

TRANSITION BETWEEN SINGLE AND MULTIPLE
STEPPING STRATEGIES IN FORWARD FALL
RECOVERY

BY

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Submitted to the graduate program in Mechanical
Engineering and the Graduate Faculty of the University of
Kansas in partial fulfillment of the requirements for the
degree of Master's of Science

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Abstract

Background. Following a balance disturbance, one or more steps are often taken. Studies have shown that older adults are more likely than young adults to take multiple steps, and that number of steps is a predictor of fall risk. In order to better understand how a stepping strategy is chosen, we investigated the transition between single and multiple stepping strategies in young adults.

Methods. Each participant responded from a sudden release from an initial forward lean. We limited available first step length with a visible boundary line to induced transitions between single and multiple stepping strategies. The available step length where the transition occurred and the biomechanics of the first step on either side of the transition were quantified.

Results. The magnitude of the transition threshold displayed hysteresis sensitive to direction of the transition (single to multiple steps versus multiple to single steps.) Step liftoff, swing, and landing times, step length, step length boundary margin, and braking forces during landing were different on either side of the transition.

Discussion. If transition threshold is used as a clinical measure, the method used to detect the threshold should be further studied. More sophisticated threshold detection protocols may minimize hysteresis. Biomechanical changes in the first step suggest that the second step is planned before liftoff of the first step, rather than only after failure of the first step to recover balance.