DOES A CONCENTRIC ONLY SQUAT ILLICIT SIMILAR POTENTIATION OF SQUAT JUMP PERFORMANCE AS A BACK SQUAT?

Darragh Graham, Andrew Harrison and Eamonn Flanagan

Biomechanics Research Unit, University of Limerick, Limerick, Ireland

KEY WORDS: complex training, starting strength, stretch shortening cycle, rugby, sledge.

INTRODUCTION: The stretch shortening cycle (SSC) involves the stretching of musculature immediately prior to being rapidly contracted. This eccentric/concentric coupling produces a more powerful contraction than concentric action alone (Flanagan, 2007). Complex training (CT) hypothesises that a near maximal muscle contraction will enhance the explosive capabilities of the muscle (Docherty et al., 2004). In order for a complex pair (CP) to be effective the exercises must be biomechanically similar (Ebben, 2002). A traditional example of a CP is a back squat (BS) and a depth jump. If the goal of the CP is to improve starting strength (SS) a suitable exercise is the squat jump (SJ). Theoretically a concentric squat (CS) is more biomechanically similar to a SJ than a BS, although not as commonly practiced. A CS does not invoke the SSC, hence motor unit recruitment may be attenuated. The aim of this paper was to examine if the biomechanically similar CP of a CS and SJ will illicit similar potentiation as a BS and SJ CP.

METHODS: Twenty male rugby players, proficient with the technique of the BS and SJ participated in this study. All subjects were part of a professional (n=13) or semi-professional (n=7) rugby academy. Physical characteristics of subjects were age 20.3 years $\pm$ 1.1, height 1.84 $\pm$ 0.07m and mass 96.6 $\pm$ 10.7kg. Day one of testing was a SJ familiarisation session and a 1RM BS and CS test. Day 2 was a pre test, a 3RM BS and a post test. Day 3 was a pre test, a 3RM CS and a post test. All pre and post tests consisted of one SJ every minute for 10 minutes. The SJ starting position was 90º flexion of the knee. All SJ's were performed on a sledge apparatus inclined at 30º as described by Harrison et al. (2004). Each jump was recorded on an AMTI OR6-5 force platform mounted at right angles to the sledge apparatus sampling at 1000 Hz. The first post test SJ was performed one minute after respective 3RM squats. Depth of BS's was 90º flexion of the knee. All CS's were performed on weightlifting jerk boxes. The starting position was 90º flexion of the knee. Days 2 and 3 3RM scores were calculated as 93% of Day 1 1RM scores. Dependent variables for each jump were height jumped, peak ground reaction force, rate of force development and SS. Max and min dependent variables were compared between pre and post tests. A GLM ANOVA examined for differences between the BS and CS conditions from the pre to post test.

RESULTS:

Results from this study will elucidate whether biomechanically similar exercises will potentiate to the same extent as a higher loaded activity.

REFERENCES:

Docherty, D., Robbins, D., Hodgson, M. (2004). Complex Training Revisited: A Review of its Current Status as a Viable Training Approach. National Strength and Conditioning Association. 26(6), 52-57.

Ebben, W.P., (2002). Complex Training: A Brief Review. Journal of Sports Science and Medicine. 1, 42-46

Flanagan, E.P. (2007). An Examination of the Slow and Fast Stretch Shortening cycle in Cross Country Skiers and Runners. Proceedings of the XXV International Symposium of Biomechanics in Sports Ouro Preto, Brazil. 51-54.

Harrison, A.J., Keane, S.P., and Coglan, J. (2004). Force-velocity relationship and stretch-shortening cycle function in sprint and endurance athletes. Journal of Strength and Conditioning Research. 18(3), 473-479.

Acknowledgements: Joseph O'Halloran and Dr. Tom Comyns.