

The Golf Caddie - The Forgotten Worker

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Received June 16, 2020; Revised July 17, 2020; Accepted July 27, 2020

Abstract Caddies are an integral part of the game of golf. As an occupation, little is known regarding the physical and psychological demands of caddying. Likewise, there is a dearth of scientific literature regarding musculoskeletal disorders (MSDs) among caddies. This research endeavor attempted to provide a review of literature regarding the physical demands associated with caddying as well as the prevalence of MSDs. The authors then provide targeted research recommendations to address the shortcomings of the current state of the scientific literature as related to the occupation of caddying. This information may help inform workplace health intervention strategies to improve job performance/satisfaction, lower the occurrence of MSDs, lower health care costs, increase occupational longevity, and enhance the quality of life for the professional caddie.

Keywords: *golf, caddie, load carriage, walking*

Cite This Article: Kent J. Adams, Trish Sevene, Joe Walsh, Mike Climstein, and Mark DeBeliso, "The Golf Caddie - The Forgotten Worker." *Journal of Physical Activity Research*, vol. 5, no. 1 (2020): 41-44. doi: 10.12691/jpar-5-1-8.

1. Introduction

A golf caddie is defined by the Professional Golf Association of America (PGA) as "a person hired to carry clubs and provide other assistance" [1]. The Western Golf Association's (WGA) Caddie Academy (where the Caddie Hall of Fame is located) provides a broader definition and states that "a caddie is someone who assists a golfer during a round of golf; their responsibilities include carrying a golfer's bag, determining yardages, replacing divots, raking bunkers and tending to the flag stick" [2]. Caddies also provide strategy on course play, helping to read and navigate terrain and obstacles, select the appropriate clubs, and provide psychological support [1,2,3]. Caddies are part of golf's history and are involved in golf at every level of the game, from recreational and amateur, to professional competition (e.g., PGA Tour). Men and women caddies regularly work at both public and private courses in the United States (USA) and around the globe. For example, California's Pebble Beach Resorts located in the Monterey Peninsula, USA, has over 250 caddies working four courses.

Despite the recognized importance of the caddie to the game of golf [1,2,3], and the role of the caddie as a recognized and sought-after profession (typically as an independent contractor), it appears that very little scientific literature exists on the caddie occupation. This includes an initial search of databases related to ergonomics, sports

medicine and sport science, workforce, musculoskeletal disorders (MSDs), etc. (e.g., PubMed, Medline). In contrast, a 2018 International Consensus Statement on Golf and Health [4] cited 75 scientific references and a recent scoping review on the relationships between golf and health identified 301 studies that met the review criteria [5]. It appears therefore that caddies have been "forgotten" in terms of work-related scientific assessment and monitoring in relation to their job needs/cost analysis and assessment of typical MSDs incurred.

Therefore, the purpose of this paper is to: a) establish the current state of knowledge on caddies related to physical job demands and MSDs; and b) highlight what we need to know about the caddie occupation and provide recommendations for next steps.

2. Methods

First, a meeting occurred between two of the authors and a professional caddie with over three decades of experience. Conversation focused on the caddie occupation in non-professional golf on public and private courses in the USA. The meeting was initiated by the caddie due to increasing issues related to MSDs occurring in caddies and their impact on longevity in the occupation. The discussion focused on job demands (e.g., carrying two bags at a time; walking distance; terrain) and typical MSDs incurred by both this caddie and professional colleagues (note that as an independent contractor,

medical insurance and medical procedures are the caddie's responsibility); and also the lack of scientific information related to the occupation. This meeting helped inform the researchers of real-world problems and issues as seen through the eyes of a professional caddie who had performed this occupation for decades. Recognizing this conversation was simply that, both researchers felt the information added to the ecological validity and informed focus of this endeavor.

Second, a systematic search of several electronic databases was conducted (e.g., Medline, PubMed, SPORTDiscus, ScienceDirect). Individual terms and their combination were used (i.e., golf caddie, golf, golf bag carriage, caddy). The search was limited to full text, English language manuscripts, both theoretical, informed perspectives and human studies research trials. Reference lists of relevant papers were also searched manually. Time period searched was from inception of the database to current (i.e., July 2020). As noted above, the search was limited to the English language; that said, during the search, two relevant studies were identified that had English abstracts only [6,7]; unfortunately, even with the use of the university's interlibrary loan, we were unable to attain the English translation of either manuscript; therefore brief comments will only address data reported in these two abstracts.

3. Current State of Knowledge

As previously stated, a review of the literature revealed an overall dearth of scientific investigation on the caddie occupation, with even less in English. Further, when studies do exist, the majority had very small sample sizes. It was also difficult to generalize the caddie occupational experience in different countries with vastly different lifestyles and occupational practices.

A review of the literature found no studies in English that assessed MSDs in caddies. Two non-English studies (abstracts only) were found specific to MSDs in caddies [6,7]. Heo et al. [6] used self-recorded questionnaires designed by the National Institute of Occupational Safety and Health (NIOSH) to study MSD rates and causal factors in 316 caddies from six different golf courses in Korea. Complaint rates of MSDs were ~ 42% in the leg/knee/ankle/foot, 36% in the shoulder, 36% in the upper back/lower back, 29% in the neck, and 29% in the arm/wrist/fingers. Other factors causing stress were associated with issues such as: work hours, weather, terrain, physical load, customer interaction, psychological demand and low job control. Wanke et al. [7] focused on the golf caddie's job in relation to occupational medicine, with emphasis on work-related demands, which have changed and expanded over time. Unfortunately, the abstract provided no other details.

Regarding steps per day, we found no studies on caddies in the USA, and little elsewhere. Average steps per day in caddies was assessed in six female caddies in Korea. Goto et al. [8] reported that caddies in their study typically walked ~20,000 steps per round of golf. Studies on golf typically report that when playing 18 holes, golfers take between ~11,000 and 17,000 steps, equating to ~4-8 miles [5]. Note that when not walking, caddies are

in the standing position, which has been reported by caddies as an additional stressor [6,9]. And often, caddies in the public/private sector caddie 36 holes a day (i.e., as independent contractors, the more they work, the more they earn in wages and tips). This doubles step load (i.e., ~30,000+/day) and often equates to ~ 10 miles/day under almost constant load. Related to steps, two studies investigated bone mineral density (BMD) in female caddies. Goto et al. [8] studied six female Japanese caddies, finding that the high amount of walking benefited BMD; and Hoshino et al. [10] found higher bone ultrasound measurements in 74 female golf course caddies compared to controls.

No study has investigated the metabolic cost (e.g., oxygen consumption, heart rate (HR)) or perceived exertion experienced by a professional caddie carrying one or two golf bags, either while caddying or while walking on a treadmill. Note that carrying two bags is quite common in the caddie occupation, since for the caddie who is an independent contractor this doubles payment over one round of golf. Two studies were conducted on the metabolic cost of carrying golf clubs in a single bag while walking on a treadmill. Holland and Godwin [11], using 16 male recreational golfers, found that carrying a 12.5 kg double-strap golf bag resulted in less metabolic stress (e.g., oxygen cost, HR) than carrying a single-strap bag. Ikeda et al. [12] found similar results in a comparable study with 15 males. Simulating golf play, Wallace and Reilly [13] measured metabolic cost in five participants carrying an eight kg backpack vs. walking on a treadmill. Oxygen consumption increased by 15% and ventilation 25% while carrying clubs.

To our knowledge, there is no uniform weight of a golf bag. Weight of golf bags in the public/private sector vary, and often there is no control over bag weight. Golfers habits vary, and weather (e.g., heat, wind, rain, hydration habits) impact what a golfer carries in a golf bag. Personal communication with professional caddies suggests that in the public/private sector bag weight is typically limited to around 12.5 kgs (25 lbs); that is if the caddie has the authority to provide input.

In relation to loading characteristics of golf bag carrying, again, very little exists in the literature, and it pertains to golfers, not caddies. The relation of the golf swing to low back pain also compounds interpretation [14]. That said, reports of low back pain, and low back and extremity injury were higher in golfers who consistently carried their bag [15,16,17]. Wallace and Reilly [13] found in six subjects that carrying clubs while walking on a treadmill resulted in greater spine shrinkage compared to walking without clubs. Also, one loosely related study investigated 75, 6-17 year old, junior golfers bag transport practices [18]. Due to the overall weight carried in relation to percent bodyweight, the authors raised concern on bag transport methods. Overall, the general recommendation from these collective works is to transport clubs with the use of a mechanical aid (e.g., cart, pull cart, etc.).

The lack of information on the caddie occupation and load carriage contrasts with the number of studies on load carriage and MSDs in other professions (e.g., military, firefighters, etc.) [19,20,21]. While comparisons can be made, the dynamics of carrying two golf bags, weighing a

minimum of 12.5 kgs each, for ~ 5 to 10 miles (i.e., one to two rounds of golf) over diverse terrain, and setting them down and picking them up, presents unique job demands yet to be quantified.

While no English language studies have assessed MSDs in caddies, a few psychological-based studies do exist that lend insight into the potential mental stressors of the job. This has relevance as there is a clear connection between mental stressors, locus of control, etc., that contribute to MSD occurrence in a variety of occupations [22]. Pilgrim et al. [3] performed a qualitative investigation of the caddies' role in elite golf. Six male caddies experienced with elite level golfers, and 17 elite Australian golfers, participated in semi-structured interviews. Focus was on the caddies' part in decision-making, psychological conditioning and tournament preparation of the golfers. While this was elite golf, findings highlight the complexity of the job and are useful in helping to guide an effective caddie-golfer relationship; and have general relevance to the expectations of caddies in non-professional golf. After all, recreational golfers are likely avid spectators of elite/professional golf. In relation, job stress and associated factors were investigated in a descriptive, cross-sectional study by Jung et al. [9] in 228 female caddies in South Korea. Factors such as poor income, diet, and work hours were identified as contributing factors to cumulative stress. Heo et al. [6] also highlighted caddie stressors related to bad language, violent customers, and instability of employment. As previously stated, one must acknowledge that generalizability to other countries or golf environments may be limited. Other studies have investigated psychology and philosophy of the caddie and the caddie/golfer relationship [23,24].

4. What We Need to Know

Like other occupations [19,20,21], it is important to the caddie profession to have scientific evidence specifically related to job demands (e.g., metabolic cost of carrying golf bags (often two bags at a time in the non-professional golf setting); perceived exertion; distance covered; biomechanics; etc.), and typical MSDs incurred. As in golfers [25] and other outdoor enthusiasts [26], risk of skin cancer is also an important variable to assess in caddies. This type of information will help inform specific workplace health intervention strategies to improve job performance, lower the occurrence of MSDs and other health hazards, and thus lower health care costs. Collectively this strategy may help to improve job satisfaction, longevity, and overall quality of life for the professional caddie.

5. Future Directions

Due to the lack of scientific data on the caddie occupation, there exists a host of research questions related to the caddie. For example, here are a few:

- What is the MSD profile (e.g., injury location, frequency) of a caddie (specifically a professional caddie working public/private golf courses in the USA)?
- What is the absolute and relative metabolic cost, perceived exertion, and biomechanics of carrying two golf bags at once vs. one golf bag?
- What are the effects of varying terrain on the metabolic cost, perceived exertion, and biomechanics of carrying golf bags?
- What is the typical weight of a golf bag at a public/private golf course submitted to the caddie by the paying golfer?
- What is the impact of body size and weight of the caddie on MSDs?
- How often is a golf bag picked up and set down over a typical round?
- What is the average number of steps taken while carrying golf bags during one round? And during one typical day of caddying?
- What are the warm-up and injury prevention strategies (e.g., strength and conditioning; lifting strategy) of the caddie?
- What is the ultraviolet radiation (UVR) exposure, skin cancer profile and skin cancer risk of caddies?
- In the USA, what is the value of the caddie to the public? And to the public and private golf clubs?

6. Conclusions

The caddie in an integral part of the game of golf. That said, little is known about the physical or psychological demands of being a caddie, or the typical MSDs incurred by a professional caddie practicing their occupation in the public/private golf club sector. This paper has attempted to set the stage for future research that will help elucidate and clarify these demands and incidence of MSDs. We are optimistic that specific caddie focused research may help lower MSDs, associated medical costs, and lost work, improve the work experience, and thereby improve the occupational longevity and quality of life of the professional caddie.

Acknowledgements

The authors have no conflicts of interest regarding this work. Other than we like carrying heavy objects and hanging out at Hole 19 on golf courses.

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