Golf injuries - common and potentially avoidable

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Injuries sustained during golf rarely receive the recognition given to injuries from sports perceived as more violent or strenuous. However, golfing injuries are believed to occur frequently. The aim of this study was to explore the injury profile of female golfers, including treatment sought and the impact of the injury on performance and participation. Forty-one team captains were given questionnaires to distribute to their players. A total of 522 golfers participating in the Victorian Women's Pennant Competition in Victoria, Australia, from both the Metropolitan and Country competitions, completed the study. Over one-third (35.2%) of the golfers reported having sustained a golfing injury within the previous 12 months, with the lower back being the most commonly injured body region. Strains were the most frequent type of injury (67.9%). Of the 184 injuries reported, 154 sought treatment from a health professional. Physiotherapists were the most common health professional consulted. Performance was affected in 78.9% of cases, with 69.7% of the injured golfers missing games or practice sessions due to injury. Golfing injuries appear common and have a substantial impact upon the injured golfer. As lower back strains are the most common injury, strategies such as performing an appropriate warm-up could be investigated to determine the possible injury prevention benefits for golfers. This study has also highlighted that the majority of treatments are from allied health professionals, suggesting that a complete epidemiological description of golf injuries requires information from broader settings than general practice clinics and hospitals.

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introduction

Golf is a popular sport that is enjoyed by millions of people of all ages and abilities[1]. Golf ranks as the third highest participation sport among Australian adults (behind swimming and aerobics)[2]. This may be because golf has no age or gender limits associated with it, making it a popular activity for all people[1]. While golf does not require extreme strength or flexibility, it does call for the co-ordinated movement of conditioned muscles throughout a large range of motion in the basic swing[3].

The incidence of golf injuries has received little attention in the literature. Published studies most commonly document unusual case reports, such as fractures of the hook of hamate[4], deaths on the golf course caused by anger[5], or natural phenomena such as lightning[6]. Although golf is usually considered a rather benign activity, it has been established that golfers play despite numerous minor and major ailments[7].

Research involving 226 professional golfers has shown the playing career incidence of injured golfers to be 89%, with the wrist and lower back the most common sites of injury (24% each)[8]. The high career incidence of injury to professional golfers can be attributed to the fact that they often play for up to 10 hr per day, six days per week[8]. Compared to professionals, amateur golfers do not place the same physical demands upon their bodies in terms of frequency of play and practice, yet those lesser demands are placed upon bodies not as well conditioned to the task as those of the professionals[7]. In addition, it is well established that the techniques practiced by amateur golfers are less refined and may place greater stress upon the musculoskeletal system during any individual swing[3,9,10,11].

Although injuries to amateur golfers have not been studied in detail, they have been shown to occur. In a retrospective study surveying 193 amateur golfers, the golfers' career incidence of injury was found to be 57%[12]. Combining data from both males and females, the most frequently injured sites were the back (36%), followed by the wrist (16%), elbow (11%), knee (10%) and shoulder (7%). Another retrospective study of 1144 amateur golfers obtained a similar career incidence of injury (62%)[13]. Once again, the back was the most commonly-injured site (35%), followed by the elbow (33%), hand and wrist (20%), shoulder (12%), and knee (9%).

Previous studies have all used a career injury incidence that may pose problems with recall bias. As the injury definition was broad or undefined in these studies, it would have been unlikely to trigger complete recall. Also, the questionnaires used were completed only by interested golfers, leading to the potential for selection bias. Prior studies have not presented data about the amount of time injured golfers spent playing or practising, nor whether treatment was sought and by whom. Therefore, the purpose of this study was to determine the injuries obtained by Victorian female pennant golfers in the previous 12 months, as well as the professional medical care they sought for treatment, and the impact of the injury in terms of altered performance and time lost from play and work.

Methods

Participants

Players from the metropolitan and country Victorian women's pennant competitions were invited to participate in this study. Both metropolitan and country pennant seasons extend for seven weeks from March through to May. The metropolitan competition comprises nine sections with eight teams in each section. Each team has approximately seven players. The country competition has 15 districts with up to 75 teams competing, each with approximately five players per team.

Procedures

Questionnaires were sent to the captain of each metropolitan team mid-way through the season. The captain's instructions were to distribute them to all team members involved in the competition, collect them once completed and return them prior to the completion of the season. The co-ordinator of the country pennant season was also sent numerous copies of the questionnaire and was instructed to distribute them to the country team captains in the same way.

Question	Question Format
Have you had an injury in previous 12 months?	Yes/No
When did injury occur?	Practising/Playing
What body region was injured?	Text
What was the nature of the injury?	Text
Did you receive treatment for the injury?	Yes/No
If you received treatment, from whom	12 tick box options
How long did you receive treatment for?	Number of days/weeks
Describe in detail how injury occurred?	Text
Did the injury affect your performance?	Yes/No
If your performance was affected, how?	Text
Did you miss any games or practices due to injury?	Yes/No
If yes, how many practice sessions?	Text
If yes, how many games?	Text
Did you miss any school or work time?	Yes/No
If yes, how many days?	Number of days/weeks
Have you had a recurrence of this injury within the previous 12 months	Yes/No

Table 1: Injury information collected by questionnaire from Victorian Women Pennant golfers.

Questionnaire

The questionnaire collected information on many facets of the golfers' attitudes, behaviours, knowledge, risk perceptions and injury history. Table 1 lists the injury information requested by the questionnaire.

Injury Definition

For the purpose of this study, the definition of injury was "damage to the body that occurs as a result of competing, training and/or participating in a golfing activity"[14]. This definition was chosen as it encompasses both training and actual game injuries as well as sport-related illnesses such as heat stress.

Data Management and Analysis

Data were collected, checked for completeness and entered on to a personal computer using SPSS (Statistical Package for the Social Sciences) for Windows, Version 11. Data were double entered to ensure accuracy. Descriptive statistics were generated for the relevant variables and 95% confidence intervals were also calculated. Body regions were categorised according to the Sports Safe Australia Sports Injury Data Dictionary[15]. Informed consent was obtained from all participants and approval for this study was granted by the Monash University Standing Committee on Ethics in Research involving Humans.

Results

All metropolitan and country teams were invited to participate in this study. Overall, 41 metropolitan teams agreed to participate in this study with the response rate of golfers in those teams being 86%. Approximately 30 country teams participated in this study with a response rate of 66%.

There were 522 respondents (276 metropolitan and 246 country), with a

Body region injured	Number of injuries	Median Age (years)	Median Handicap
Lower back	58	54.0	14.0
Shoulder	31	57.0	16.0
Elbow	19	55.0	14.0
Knee	13	62.0	16.0
Foot	13	53.0	14.0
Forearm	11	54.0	11.0
Thorax	9	54.0	10.0
Wrist	8	44.5	11.0
Pelvis	7	40.0	8.0
Hand & fingers	6	53.5	14.0
Ankle	6	61.5	15.0
Neck	2	52.0	22.5
Thigh	2	57.0	18.0

Table 2: Body region injured, Median age and handicaps of Victorian Women Pennant golfers who reported an injury in the previous 12 months.

Nature of Injury	Number of Injuries	%	95% CI
Strain	125	67.9	59.7, 76.1
Tendinitis	11	6.0	0.0, 20.0
Stiffness	9	4.9	0.0, 19.0
Fracture	7	3.8	0.0, 18.0
Neural	5	2.7	0.0, 16.9
Bony spur	3	1.6	0.0, 15.8
Sprain	2	1.1	0.0, 15.6
Unsure	2	1.1	0.0, 15.6
Other*	20	10.9	0.0, 24.6

*includes missing data and injuries misclassified during survey reporting

Table 3: The nature of most frequent injuries reported by Victorian Women Pennant Golfers.

median age of 54 y (range: 16 y-75 y). The median handicap of the golfers was 17 (range: 2-44), and they had been playing golf for a median of 15 y (range: 1y-52 y). With regard to playing and practising techniques, the average golfer played a median of 8 hr a week (range: 4 h-20 h), while the median number of hours spent practising per week was one (range: 0-20).

The respondents reported 184 injuries over the previous 12 months, equating to 31.4% of golfers with a history of one injury, 3.6% reporting two injuries and 0.2% reporting three injuries during the recall period. Sixty-eight golfers (38.6%) reported that the injury recurred during the year.

The median age and handicap of golfers reporting injuries is shown in Table 2. Respondents reported the lower back as the most frequently-injured body region (31.5%).

There was a trend showing pelvic and wrist injuries occurred in younger (40.0 y and 44.5 y respectively), more able players (handicap averages 8.0 and 11.0

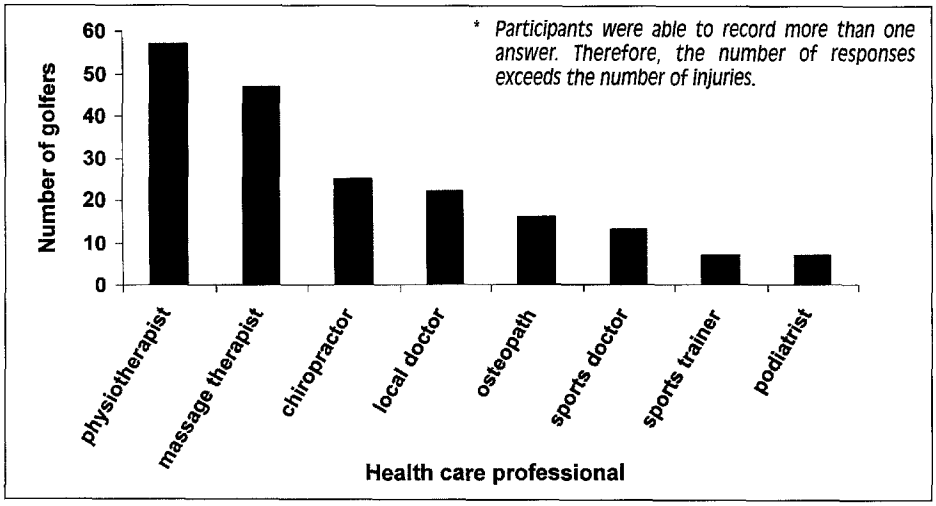

Figure 1: Most common health care professionals consulted by injured Victorian Women Pennant Golfers.

respectively). The small number of neck injuries occurred in the mid-aged (52.0 y) higher handicap golfers (median handicap 22.5). Better players (in terms of their handicap) sustained more thorax and forearm injuries (median handicaps 10.0 and 11.0 respectively). Older golfers sustained more knee and ankle injuries (median ages 62.0 y and 61.5 y respectively).

The nature of injuries sustained is shown in Table 3 and shows that strains were the most frequent type of injury reported. Lower back strains were the most common injury reported.

The most common self-reported mechanism of injury (excluding those who were unsure) was overuse (43.6%), followed by a technical error (18.0%). Other relatively common mechanisms were contact with a static object (eg, ground) (11.3%) and a sudden or rapid change of club speed (9.8%).

Of the 184 injuries, 154 were significant enough to require treatment from a health professional (83.7%). Figure 1 shows the most common health professional visited for treatment was a physiotherapist (20.1%).

Of the 163 golfers who received treatment for their injury, the majority needed treatment for one to two weeks (30.7%). This was followed by golfers needing treatment for less than one week (22.1%), and for greater than five weeks (21.5%).

Of the 185 injured golfers, 146 (78.9%) reported an impact on their performance or participation. The most common injury sequelae were an inability to play (29.6%), an altered swing (17.6%) and a decrease in performance (16.7%). More than two-thirds (69.7%) of the injured golfers missed participation time due to injury, with 50.8% missing at least one practice session and 57.3% missing at least one game. The most frequent number of missed practice

sessions was one to three (59.1%), followed by seven to 10 (10.8%). Golfers frequently missed one to three games (45.7%), but a substantial number missed more than six (31.4%). Seventeen of the injured golfers (9.2%) needed time off from school or work because of their injury, with most requiring one to two weeks away from school/work (64.7%), followed by less than one week (29.4%).

Discussion

This is the first study to look at injuries specific to women golfers, and to explore the treatment sought and the impact of golf-related injuries on participation, performance and work. The results of this study confirm the common occurrence of golf injuries and that these injuries have a significant impact upon the golfer. The literature contains very little research about golfing injuries and two of the three prior studies have looked at career incidence, a methodology likely to result in considerable recall bias. The findings of the current study (35%) are consistent with a previous study using a 12-month recall period (33%)[16]. The study by Fradkin et al, however, studied both males and females, whereas this study was restricted to females only[16].

The most commonly-injured body region was the lower back, a finding consistent with all previous studies[4,5,6,7,16]. Shoulder injuries are also common, but the frequency between studies differs markedly. As lower back strains were the most common injury identified in this study, it is possible that many of these injuries are preventable with some form of physical intervention.

There is a paucity of information regarding the type of health professionals consulted by injured golfers. Data from the Western Australia Sports Injury Study (WASIS) reported a similar percentage of injured sporting participants seeking treatment for an injury (74.5%)[17] as this current study (84%). The WASIS study, however, did not investigate golf-specific injuries, but rather hockey, Australian Football, basketball and netball. The WASIS study also showed that physiotherapists provided the majority of treatments[17]. It is important to note that the majority of treatments were non-medical. This implies that surveillance of sports injuries requires a much broader capture than doctors' clinics and hospitals. To obtain a complete description of injuries, surveillance from all professionals commonly visited would be required (eg, physiotherapist, chiropractors etc).

As more people continue to participate in golf, the risk of sustaining an injury could also increase, thus the need for proven preventive strategies. This study has shown that overuse injuries to the lower back and strains to the lower back are the most common injuries. These injuries are potentially avoidable if preventive measures are implemented. A possible preventive measure to help reduce the number of injuries in golfers is performing an appropriate warm-up. A previous study has shown that golfers' performances were significantly improved by undertaking a golf-specific warm-up program compared to not performing the warm-up[18]. However, to date, there have been no golf-specific studies investigating whether or not performing a warm-up will help prevent injuries.

There are other possible prevention strategies that could be implemented to help reduce the risk of injury to golfers. A strengthening or conditioning program could benefit golfers by building up the muscles around the shoulder

as well as the core stability muscles[11,18]. It is possible that by making these areas stronger that the risk of injury could be reduced. Another possible prevention strategy could be analysis and correction of the golfers' actual swing mechanics. Potentially, if golfers have an incorrect swing, they are placing more pressure on certain parts of their bodies and thus increasing the risk of injury to that region[10]. These factors could be considered for future golf injury prevention research.

This study has some limitations that could restrict the generalisability of these results. Only female golfers who were registered to play in the Victorian Pennant season were studied. This group of golfers would probably play and practice more frequently than the average golfer. Thus it is possible that the incidence of injury would be higher in this group. Also, golfers playing pennant must have a registered golf handicap. Therefore, it is possible that the skill level of these golfers would be higher than the average golfer. It is also not known whether or not there is a difference in injury rates and types between male and female golfers, and this needs to be investigated further.

The frequency of injuries was too few in some locations to allow detailed analyses. Finally, the data in this study were all self-reported and validation was not undertaken. A previous study has shown that both the self-reported health professional sought and the body part injured had good agreement when validated against an external source, but the type of injury had only a moderate agreement[17]. Respondents were non-medical personnel and therefore the injury types reported may have been incorrect.

In conclusion, this study has shown that injuries occur to female golfers of differing ages and abilities. This study has highlighted that the majority of treatments were non-medical which suggests that the surveillance of sports injuries requires a much broader capture than general practice clinics and hospitals. Strategies to attempt to lower the risk of injury to golfers need to be investigated. As lower back strains are the most common injury, strategies such as performing an appropriate warm-up could be investigated to determine the possible injury prevention benefits for golfers. Performing an appropriate warm-up has been shown to improve performance significantly in amateur golfers. However the injury prevention benefits have not been explored and thus should be considered.

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