

## The Metabolic Cost of Pushing versus Carrying a Golf Bag

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### ABSTRACT

The two most common non-motorized methods for transporting golf clubs in recreational and amateur golf are carrying a double strap bag or pushing a wheeled cart. The transportation method of golf clubs can have a direct impact on the necessary metabolic, musculoskeletal and cardiorespiratory requirements of golf performance. **PURPOSE:** To compare the metabolic cost of pushing versus carrying a golf bag. **METHODS:** Twenty two participants (18 Male, 3 Female, 24.2±8.9 yrs, 176.6±14.5 cm, and 76.2±14.5 kg) were recruited for one session in which they walked one mile while carrying and one mile while pushing a 25lb golf bag (determined as the average weight of a tournament bag for 5 male and 5 female collegiate golfers). Half of the participants completed the carrying condition first while the remaining participants completed the pushing condition first. All testing was performed on an indoor track. An approximate pace of 3.5mph during each walk was maintained by checking the time every 1/16 mile at which point feedback was provided to the participant to speed up, slow down, or maintain pace. It was required that each trial be completed with a time corresponding to ±5% of the 3.5 mph target pace. The walking trials were separated by a 10-minute recovery period. VO<sub>2</sub> and HR were recorded for each transportation method using the PNOE (Athens, Greece) portable metabolic measurement system and Polar (Bethpage, NY) heart rate monitor. The use of the PNOE device required participants to breathe through a mask, which sealed the nose and mouth, for the duration of both walks. The device was removed during the recovery period. Steady state VO<sub>2</sub> and average HR were computed for the five-minute period between minute 7 and minute 12 of each trial. Steady state VO<sub>2</sub> and average HR were compared between walking conditions using a paired t-test. **RESULTS:** The mean±SD VO<sub>2</sub> and HR were 1.48±0.19 L/min and 118.2±17.3 bpm, respectively for the carry condition and 1.34±0.17 L/min and 110.4±17.9 bpm, respectively for the push condition. Pushing the cart resulted in a significant 10.4% reduction in VO<sub>2</sub> ( $t_{19}=1.73$ ,  $p<0.001$ , Cohen's  $d=1.72$ ) and a significant 6.8% reduction in HR ( $t_{19}=1.73$ ,  $p<0.001$ , Cohen's  $d=1.35$ ) as compared to the carrying condition. **CONCLUSION:** This study provides novel evidence that transporting a competition golf bag using a pushcart significantly reduces metabolic cost as compared to carrying. Thus, these data support utilizing a pushcart and shows that removing the load of equipment from the body has the potential to reduce fatigue experienced by the golfer. Currently within the golf community and especially within the demographic of college aged and younger golfers, there is a stigma around utilizing a pushcart. There has been no published study thus far that focuses on providing empirical evidence on the metabolic cost of pushing versus carrying a golf bag and therefore no evidence to support the choice of either method from an energy cost standpoint. Given the significant reduction in metabolic cost observed during the pushing method in this study, further study is warranted to see how the mode of transporting equipment would affect metabolic cost during an actual golf round.