

Front Squat or Back Squat: Which Is Better?

What Was the Question?

Traditionally, the terms “squat” and “back squat” have been used synonymously. However, “squat” can apply to a number of lower-body exercises such as body-weight squats, front squats, and split squats, just to name a few. Each of these variations has different effects on the joints and muscles in the legs. Gullett, Tillman, Gutierrez, and Chow (2009) compared the force and torque placed on the knee during front and back squats, as well as the effects both types of squats had on primary, secondary, and stabilizing muscle groups. Since a strong and stable knee is important for the performance of many basic skills required in activities of daily living, the information about knee biomechanics provided in this study is valuable to coaches, as well as to health and physical education professionals.

What Was Done?

The researchers studied nine men and six women who were well trained, had no orthopedic injuries, and had been incorporating both front and back squats into their regular workout routine for at least one year. The study included two visits to the laboratory. The first visit involved a pretest during which each participant performed four to five short sets of both front and back squats in order to determine their one repetition maximum. Before performing squats during the second visit, anthropometric data were obtained from each subject. Electrodes were placed over six major muscles used during a squat in order to confirm accurate data collection. Participants performed maximum voluntary isometric contractions (MVIC) for knee extension, knee flexion, and trunk extension to measure maximum force production. After the MVIC was complete,

each participant performed three to five practice squats using a regular Olympic bar without weights. Once the participant had correct form and technique, he or she placed the right foot on a force plate and the left foot on a wooden platform of the same height. Participants performed two sets of three repetitions for each variation of the squat using 70 percent of their 1-RM. Any order effect was controlled by randomly selecting the order in which the front and back squats were performed. The average data recorded from the second repetition of the two trials were used in data analysis. Data from the electromyography (EMG), force plates, and video cameras detecting reflective markers placed on the participants were used for analysis.

What Was Found?

Since the same percentage of weight was used for the front and back squat, researchers were able to make a direct comparison of knee kinetics and muscle activity. The data showed that the back squat produced greater-than-average maximum compressive forces on the knee, as well as higher maximum extensor moments. The net shear force on the knee did not vary based on bar location. Both squats required minimal muscle activation during the downward phase and maximal activation during the upward phase, yet the bar position had no effect on muscle activation. The differences in knee kinetics were attributed to the use of a greater weight load during the back squat than the front squat—roughly 90 percent and 70 percent of the participants’ body mass respectively.

What Does the Study Mean?

Back squats have been the traditional form of squats for decades. While it is a beneficial exercise,

it causes greater compression force at the knee, which can cause injury in individuals over a period of time or if the squat is done incorrectly. The role of compressive loading relative to good joint health is a concern given the negative impact of increasingly prevalent obesity-related osteoarthritis. This study supports the belief that squats—particularly front squats—can be used safely and effectively to strengthen the leg muscles surrounding and supporting the knee joint. For the general population and those who have knee and shoulder problems, the front squat is an excellent and safe alternative to the ever popular back squat.

Reference

Gullett, J. C., Tillman, M. D., Gutierrez, G. M., & Chow, J. W. (2009). A biomechanical comparison of back and front squats in healthy trained individuals. *Journal of Strength and Conditioning Research*, 23, 284-292.

—Abstracted by Nicole Santorno, *Fitness Together*, Salem, OR.

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