# The influence of rotational exercises on strength indicators and competitive lift technique in elite weightlifters

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## Abstract

This article examines the influence of rotational exercises on the performance indicators and competitive lift technique of elite weightlifters. The study is based on modern methods for assessing functional and strength indicators, biomechanical control of exercise technique, and digital monitoring of the training process. It has been proven that the systematic inclusion of rotational exercises in strength training contributes to an increase in maximum strength indicators and technical stability when performing competitive lifts [1,2]. The methodology for planning and integrating these exercises into the training process is substantiated.

**Keywords:** rotational exercises, weightlifting, sports performance, strength training, elite athletes, biomechanical control.

## Introduction

Weightlifting demands a high level of strength, coordination, and joint stability. Research indicates that rotational exercises, which are aimed at strengthening the rotator musculature of the shoulder girdle and hip joints, improve body stabilization and movement efficiency [1,2]. However, the existing data on the impact of these exercises on the performance of elite weightlifters are limited.

The effect of rotator exercises on athletic performance indicators and competitive lift technique in weightlifters has been explored in the scientific literature by a number of authors, including A.V. Pakov, V.S. Avanesov, and R.M. Matkarimov, as well as in research by A.Z. Khodjaev on improving barbell lifting technique in elite weightlifters.

The relevance of this study is driven by the need to increase the effectiveness of athlete training and reduce injuries under high competitive loads.

The purpose of the study was to determine the effect of rotator exercises on the strength indicators and competitive lift technique of elite weightlifters.

## Methods

Literature review, questionnaires, pedagogical observation, expert assessment, heart rate monitoring, pedagogical experiment, and methods of mathematical statistics.

The study involved 18 elite weightlifters (MS and MSIC) aged 16–24, with 4 to 8 years of competitive experience.

An experimental-control design was used over a 12-week period. The subjects were divided into a control group (standard strength training) and an experimental group (which additionally performed rotator exercises).

*The experimental group performed a set of rotator exercises 5 times a week, which included:*

*shoulder girdle rotation with resistance bands;*

*external and internal shoulder rotation;*

*scapula and shoulder joint stabilization exercises;*

*hip rotation exercises with additional load.*

The control group followed a standard training regimen without special rotational exercises.

Strength indicators: maximum results in the snatch and the clean and jerk (kg).

Biomechanical analysis of technique: video recording and sensors.

Functional monitoring: post-exercise recovery indicators.

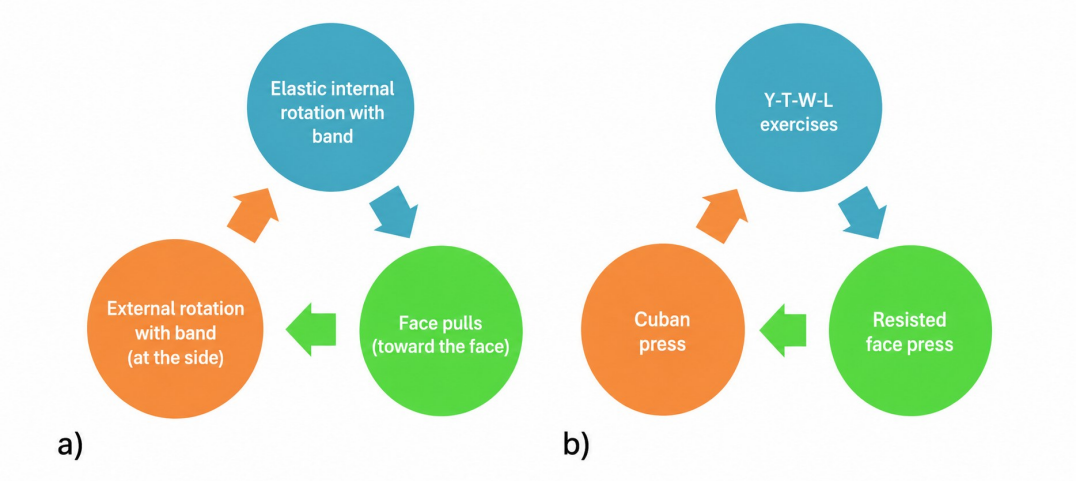
Statistical analysis: analysis of variance, t -test, and correlation analysis to assess the significance of differences between groups ($p<0.05$).

## Results and discussion

Biomechanical analysis revealed a 12% decrease in the amplitude of uncontrolled shoulder girdle movements in the experimental group. Functional monitoring confirmed improved post-training recovery and a reduction in signs of muscle overstrain.

Rotator exercises positively impact technique stabilization and strength performance, which is consistent with modern research on strengthening the rotator musculature [1,2,5,7,11,14]. Integrating these exercises into

**Fig 1. Rotator exercises for elite weightlifters**
***Note: a)*** *$A_1$-group for snatch specialists* ***b)*** *$B_1$-group for clean and jerk specialists*




the training process reduces injury rates and enhances competitive performance.

As is well known, injury prevention and recovery in elite athletes is one of today's most pressing topics. In this regard, to facilitate recovery after heavy loads and improve training quality, we used specially developed exercises in our study. Exercises for the rotator cuff (which stabilizes the shoulder joint) are very important for elite athletes in sports such as weightlifting, wrestling, boxing, gymnastics, and swimming.

The experimental group showed a significant increase in maximum results in the snatch and the clean and jerk compared to the control group.

The main benefits of these exercises for athletes are listed below:

1. Strengthening the shoulder joint. The rotator muscles maintain the stability of the shoulder joint. These exercises increase the strength and stability of the shoulder.

2. Injury prevention. The muscles of the shoulder girdle are heavily used in weightlifting. Rotator exercises maintain muscle balance and reduce the risk of dislocation, shoulder strains, and joint inflammation (impingement syndrome).

3. Increases the amplitude of motion. The athlete's shoulder can move freely and fully, which facilitates the correct execution of the technique.

4. Supports powerful movements in sports. Developed rotator muscles, like the thigh muscles, require a long recovery period: in the snatch and the clean and jerk. Rotational exercises help maintain muscular and structural balance. During this study, exercises recommended by Chinese specialists were also used effectively.

"Rotational exercises" performed by elite weightlifters during the preparatory period are presented; this method is primarily performed using special resistance bands. "Rotational exercises" are subdivided into exercises for developing internal rotation and shoulder rotation. First, athletes are introduced to "rotational exercises" based on the coach's instructions (see Table 2).

- Improved mobility expands the range of motion of the spine, pelvis, and shoulders, enhancing adaptability.
- A healthy lower back strengthens the core muscles and provides back stability.
- Increased strength and athletic performance - in combat and dynamic sports, the transfer of power through body rotation plays an important role. Core muscle strength actively engages the oblique and deep abdominal muscles.
- Improved mobility expands the range of motion of the spine, pelvis, and shoulders, and increases flexibility.
- A healthy back strengthens the core muscles and provides spinal stability.
- Increased strength and athletic performance: In combat and dynamic sports, transferring power through body rotation plays an important role.
- Core strength actively engages the oblique and deep abdominal muscles.
- Reduced risk of injury: Prevents excessive strain on unprepared areas by stabilizing the body.

The research methodology supports the recommendation to integrate rotational exercises into the training of elite weightlifters, with

**Table 3. Description of "rotational exercises" performed by elite weightlifters during the preparatory period**

| No. (Item No.) | Activity | Primary Objective | Execution Method (Description) | Sets and Repetitions |
|---|---|---|---|---|
| 1. | **Activating Internal and External Rotation** | Strengthening External Rotation | Rotate the handle or cable outward with your forearm, keeping your elbow bent at a 90° angle. | *2-3 × 12-15 reps* |
| 2. | | Strengthening Internal Rotation | Pull the handle inward, keeping your elbow bent at 90°. The movement should only come from the forearm. | *2-3 × 12-15 reps* |
| 3. | **Shoulder Rotator Activation** | Deep Rotator Cuff Activation | Lying on your side, press your bottom elbow to your body and hold a light weight. Perform an outward rotation. | *3 × 10-12 reps* |
| 4. | | Activating the Shoulder Stabilizer Muscles | Raise a kettlebell at a 30-45° angle in the frontal plane without bending your elbow. | *3 × 10-15 reps* |
| 5. | | Activating the Posterior Shoulder Muscles | Lying on your stomach, raise your straight arms up (I), slightly out to the sides (Y), and wide out to the sides (T). | *2 × 8-10 reps each* |
| 6. | | Strengthening the Shoulder Muscles | Walk steadily with a barbell or kettlebell held overhead (using a light weight). | *3 × 30-40 meters* |

load periodization and functional state monitoring.

## Conclusion

Systematic performance of rotational exercises increases maximum strength indicators and stabilizes the execution technique of competitive lifts.

The inclusion of rotational exercises in the preparatory and pre-competitive periods not only positively affects the athlete's strength indicators when performing competitive lifts with heavy weights, but also prevents injuries by improving joint stabilization. It is recommended to integrate rotational exercises into the training programs of elite weightlifters, accompanied by load control and biomechanical monitoring.

For the elite weightlifters in the experiment, the set of rotational exercises, aimed at maintaining work capacity, had a positive impact on active recovery by helping to eliminate fatigue factors after a training cycle for major competitions, and it facilitated adaptation to planned heavy loads.

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