

# Describing the epidemiology and associated age, gender and handicap comparisons of golfing injuries

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## 1. Introduction

Injury is the most under-recognized public health problem facing the world community (Theriault and Lachance 1998). In addition to being an enormous public health issue, injuries continue to usurp limited healthcare financial resources (Bauman and Owen 1999). Sports and recreational injuries are a significant public health problem (Bauman and Owen 1999). With an increase in physical activity participation rates, there is also a subsequent increase in injury exposure and injury risk (Bauman and Owen 1999).

There has been a lack of epidemiological studies illustrating the extent of golfing injuries in the United States, as most research has focused upon sports perceived as being more aggressive or demanding. Injury studies are important to accurately determine the extent, nature and location of injuries so that appropriate intervention strategies can be developed (Bauman and Owen 1999).

Therefore, the purpose of this study is to determine injuries sustained by golfers in the USA in the previous 12 months, including the professional medical care sought for treatment and the impact of the injury. A secondary aim is to investigate differences in the epidemiology of golfing injuries sustained by age, handicap and gender.

## 2. Materials and methods

### 2.1. Participants

Golfers' aged over 18 years who visited a golf fitness laboratory were invited to participate in this study. Golfers had to play golf on a regular basis over the previous 12 months (once/week) and have a registered golf handicap to be eligible.

### 2.2. Procedures

Recruitment for this study took place between December 2005 – May 2006 at Pinehurst Resort and Country Club, North Carolina. All golfers who participated in this study completed a questionnaire.

### 2.3. Questionnaire

The questionnaire was based on previous questionnaires investigating golf injuries (Fradkin *et al.* 2003, 2005, 2007). Golf play was defined as 'playing at least nine holes on a golf course', whereas golf practice was defined as 'any other form of golf'. The questionnaire covered demographics, golf and warm-up history and 12-month injury history.

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## 2.4. Injury definition

The definition of injury was ‘damage to the body that occurs as a result of competing, training and/or participating in a golfing activity’ (Fradkin *et al.* 2003, 2005, 2007). This definition was chosen as it encompasses both training and actual game injuries as well as sport-related illnesses such as heat stress.

## 2.5. Data management and analysis

All data were analysed using SPSS version 12 (SPSS Inc., Chicago, IL, USA) and were entered on two independent occasions to ensure accuracy. Frequencies and descriptive statistics were generated for relevant variables and 95% CI calculated. A one-way ANOVA with Bonferroni alpha corrections was performed for each variable across gender, age and handicap to ascertain whether significant differences were evident.

## 3. Results

This study consisted of 304 golfers with a median age of 53 years, with the majority of golfers being male (71.4%). The median USGA handicap of the golfers was 13 and they had been playing golf a median of 18.5 years. The average golfer played a median of 8 hours per week and practised 2 hours per week. There were 111 golf injuries reported equating to 36.5% of golfers with a history of injury. The median age and handicap of golfers reporting injuries is shown in table 1.

Strains were the most frequent type of injury reported (37.8%), followed by stiffness and inflammation (9.9% each). The most common mechanisms of injury (excluding those who were unsure) were overuse (29.7%)

Table 1. Body region injured, median age and handicaps of golfers who reported an injury in the previous 12 months.

Body region injured	Number of injuries	Median age (years)	Median handicap
Lower back	40	50	9.5
Shoulder	15	56	12
Elbow	13	58	18
Knee	8	66	16.5
Ankle	6	26	6
Hand and fingers	6	51	4
Wrist	6	44	13
Foot	3	61	6
Groin	2	63.5	12
Hip	2	57	18
Neck	2	55.5	13
Ribs	2	42	11
Upper back	2	22	4
Other	4	46.5	22

and overexertion (26.1%). Of the 111 injuries, over half sought treatment from a healthcare professional (51.4%) (figure 1).

The majority of injured golfers needed treatment for 1–2 weeks (29.8%) and 51.3% reported an impact on their lives. The most common injury sequelae were an inability to play (47.4%) and an altered swing (21.1%). Almost two-thirds (64.0%) of the injured golfers missed participation time due to their injury, with 39.3% missing one to three practice sessions, followed by seven to ten (9.8%). Golfers frequently missed one to three games (46.8%), but a substantial number missed more than six (27.4%). Eight of the injured golfers (7.2%) needed time off from school or work due to their injury, with most requiring 1–2 weeks absence (50.0%).

Chi-square analysis showed that golfers’ handicaps ( $p=0.041$ ; 95% CI  $-0.546, -0.011$ ), hours of golf play ( $p=0.003$ ; 95% CI  $0.727, 3.478$ ) and hours of golf practice ( $p=0.013$ ; 95% CI  $0.206, 1.746$ ) were significantly associated with their injury status.

There were few significant associations in injured golfers across gender and handicap. Males devoted more hours to golf practice compared to females ( $p=0.008$ ) and lower handicap golfers play and practice more than all other groups (play 11.3 vs. 9.3 hours/week ( $p=0.007$ ); practice 4.9 vs. 1.8 hours/week ( $p < 0.001$ )). There were, however, significant differences across groups in many variables (see table 2).

## 4. Discussion

The results of this study add further weight to the evidence that golf injuries are a common occurrence and impact golfers’ lives. Two previous studies have looked retrospectively at injuries sustained over a 12-month period and the injury incidence in this study (36.5%) is consistent with these studies (33 and 35%) (Fradkin *et al.* 2003, 2005).

Younger golfers and highly skilled golfers were more likely to report sustaining a golfing injury. Less skilled players sustained more hip, elbow and knee injuries, while older golfers sustained more knee, groin and foot injuries. Higher handicap golfers may be at an increased risk of hip, elbow and knee injuries due to poor swing mechanics (Mallon and Hawkins 1994), whilst older golfers may be sustaining more injuries due to strength decreases and joint degeneration (Yamada *et al.* 2001).

Older golfers were found to play significantly more hours of golf than all other age groups, which is probably due to this group being retired and having more leisure time. Younger golfers were shown to practise significantly more than other groups, which again is probably a by-product of time as these golfers do not have 4 hours to devote to a round of golf, but instead use their limited time to practice. Older golfers were also more likely to seek treatment for

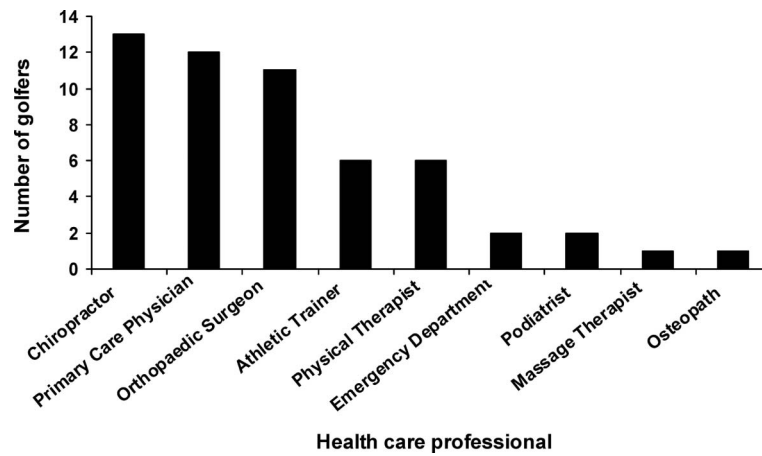


Figure 1. Most common healthcare professionals consulted by injured golfers.

Table 2. Age group comparisons of injured golfers.

	Reference age group (years)	Age group (years)	Significance	95% CI
Mean hours of golf play/week	62+	18–36	0.257	–0.21, 1.55
		37–53	0.005*	0.28, 2.22
		54–61	0.617	–0.38, 1.58
Mean hours of golf practice/week	18–36	37–53	0.000*	0.46, 2.04
		54–61	0.001*	0.37, 1.99
		62+	0.000*	0.50, 2.00
Treatment sought for injury?	62+	18–36	1.000	–0.44, 0.23
		37–53	0.022*	–0.76, –0.04
		54–61	0.658	–0.60, 0.15
Have you had a recurrence of the injury?	37–53	18–36	1.000	–0.26, 0.34
		54–61	0.044*	0.01, 0.67
		62+	1.000	–0.26, 0.37

\*The mean difference is significant at the 0.05 level.

their injury than middle-aged golfers, potentially because they have more medical conditions than younger age groups and are probably more inclined to visit a healthcare professional when something is physically bothering them.

There is a paucity of information regarding the type of health professionals consulted by injured golfers. Only one previous study has investigated the types of healthcare professionals visited by injured golfers (Fradkin *et al.* 2005); however, there were very few similarities between that study and the current one. This may be due to a cultural difference as the previous study was conducted in Australia.

As more people continue to participate in golf, the risk of sustaining an injury is likely to increase, thus the need for proven preventive strategies. This study has shown that overuse injuries and strains to the lower back are the most

common injuries sustained. These injuries could be potentially avoided if adequate preventive measures are implemented. Warm-up was shown to be one of these preventive measures and it was highlighted in a previous study (Fradkin *et al.* 2007) to be effective.

In conclusion, this study has demonstrated that golfing injuries occur to golfers of all ages and ability levels and the injury incidence is consistent with similar studies conducted in other countries. The injuries sustained were shown to have a significant impact upon the golfers' lives. As warming-up has been shown to reduce injury risk, future studies should focus upon the best way to promote warm-up to golfers.

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