CHAPTER NUMBER 17

Physical Activity-Related Benefits of Walking during Golf

Timothy C. Sell, University of Pittsburgh
John P. Abt, University of Pittsburgh
Scott M. Lephart, University of Pittsburgh

ABSTRACT

Over 350,000 preventable deaths occur each year due to a combination of poor nutrition and physical inactivity that contributes to diseases such as type–2 diabetes, heart disease, high blood pressure, high cholesterol, and certain types of cancers. Golf can potentially serve as a component of a healthy lifestyle and may reduce the risks of many preventable diseases. The purpose of this case study was to determine the physiological demands of playing golf and the potential physical activity-related health benefits (based on the American College of Sports Medicine's recommendations) associated with walking whilst playing. One subject underwent metabolic testing while playing golf under three different conditions: walking while carrying bag, walking with caddy, and cart riding. A portable telemetric metabolic system integrated with a heart rate monitor were utilized to measure oxygen uptake, heart rate, respiratory exchange ratio, and caloric expenditure. In addition, an integrated body monitoring system was used to capture total walking distance. Total distance walked and time to completion varied for the walk-carry (8.69 km, 2.88 hours), walk-caddy (7.89 km, 2.88 hours), and cart-riding (3.86 km, 3.37 hours) conditions and average heart rate was higher in the walk-carry condition (67.4% of max heart rate, 120 bpm) compared to the walk-caddy (61.8%, 100 bpm) and cart-riding (49.4%, 88 bpm) conditions. The breakdown of heart rate zones according to condition was as follows: walk-carry (<40% MHR- 9%, 40-50% MHR- 53%, 50-60% MHR- 34%, >60% MHR- 4%; walk-caddy: (<40% MHR- 31%, 40-50% MHR- 59%, 50-60% MHR- 9%, >60% MHR- 0%; cart: (<40% MHR- 9(%, 40-50% MHR- 1%, 50-60% MHR- 0%, >60% MHR- 0%). The average V(dot)O_2 was higher in the walk-carry condition (22.4 ml•kg•min^{-1}) compared to the walk-caddy (18.3 ml•kg•min^{-1}) and cart-riding (15.6 ml•kg•min^{-1}) conditions with total caloric expenditure for the round of golf during the walk-carry (1954 kcal) condition was higher than either the walk-caddy (1527 kcal) or cart-riding (1303 kcal) conditions. Golf and walking may provide a more appealing alternative to individuals who do not participate in regular physical activity while inducing the recommended amount of physical activity that promotes a healthy lifestyle.

Keywords: Fitness, Health, Walking, Heart Rate

INTRODUCTION

The fitness benefits associated with golf are often overlooked or ignored by the majority of participants who either choose to or are required by golf courses to ride a cart during participation. Golf courses often view cart revenue and pace of play as a necessity for the fiscal solvency of operation. However, golf and walking may provide a vehicle to improve the health and well-being of individuals by combating a sedentary lifestyle that has proven to be a primary risk factor for hypokinetic diseases such as type–2 diabetes, cardiovascular disease, hypertension, dyslipidemia, obesity, and certain types of cancers.

Guidelines outlined by the American College of Sports Medicine (ACSM) indicate that a minimum of 30 minutes of moderate intensity exercise (55 – 70% of age predicted maximum heart rate) performed five days of the week, and expending a minimum of 150 calories per day will reduce the risk of hypokinetic diseases (Pate *et al., 1995*). The health benefits associated with golf have received limited attention (Parkkari *et al., 1995*), although theoretically, golf with walking should provide a means to improve health and well-being. The purpose of this case study was to determine the physiological demands of playing golf and the potential physical activity-related health benefits associated with walking while playing.

METHODS

Participant

A single-subject (Age: 43 years, Stature: 1.77 m, Mass: 85.0 kg) case design was used to compare the metabolic differences between three golfing conditions (walking while carrying bag, walking with caddy, cart riding). The subject provided written informed consent in accordance with the University's Institutional Review Board prior to participation.

Experimental Conditions

The subject performed an 18-hole round of golf under each condition with the rounds separated by a minimum of one week and maximum of 10 days. The temperature and humidity was similar for each round (approximately 70 degrees and 40% humidity). Total course length measured 6.04 km (USGA Course Rating: 73.1, Slope Rating: 139). The golf club was located in a regionally hilly area, yet designed for walking with most tees and greens in close proximity to each other. Each golfing condition consisted of a carry bag with 13 clubs and testing equipment. The total weight of the bag, gas analyzer, and battery pack was 10.5 kg.

PROCEDURES

The subject was fitted with a portable telemetric metabolic system (K4b^2, Cosmed USA) integrated with a heart rate monitor (S210, Polar USA) to measure the physiological responses of oxygen uptake, heart rate, respiratory exchange ratio, and caloric expenditure. The metabolic system included an open-circuit respiratory mask connected to a gas analyzer. The gas analyzer and battery pack were worn in a harness on the chest and back of the player (see Figure 1). An integrated body monitoring system (Sensewear Armband, Body Media) was used to capture total walking distance for each round and was worn on the mid triceps region of the right arm. All equipment was calibrated before and after each round according to manufacturer's guidelines.

Figure 1. Golfer wearing portable metabolic testing equipment.

RESULTS

Total distance walked and time to completion varied for the walk-carry (8.69 km, 2.88 hours), walk-caddy (7.89 km, 2.88 hours), and cart-riding (3.86 km, 3.37 hours) conditions. Scores were similar for each round: walk-carry (83), walk-caddy (82), and cart-riding (84). Average heart rate across the 18 holes, as a percentage of maximum heart rate (206.9- (0.67*age)), was higher in the walk-carry condition (67.4%, 120 bpm) compared to the walk-caddy (61.8%, 100 bpm) and cart-riding (49.4%, 88 bpm) conditions (See Figure 2). The breakdown of heart rate zones according to condition was as follows: walk-carry (<40% MHR- 9%, 40-50% MHR- 53%, 50-60% MHR- 34%, >60% MHR- 4%; walk-caddy: (<40% MHR- 31%, 40-50% MHR- 59%, 50-60% MHR- 9%, >60% MHR- 0%; cart: (<40% MHR- 9(%, 40-50% MHR- 1%, 50-60% MHR- 0%, >60% MHR- 0%). Average V(dot)O_2 was higher in the walk-carry condition (22.4 ml•kg•min^{-1}) compared to the walk-caddy (18.3 ml•kg•min^{-1}) and cart-riding (15.6 ml•kg•min^{-1}) conditions. Average ventilation was higher in the walk-carry condition (50.8 l•min^{-1}) compared to the walk-caddy (44.2 l•min^{-1}) and cart-riding (33.1 l•min^{-1}). Respiratory exchange ratio was higher in the

walk-carry condition (0.87) compared to the walk-caddy (0.63) and cart-riding (0.71) conditions. Total caloric expenditure for the round of golf during the walk-carry (1954 kcal) condition was higher than the walk-caddy (1527 kcal) and cart-riding (1303 kcal) conditions.

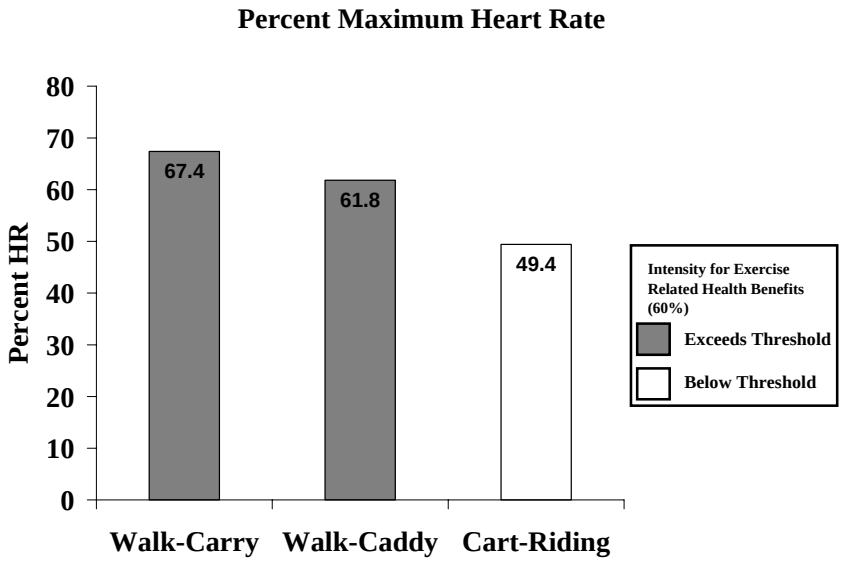

Figure 2. Percentage of heart rate for each playing condition.

DISCUSSION

Participation in golf while walking and carrying clubs and walking with a caddy elicited an average heart rate response and caloric expenditure above the minimum threshold of recommended physical activity guidelines set forth by ACSM. Participation in physical activity that expends a minimum of 150 calories a day or 1000 calories a week has been reported to decrease the risk of coronary heart disease by 50% and the risk of colon cancer, hypertension, and diabetes by 30% (Pate *et al., 1995*). The health benefits achieved by expending a total of 1000 – 2000 calories a week will result in the greatest risk reduction of developing preventable diseases (Murphy *et al., 2002;* Thompson *et al.*, 2004; and Tully *et al., 2005*) by altering the risk factors associated with the development of hypokinetic diseases. Walking and golf-related training interventions have elicited a reduction in body fat (Murphy *et al., 2002* and Parkkari *et al., 2000*), increased high density lipoporotein cholesterol (Murphy *et al., 2002* and Parkkari *et al., 2000*), decreased systolic and diastolic blood pressure (Tully *et al.,2005*), and increased functional

capacity (Tully *et al., 2005*), all of which are factors associated with the development of hypokinetic diseases.

Unfortunately, many individuals lack the motivation to become more physically active with traditional forms of exercise. Golf and walking may provide a more appealing alternative to individuals who do not participate in regular physical activity. Additionally, participation in golf while walking can provide the recommended amount of physical activity (heart rate intensity, daily caloric expenditure) that promotes a healthy lifestyle compared to cart riding.

APPLICATION

Participation in physical activity that meets the minimum guidelines established by ACSM will decrease the risk of hypokinetic diseases. The current study demonstrates that golf and walking provide the recommended amount of physical activity that has been shown to improve overall health and well-being. Unlike many other physical activities, golf can be enjoyed across the lifespan by women and men alike, from which the associated health benefits may be continually experienced. Golf and walking provide an avenue by which fitness and weight-related goals may be achieved as well as maintained over the lifespan.

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