

INFLUENCES OF GOLF BAG LOAD CARRIAGE STYLE ON VERTICAL JUMP HEIGHT AND PERCEIVED EXERTION

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Introduction

During a round of golf, players will typically transport their clubs and subject themselves to the external load while covering the course distance. Research on load carriage has illustrated loads positioned closer to the center of mass will elicit decreased energy cost and perceived strain. Further, golf bags specifically when carried by means of a double strap have been shown to attenuate perceived effort and physiological demands than that of a single strap. Countermovement vertical jumps (CMVJ) are often used to predict club head speed in golfers of varying skill. Additionally, CMVJ height and force production are associated with club head speed, and previous research has suggested that vertical jump performance decreases following load carriage tasks. However, no evidence exists to determine which golf bag carriage technique presents minimal influence on vertical jump performance and perception of carrying the bag. Therefore, the purpose of the current study was to determine how each golf bag transportation mode affected perception of the prolonged carrying task and unloaded vertical jump performance.

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 and reported ratings of perceived exertion (RPE). Jump testing consisted of three two arm, countermovement jumps with the highest jump height of the three used for analysis. RPE was reported using a BORG 6-20 scale. All 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 Bonferroni 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

The repeated measures ANOVA for vertical jump height revealed a significant interaction ($F(48,432)=1.699$, $p=0.003$, $\eta^2=0.159$). Follow-up analyses for the vertical jump height suggest that the dual strap low bag condition had significantly higher jump heights compared to the unloaded conditions (no bag and push cart) during the first mile. However, after the 1 mile mark there were no further statistical differences between any of the load conditions. Analyses for RPE suggest a significant interaction. There were no significant differences between any load conditions at the start of testing. At the 1.5 mile mark the single strap condition RPE was significantly higher than the no bag, dual strap low bag, and push cart condition. Further, the dual strap high bag condition was greater than the no bag and push cart condition. At the 3 mile mark, the single strap condition RPE was significantly higher than the no bag, dual strap low bag, and push cart conditions. The dual strap high bag condition was also greater than the no bag condition and push cart condition.

Significance

The method in which many amateur golfers transport their clubs during a round is primarily chosen based off personal preference with little regard to whether it may influence performance. With the countermovement jump being a common method used to assess clubhead speed and lower body force and power development, we examined whether common bag carry methods influence this vertical jump performance as well as subjective measures of exertion while transporting the bag for 3 miles, equivalent to approximately 9 holes. Our results tell an interesting story with initial greater jump heights in the dual strap low bag condition while also having lesser RPE throughout the walk compared to other carry conditions. This may suggest that carrying the bag in the lower position for the initial mile may improve performance while not increasing exertion, however, beyond the first mile, this position no longer results in improved performance despite RPE still be less than other carry methods. Our findings of the single strap condition showing increased perceived exertion levels throughout the walk are corroborated by previous findings that suggested that carrying a golf bag acutely did increase energy expenditure and exertion compared to that of a dual strap carry. We expand on that here with a much more prolonged walk more similar to what a player would actually experience during a round as well as with comparisons to unloaded conditions such as the push cart, which players may utilize. Based upon alterations to jump performance and subjective exertion levels our findings suggest that players should attempt to use a push cart when possible to unload themselves while transporting their clubs. Though, if players do choose to carry their

clubs they should attempt to use dual straps, and wear the bag lower on the back to mitigate perceived exertion during the round.