

The Effect of Age and Sex on Lower Extremity Joint Power Coordination

ISABELLA G. MARTINEZ, KYLIE B. GARCIA, & MICHELE LEBLANC

Biomechanics Lab; Exercise Science Department; California Lutheran University;
Thousand Oaks, CA

Category: Undergraduate

Advisor / Mentor: Leblanc, Michele (mleblanc@callutheran.edu)

ABSTRACT

Previous research has provided conflicting results regarding interjoint coordination during a squat jump for young and old adults. In particular, researchers have noted if a proximal-to-distal sequencing (PDS) pattern characterized by hip, then knee, then ankle movement was utilized. Argaud et al. (2019) concluded that both groups used a PDS pattern while Haguenaer et al. (2005) reported that older adults exhibited a more simultaneous strategy. However, both of these studies only investigated male subjects. **PURPOSE:** The purpose of this study was to determine if there are differences in joint power sequencing between males and females and between young and older adults during a squat jump. **METHODS:** 32 moderately active and injury-free subjects participated (19 young (9F, 10M) and 13 older (7F, 6M)). There was no significant difference in the Physical Activity Rating form levels between age groups or sexes. Subjects performed squat jumps from a starting position with a minimum knee flexion angle of 120 degrees with hands on hips and rest given between trials. Three-dimensional body coordinates and ground reaction force data were collected using seven Vicon Vantage cameras (120 Hz) and two Kistler force plates (1200 Hz), respectively. Three trials per subject were used for analysis, excluding any trials with a countermovement. Hip, knee and ankle joint power data were computed using Nexus software and used to assign the degree of PDS for each trial (both leg, one leg, neither leg). Chi-squared was run to determine associations between sex and age with degree of PDS ($p < 0.05$). **RESULTS:** There was a statistically significant association between age and degree of PDS ($p = 0.041$). Both legs used PDS for 74% and 49% of the younger and older adult trials, respectively, and neither leg used PDS for 12% and 21% of their trials, respectively. There was no significant association between sex and degree of PDS. However, 71% and 56% of the males and female trials used PDS for both legs while 8% and 23% of their trials used PDS for neither leg. **CONCLUSION:** It appears that older adults, especially females, use a PDS strategy less frequently when attempting to generate lower extremity power. This difference is not related to activity levels or disease and may be related to neuromuscular changes associated with aging or jump experience.

This research was funded by the Swenson Summer Research Fellowship Program.