THE EFFECTS OF GOLF BAG TRANSPORT STYLE ON VERTICAL JUMP KINETICS

Samuel J. Wilson[1], Austen L. Arnold[1], Paul T. Donahue[2], Nicholas J. Siekirk[1],
Jessica A. Mutchler[1], Barry A. Munkasy[1] & John C. Garner[3]
[1]Department of Health Sciences and Kinesiology, Georgia Southern University, Statesboro, GA, USA
[2]School of Kinesiology and Nutrition, University of Southern Mississippi, Hattiesburg, MS, USA
[3]Department of Kinesiology & Health Promotion, Troy University, Troy, AL, USA
Email: sjwilson@georgiasouthern.edu

Introduction

For amateur golfers, there are multiple ways to transport their clubs during a round while covering the course distance. Golf bags specifically when carried by means of a double strap have been shown to attenuate perceived effort and physiological demands compared to carrying a bag with a single strap over one shoulder. Countermovement vertical jumps (CMVJ) are often used to predict club head speed in golfers of varying skill. Further, kinetic measures during these jumps such peak force production and the rate of force production are common measures associated with lower body power and athleticism. These kinetic measures are also associated with club head speed, and previous research has suggested that vertical jump performance decreases when carrying external loads such as a golf bag. However, there is a dearth of literature on golf bag carriage technique and its effects on lower body kinetics during a vertical jump. Therefore, the purpose of the current study was to determine how different golf bag transportation styles affected unloaded vertical jump kinetics.

Methods

Recreational male and female golfers (n=10; f=6, m=4) completed the study. Participants completed a 3 mile walk along a designated path within the biomechanics laboratory while donning each load carry condition (no bag, push cart, single strap, dual strap high, dual strap low). At each quarter mile completed, participants removed the bag (if applicable) and completed vertical jump testing on a force plate. Jump testing consisted of three two arm, countermovement jumps. For each jump concentric peak force was calculated, as well as time to peak concentric force. The kinetic variables were averaged over the three jumps and the average was used for analysis. Dependent variables of interest were analyzed using a 5 x 13 (Load [No bag, single strap, dual strap above sacrum, dual strap below sacrum, push cart] x distance [Pre, .25M, .5M, .75M, 1.00M, 1.25M, 1.5M, 1.75M, 2.00M, 2.25M, 2.5M, 2.75M, 3.00M]) repeated measures analysis of variance. Significant main effects were further examined using a Bonferonni correction factor and for interactions, simple effects were calculated to examine the nature of the interaction. All analyses were conducted with an *a* priori alpha level of 0.05, and partial eta squared were calculated as measures of effect size.

Results and Discussion

Analyses comparing concentric peak force revealed a statistically significant interaction ($F(48,432) = 1.395$, $p = 0.047$, $\eta^2 = 0.134$). Post-hoc comparisons between load types and distance suggest that throughout the walking protocol the push-cart had significantly greater peak force than all other loaded conditions but not greater than the no bag condition. Further, after half of a mile the differences between the push cart and single strap condition were no longer significant and following 1 mile the differences between the push cart and low bag were no longer significant. Additionally, while the peak forces in the high bag condition remained significantly lower than the push cart, during the final mile the high bag peak forces were also significantly lower than all other load conditions and the no bag condition at 3 miles. The results comparing load conditions and distance for time to peak force also revealed a significant interaction ($F(48,432) = 1.750$, $p = 0.002$, $\eta^2 = 0.180$). Follow up analyses for the time to peak force suggest that, similar to the concentric peak forces, the push cart had significantly lower (faster) times compared to the other load conditions but not the no bag condition through the first 1.5 miles of the walk. Following the 1.5 mile mark, there were no statistically significant differences between any conditions.

Significance

Amateur golfers are provided multiple options to transport their clubs during a round, and the choice is generally not made with potential performance alterations considered. With the countermovement jump being a common method used to assess clubhead speed and lower body force and power development, the current study examined whether common bag carry methods influence kinetics during the vertical jump while transporting the bag for 3 miles, equivalent to approximately 9 holes. Our findings in the current study suggest that vertical jump peak force was greater throughout the walk in the push cart condition and that those peak forces were produced faster. This may suggest that lower body force production capacity is maintained longer when the external load is transported via cart instead of being carried. The current findings of the higher bag position causing negative effects is contradictory to literature. However, the load carriage literature on bag placement commonly examines strain on the upper body (neck, shoulders, and back) instead of the lower extremity examined in the current study. It is possible the higher bag location decreased whole body stability putting the lower extremities under a greater workload while walking which affected jump kinetics. Our findings support the use of amateur golfers using a push cart to transport their clubs when possible in order to maintain lower body force production throughout the round.