THE KINEMATIC SIMILARITY OF THE TRIPLE JUMP AND ASSOCIATED TRAINING DRILLS

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KEYWORDS: sports biomechanics, technique, progressions.

INTRODUCTION: The triple jump is a complex sporting movement consisting of three phases with the aim of maximising total jump distance. The ground contacts preceding the hop, step and jump phases largely determine the subsequent flight distances. The transition between the hop and step phases is said to be the most critical element in triple jumping performance (Jurgens, 1998) and the minimisation of horizontal momentum losses during ground contacts has been linked to successful performance (Hay, 1992). Triple jumpers employ a variety of drills to help facilitate the effective execution of the ground contacts between each of the phases. These drills attempt to expose the performer to the physical demands of the movement and to replicate the movement patterns that occur thereby serving the specificity training principle identified by Matveyev (1981). The first aim of this study was to quantify the losses in horizontal momentum during the hop-step transition and hence to assess the subsequent effect on performance. The second aim of the study was to identify which of the training drills used by triple jumpers most closely match the movement patterns utilised within a triple jump performance during this critical transition.

METHOD: The experimental set-up consisted of a 12-camera Vicon^{TM} MX13 motion analysis system (Oxford Metrics Ltd., Oxford, UK), sampling at 100 Hz and calibrated to the manufacturer's instructions and a force platform (Kistler, 9287BA, Switzerland) sampling at 1000 Hz. Three-dimensional kinematic and ground reaction force data were simultaneously collected during the hop-step transition phase of six triple jump performances and during the ground contact phase of eight associated training drills for five competitive triple jumpers. Coordinates for 39 reflective markers, used with the Plug-In-Gait marker set, were reconstructed using Workstation software (Vicon^{TM} version 5.2.4). Lower extremity joint angles were subsequently calculated. The frames associated with touchdown and toe-off of the hop-step transition phase were established using the ground reaction force data.

RESULTS: The loss in horizontal momentum during the hop-step transition in the triple jump trials ranged from 3.2 % to 12.2 %. Based on the initial measures, it appears that the athletes with greater losses in horizontal momentum achieved greater flight distances in the step phase that followed. The joint angle-time histories of the training drills performed indicate that a 3 stride "pop-up" from a 30 cm raised platform most closely matched the hop-step transition in triple jump performance.

CONCLUSION: In isolation, the loss in horizontal momentum during the hop-step transition is not appropriate as a determinant for successful performance. The conversion of horizontal to vertical momentum needs consideration when assessing the success of the transition. The movement patterns of the eight training drills investigated in this study are similar to the target skill; however, a kinetic analysis would provide more insights into the roles of individual and coordinated joint contributions and hence inform future training specificity.

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