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Bilateral Asymmetry in the Forward Lunge Exercise

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Bilateral asymmetry is a common metric used by clinicians and professionals within the medical community. Between-limb asymmetry is an indicator of strength, power, and mechanical progression in athletes recovering from unilateral injury, and thus may have application in return-to-play (RTP) evaluations. Consensus normative values for bilateral asymmetry indices (BAI) are lacking within the literature for many common rehabilitation exercises, making it increasingly difficult to use BAI as a RTP metric. **PURPOSE:** To determine normative BAI values for select biomechanical measures for a forward lunge exercise. **METHODS:** As part of a larger study, 10 female and 3 male healthy, college-aged individuals with no prior neuromuscular or musculoskeletal pathologies participated. A total of 24 reflective markers were placed on the participant on both left (L) and right (R) lower extremities, creating a 7-segment model (pelvis and R/L thighs, lower legs, and feet). Three trials of 5 rehabilitation exercises/functional movements were completed but only the lunges were analyzed for this study. 3D kinematic and kinetic data were collected via a motion capture system integrated with force plates. Maximum flexion angles at the ankle, knee, and hip joints, medial-lateral (ML) knee displacement, maximum percent power at these joints, and maximum percent loading on the front foot were used for BAI analysis. BAI was calculated as $BAI = 100 * \frac{[(RMAX,LMAX)-(RMIN,LMIN)]}{[(RMIN,LMIN)]}$. **RESULTS:** Mean L and R BAI was 15.69±17.92% for max ankle dorsiflexion, 3.80±2.13% for max knee flexion, and 6.16±4.07% for max hip flexion. ML knee displacement BAI was 49.92±64.26%. Mean max sagittal joint power BAI was 43.17±52.46% for the ankle, 22.42±22.34% for the knee, and 32.90±52.13% for the hip. Mean BAI for percent loading on front foot was 2.25±1.96%. **CONCLUSION:** Preliminary findings suggest that there are large BAIs in joint kinematics and kinetics related to control of movement in a forward lunge rehabilitation exercise in healthy populations. Variables related to movement outcome (e.g., lunge depth) such as knee and hip flexion were more symmetric (>93%). Kinematic and kinetic

BAIs for a lunge are large and variable in uninjured populations, therefore, the feasibility of BAI of biomechanical markers as rehabilitation metrics remains in question.