



Methodology for the Development of the Technique of Surge in Weightlifting

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Annotation: Based on the biomechanical analysis of the snatch technique, temporal, spatial and spatio-temporal ranges for the main phases in the snatch for different weight categories of male weightlifters were identified. Regression equations are proposed that allow calculating the quantitative values of key biomechanical characteristics, taking into account the weight of the athlete. An algorithm for urgent pedagogical correction of the snatch technique in weightlifting has been developed.

Keywords: weightlifting, snatch, sports equipment, biomechanical characteristics, biomechanical analysis.

Introduction. The modern development of sports is characterized by the rapid introduction of new information technologies into the training and competitive processes, which serve as a tool for obtaining the necessary biomechanical data.

To study the kinematic and dynamic characteristics of movements, optical-electronic systems, mechanical-electrical and electro-physiological research methods are widely used [1, 2]. At the same time, many of the listed techniques began to be used not only in laboratory conditions, but also in high-ranking competitions [3, 4, 5].

To date, studies related to the biomechanical analysis of the technique of sports exercises have shown their effectiveness in gymnastics [6], athletics [7, 8]. The results obtained allow us to count on the effectiveness of using this approach when studying the snatch technique in weightlifting. In this regard, in our opinion, it is relevant to determine the biomechanical characteristics of the snatch, and the use of the results obtained in the formation of the rhythmic structure of a competitive exercise in the pedagogical process can significantly increase its effectiveness [9, 10].

Determining the model characteristics of exercises is possible only after processing the extensive statistical material of recording the movements of real athletes [11, 12, 13]. To obtain it, we conducted several series of video filming of the snatch technique in weightlifting among athletes of high sports qualification.

Preliminary pedagogical structuring of the weightlifting exercise snatch [14, 15] with subsequent biomechanical analysis of this exercise made it possible to establish key indicators, the achievement of which significantly affects the sports result and, ultimately, determines the success of a competitive attempt. We attributed the following biomechanical characteristics to such indicators [16]:

1. Vertical speed of the rod in the period of "undermining".
2. The linear speed of the athlete's departure under the bar in the "undermining" period.
3. Difference between the maximum height of the bar overhang and the coordinate of the shoulder joints in the "undermining" period.
4. The maximum linear speed of the rod in the period of "acceleration".
5. The difference between the height of the bar after lifting and the height in gray.

However, we note the following facts:

- the temporal characteristics of the movement are the most quickly obtained characteristics of the express analysis of the videogram;
- Speed characteristics are directly dependent on the time indicators of the jerk.

Then, in order to reduce the time of operational correction of the athlete's technical actions, the time intervals of the main periods of the jerk can serve as the primary criteria for assessing the rationality of the athlete's technical actions.

Further, based on the obtained data, regression models were built to determine the quantitative values of key biomechanical characteristics [17, 18].

Without disputing the thesis about the individuality of the technique of a particular performer, at the same time it is necessary to indicate that any competitive exercise must satisfy certain parameters, without which it is impossible to solve the set motor task. That is, for any sports exercise, you can specify the corridors, within which there should be numerical values of the biomechanical characteristics of movement. Having collected sufficient material of successful competitive snatch attempts in weightlifting, it becomes possible to use regression equations to determine the proper biomechanical parameters of movement depending on the athlete's weight category.

However, it is necessary to answer the question of determining the exact upper and lower boundaries of the corridor, that is, to indicate such corridors within which the variations of indicators do not lead to uncompensated motor errors and are acceptable in terms of the successful implementation of the approach.

Calculation of the range of corridors for the previously identified key biomechanical parameters of the snatch made it possible to build the following models of the proper characteristics of the studied competitive exercise:

- model 1 - the time duration of the "acceleration" period;
- model 2 - the time duration of the phase "reducing the load";
- model 3 - the time duration of the period of "rise";
- model 4 - the maximum speed of undermining the rod in the period of "acceleration" along the OY axis;
- model 5 - the difference between the maximum height of the bar above the support and the coordinates of the shoulder joints in the period of "acceleration";
- Model 6 - the speed of going under the bar in the period of "acceleration".

So, in the arsenal of the coach there are equations, substituting into which the mass of the athlete, he gets the quantitative values of the proper biomechanical parameters in the snatch.

The developed regression equations make it possible to determine the quantitative values of the proper biomechanical characteristics of the snatch for athletes of any weight category. Then, by recording the indicators of the athlete's real movement, it becomes possible to organize an urgent pedagogical correction of the weightlifter's technical actions.

Conclusions. As a result of the study, the following generalized conclusions can be drawn:

1. Temporal, spatial and spatio-temporal ranges for the main phases in the snatch for different weight categories of male weightlifters have been identified. It has been established that these characteristics do not obey a linear law with a change in the weight category.
2. Regression equations are proposed that allow calculating the quantitative values of key biomechanical characteristics, taking into account the weight of the athlete. The acceptable accuracy of the model is provided by polynomials of the third degree.

3. The formative pedagogical experiment proved the effectiveness of the use of regression models for quantitative description of the technique of the competitive exercise "snatch" in the training process of weightlifters.

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