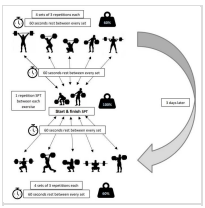

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Olympic Weightlifting Lifts and Derivatives for Fatigue Impact Quantification

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ABSTRACT

Load management is an extremely important subject in the control of fatigue and adaptation process in almost all sports. In Olympic Weightlifting (OW), some of the load variables are known, namely intensity and volume. However, the type of exercise remains unknown in specific terms, this is because empiricism tells us that some exercises induce greater fatigue than others, nonetheless we do not know specifically the value for this quantification. Thus, this work intends to evaluate the amount of fatigue provoke by various types of OW exercises. We resorted to an experimental quantitative design, where we induced fatigue in adult individuals with weightlifting experience of at least 2 years, through the execution of a set of 10 of the most used exercises in OW, in which the intensity and volume between them were equalized (4 sets of 3 repetitions), after which a Snatch Pull test was performed and changes in maximum and medium velocity, range of motion and medium power were evaluated as fatigue measurement, between before and after the protocol of each exercise through the linear transductor Vitruve (Vitruve encoder; Madrid, Spain). Nine women and 12 men have participated in the study (age, 29.67±5.74years and 28.17±5.06years; height, 158.78±6.70cm and 174.50±6.07cm; body weight, 60.84±7.34kg and 79.46±5.32kg; %body fat, 17.76±7.63% and 16.98±5,14%, respectively). For the total sample, significant differences were found in the range of motion (ROM) of Snatch Pull, Snatch and Back Squat (respectively, $p<0.001$ and ES=0.986; $p=0.003$ and ES=0.731 ; $p=0.021$ and ES=0.547) and also on C&J ROM ($p=0.015$ and ES=0.582), in the mean power variable, significant differences were found in Power Snatch, Snatch, Snatch Pull and Back Squat and C&J (respectively, $p=0.043$ and ES=0.472; $p=0.048$ and ES=0.460; $p=0.003$ and ES=0.729; $p=0.009$ and ES=0.636 ; $p=0.037$ and ES=0.488), in peak velocity, significant differences were found in Power Snatch, Snatch, Snatch Pull and Back Squat (respectively, $p=0.008$ and ES=0.638; $p<0.001$ and ES=0.998; $p<0.001$ and ES=0.906 ; $p<0.001$ and ES=0.906), in the mean velocity variable, significant differences were found in Snatch Pull and Back Squat (respectively, $p=0.030$ and ES=0.509; $p=0.003$ and ES=0.727). When genders

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were analyzed separately, on the female group, significant differences were noticed in Snatch ROM, Snatch Pull and Back Squat (respectively, p=0.006 and ES=1.218; p=0.001 and ES=1.776; p=0.002 and ES=1.474), in the mean power variable, significant differences were found in Snatch, Snatch Pull and Back Squat (respectively, p=0.006 and ES=1.227; p=0.002 and ES=1.512 ; p=0.001 and ES=1.679), at peak velocity significant differences were revealed in Snatch, Snatch Pull and Back Squat (respectively, p=0.002 and ES=1.469; p=0.005 and ES=1.258; p<0.001 and ES=2.058), for the mean velocity variable, significant differences were found in Snatch, Snatch pull and Back squat (respectively, p=0.006 and ES=1.228; p=0.003 and ES=1.372 ; p=0.001 and ES=1.660). In the male group, differences were found in the ROM of Snatch Pull, C&J and Clean (respectively, p=0.042 and ES=0.663; p=0.004 and ES=1.033; p=0.020 and ES=0.786) also, significant differences in mean power were only found in C&J (p=0.009 and ES=0.910, at peak velocity were revealed significant differences in Power Snatch, Snatch and Snatch Pull (respectively, p=0.009 and ES=0.910; p=0.025 and ES=0.745; p=0.039 and ES=0.675), the mean velocity showed significant differences only in the C&J (p=0.011 and ES=0.876). It is thus concluded that there are differences in the induction of fatigue between most of the exercises analyzed, and that the female gender seems to be more resistant to fatigue than the male gender, in relation to exercises derived from C&J, however in the exercises derived from snatch the reverse seems to happen in most variables except at maximum speed, in which both genders present similar fatigue in the analyzed exercises.

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KEYWORDS

Olympic Weightlifting, Fatigue, Clean & Jerk, Snatch, Squat, weightlifting derivatives

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MATERIALS TEXT

Isoinertial Dynamometer 1Khz 1 Vitruve (formerly named speed4lifts)
Isoinertial sensor 1 Beast
Bioimpedance equipment 1 InBody S10 equipment (Model JMW140, Biospace Co, Ltd, Seoul, Korea) Stadiometer/scale 1 SECA 220, Germany, Hamburg
20 Kilograms Olympic Barbell 1 Semperfit
15 Kilograms Olympic Barbell 1 Semperfit
25 kilograms Olympic Plates 4 Semperfit
20 Kilograms Olympic Plates 2 Semperfit
15 Kilograms Olympic Plates 2 Semperfit
10 Kilograms Olympic Plates 2 Semperfit
5 Kilograms Plates 2 Semperfit
2,5 Kilograms Plates 2 Semperfit
2 Kilograms Plates 2 Semperfit
1,5 Kilograms Plates 2 Semperfit
1 Kilogram Plates 2 Semperfit
0,5 Kilogram Plates 2 Semperfit
2,5 Kilogram Olympic Collars 2 Semperfit
Straps 2 Unbranded
Tripods 3 Unbranded
Smartphone 2 Huawei p Smart Pro
Tablet 1 Ipad 128Mb
Laptop personal computer 1 Dell Latitude E6430
Pen 5 BIC
A5 Textbook 3 Unbranded
Statistics software 1 IBM SPSS v28.0 statistics software

1 Protocol Test

1. A standardized 10 minutes warm-up including, mobility exercises, several OW repetitions and jumps was carried out to all experimental groups before the beginning of each training session, to minimize the risk of injury, additionally there were always two assistants to monitor exercise execution.

2. Participants started their personal warm-up exercise/specific for training session up to 60% of the Snatch 1RM, followed by two 50%, one 70% and one at 100% of Snatch 1RM, SPT attempts separated by 1 minute recovery, verbal feedback and technical advice will be given by coaches, if necessary, before each SPT verbal instruction cues were given in a standardized form, namely: “Pull hard and fast.”

3. On the first day Snatch and Derivatives protocol took place, after the warm-up, the baseline SPT evaluation took place (figure 1), making 1RM of Snatch after which data was collected. Then participants rested 1 minute followed by the Muscle Snatch protocol, of 4 sets of 3 repetitions, at 60% of the Snatch 1RM (1 minute rest between sets). After the protocol,

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participants then took 1 minute rest before the post muscle Snatch SPT evaluation (1RM).
4. Followed by the Power Snatch protocol, of 4 sets of 3 repetitions, at 60% of the Snatch 1RM (1 minute rest between sets), after the protocol, participants then took 1 minute rest before the post Power Snatch SPT evaluation, also one repetition at 100% snatch 1RM after which data was collected, participants would then rest 1 minute.
5. Followed by the Snatch protocol, of 4 sets of 3 repetitions, at 60% of the Snatch 1RM (1 minute rest between sets), after the protocol, participants would then take 1 minute rest before the post Snatch SPT evaluation, also one repetition at 100% Snatch 1RM after which data would be collected, participants would then rest 1 minute.
6. Followed by the Snatch Pull protocol, of 4 sets of 3 repetitions, at 60% of the Snatch 1RM (1 minute rest between sets), after the protocol, participants would then take 1 minute rest before the post Snatch Pull SPT evaluation, also one repetition at 100% Snatch 1RM after which data would be collected, participants would then rest 1 minute.
7. Followed by the Back Squat protocol, of 4 sets of 3 repetitions, at 60% of the Snatch 1RM (1 minute rest between sets), after the protocol, participants would then take 1 minute rest before the post Back Squat SPT evaluation, also one repetition at 100% Snatch 1RM after which data would be collected.
8. On the second test day, three days after the tests were performed in the Snatch derivatized exercises, was time for the C&J and derivative exercises protocol, therefore, participants started their personal warm-up exercise/specific for training session up to 60% of 1RM (C&J), followed by two 50%, one 70% and one at 100% of Snatch 1RM, SPT attempts separated by 1 minute recovery. Feedback and technical advice were given by coaches, if necessary, before each SPT verbal Instruction cues were also be given, namely: “Pull Hard and Fast.”.
9. After the warm-up, the baseline SPT Evaluation took place, making one repetition at 100% of Snatch 1RM after which data was collected, participants would then rest 1 minute, followed by the Power Clean protocol, of 4 sets of 3 repetitions, at 60% of the C&J 1RM (1 minute rest between sets), after the protocol, participants would then take 1 minute rest before the post Power Clean SPT evaluation, also one repetition at 100% Snatch 1RM after which data would be collected, participants would then rest 1 minute.
10. Followed by the C&J protocol, of 4 sets of 3 repetitions, at 60% of the C&J 1RM (1 minute rest between sets), after the protocol, participants would then take 1 minute rest before the post C&J SPT evaluation, also one repetition at 100% Snatch 1RM after which data was collected, participants would then rest 1 minute.
11. Followed by the Clean protocol, of 4 sets of 3 repetitions, at 60% of the C&J 1RM (1 minute rest between sets), after the protocol, participants would then take 1 minute rest before the post Clean SPT evaluation, also one repetition at 100% Snatch 1RM after which data would be collected, participants would then rest 1 minute.
12. Followed by the High Hang Clean protocol, of 4 sets of 3 repetitions, at 60% of the C&J 1RM (1 minute rest between sets), after the protocol, participants would then take 1 minute rest before the post High Hang Clean SPT evaluation, also one repetition at 100% Snatch 1RM after which data would be collected, participants will then rest 1 minute.
13. Followed by the Hang Power Clean protocol, of 4 sets of 3 repetitions, at 60% of the C&J 1RM (1 minute rest between sets), after the protocol, participants would then take 1 minute rest before the post Hang Power Clean SPT evaluation, also one repetition at 100% Snatch 1RM after which data would be collected.

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