

## COMPARATIVE ANALYSIS OF EXERCISE EQUIPMENT JERK IN WEIGHTLIFTING AND WEIGHT SPORT

Djim V.Y.

Kharkov State Academy of Physical Culture

**Annotation.** The approaches to the analysis of exercise equipment in weightlifting and weight sport. The method of photographic images and analysis videogram movement. Exercise performed once with the weights of 50, 65 and 75% of the maximum limit. Kettlebell snatch carried out using two dumbbells weighing 32 kg each. An improved technique spurt in which efficiency is the greatest. It is noted that under the dash with undergrowth performed the lead from the platform heels. This technique does not allow the movement of the full potential of the athlete. Technique of the jerk with full support legs for the entire period lifting a barbell. Found that it reduces the lift rod and provides the trajectory of the rod with the continuous growth to its final value.

**Keywords:** comparative analysis, spurts, weight lifting, movement technique.

### Introduction

The problem of improvement of sportsmen's technical training in weight lifting is the most important for organization of sport training, as far as for obtaining the best results it is necessary to have optimal technique, which permits for sportsman to lift maximal weight with minimal efforts [1-3]. Analysis of scientific methodic literature and practical experience of weight lifting showed problems in technical training of weight lifters. This problem was dealt with by a number of known specialists in physical culture and sports (V.G. Oleshko, L.S. Dvorkin, A.N. Vorobyov, Z.S. Arkhangorodskiy, N.I. Galashko, A.S. Medvediev et al.), as well as foreign scientists [13-20].

However the problem of complex appraisal of preparedness level in weight lifting and estimation of its separate components has not been paid sufficient attention to. As one of perspective directions technique of snatching with keeping full support of legs during all period of weight lifting was offered that shortens time of weight lifting and ensures trajectory of weight movement with its continuous rising up to final position. In accessible scientific-methodic literature there widely discussed questions, connected with estimation of sportsmen's level of preparedness in different kinds of sports. In the given context, with equal efforts efficiency increases only if sportsman has optimal technical level [1-3, 4-7]. Thus, optimization of technique ensures increasing of effectiveness in weight lifting that conditioned urgency of present work.

The work has been fulfilled as per combined plan of research works in field of physical culture and sports in Ukraine "Methodological and organizational principles of individual norm's determination of human physical condition", registration number: 0111U000192.

### Purpose, tasks of the work, material and methods

*The purpose of the research* was comparative analysis of snatching technique in weight lifting with the help of photo-registration and analysis of video-records of movements.

*Materials of the research.* The research was built in the following way. The tested G.-s, who was master of sports in separate weights lifting and candidate master of sports in weightlifting, was video-recorded in the process of snatch exercises in both kinds of lifting. Exercise was fulfilled as single one with load of 50%, 65% and 75% from maximum, separate weight snatch was fulfilled with two weights, 32 kg each. At video-grams section 0-1 corresponds pre-lifting, 1-2 – to squatting, 2-3 – to squatting without support and 3-4 – finalizing lifting of weight. We analyzed angle of inclination and duration of movement phases.

### Results of the research

The main task of sportsmen training's improvement in weight lifting implies mastering of weight lifting technique as well as using of optimal technique for achievement of maximal result [10-12]. In our researches we chose exercise "snatch". The task was to find the best technique for fulfillment of this exercise, with which sportsman would spend minimal efforts for lifting maximal weight [8-10].

When organizing the experiment we set task – to fulfill single exercise with weights 50%, 65% and 75% from extreme maximal weight [5]. With it, we recorded trajectory of weight bar's movement. On the base of movement's trajectory of the marked point of holistic kinematic system we determined variation of their movement with increasing of weight. During experiment we noticed that at the moment of pre-lifting (fig.1) sportsmen stands on tiptoes in order to develop further effort.



Fig.1. Technique of competition exercise “Classic snatch”

Results of analysis of diagram 1 permit to specify, depending on trajectory of movement, productive sectors and affirm, that in point 1 there is maximal height of pre-lifting, then sportsman squats that requires additional efforts owing to inhibition of lifting weight. Downward sportsman’s movement with weight is marked by segment 1-2. After this sportsman is in supported squat, when holding weight requires significant energy consumption. This section corresponds to interval 2-3, which is about 25% of exercise time. In general 0.43 seconds of exercise time are spent not productively. Speed of weight’s lifting at intervals 0-1 and 3-4 is a substantial indicator of tiredness in involuntary phase of snatch. Segment 3-4 marks trajectory of lifting phase, with given weight, in finalizing phase of the exercise.

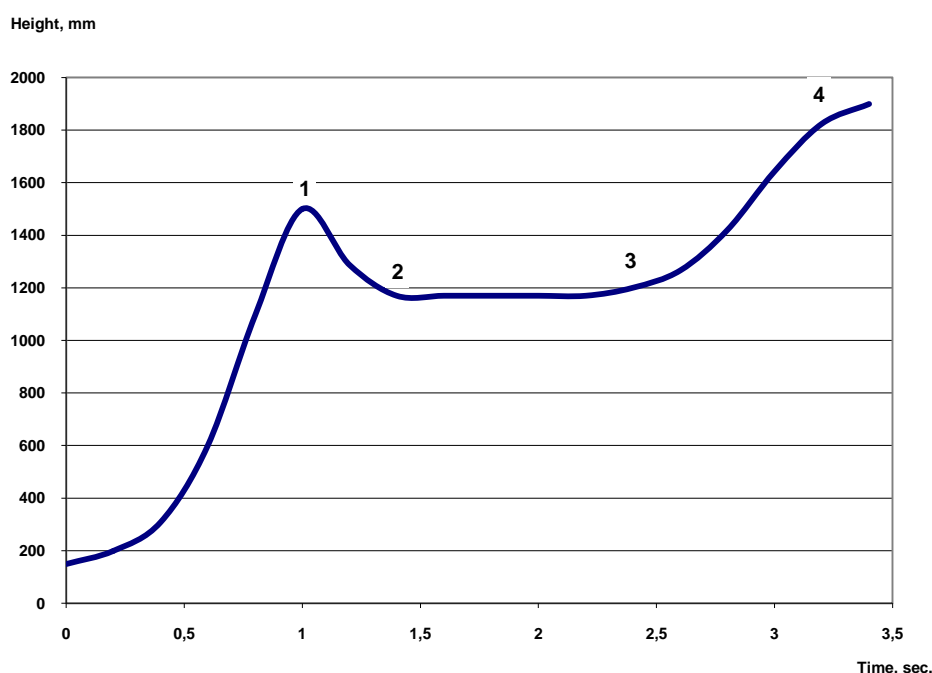
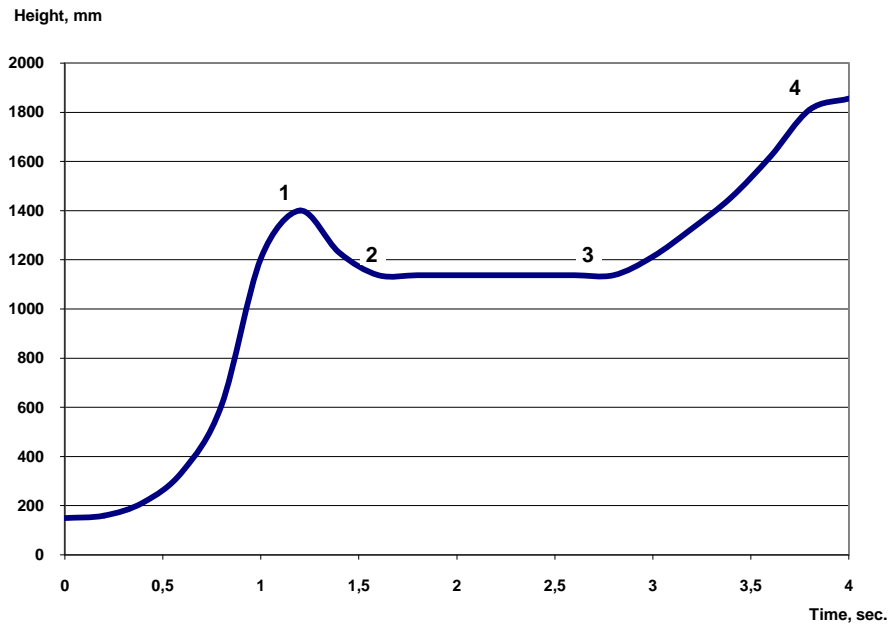
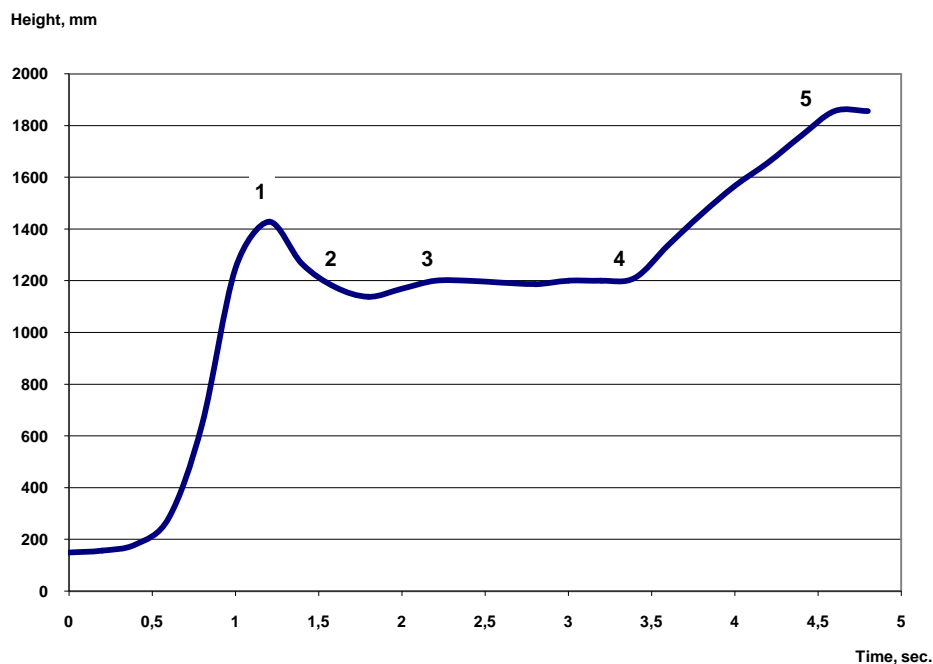


Diagram 1. Results of snatch with weight 50% from maximal

In diagram 2 sportsman works with 65% weight from maximal value. In this case for squatting sportsman spends more time (segment 1-2). In similar way he spends more time for holding weight in squatting position. (2-3). Lifting phase is more gentle that points at higher tiredness; besides, it is more difficult for sportsman to stand upright with this weight.



*Diagram 2. Results of snatch with weight 65% from maximal*



*Diagram 3. Results of snatch with weight 75% from maximal*

In this diagram we can see that after taking squat position (segment 1-2) sportsman sits lower than in previous attempts (segment 2-3), holds weight (segment 3-4). He finalizes lifting of weight but slower than it was in segment (0-1). The more time sportsman holds weight in squatting position and the heavier weight is, the more energy he spends in not productive phase (3-4) and the more difficult for him to stand upright. When training technique of separate weights lifting we paid attention to absence of sub-squat, which is characteristic for weight lifting snatch. To compare effectiveness of energy consumption with lifting of separate weight and weight lifting of equal mass we carried analysis of video-grams of exercises, snatching of separate weights.

In this case sportsman carried out snatch of two weights, total mass of which was equal to mass of weight 65% (see fig.2.).



Fig.2. Technique of snatch by two arms (32 kg) with heels' full contact with floor

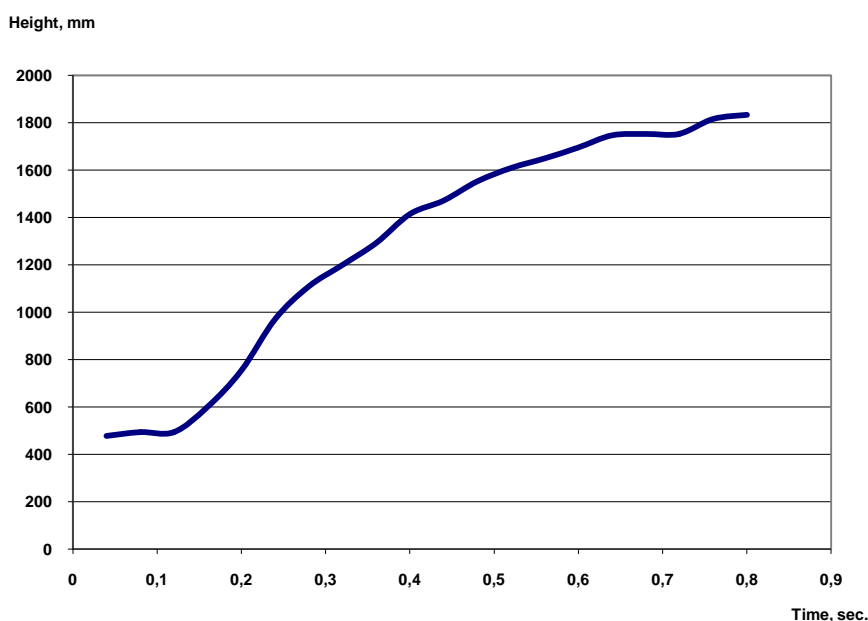


Diagram 4. Snatch trajectory with weight 65% from maximum. Apparatus- separate weights.

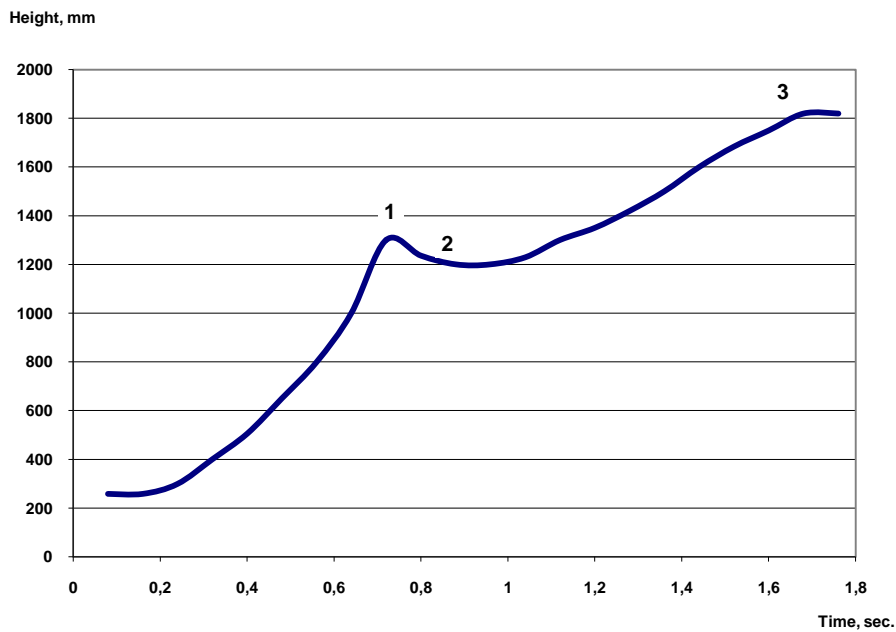
In this case trajectory of separate weights' movement practically continuously rises. Sportsman, lifting weights, does not separate heels from the floor and does not take deep squat position (see fig.2). That is why there is no significant energy consumption and the snatch is fulfilled as single-phase movement. This technique was applied in weightlifting, with which sportsman comes in pre-lifting position, not separating heels from floor (see fig.3). In diagram 5 sportsman works with weight 65% from maximal. Sportsman pre-lifts weight, not separating heels from floor, then moves a little downward (segment 1-2) and immediately start rising upward (segment 2-3). Using this technique, sportsman spends minimal time and efforts for lifting weight. The obtained movement trajectory was not improved from technical point of view, but even in preliminary description of snatch by this technique involuntary phase is absent.

This method of training was developed for the first time and tested with weight-lifters at department of weightlifting of Kharkov state academy of physical culture.

In fig. 3 we can see technique of lifting of separate weights, applied in weightlifting.



*Fog.3 Technique of classic snatch without separation of heels from floor*



*Diagram 5. Results of snatch with weight 65% from maximal. Figures mark main phases*

**Conclusions:**

Comparative analysis of snatches' fulfillment in lifting of separate weights and in weightlifting permits to state presence of critical differences in kinematics of movements. If in weightlifting movement has clear structure, with it, with increasing of weight this structuralizing increases, reflecting correlation of energy consumptions, connected with fulfillment of different movement's phases, then in lifting of separate weights it is maximally smoothed; it is rather difficult to mark out main phases. In our opinion it is conditioned, first of all, by the mass of weight. Besides, methodic specificities of snatch's fulfillment are also important. I.e. in weightlifting possibility of heel's separation from the floor gives sportsman opportunity to additionally accelerate lifted weight that can be appraised as one more factor, facilitating snatch's fulfillment. At the same time in lifting of separate weights this technique is impossible owing to great number of weights' lifting. The carried out researches permit to confirm differences in training processes for weightlifters and lifters of separate weights, conditioned by different realization mechanisms of similar y form but critically different by load snatches. Technique of snatch in lifting of separate weights is more ergonomic in comparison with weightlifting that is conditioned by the fact that sportsman fulfills aerobic work, i.e. multiple lifting of object (s) in contrast to single lifting in weightlifting.

*The prospects of further researches* in this direction will be connected with determination of optimal weight for the most effective snatch's technique and optimal load (quantity of attempts) with which it would be purposeful to improve movement's technique and develop sense of lifting object.



### References:

- 1 Dvorkin L.S., Slobodian A.P. *Vazhka atletika* [Weightlifting], Moscow, Soviet sport, 2005, 600 p.
- 2 Dvorkin L.S. *Vazhka atletika i vik* [Weightlifting and age], Sverdlovsk, UrU Publ., 1989, 200 p.
- 3 Arkhangorodskij Z.S. *Girevoj sport* [Weight sport], Kiev, Health, 1980, 72 p.
- 4 Goruliev P.S., Rumianceva Ie.R. *Zhinocha vazhka atletika* [Women's weightlifting], Ufa, USNTU, 2004, 199 p.
- 5 Oleshko V. G. *Pidgotovka sportsmeniv u silovikh vidakh sportu* [Training of athletes in power sports], Kiev, DIA, 2011, 444 p .
- 6 Platonov V.N., Gus'kov S.I. *Olimpijs'kij sport* [Olympic Sports], Kiev, Olympic Literature, 1997, 383 p.
- 7 Druz' V.A., Krivoderev V.V., Evtushenko P.S. *Slobozhans'kij naukovo-sportivnij visnik* [Slobozhansky scientific and sport bulletin], 2009, vol.3, pp. 230 – 233.
- 8 Romanenko V.A. *Diagnostika dvigatel'nykh sposobnostej* [Diagnosis of motor abilities], Donetsk, Donetsk National University, 2005, 290 p.
- 9 Vorob'ev A.I., Mul'chin A.I., Anisimov V.A. *Nauchnye issledovaniia v tiazhelej atletike* [Scientific research in weightlifting], 1967, vol.1, pp. 106-114.
- 10 Borisevich S.A. *Postroenie trenirovochnogo processa sportsmenov-girevikov vysokoj kvalifikacii* [The construction of the training process weights lifters qualifications], Cand. Diss., Omsk, 2003, 24 p.
- 11 Van Sin'na, Dzhim V.Iu. *Slobozhans'kij naukovo-sportivnij visnik* [Slobozhansky scientific and sport bulletin], 2010, vol.3, pp. 86 -88.
- 12 Медведев А.С. Тяжелая атлетика и методика преподавания [Weight lifting and teaching method], Moscow, Physical Culture and Sport, 1986, pp, 19-23.
- 13 Can S. Determination of the factors motivating and motivation level of the weightlifters participating in Turkish weightlifting championship. *Procedia - Social and Behavioral Sciences*. 2010, vol.2(2), pp. 4245–4249. doi:10.1016/j.sbspro.2010.03.672.
- 14 Cornelius A.E., Brewer B.W., Van Raalte J.L. Applications of multilevel modeling in sport injury rehabilitation research. *International Journal of Sport and Exercise Psychology*. 2007, vol.5(4), pp. 387 – 405. doi:10.1080/1612197X.2007.9671843.
- 15 Galieto R., Crowther J.H. The effects of exposure to slender and muscular images on male body dissatisfaction. *Body Image*. 2013, vol.10(4), pp. 566–573. doi:10.1016/j.bodyim.2013.07.009.
- 16 Hébert-Losier K., Holmberg H.-C. Knee angle-specific MVIC for triceps surae EMG signal normalization in weight and non weight-bearing conditions. *Journal of Electromyography and Kinesiology*. 2013, vol.23(4), pp. 916–923. doi:10.1016/j.jelekin.2013.03.012.
- 17 Hodson H. Motion capture weightlifting coach keeps you on form. *New Scientist*. 2013, vol.217(2909), pp. 21. doi:10.1016/S0262-4079(13)60733-2.
- 18 Martins R.A., Gomes G.A.S., Aguiar Jr. O., Medalha C.C., Ribeiro D.A. Chromosome damage and cytotoxicity in oral mucosa cells after 2 months of exposure to anabolic steroids (decadurabolin and winstrol) in weight lifting. *Steroids*. 2010, vol.75(12), pp. 952–955. doi:10.1016/j.steroids.2010.05.015.
- 19 Rahman S.M.M., Ikeura R. Estimating and Validating Relationships between Actual and Perceived Weights for Lifting Objects with a Power Assist Robot: The Psychophysical Approach. *Procedia Engineering*. 2012, vol.41:685–693. doi:10.1016/j.proeng.2012.07.230.
- 20 Visek A.J., Watson J.C., Hurst J.R., Maxwell J.P., Harris B.S. Athletic identity and aggressiveness: A cross-cultural analysis of the athletic identity maintenance model. *International Journal of Sport and Exercise Psychology*. 2010, vol.8(2), pp. 99–116. doi:10.1080/1612 197X.2010.9671936.

**Information about the author:**

**Djim V.Y.:** djimvictor@mail.ru; Kharkov State Academy of Physical Culture; Klochkovskaya str. 99, Kharkov, 61022, Ukraine.

---

**Cite this article as:** Djim V.Y. Comparative analysis of exercise equipment jerk in weightlifting and weight sport. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2013, vol.11, pp. 10-16. doi:10.6084/m9.figshare.815868

The electronic version of this article is the complete one and can be found online at: <http://www.sportpedagogy.org.ua/html/arhive-e.html>

This is an Open Access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited (<http://creativecommons.org/licenses/by/3.0/deed.en>).

---

Received: 13.08.2013  
Published: 05.11.2013