

A BIOMECHANICAL COMPARISON OF THE LOWER EXTREMITY DURING FRONT AND BACK SQUATS IN HEALTHY TRAINED INDIVIDUALS

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INTRODUCTION: The two most common forms of the squat exercise are the back squat (BS) and the front squat (FS). While used interchangeably, there is little empirical evidence to inform the strength professional as to which variation may best benefit an athlete. Recently, Gullett et al. (2008) suggested that the lower compressive forces in the knee during a FS may make this variation the primary training choice. The purpose of this research is to compare the forces and moments at the hip, knee, and ankle during a BS and a FS in healthy trained participants.

METHODS: Currently, data have been collected from one individual, a healthy female who was trained in both the FS and BS variations. A 7-camera three-dimensional motion analysis system (Vicon, Centennial, CO) and AMTI force plate (Watertown, MA) were used to record data. Linear forces at the knee, moments at the hip, knee, and ankle, EMG of the rectus femoris (RF) and semitendinosus (ST) muscles, and kinematic data for the lower extremity were measured during a FS and BS movement at 65% of previously measured 1-RM loads.

RESULTS: Despite comparable relative loads, absolute loads differed between the FS and BS (52 kg and 55 kg, respectively). EMG measurements (%MVC) were higher in both RF and ST during the FS. Knee flexion and extension moments were similar between the squat conditions. This is contradictory to the results found by Gullett et al. (2008).

DISCUSSION: Further data should definitively support or contradict recent findings regarding FS and BS differences in the lower extremity. Linear and angular forces measured at the joints proximal and distal to the knee will help complete our understanding of lower-extremity biomechanics during these two squats types. The full results of all participants will be available at the August conference.

CONCLUSION: As technology advances, so does the ability of researchers to reexamine past practices for their safety, effectiveness, and efficiency. This enables the professional to make educated decisions based on empirical evidence regarding the nature of a prescribed training program. The back squat is a standard lower-body exercise and can be found in nearly any resistance training program. The front squat may elicit similar or higher muscle work output at a lower absolute load, resulting in comparable strength gains with lower joint stress. This would indicate that the front squat, while much less common, may in fact be safer and more efficient than the back squat, and if so, should be considered for use by strength and conditioning professionals and their peers.

REFERENCES:

Gullett, J.C., Tillman, M.D., Gutierrez, G.M. and Chow, J.W. (2008). A biomechanical comparison of back and front squats in healthy trained individuals. *Journal of Strength and Conditioning Research*, 23(1): 284-292.