: The horizontal distance representing the weight's deepest deflection toward the weightlifter during the first pull .[4]
3. Weight removal speed: The weight's speed from the moment the weight is removed from the drum to the end of the first pull .[9]
4. Snatch completion: Each weightlifter is given three attempts, according to international weightlifting law, to lift the maximum weight for a successful attempt from the right and left sides of the weight's path for each weightlifter.[9] The two images illustrate the kinetic path of the snatch lift with the studied variables.

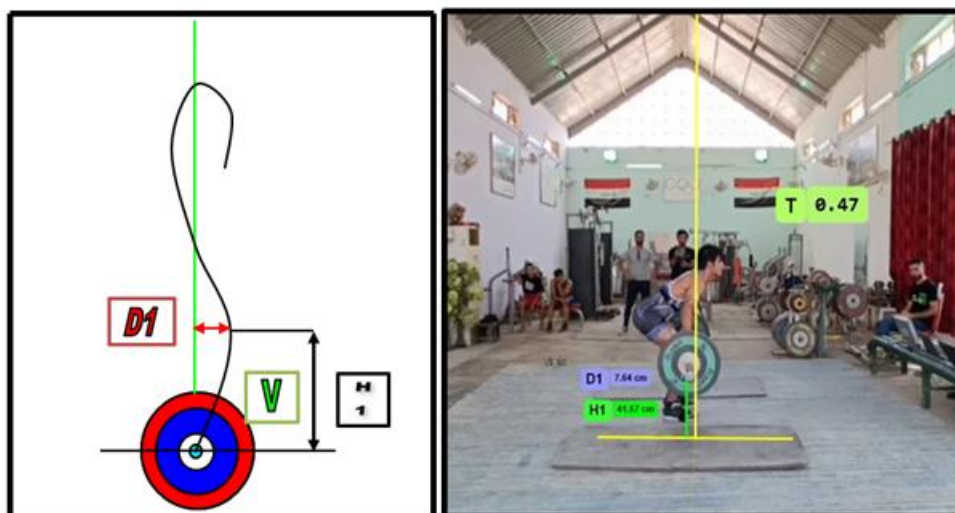


Figure 1. illustrate the kinetic path of the snatch lift with the studied variables

Main Experiment:

Pre-tests were conducted for young weightlifters on the dependent variables (H1, D1, weight speed, snatch lift) in the weightlifting hall at the College of Physical Education and Sports Sciences - Al-Qadisiyah University on Tuesday, September 17, 2024, at twelve noon, for the two research groups. After that, basic strength training was implemented for the leg and trunk muscles, starting from Friday, September 20, 2024, until Tuesday, November 12, 2024. The number of training units was (24) units, over a period of (8) weeks, at a rate of (3) training units per week for the experimental group sample, while the control group remained on the trainer's curriculum. The basic strength training included maximum strength exercises by releasing the weight from a stationary position to a moving position, and so on, without continuity in performance, to accustom the weightlifter to breaking the weight's inertia during the beginning of the lift, as this stage is one of the most important stages in the success of the lifts. After the end of the training period, and to identify its effect on the weightlifters, a post-test was conducted. On the same variables studied in the pre-test, considering the same test conditions on Friday, November 15, 2024, at twelve noon, for the two research groups. This is a model of a training unit for the research sample, the experimental group.

Table 1. Sample training unit.

Department	time	Exercises	Exercise intensity	Training volume		Rest between sets	Rest between exercises
				repetition	The ladies		
Main	60 Min	Seated Snatch	80%	4	3	3Min	4Min
		Ground Snatch		5	3		
		Deadlift		6	3		
		Front Dumbbell		6	3		

Result & Discussion

Results:

Table 2. shows the differences in the study variables in the pre- and post-tests for the control group.

Measurements	Units	Pre-test		Post-test		(T) value*	Sig. value
		Mean	SD	Mean	SD		
H1	Cm	49.167	1.472	51.667	2.160	2.953	0.032
D1	Cm	4.500	0.548	4.167	0.753	0.791	0.465
Gravity speed	M/S	0.183	0.024	0.197	0.016	1.581	0.175
Achievement	Kg	74.833	5.154	77.500	5.244	2.902	0.034

* The significance of the variables when the Sig value is less than (0.05)

Table 3. shows the differences in the study variables in the pre- and post-tests for the experimental group

Measurements	Units	Pre-test		Post-test		(T) value*	Sig. value
		Mean	SD	Mean	SD		
H1	Cm	50.167	1.941	59.167	3.971	5.031	0.004
D1	Cm	3.833	0.753	2.667	0.816	2.907	0.034
Gravity speed	M/S	0.178	0.025	0.255	0.045	3.637	0.015

Achievement	Kg	75.833	4.916	84.333	5.465	4.029	0.010
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*The significance of the variables when the Sig value is less than (0.05)

Table 4. shows the differences in the study variables in the post-test for the control and experimental groups.

Measurements	Units	Control group		Experimental group		(T) value*	Sig. value
		Mean	SD	Mean	SD		
H1	Cm	51.667	2.160	59.167	3.971	3.374	0.007
D1	Cm	4.167	0.753	2.667	0.816	3.374	0.007
Gravity speed	M/S	0.197	0.016	0.255	0.045	2.400	0.037
Achievement	Kg	77.500	5.244	84.333	5.465	5.491	0.000

*The significance of the variables when the Sig value is less than (0.05).

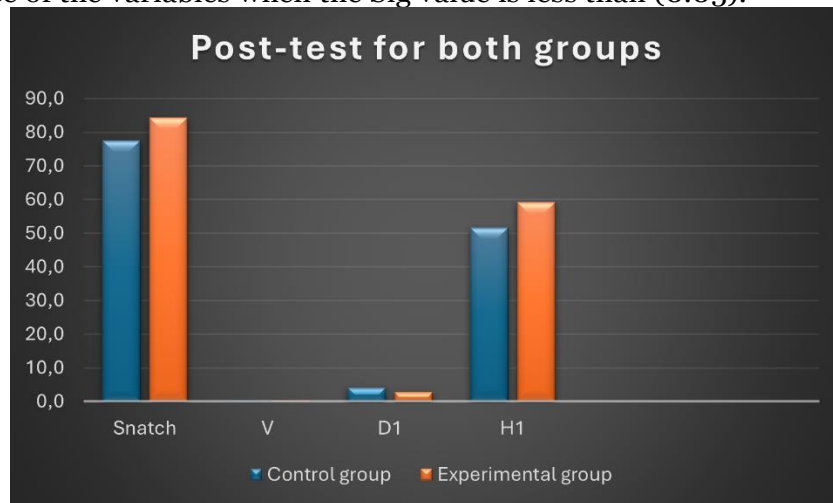


Figure 2. Show the posttest for both groups

Discussion

It is clear from the above tables (2, 3, 4) that there are significant differences in the pre- and post-tests of the control and experimental groups. The control group achieved significant improvement in the variables (H1, achievement), while there was no significant superiority in the variables (D1, weight-removal speed). This indicates that the control group's trainer focused on technique and increasing strength at the expense of weight-removal speed, which is of great importance in significantly facilitating the task of lifting weights. However, the experimental group achieved superiority in all studied variables. This indicates that the training implemented by the researcher achieved the goal of increasing the initial height and reducing the initial deviation from the moment the weight is removed from the ground to knee level. This was thanks to the initial strength training that focused on the muscles involved in the phase of removing the weight from the ground to knee level, which is one of the most difficult phases for weightlifters because it requires the mobilization of great force to move the weight in the direction opposite to the force of gravity. Therefore, the researcher focused his training on the muscles. (The legs and the trunk) because they are the main muscles at the moment of breaking the inertia of the weight (stability) and to change its state requires great strength in the muscles of the legs and the trunk, thanks to which development has occurred due to continuity in training over the course of (8) weeks and the resulting adaptation requires an appropriate period of time to have an effect on the body's functional systems which is reflected in the level of technical performance of the lift. This is what (Abu Al-Ala and Ahmed) confirmed, quoting (Wilmore and Castle) "that most of the changes resulting from training occur during the first period of the program within 6-8 weeks" .[1] Also, the advantage of primitive strength training is overcoming the inability to lift weights from a stationary position, and this matter requires additional muscular strength capable of moving the weight, unlike continuity, which helps in completing the motor duty more easily, as "the body or tool to be moved is fixed and we want to give it a speed of (10 m/s), the matter requires a certain amount of strength, but if the body or tool itself is in a state of movement, even if slow, to give it the same speed, then the force used is less than in the first case, and this explains to us the importance of movements Preparatory.[5]

And the improvement in the (H1) variable increased the weightlifter's ability to lift the weight from the ground at the appropriate speed, which led to the correct extension of the weightlifter during the first pull phase

thanks to the training provided that increased the weightlifter's pulling strength, which led to raising the level of the point of the deepest internal deviation towards it, "which qualifies the weightlifter to adopt the correct and appropriate position for the snatch, in addition to the position the body adopts during the kneeling phase, especially the trunk position that approaches the vertical position, qualifying it to achieve greater force" .[3] This also applies to the (D1) variable, which is the distance the weight is from the body during the first pull, and the closer the weight is to the body, the less resistance the weight produces due to reducing the resistance torque, as "the art of performing the snatch lift well is to create a movement path in which the weight deviates more towards the weightlifter during the first pull phase" .[6] (Wissam, 2009) confirms, quoting Wadih, that "at the moment of lifting the weight from the ground, the weightlifter directs his attention to bringing the center of gravity closer to the body." The weight of the barbell is shifted from the center of gravity of the body (the center of gravity), and this occurs by tilting the weightlifter's body backwards to place the center of gravity above the base of balance. By achieving this position, the weightlifter maintains his balance and can use his strength effectively .[8] As for the current development in the variable (weight speed), "the increase in weight speed is a good indicator of the weightlifter's ability, as it is affected by the two factors of speed and strength, and increasing them enables the weightlifter to overcome the resistance of the weight with heavier weights" .[9] As a result of the development that occurred in all the variables studied for the experimental group, it was positively reflected in the weightlifters' achievement in the snatch lift. The researcher believes that focusing on small particles and their differences in closed games contributes significantly to improving the weightlifters' numbers. Therefore, the researcher devoted this study to this because "the goal of the training process is to reach the best methods that work to raise the level of the player's achievement, considering that achievement is the focus of attention in the training process".[10]

Conclusion

1. The initial strength training focused greatly on mobilizing the largest number It is possible for muscle fibers to lift the weight and change its state from rest to movement.
2. The increase in muscle strength resulting from the given exercises helped reduce the weight's outward deflection, which reduced the resistance torque, contributing to the economy of effort.
3. Reducing the deflection (D1) reduced the force exerted by saving effort and consequently increased the weight's height in the first pull (H1). This increased the weight's speed during the lift from the ground to the end of the first pull.
4. The clear improvement in the studied variables, given their significant importance in completing the lift correctly, positively impacted the development of the youth snatch lift.

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