ACUTE EFFECTS OF HOPPING WITH WEIGHTED VEST ON VERTICAL STIFFNESS

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INTRODUCTION: Stiffness is defined as the resistance of a body to deformation (Brughelli & Cronin, 2008). It influences how the body interacts with the ground in terms of mechanics and joint kinematics (Farley & Morgenroth, 1999). Optimal stiffness is important in sprinting and jumping as it relates to efficient use of the stretch-shortening cycle. Weighted vests are used to overload the muscles in warm-up and training and have been found to enhance subsequent jumping performance (Faigenbaum et al., 2006). The purpose of this study was to examine the acute effects of wearing a weighted vest on vertical stiffness during hopping in place using a simple spring mass model.

METHODS: Ethical approval was obtained from the university ethics committee. Thirty active males were randomised into experimental (age: 21 ±1.4 years; mass: 85.6 ±10.1 kg; height: 1.83 ±7.3 m) and control groups (age: 21 ±1.1 years; mass: 85.5 ±9.5 kg; height: 1.85 ±7.6 m). Markers were placed on the sacrum, anterior superior iliac crests, greater trochanters, femoral condyles, tibial tubercles, lateral malleoli and 5th metatarsals. Participants performed 3 trials of double leg hopping on a Kistler force plate operating at 500 Hz. Each trial lasted 10 s with 4 min recovery between trials. Participants hopped for maximum height in time to the beat of a metronome at 2 Hz. The experimental group wore a vest weighted with 10% body weight during the second trial. Three-dimensional kinematics were obtained simultaneously using 6 Qualisys cameras, operating at 200 Hz. Vertical stiffness (kvert) was calculated by dividing peak vertical ground reaction force (GRF) by vertical displacement of the sacrum marker during ground contact. GRFs and kvert values were normalised to body weight for all participants. A repeated measures two-way ANOVA with 1 between-subjects factor (group) and 1 within-subjects factors (trial with 3 levels) was carried out using SPSS v.15.

RESULTS: Statistical analysis showed no significant group, trial or group x trial interaction effects for absolute or normalised kvert or GRF (p>0.05).

DISCUSSION: Existing research has found that kvert varies with surface and task demands. This suggests that there may be acute changes when wearing a weighted vest but this was not supported by the results. Brughelli & Cronin (2008) recommended that future research examine training practices that may affect stiffness and subsequent running performance.

CONCLUSION: The results indicated that wearing a weighted vest had no acute effects on vertical stiffness or ground reaction force. Future analysis will examine how wearing this device affected joint kinematics during this task.

REFERENCES: