

Want to be an elite weightlifter? It takes a strong pair of knees

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Researchers from China's Ningbo University have discovered what makes the critical difference between an elite snatch style weightlifter and a sub-elite one, according to a new study published in the journal *Heliyon*. In the Olympic sport of snatch style weightlifting, athletes squat, take hold of a barbell on the ground, and then lift it with outstretched arms overhead, using one continuous motion. Findings show that the success of this maneuver comes down to the strength of a part of the body that might not seem immediately obvious: the knees.

"These results can provide valuable information for lower level lifters and coaches to achieve better competition performance by altering their training methods accordingly," said the study's corresponding author Yaodong Gu, Ph.D.

To find out their secret in the new study, Dr. Gu and colleagues, including first author Gongju Liu, analyzed video data collected during the 2015 Men's Chinese National Championship and the 2016 Men's Chinese Olympic trials using a sophisticated motion analysis system. China has had a long history of success in the sport, with gold medals in the 69kg class in the past four Olympic Games. The top six weightlifters analyzed were considered top-elite athletes. Athletes ranked in 2nd to 7th place at the Chinese Championships, a second-tier event in China, were considered sub-elite. The question was: what's the difference between them?

The researchers report the major differences were in the maximum

vertical height of the barbell, as well as its height relative to the individual lifter's height. There were also differences in the vertical linear velocity of the barbell, and in its vertical acceleration. For sub-elite lifters to reach elite status, those are the areas to work on.

"Coaches of sub-elite lifters should focus on exercises suitable to the strength characteristics of the first and third phases of snatch lift," Dr. Gu said. He also highlights that the main findings of the present study have already been applied to the training guidance of China's snatch style athletes, one of whom won the gold medal in the 2016 Rio Summer Olympic Games and the Gold Medal in the 2015 World Championships.

There was something else, however: Sub-elite lifters showed significantly slower angular velocity of the knee joint in the second phase of the lift compared with top-elite lifters.

The additional findings suggest that sub-elite lifters should work on strengthening the flexor muscles of their knee joints, making it possible for them to generate and use more elastic energy in the second phase of a lift.

Dr. Gu and his research team are now exploring the snatch technique of three Olympic Champions, and plan to carry out further studies of the snatch technique of top-elite weightlifters as they lift even heavier weights.

More information: "Comparative 3-dimensional kinematic analysis of snatch technique between top-elite and sub-elite male weightlifters in 69-kg category" *Heliyon*, [DOI: 10.1016/j.heliyon.2018.e00658](https://doi.org/10.1016/j.heliyon.2018.e00658)

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