Austin Journal of Nutrition & Metabolism

Open Access

Austin Publishing Group

Research Article

Measurement of Metabolic Parameters in Collegiate Golfers

Knight KB* and Valliant MV
Department of Nutrition and Hospitality Management, University of Mississippi, USA

***Corresponding author:** Knight KB, Department of Nutrition and Hospitality Management, University of Mississippi, PO Box 1848, University, MS 38677, USA

Received: February 16, 2017; **Accepted:** March 13, 2017; **Published:** March 24, 2017

Abstract

Golf is a popular sport played on a number of skill levels; however, there is limited research literature on the various metabolic parameters associated with playing or nutritional recommendations specific to the sport. Consequently, dietary recommendations for golfers are often based on information from other sports. The purpose of this study was to measure body weight, blood glucose utilization, and specific gravity of urine in golfers before and after an 18 hole round of golf in to detect changes that might occur during competition conditions.

Eleven members of a National Collegiate Athletic Association (NCAA) Division 1 men's golf team participated in a study to collect metabolic parameters related to athletic performance in golf. Body weight, blood glucose levels, and specific gravity of urine were assessed at the beginning and ending of an 18-hole practice round simulating tournament conditions and body mass index (BMI) was assessed for each golfer. Significant changes were noted in body weight [-2.3 lb ($p<0.01$)], blood glucose levels [8.63 mg/dl ($p<0.01$)], and specific gravity of urine [0.0116 ($p<0.01$)]. The change in metabolic parameters suggests that NCAA golfers participate in moderate, long-term activitythat is unique to other sports, and further research should be conducted on the dietary needs of its athletes.

Keywords: Golf, Body metabolic parameters, Sports performance, Nutrition

Abbreviations

NCAA: National Collegiate Athletic Association; DXA: Dual Energy X-ray Absorptiometry; cm: centimeters; M: meters; BMI: Body Mass Index; lb: pounds; mg: milligrams; dl: deciliters

Introduction

Over the past twenty-five years, research has clearly documented the beneficial effects of nutrition on exercise performance [1]. However, much of this research has been done in either high-endurance sports such as distance running [2] or other track events [3] or in football [4]. Although golf is a popular sport that is played at a number of levels, there is little information in research literature about either the various metabolic parameters associated with playing or nutritional recommendations specific to the sport. Most research with golfers focuses on kinematic analyses of the golf swing [5,6] and other biomechanics [7] Wells, et al. [8] measured various physiological parameters while asking golfers to perform specific, sport-related activities and found significant correlations between BMI, sit-height, and arm-length and strength of swing.

Measurements of factors such as body weight, blood glucose utilization, and specific gravity of urine have rarely, if ever, been measured in collegiate golfers and consequently, dietary recommendations are based on information that is gathered from other age groups or type of athletes.Although this lack of attention to collegiate golf may have arisen from the attitude that it was regarded as only a recreational sport with few real physical demands, this is far from true. Collegiate tournaments may include as many as four rounds in multi-day competitions with one round taking between three to five hours to play. The average golf course is seven kilometers from the first to last hole and a player may walk 10-20 kilometers in a game [9] as golf cart use is not allowed. In a review of the role of physiology in golf performance, Smith [10] outlined the rigorous physical demands of the sport and suggested that the effects of poor nutrition and inadequate hydration may impair player performance through physical and mental fatigue. He also called for more research, especially in women, junior, and special-needs groups. Low blood glucose levels have been observed following 18 holes of golf in elderly male participants [11]. A reduction of blood glucose during activity can result in a decreased ability to concentrate, a critical component to golf success. . Euhydration is another consideration for optimal performance [12]. Assessing hydration can be done in several ways with the most common being changes in body weight and urine specific gravity which have been documented to be reliable techniques [13].

Because of the lack of physiological and nutritional information about the requirements associated with training for and playing golf, this studymeasured body weight, blood glucose levels, and specific gravity of urine, on male National Collegiate Athletic Association NCAA golfers, at the beginning and ending of an 18-hole practice round simulating tournament conditions. The analysis of this data can then lead to recommendations for training and dietary intake that is specific to the sport.

Methods

Eleven members of an NCAA Division 1 men's golf team

Citation: Knight KB and Valliant MV. Measurement of Metabolic Parameters in Collegiate Golfers. Austin J Nutr Metab. 2017; 4(1): 1043.

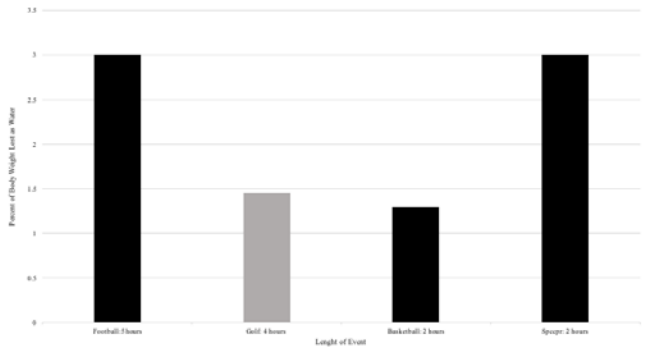

Figure 1: Percent body weight lost by subjects during this golf round compared with other collegiate sporting events.

participated in a study to collect metabolic parameters related to athletic performance in golf. The university (which was the same for both researchers and golfers) Institutional Review Board approved the research protocol and associated activities, and each participant reviewed and signed informed consent forms prior to participating in the study.

Each golfer completed a health history questionnaire, and then body composition and bone mineral content were determined using dual energy X-ray absorptiometry (DXA). Heights were measured using a portable wall-mounted measuring tape (White Stature Meter Height Measure Measuring Tape 200 cm/2M). Blood glucose levels, specific gravity of urine and weights of the golfers were assessed at the beginning and ending of an 18-hole practice round simulating tournament conditions. Because sweat on clothing could add weight, the golfers weighed nude, privately in a separate room. Weights were measured to the nearest 0.1 pound with a portable digital scale (Tanita HD-384 Digital Scale).

Demographic data and beginning heights and weights were analyzed using descriptive statistics, and body mass index (BMI) was calculated for each golfer. BMI is an index of body mass divided by the square of height expressed as kg/m^2 and provides a relative weight that allows comparisons of weight between individuals or between an individual and an ideal weight. All statistical analysis was conducted using IBM SPSS Statistics for Macintosh, Version 23.0.

Results

Demographic and beginning heights and weights can be found in Table 1. All the golfers were Caucasian and the mean body mass index was 24. Although the mean BMI score indicated that most of the golfers fell into the "normal" range, four of the golfers were in the "overweight" range with BMI's ranging from 25 to 27. One golfer was in the "underweight" range with a BMI score of 18.

Results for the measurement of pre- and post-round body weight, blood glucose levels, and specific gravity of urine can be found in Table 2. Significant changes that were noted are: body weight [-2.3 lb ($p<0.01$)], blood glucose levels [8.63 mg/dl ($p<0.01$)], and specific gravity of urine [0.0116 ($p<0.01$)].

Discussion

The 18-hole practice round was completed by the golfers in four hours and 10 minutes, which was comparable to NCAA tournament rounds. The golfers carried their own clubs, and were allowed to drink water ad libitum. The golfers lost weight with a post-round average weight of 169±20.8 pounds ($p<0.05$), and since the specific gravity of their urine also rose from 1.018±0.013 to 1.031±0.011 ($p<0.01$), the weight loss was likely attributed to water loss through sweat. As seen in Figure 1, the weight lost during this round of collegiate golf is comparable other collegiate sports [15] Hillyer, et al. [14] suggested that the effects of dehydration on athletes in skill-based sports goes beyond a physiological explanation and may result in impaired cognitive function. They recommend further research using standardized methodology so that effects can be better quantified.

Table 1: Baseline demographic characteristics of participants.

Variable	Overall Sample (n = 11)
Age (Years)	20.55 ±0.43
Gender	Male
Ethnicity	Caucasian
Height (in)	70.49±1.06
Weight (lbs)	171.6±21.6
Body Mass Index	24

Table 2: Mean metabolic parameters before and after an 18-hole round of golf.

Metabolic Parameter	Pre-Round	Post-round	Change
Body weight (lbs)	171.6±21.6	169.3±20.8	-2.3±0.4*
Blood glucose (mg/dl)	94.1±9.5	84.2±5.7	-8.6±0.7**
Urine specific gravity	1.018±0.013	1.031±0.011	+0.011±0.018*

*$p<0.05$
**$p<0.01$

Blood glucose levels fell during the round as well, dropping from 94.1±9.5 to 84.2±5.7 mg/dl, a change of 8.6±0.7 mg/dl ($p<0.01$).The need for glucose during sports activity is well documented [1,2] and is especially needed in sports that combine physical exertion with the need for high mental acuity [10]. Because NCAA golfers walk the course and carry their clubs, they fall into the aforementioned classification.

Adequate hydration and blood glucose levels are not only needed for optimal performance; they are needed for recovery from the physical demands of sport as well. The loss of water weight and lowering of blood glucose levels in this study suggest that, for NCAA golfers, the sport is strenuous enough to warrant serious attention to these physiological parameters. Dietary assessment should include measurement of fluid and carbohydrate intakes. Additionally, since many tournaments are multiday, the consequences of inadequate recovery can accumulate and have a greater negative impact on subsequent days. Thus, nutrition education should stress these topics.

Conclusion

The change in metabolic parameters suggests that NCAA golfers participate in moderate, long-term activitythat is unique to other sports, and further research should be conducted on the dietary needs of its athletes.

Acknowledgement

The authors would like to acknowledge William Roebuck for

significant contribution to the literature review and formatting of this project, and the golfers who participated in the study.

References

1. Thomas DT, Erdman KA, Burke LM. Position of the academy of nutrition and dietetics, dietitians of canada, and the american college of sports medicine: Nutrition and athletic performance. J Acad Nutr Diet. 2016; 116: 501-528.
2. McArdle WD, Katch FI, Katch VL. Exercise physiology: nutrition, energy, and human performance. Lippincott Williams & Wilkins; 2010.
3. Pöchmüller M, Schwingshackl L, Colombani PC, Hoffmann G. A systematic review and meta-analysis of carbohydrate benefits associated with randomized controlled competition-based performance trials. J Int Soc Sports Nutr. 2016; 13: 27.
4. Alghannam AF. Carbohydrate–protein ingestion improves subsequent running capacity towards the end of a football-specific intermittent exercise. Appl Physiol Nutr Metab. 2011; 36: 748-757.
5. Nesbit SM, McGinnis R. Kinematic analyses of the golf swing hub path and its role in golfer/club kinetic transfers. J Sports Sci Med. 2009; 8: 235-246.
6. Lehman GJ. Resistance training for performance and injury prevention in golf. J Can Chiropr Assoc. 2006; 50: 27-42.
7. Hume PA, Keogh J, Reid D. The role of biomechanics in maximising distance and accuracy of golf shots. Sports Med. 2005; 35: 429-449.
8. Wells GD, Elmi M, Thomas S. Physiological correlates of golf performance. J Strength Cond Res. 2009; 23: 741-750.
9. Kobriger SL, Smith J, Hollman JH, Smith AM. The contribution of golf to daily physical activity recommendations: how many steps does it take to complete a round of golf?. Mayo Clin Proc. 2006; 81: 1041-1043.
10. Smith MF. The role of physiology in the development of golf performance. Sports Med. 2010; 40: 635-655.
11. Hillyer M, Menon K, Singh R. The Effects of Dehydration on Skill-Based Performance. International Journal of Sports Science. 2015; 5: 99-107.

Citation: Knight KB and Valliant MV. Measurement of Metabolic Parameters in Collegiate Golfers. Austin J Nutr Metab. 2017; 4(1): 1043.