

# ECCENTRIC AND CONCENTRIC JUMPING PERFORMANCE DURING AUGMENTED JUMPS WITH ELASTIC RESISTANCE: A META-ANALYSIS

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## ABSTRACT

**Introduction:** The initial rapid eccentric contraction of a stretch-shortening cycle (SSC) activity is typically reported to accentuate the subsequent concentric jump performance. Some researchers have rationalized that adding elastic resistance (ER) to explosive type activities (e.g. countermovement jumps and drop jumps) would increase excitatory stretch reflex activity and mechanical recoil characteristics of the musculotendinous tissues. The purpose of this meta-analysis was to examine the available literature on jumping movements augmented with ER and to provide a quantitative summary on the effectiveness of this technique for enhancing acute eccentric and concentric jumping performance.

**Methods:** In a random-effects model, the Hedges'  $g$  effect size (ES) was used to calculate the biased corrected standardized mean difference between the augmented and similar non-augmented jumps.

**Results:** The results demonstrated that augmented jumps provided a greater eccentric loading compared to free jumps (Hedges'  $g$  ES = 0.237,  $p = 0.028$ ). However the concentric performance was significantly impaired, particularly if the downward elastic force was used during concentric phase as well (ES = -2.440,  $p < 0.001$ ). Interestingly, no performance decrement was observed in those studies, which released the bands at the beginning of the concentric phase (ES = 0.397,  $p = 0.429$ ).

**Discussion:** The authors postulated that the excessive eccentric loading might trigger reflex inhibition, alter the muscle stiffness, increase downward hip displacement and dissipate mechanical recoil properties. These results suggest that the release of elastic force at the beginning of the concentric phase seems to be a critical point to avoid impairment of acute concentric performance in augmented jumps.

**Level of Evidence:** 2a

**Keywords:** Elastic tubing, exercise bands, surgical tubing, stretch-shortening cycle, strength, power

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**Conflicts of Interest:** Dr. Aboodarda and Dr. Behm have no financial or perceived conflicts of interest. Dr. Page is the Director of Clinical Education and Research for Performance Health Inc., which manufactures and distributes similar products (TheraBand).