

Dancers Exhibit Different Organizations of Muscular Effort in the Dominant versus Non-Dominant Limb during the Impact Phase of the Grand Jeté

BRANDON NUNLEY¹, RYAN LANIER¹, ISABELLA GONZALES¹, TANYA CALAMONERI², ALI DUFFY², and JOHN R. HARRY¹

¹Human Performance & Biomechanics Laboratory; Department of Kinesiology & Sport Management; Texas Tech University; Lubbock, TX

²Creative Movement Studio; School of Theatre & Dance; Texas Tech University; Lubbock, TX

Category: Masters

Advisor / Mentor: Harry, John (john.harry@ttu.edu)

ABSTRACT

Overuse musculoskeletal injuries of the hip, knee, and ankle are prevalent in dancers. Differences in muscular effort between the dominant and non-dominant limbs may increase musculoskeletal injury risk during dance movements involving a jump followed by a high-impact unilateral landing. **PURPOSE:** To investigate potential differences in lower extremity muscular effort (i.e., joint angular work) between the dominant and non-dominant limbs during the landing phase of a grand jeté movement in dancers. **METHODS:** Collegiate dancers consisting of eight women (19 ± 1 y; 54.7 ± 6.9 kg; 1.7 ± 0.1 m) and two men (21 ± 1 y; 70.6 ± 8.9 kg; 1.8 ± 0.01 m) performed three trials of the grand jeté movement on each leg (6 total trials) while kinematic and kinetic data were collected using a 12-camera motion capture system (200 Hz) and a force platform (1000 Hz). Paired-samples t-tests ($\alpha = 0.05$) were conducted to compare the dominant and non-dominant limbs for the following variables of interest: total lower limb work (absolute sum of the angular work performed about the hip, knee, and ankle joints) and the corresponding percent contributions of the hip, knee, and ankle joints during the loading (time between ground contact and peak vertical ground reaction force [GRF]) and attenuation (time between peak vertical GRF and the end of downward center of mass motion) phases of landing. Effect sizes (ES) were calculated to supplement statistical probabilities and provide the magnitude of the mean differences. **RESULTS:** Total lower limb work was not significantly different between the dominant and non-dominant limbs during the loading phase and the mean difference was small ($p = 0.062$; $ES = 0.40$). However, the difference between limbs for the percent contribution of the knee musculature during the loading phase was large despite not being statistically significant ($p = 0.076$; $ES = 0.89$), with greater contributions occurring during landings on the non-dominant limb ($49.0 \pm 14.8\%$) versus the dominant limb ($36.7 \pm 12.9\%$). No other differences were detected during either phase of landing. **CONCLUSION:** Dancers appear to utilize limb-specific energy absorption strategies during the landing portion of the grand jeté, with greater muscular efforts about the knee joint in the non-dominant limb during the time when greatest external stress is experienced. As such, dancers may be at greater risk for developing overuse injuries or chronic ailments (e.g., patellofemoral pain syndrome) in the non-dominant limb.