

### Low Back Demand of Equipment Carriage Tasks in Golf

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#### ABSTRACT

Low back injury is a common concern in golfers and caddies. The literature often points to the biomechanics of the golf swing as the major contributing factor; however, golfers and caddies can regularly walk upward of 10,000 steps on uneven terrain while carrying equipment, which can contribute to the cumulative load on the low back. **PURPOSE:** To examine the low back biomechanical demands during golf equipment carriage and pick-up tasks. **METHODS:** Sixteen golfers (11M/5F, 27.4±3.5yrs) participated in 3D motion capture of a golf bag pick-up task and 3 walking tasks (1. unloaded walking [UW], 2. unilateral carrying on the right shoulder [SS], and 3. carrying the golf bag across both shoulders [DS]); using an 11.3 kg duo-strap carry bag. Kinematic and Kinetic data were collected at 60Hz and 1500Hz, respectively, and filtered with a 6Hz lowpass filter. The lower extremity, pelvis, and trunk were modeled as rigid segments, and lumbosacral (L5S1) kinematics and kinetics were calculated in Visual 3D. Peak internal moments were calculated via inverse dynamics and normalized to body weight. Descriptive statistics were calculated for sagittal and frontal plane peak L5S1 moments. Hedge's g effect sizes were calculated for frontal plane bilateral peak moment differences in the pick-up task. **RESULTS:** The pick-up task yielded peak extensor moment of 1.14 ± 0.32 and peak left lateral flexor moment of 1.08 ± 0.27 Nm/Kg. Compared with peak right lateral flexor moment (0.09 ± 0.07 Nm/Kg), peak left lateral flexor was 12 times higher with a large effect size (g=2.77). In the walking conditions, peak extensor moment was highest in UW (0.28 ± 0.14 Nm/Kg) follow by SS (0.25 ± 0.2 Nm/Kg) then DS (0.07 ± 0.19 Nm/Kg). In contrast, peak flexor moments were highest in DS, follow by SS then UW. In the frontal plane, SS yielded peak left lateral flexor moment of 0.62 ± 0.14 Nm/Kg, which was 3 times higher than UW and more than twice higher than DS. **CONCLUSION:** The pick-up task is unilateral and yielded comparable peak L5S1 moments to the golf swing. Carrying the golf bag while walking alters the position of center of mass, which alters low back demands compared to unloaded walking. Due to the large number of cycles performed, equipment carriage tasks should be considered when estimating cumulative low back demand in golfers and caddies.