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.

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