KINETIC AND KINEMATIC CHANGES ASSOCIATED WITH ALTERING HEEL HEIGHT DURING CRICKET MEDIUM-FAST BOWLING

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INTRODUCTION: During a cricket bowling delivery, the major impact with the pitch occurs at front foot impact (FFI), generating forces approximately 5.7 times body weight (BW) in the vertical plane and 3.5 BW in the horizontal plane. (Hurrion *et al*. 2000). Although cricket footwear has been acknowledged by researchers as worthy of investigation, to date there is no research published to inform of the potential for injury prevention.
Bartold (2005) found when investigating midsole height in football footwear that a graduated rise of 1cm altered lower limb muscle activity and reduced peak pressures under the foot during treadmill running. Associated altered kinematics reported by Bartold (2005) is in accordance with reports by Eslami et al. (2005) who found a 0.4cm posterior wedge can be utilised to alter the angular variability of the subtalar joint and its proximal joints and segments in their respective planes of movement during single limb stance.
This study looks at the effect of within shoe heel raises upon ground front foot impact forces. It is believed that by raising the rearfoot in relation to the forefoot, the windlass mechanism will be elicited, increasing medial longitudinal arch height to further improve the shock attenuation properties of the foot, and thus lower the stresses higher up in the kinetic chain.

METHOD: Six medium-fast amateur bowlers with no recent injury or pathology were recruited. The bowlers wore new footwear with which they had become habituated (ASICS 8 for 64). Two heel raises of 0.5 cm and 1 cm were constructed from EVA220 to mimic midsole density. FFI was sampled at 500Hz using a 9851B Kistler force platform with simultaneous capture of movement kinematics by two 100Hz Basler digital cameras using Peak Motus software. Marker placement was chosen to enable accurate replication of skeletal movement, with emphasis placed on the trunk and lower limb. Following warm-up, each subject bowled one over without heel raises, then one over using each of the heel raises in a randomised order. Data analysis will compare key variables of ground reaction force and lower extremity kinematics, in addition to the performance variable of ball release velocity.

RESULTS: A significant ($p<0.05$) mean reduction in peak vertical force of 0.71 *BW* was experienced by all three participants who bowled with an extended (>170°) knee at FFI. There was an individualised, and non-systematic response to peak braking and medio-lateral forces. In addition, a 1 cm heel raise significantly ($p<0.05$) lowered peak instantaneous braking loading rates by an average of 119 *BW*/s for four participants.

CONCLUSION: The incorporation of a heel raise in bowling footwear may assist in injury prevention. However, individual assessment of players is imperative prior to prescription.

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