

# Bilateral Asymmetry in Standard Rehabilitation & Strength Exercises

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## ABSTRACT

Asymmetries in different exercises have been studied for many years, however a majority of the literature involves asymmetry in exercises and tests done during pre-habilitation and rehabilitation of athletes and clients. Normative asymmetry data is essential, however, it is currently lacking. This study looked to find asymmetries among healthy subjects and ultimately provide the medical community with data for the selected rehabilitation exercises and tests. The main purpose of this study was to determine normative bi-lateral asymmetry values during standard rehabilitation exercises and tests. In order to do this, seventeen healthy college-aged individuals (n=6 male, n=11 female) each completed a 45-minute day of testing. Individuals were encouraged to participate if they were cleared and able to perform standard physical activity without limitation or pain and were familiar with the rehabilitation exercises in question. Participants were excluded from the study if they had current concussion symptoms or balance disorders, or potential neuromuscular/musculoskeletal conditions that would limit the performance of the studied exercises and movements. Individuals were asked to wear tight-fitting athletic shorts and sneakers upon the day of their testing session. On testing day, the individual was first asked to complete and sign an informed consent document followed by an

injury history form to inform the researcher of any recent musculoskeletal injuries, surgeries resulting from injury, and diseases. Once it was determined that the individual was cleared to participate, the participant was asked to complete a physical activity form to inform the researchers of their activity and walking habits during the past week. During form completion, the investigators calibrated the motion capture system (VICON) along with AMTI force plates. Following form completion, the participant was asked to complete three trials of a single-leg weight-bearing lunge test to evaluate dorsiflexion capabilities between extremities, measured at the heel in centimeters. 18 reflective markers were then placed on the participant at the ankle, knee joint, and pelvis, and clusters of 3 reflective markers were pre-wrapped to the participant's lower and upper legs. Following subject calibration in VICON, the participant was asked to perform the following rehabilitation exercises in socks: right and left lunges, right and left single leg step downs, and bodyweight squats. The participant was then asked to put their shoes on for the remainder of the exercises, consisting of right and left single leg hops and standing broad jumps. The investigator demonstrated each movement to the participant to familiarize them with the exercise and allowed them to complete practice trials prior to trials for data collection through motion capture. Participant jump length was measured in meters from the edge of the force plate for the jump trials. Three trials were completed for each exercise and exercise order was altered between participants as well. This study investigated ground reaction forces during a series of standard rehabilitation and strength to determine bilateral asymmetry across the lower extremity, which can then be normalized to distinguish strength differences. The goal of the project was to create a standardized data set to be used in medical and rehabilitation settings that shows expected deviance in lower extremity movements, specifically for individuals returning from injury. The data is expected to be analyzed within the coming weeks, with an emphasis on

examining asymmetries between right and left step downs and right and right and left lunges. Up to this point, several other studies have researched lower extremity joint and movement asymmetry, serving a variety of different purposes. The field of Exercise Science looks to investigate discrepancies in movement whether that be joint angles, range of motion, or applied force, and the causes behind those differences. Yet, there has been a lack of practical use of much of this data which is what this research works to do. The aim to standardize strength discrepancies for future medical use has the potential to allow medical professionals to understand the true extent to which an injured individual has been rehabilitated and the impact an injury may have had on strength.