ACUTE EFFECTS OF WHOLE-BODY VIBRATION ON KNEE JOINT DROP LANDING KINEMATICS AND DYNAMIC POSTURAL STABILITY

Eamonn Delahunt[1], Domenico Crognale[1], Brian Green[1], Chris Lonsdale[1], Denise McGrath[1]

School of Physiotherapy and Performance Science, University College Dublin, Dublin, Ireland[1]

KEY WORDS: squat, knee, landing, joint movement, balance.

INTRODUCTION: Whole-body vibration (WBV) is being increasingly utilized in addition to other training modalities in order to prevent and rehabilitate athletic injuries. Excessive knee joint movement has been reported to be a contributing factor to many traumatic and overuse knee joint injuries (Sigward et al., 2008). However the effects of WBV on sensorimotor function and consequent knee joint kinematics is unknown. Thus, the aim of the present study was to examine the effects of an acute WBV exposure on knee joint drop landing kinematics and dynamic postural stability in healthy participants. The null hypothesis was that acute WBV exposure would not influence lower limb drop landing kinematics or dynamic postural stability.

METHODS: 12 healthy male subjects with no history of previous knee joint injury volunteered to participate in this study. Each participant performed a series of 10 squats under three different counter-balanced conditions, with those conditions being: (1) over-ground, (2) 30 Hz vibration, (3) 50 Hz vibration. Immediately following each series of squats, each participant performed 3 single-leg drop landings from a height of 30 cm. Knee joint kinematics (peak valgus, peak flexion, and peak internal rotation) were assessed using a CODA 3D motion analysis system, while ground reaction forces were recorded using an AMTI force-plate, and subsequently used to calculate the dynamic postural stability index (DPSI).

RESULTS: Separate repeated-measures ANOVAs were conducted, using a Greenhouse-Geisser correction when violations of the sphericity assumption were observed. These analyses revealed no significant differences at $P < .05$ for peak knee valgus ($F_{1.07,10.60} = .81$, $P = .69$, $\eta^2 = .08$, observed power = .07), peak knee flexion ($F_{2,20} = 2.44$, $P = .11$, $\eta^2 = .20$, observed power = .43), peak knee internal rotation ($F_{1.11,11.12} = 1.12$, $P = .32$ $\eta^2 = .10$, observed power = .17) or the DPSI ($F_{1.30,13.03} = 1.03$, $\eta^2 = .09$, observed power = .17).

DISCUSSION: In this study, acute vibration exposure showed no significant effect on knee joint drop landing kinematics or dynamic postural stability.

CONCLUSION: Further research with a larger sample is needed to determine whether vibration stimuli can enhance parameters of knee joint neuromuscular control in non-injured and injured subjects. Also the effect of a specific training programme conducted over a period of weeks requires consideration.

REFERENCES:

Sigward, S.M., Ota, S., and Powers, C.M. (2008). Predictors of frontal plane knee excursion during a drop landing in young female soccer players. *Journal of Orthopaedic and Sports Physical Therapy*, 38, 661-667.