

A Study of Injuries Associated with Golf.

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Contents Page.

Contents Page	Page 2.
Abstract	Page 3.
Introduction.....	Page 4
Method.....	Page 8.
Results.....	Page 10.
Discussion.....	Page 13
Acknowledgements.....	Page 17
Table 1.....	Page 18
Table 2	Page 19
Figure 1.....	Page 20
Figure 2.....	Page 21
Figure 3.....	Page 22
Figure 4.....	Page 23.
References.....	Page 24
Appendix 1.....	Page 25
Appendix 2.....	Page 26
Ethics Approval.....	Page 29
Instructions to contributors to Journal of Science & Medicine in Sport.	Page 31
Raw Data.....	Page 36

Abstract.

Golf is a game many believe to be relatively safe due to its benign nature. According to certain studies golfers have a career incidence of injury as high as 57%. The aim of this study was to explore the injury profile of golfers from an elite golfing program at the Victorian Institute of Sport (VIS) as well as golfers representing a group of golf courses from the 'Sandbelt' region of Melbourne, Victoria. In total 106 golfers completed a questionnaire that asked for information regarding their physical stature, golfing ability and injury occurrence in the golfing season from March 2004 to March 2005. Approximately one third (38%) of the golfers who participated in this study experienced an injury of some kind over the twelve-month period. The lower back was the most common location (31.6%), whilst muscular strains were the most common type of injury (51.0%). Of the golfers who reported injuries, 65.2% reported one injury, whilst 29.0% reported two. Of the golfers injured, 79% indicated that they required treatment for their injury, with a visit to the physiotherapist being the most common (73%) form of treatment. Half of those injured were unable to play due to their injury (50%). It is possible to conclude from this study, along with studies performed previously, that injuries in golf do occur and that serious musculoskeletal can occur.

Key Words: Golf, injury, location, type, handicap. (250 words)

Introduction.

Golf is one of the most popular and fastest growing sports. It is believed by many throughout the world that golf is practised by up to 10 to 20% of the adult population ^[1]. According to the Australian Bureau of Statistics, golf has the third highest participation rate amongst Australian adults ^[2]. The popularity of playing golf is not matched however with the amount of evidence on golf related injury. Gosheger et al. state that in comparison to other sports, golf lacks reliable large-scale epidemiological data on injuries ^[3].

Golf is regarded traditionally as a relatively safe sport because of its seemingly benign nature ^[4]; however, an increasing amount of research suggests that this is not always the case. Studies by McCarroll & Gioe ^[5], Batt ^[6], McCarroll ^[7] and Gosheger et al. have illustrated that golfers experience a range of injuries ^[3]. Injuries that were common in all of these studies included muscular strain injury to the lower back, wrist, shoulder and the hand. The preponderance of muscular injuries, as these authors suggest, may be due to a couple of common reasons such as over-use or even trauma-induced injury. A presumption of a valid diagnosis has also been made in these studies.

The anatomical region most commonly injured seems to vary according to player type as well as study type ^[4,5,6]. McCarroll ^[7] noted that in the professional golfer, the left wrist was most commonly injured. The lower back, left hand, left shoulder and then the left knee followed. McCarroll & Gioe ^[5] found that the lower back (lumbar spine) was the most frequently injured site in the professional golfer. The results of the study conducted by Gosheger ^[3] largely concur with those of McCarroll & Gioe ^[5]; however Gosheger ^[3] states that the back, referring to the lumbar spine, followed by the wrist, then the shoulder were the most commonly injured. Comparison of these three studies indicates that there are slight variations in the order of injury incidence, possibly owing to the differing populations utilised in each study, be it differing ages and ability. However these studies have had limitations. Due to their chosen study population, these authors are only able to comment on certain golfing sectors and not on the greater golfing population. Few authors to date have been able to comment on the injury patterns of a wide scope of

golfers from the elite professional to the weekly amateur golfer, as well as both male and female golfers. Only Gosheger et al ^[3] who interviewed 703 golfers from 24 randomly selected golf courses in Germany regarding the injuries sustained over a two-year period, and McCarroll & Gioe ^[5], surveyed professional golfers showed similarities to this study.

Injuries that occur in both professional and amateur golfing populations are assessed in various studies in order to determine why players are injured, as well as ways to reduce the occurrence of injuries in the future. Whilst the injuries sustained by professional golfers have been analysed, research into injury patterns of the recreational or weekend golfer is limited. It has been established that on average, a professional golfer suffers approximately two injuries per year ^[7]. This is possibly as a result of the constant and repetitive action of hitting the hundreds of balls each day that are required to become an elite player. In one of the first studies of its kind, McCarroll⁷ stated that the overall prevalence of injury for a golfer was 62%. This study surveyed a total of 1144 participants, including male and female, amateur and professional golfers. Batt ^[9] also reported a similar occurrence of injury (57%) in a UK amateur golfing population. Theriault ^[1], however, reported a somewhat lower injury incidence (25.2%). This indicates that differing injuries rates occur in the various studies.

McCarroll ^[7], in another study suggests that amateur golfers may not suffer the same injuries as the professional because of poor conditioning and/or poor swing technique. McCarroll & Gioe ^[5] suggest that an amateur golfer has a poorer technique and the extreme twisting of the torso, at high speeds, increases their chances of injury. Although this can explain injuries that occur to the spinal region, it is perhaps not sufficient to explain injuries that occur to other areas of the body.

Golf is a game that is played by a vast range of people. It is a unique aspect of golf that participation can continue throughout the golfer's lifetime. Therefore, when surveying golf injuries, a wide spectrum of people is required in order to obtain a greater representation of the golfing population. Age, gender, fitness and ability are all areas that should be noted when investigating injury related to golf. Batt ^[6] states the game is played by a diverse age group of differing ability, and the consequent

variation in injury patterns reflects these factors in addition to the overuse that arises from both play and practice. It should also be remembered that golf is a popular sport undertaken by both men and women. McCarroll and Gioe ^[5] demonstrated a slight difference in the type of injuries that occur in the elite male and female golfers. These authors report that the back was more often injured in the male whilst the left wrist was most commonly injured in the female. However, the fact that this study was published in 1982 limits the implication of their findings as modern club technology, improved coaching and physical conditioning over this time may have affected the relevance to the modern golfer.

Recent studies on golf injuries have not assessed the anatomical injury sites in relation to gender and physical stature as well as the relationship between the use of injury prevention mechanisms (i.e. warm up) used and the injury rates and locations. A study by Fradkin et al ^[10] investigated the injury status of female Victorian country and metropolitan pennant-playing participants over a one-year period. The authors reported that female pennant players actually sustained injuries at a similar rate and location as reported in previous studies ^[3,5]. Of interest Fradkin et al ^[10] also discussed the types of treatment that were sought by the injured golfer and revealed that by far the most common health professional visited was the physiotherapist.

Many previous studies have used a career injury incidence and this, as these authors state, may pose problems with recall bias. Only Fradkin et al. ^[10] used a one-year study analysis period and Gosheger ^[3] used a two-year analysis period. Both of these studies were retrospective studies, which does pose problems with recall bias. Many of the other studies have used a career injury incidence; further raising problems of recall bias.

Another point of contention is the definition of 'injury'. Gosheger et al ^[3] refers to minor and major injuries by the amount of time the golfer had to sit out from the game, thus implying that if the golfer was unable to play then there was an injury. Fradkin et al ^[10] refers to injury as damage to the body that occurs during practice or play. These definitions raise an important issue. Pain is due to actual or potential tissue damage ^[11], and whilst golfers might report a pain experience, pain alone cannot be considered to be evidence of tissue damage.

The aim of the present retrospective study was to identify injury rates and common anatomical regions of injury across a wide range of the golfing population.

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Method.

The aim of this retrospective study was to investigate the injuries that occur in golfers of various standards. Golfers were asked to complete the 'Golf Injury Questionnaire' (Appendix 2) which included questions aimed at providing information on the types of injuries and the consequences of these injuries over the golfing season of March 2004 to March 2005. Members of the Victorian Institute of Sport (VIS) golfing program as well as members of golf courses throughout the most famous and prestigious golfing region in Melbourne, the 'Sand-belt', were invited to participate. A retrospective study design was chosen as it has been used in previous studies with good affect, as well as making it easier and quicker for the volunteer to complete. The Victoria University Faculty of Human Development Human Research Ethics Committee approved this study.

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"^[12]. This definition was chosen as it encompasses both training and actual game injuries.

Participants.

The participants invited to participate in this study included golfers from a variety of areas. These incorporated the twenty elite golfers who constitute the members of the Victorian Institute of Sport (VIS) golfing program. Participants under the age of 18 were required to have a parent/guardian present during completion of the questionnaire.

One hundred (n=100) questionnaires were placed at the 'Sandbelt' golf clubs for recreational and weekend golfers. These players were invited to volunteer for this study via the placement of the questionnaires in the club locker rooms.

Materials.

The 'Golf Injury Questionnaire' was based on the questions outlined in the study by Gosheger & Liem et al^[3]. The questionnaire consisted of two parts. Part 1 consisted of a general information section requesting participants to provide information with regard to age, sex, height, weight, handedness, handicap, amount of

playing time, and the amount of stretching or warm up time before a round or practice. Part 2 asked participants to provide information with regard to injuries related to their participation in the game of golf over the golfing season from March 2004 to March 2005. Following the development of the questionnaire, a pilot study was undertaken by five (n=5) members of a Melbourne metropolitan golf club in order to determine the validity of the questionnaire. These five members were asked to complete the questionnaire and comment on any changes that may be required with regard to each question. No changes to the questionnaire were required following the pilot study. The Questionnaire is placed as Appendix 2.

Procedure.

Questionnaires were delivered to the VIS and the golf clubs towards the end of the season. The VIS representative was the VIS golf program Osteopath. Each of the VIS members were invited to participate during a training session and then return the questionnaire in a sealed envelope to the VIS representative when completed. A representative from each golf club was in charge of placing the blank questionnaires at the desk in the male and female locker rooms with a sign informing the members of the study. The members were able to volunteer their time independently and once completed place the questionnaire in a locked box at the club. Consent for this study was implied if the questionnaire was completed. The questionnaire was filled out prior to the participant's game of golf.

Statistical methods.

Data obtained from the completed questionnaires was tabulated in Microsoft Excel (2000). The quantitative material was analysed using percentage analysis in order to compare the varying anatomical locations, as well as the type of injury, that was reported by the golfers. Age, gender and ability were cross-correlated with type and location of the injury using Excel. This information was then analysed using cross sectional correlations with the SPSS (Statistical Package for Social Science) program.

Results.

A total of 106 of the 120 printed surveys were completed and included in the analysis. This comprised of responses from 17 (16%) members of the VIS golf program and 89 (83.9%) members of the participating golf clubs. Fourteen of the surveys were returned blank.

The most common age of the participants fell into the 36-45 year age group, however participants ages ranged from 15 to greater than 55 years of age. It comprised of 91 males (85.8%) and 15 females (14.2%). The mean handicap of the golfers was 12.23 (range +1 to 45). With regard to years spent playing the game, the majority said that they had been playing for greater than 14 years (54.7%).

With regard to total playing and practicing time for the participants the most frequent time bracket was between 5-7 hours per week of all participants. However the most frequent time of those that were actually injured was slightly higher at 8-10 hours of practice per week.

INSERT Figure 1.

Questions regarding warm-up protocols were also asked. Most of the participants (89%) indicated they used a warm up, of which 62% indicated that their warm-up lasted for between 1-10 minutes. There was no correlation between injury location or injury type and presence of a warm-up ($r = 0.055$ and 0.28 respectively). There was also no correlation between injury rate and warm-up ($r = -0.159$).

Of the 106 questionnaires returned, 38 (36%) of respondent's reported an injury or injuries related to their participation in the game of golf over the twelve-month period from March 2004 to March 2005. A total of 58 injuries were reported over the twelve-month period. Of the 38 participants who reported a golf related injury, 65.7% ($n=25$) reported one injury, 28.95% reported ($n=11$) reported two injuries, one participant sustained three injuries, (3%) and one (3%) participant reported 5 injuries during the twelve-month period.

Comparison of injury between the differing genders was also analysed. Overall, 91 males (85.8%) and 15 females (14.2%) made up our cohort. The average age did not differ significantly (both between 36-45 years). Also playing habits, such as number of rounds played, warm up prior to round and number of hours practiced/played per week were comparable for men and women. In terms of injury comparison, 46.67% (7) of the females were injured, compared with 34.1% (31) of the male golfers. The injured locations can be seen in figure 1. The types of injury varied slightly and can be seen in figure 2.

INSERT Figure 2 & 3.

The injury location and type of reported injury is tabulated in Table 1 and Table 2. The lower back was the most common location of reported injury, with muscular tightness, or strain, being the most common type in this region. It was noted that there was no correlation between the standard of the golfer and the location of the injury ($r = -0.044$). Although there was no statistically significant correlation between handicap and injury type ($r = 0.525$), the relationship between the two was stronger than any injury variable compared with the standard of golfer.

INSERT Table 1

Of note is the corresponding median age and median handicap of each of the injury locations. This table shows that reported injuries in general occurred most in the 36-45 year age group, however this was also the most common age group of the cohort. Of those golfers that were injured, most indicated that they played between 8-10 hours per week, however, an interesting variant was the fact that those with shoulder injuries in this population had a reduced playing time per week (5-7hrs).

Table 2 demonstrates the nature of the injury and its incidence within those participants who reported an injury.

INSERT Table 2

The cohort reported that the lower back was the most common area strained. In fact, of the injuries that occurred to the lower back, there were seven reported cases of low back strains and seven cases of the lesser problem of low back tightness, totalling 24% of injuries reported.

Of the 38 injured golfers, half (n=19) reported that they were unable to play golf for a period of time, with the time frame varying from player to player. Thirteen (68%) reported that they had been unable to play from between 1 week to 1 month due to injury, followed by two months to 6 months (16%), three greater than 6 months (11%) and finally only one (5%) was unable to play for less than one week.

Of the 38 golfers who reported an injury, a total of 79% (n=30) indicated that they received treatment for their injury. Of these, a visit to the physiotherapist (n=22, 57.98%) was the most common. Figure 3 shows the most common health professionals visited by golfers over the past year.

INSERT Figure 3.

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Discussion.

The aim of this study was to perform an analysis of the different injuries that occur in golfers of varying standards over a twelve-month period.. The present study collected data on age, sex, and physical stature, playing level and reported injuries. It was also the aim of this study to build upon the research previously undertaken in the area, as well as explore new data that might aid in the understanding of golfing injuries. Unlike the most recent comparable study ^[10], the present study includes both males and females.

The literature to date contains very little research regarding golfing injuries over a twelve-month period. Most studies have looked at career incidence of injuries, which carries the risk of recall bias, and the may not provide an accurate indication of injury rates. The only study that has so far looked at injuries occurring over a recent 12-month period concerned female pennant-level players exclusively ^[10].

When comparing the injury location and the injury type in female and male golfers slight differences were found. The lower back was injured the most in the male participants, where as the elbow and the hand regions were most affected in females. Whilst we could attempt to find reason for this difference, it is mentioned in previous studies ^[8,10,15] that the wrist and the lower back are both areas that are commonly affected in the injured golfer.

Unlike previous studies, the present study explored a broad spectrum of handicaps, which is valuable when assessing golfers injury rate. Although the median handicap was 12.23, the range was from +1 to the highest possible in Australian golfing handicaps of 45. With such a broad spectrum of playing abilities, it was possible to evaluate if there was any correlation between ability and injury location or type. However, a strong correlation between these parameters was not found in this sample. Whilst a relationship between handicap and injury type ($r = 0.525$) was found, it was not considered strong enough for comment. The relationship between handicap and location of injury ($r = -0.044$) was very weak. In future a larger study group could be used to gather a better understanding of this aspect of a relationship between golfing injuries and standard of play, especially with regard to injury type.

The overall injury rate reported in this study (36%) was consistent with that reported by Fradkin et al ^[10] of 35.2%. The present study is of a different population in that both females and males were included; where as the other study ^[10] mentioned only surveyed female pennant players. Interestingly, although the study populations were different, similar results were evident. Batt ^[8], who performed his study on amateur golfers from the UK reported a somewhat higher injury rate of 57%. However the average age of males (49.5 years) and females (53.0 years) for the study was slightly higher than this study (range = 36-45), which may or may not account for the increase in injury rate. Our overall injury rate, along with that of Fradkin et al.^[10] can also be compared with the injury rates from McCarroll et al.^[8] on amateur golfers in the US (62%). The differing rate of injury in the McCarroll ^[8] study is difficult to explain other than a differing in study population.

It should be noted that some of the golfers in this study reported having more than one injury. In fact 13 (34.3%) participants reported having two or more injured regions over the one-year period.

By far the most common location for reported injury in this study was the lower back (31.57%), and this is consistent with previous studies ^[7,10,13]. It should be noted that low back pain, whilst not only being common to golfers in this study and many others, is a common occurrence in non-golfers also. Shoulder injuries (12.28%) were also common in this study and in previous studies ^[4,10,14]. Although all studies have reported injuries to the shoulder, there has been a great deal of difference in the rate of injuries affecting this region. Fradkin et al ^[10] reported 16.8% of the injuries to the shoulder. However, only 7.7% were reported in the article by Jobe et al ^[12], which considered data from the professional golfers on the senior PGA tour over a five-year period. However, the differing study cohorts could, in some way, explain this as Fradkin used female pennant players whilst Jobe used PGA professionals. Another factor, which maybe involved is the age of the golfer. The most recent study in this area suggested that the median age of players who suffered a shoulder injury was 57.0 years ^[10]. As the average age range for this study was between the 35-46 years, there is possibly less chance of injury to the shoulder in the present sample.

Not only it is important to identify the areas that players sustain injuries while playing golf, it is also important to identify the types of injuries that occur. The most common type of injury reported was a muscular strain (51.02%), followed by reports of muscular tightness/stiffness (36.73%). Furthermore, the most common combination of location and type of injury was a low back muscular strain. Although this form of questioning is common in many of the previous studies regarding golfing injuries, it does raise the question of the validity of the diagnosis. Many of the diagnoses given are likely to have been self-diagnosed, thus making it difficult to accurately comment on the answers given.

According to Fradkin et al ^[10], (page 168), 'it is possible that many of these injuries (strains) are preventable with some form of physical intervention'. Therefore, it can be suggest that the strengthening and conditioning aspects of golf could be looked at in order to further prevent the impact that injury can have on all players.

This study also investigated the use of a warm-up before play, as well as the length of the warm up used prior to practice or play and in turn its impact on injury rates. Fradkin et al. ^[15] has shown that a golfers' performance is significantly improved by undertaking a golf specific warm up program compared to not performing the warm up. This study found that 89% actually attempted some form of warm up, and of these most (62%) warmed up for between 1-10 minutes. This demonstrates that the majority of golfers in this study were aware of the importance of performing a warm-up before play to possibly prevent injury. However, limitations exist with this question in the survey. We are unaware of what their warm-up comprised of, combined with the fact that there is a big difference between a 1 minute warm up and a 9 or 10 minute warm up. Also of note was the lack of correlation between injury rate and warm-up (-0.159) in this study.

Besides the warm-up, there are other possible injury prevention strategies that could be implemented by the club golfer. Fradkin et al ^[10] also suggest that injury prevention via the use of analysis and correction of the golfers' actual swing may be useful in preventing some injuries. It is possible that those golfers who have a biomechanically poor golf swing are more than likely to place certain areas of their body under stress and possibly increase risk of injury to that area.

As more people become active in playing golf, it is likely that the total number of injuries will increase on a pro-rata basis. From a health professionals perspective we are interested in which form of health care the injured golfer is likely to visit. It is possible to determine this by looking at Figure 3 that by far the most common health professional visited by participants in this study was a physiotherapist (57.89%). This is considerably lower than the 84% reported by Fradkin et al ^[10] to have visited a physiotherapist. From a health care professionals perspective this is interesting. Whether this is a trend that is going to continue with different golfers seeking alternative health care therapies, only time will tell.

There are a number of limitations in the present study. The frequency of injuries in some areas for instance was too few to comment on. A possible way to better represent some of these would be to broaden the study population in the study. Another issue already mentioned was the validity of the description of the injury given that it was from the golfer and not from a medical professional. This is an issue discussed in previous studies ^[8,10,15] and will continue to be a problem in future studies. The fact that amateur participants picked up questionnaires from the members locker rooms, and not from the examiners also contributed to possible incorrect understanding of the questions in some cases. Like the other studies before, recall and responder/volunteer bias is an issue. Placing the questionnaires in the member's locker rooms may have affected participation numbers, and asking golfers about injuries that may have affected them almost a year ago may have been difficult. It should also be noted that the use of a prospective study design might have also enabled more accurate results in that recall bias would not have been such a limitation.

In conclusion, it is possible to ascertain that injuries do in fact occur in either the practice or play of the game of golf. Also, these injuries occur to a broad spectrum of players, from differing age, sexes, and abilities. It is the greater knowledge of injuries associated with golf that is required to in turn contribute in making golf a safer and therefore more enjoyable lifetime activity. This study, along with studies performed previously aims to do this. It has shown that injuries in golf do occur and that serious musculoskeletal injuries can occur. It has been shown by this study that

the low back is the most common location of injury in this study cohort, and most reported muscular tightness or strain as the likely cause of the pain. In terms of prevention of this type of injury, perhaps further research should be directed towards areas such as core stabilization techniques, better warm up protocols and general strength and conditioning exercise programs could be beneficial.

Acknowledgements.

Special thank-you must be to Dr. Tina Maio and the Victorian Institute of Sport for their help in accessing the elite golfers in the VIS golfing program. Also thanks goes to the Metropolitan Golf Club, Royal Melbourne Golf Club, Kingston Health Golf Club and the Huntingdale Golf Club for their assistance.

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Body region	Number of injuries	Percentage of injuries	Avg. median age Group. (Years)	Avg. mean Handicap	Most freq. played hrs/wk.
Lower back	18	31.57%	36-45	7.78	8-10
Shoulder	7	12.28%	36-45	15.0	5-7
Neck	5	8.62%	26-35	13.0*	8-10
Elbow	5	8.62%	46-55	14.8*	8-10
Wrist	5	8.62%	26-35	14.2*	8-10
Hand	4	6.89%	46-55	13.5*	5-7
Upper back	3	5.17%	26-35	5.33	16-18
Hips, pelvis, buttock	3	5.17%	36-45	7.33	8-10
Knee	3	5.17%	36-45	3.0	8-10
Thigh	2	3.44%	36-45	8.0	5-7
Ankle	1	1.72%	36-45	3.0	16-18
Foot	1	1.72%	16-25	-1.0	8-10
Fingers	1	1.72%	46-55	45.0	13-15
Totals	58	100%	36-45	11.46	8-10

Table 1. Injured players' data. Percentage of total injuries, the mean age for that injury and the median handicap for that injury are also indicated.

Nature of Injury	Number of Injuries	Percentage of Injuries.
Muscular Strains	25	51.02%
Muscular tightness/stiffness	18	36.73%
Ligament strain	3	6.12%
Disc bulge	3	6.12%
Tendonitis	3	6.12%
Dislocation/subluxation	1	2.04%
Haematoma/bruise	1	2.04%
Neural	1	2.04%
Capsular tear	1	2.04%
Osteoarthritis	1	2.04%
Ganglia	1	2.04%
Totals	58	100%

Table 2. The nature of the most frequent injuries and the percentage of total injuries. (These diagnoses have been reported by the study cohort.)

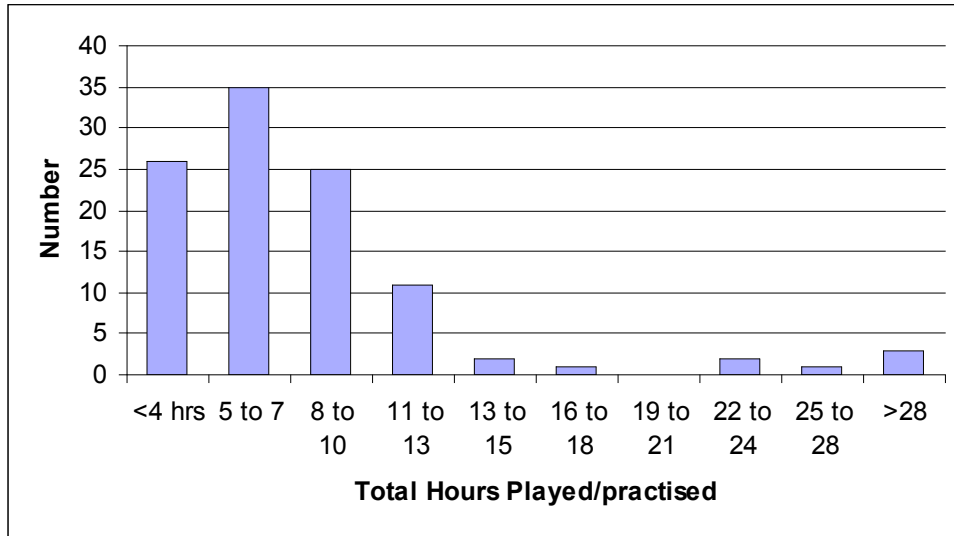


Figure 1. Total hours played and practised by all participants.

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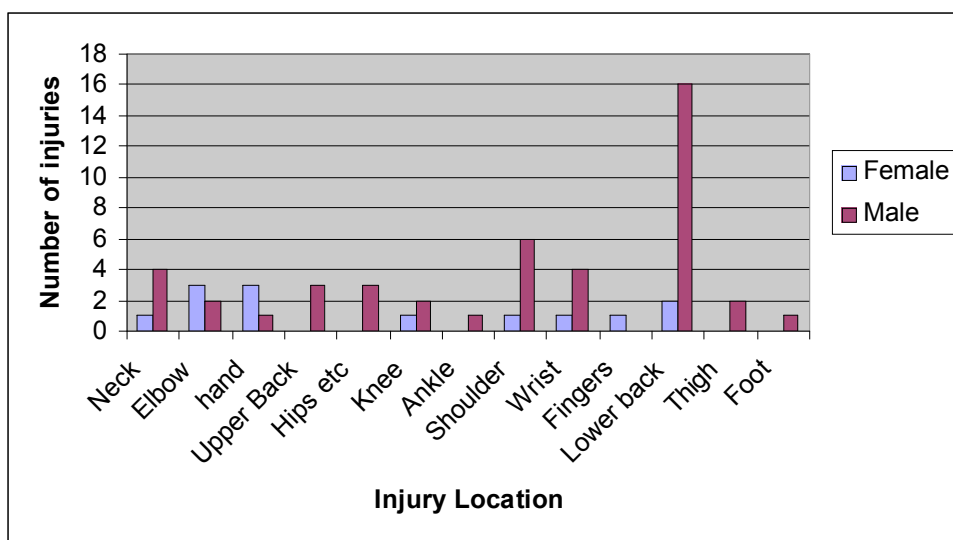


Figure 2. Locations of injuries to both male and female golfers.

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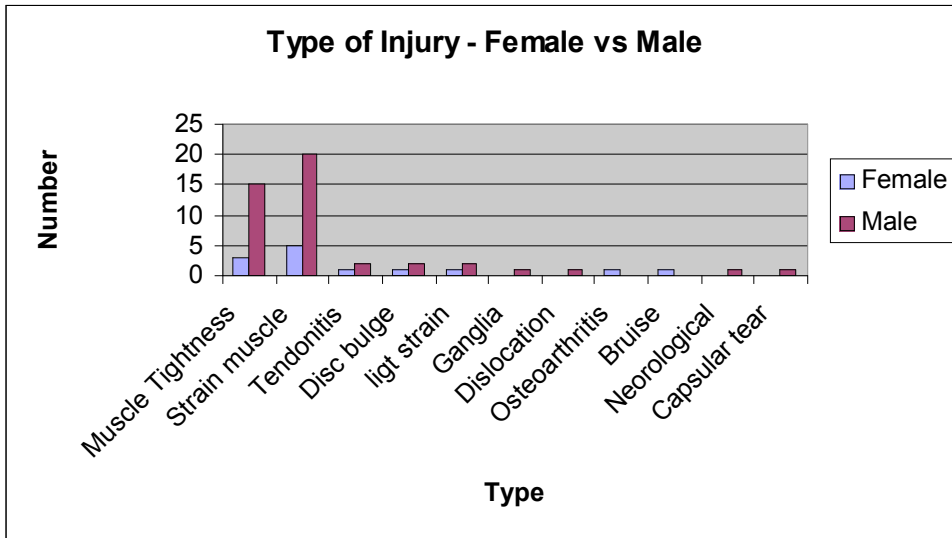


Figure 3. Comparison of types of injury with females and males.

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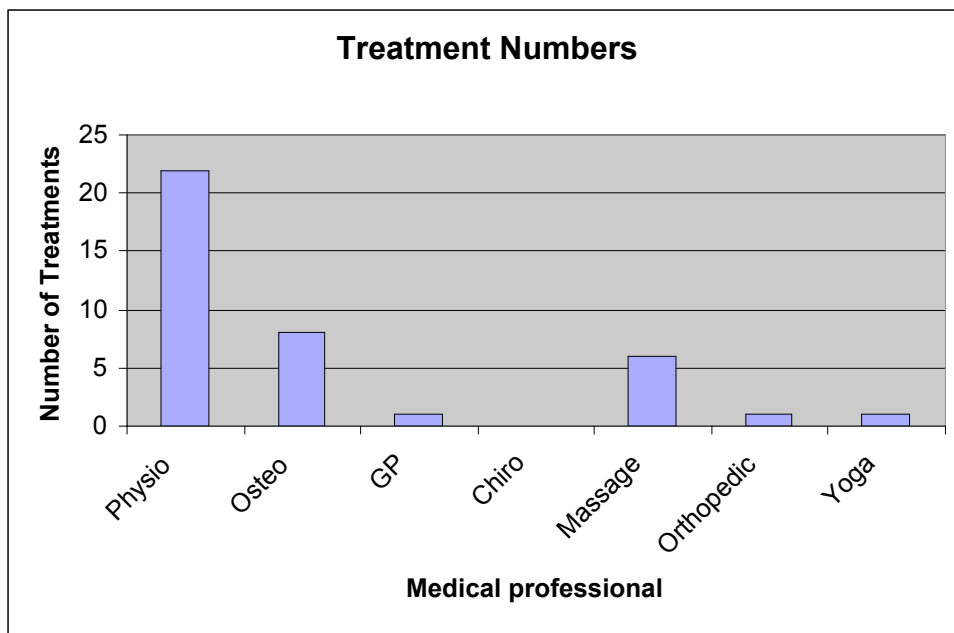


Figure 4. Most common health care professionals consulted by injured golfers. (NB some golfers visited more than one health care professional for a particular injury.)

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Appendix 1.

Victoria University of Technology

Dear participant,

You have been invited to participate in a study that is aimed at investigating the injuries that occur in golfers of various standards. With this study, it is expected that there will be a greater understanding of injuries that golfers experience and why they occur.

You, as a member of the Victorian Institute of Sport (VIS) golfing program, or as a professional or member of The Metropolitan Golf Club, Huntingdale Golf Club, Kingston Heath Golf club and Royal Melbourne Golf Club will be asked a collection of questions. It is assumed that due to your commitment to your membership or your occupation that you are a regular golfer and that you do experience injuries whilst playing golf. It is for this reason that you are invited to participate as we feel that you have a part to play in the research of golfing injuries. All the reported data that is collected will be in the de-identified form.

The information that you give on the questionnaire will be kept private and confidential for a total of five (5) years under the supervision of Mr Patrick McLaughlin. It will be kept in his office under lock and key for this time.

At any stage of the Questionnaire you will be able to withdraw from the study for any reason at all. If you feel uncomfortable at any stage throughout the study, you are entitled to remove yourself from the study. No prejudice will be given to any person that withdraws from the study.

Any queries about your participation in this project may be directed to the researcher (Mr. Patrick McLaughlin. ph. 9248 1101). If you have any queries or complaints about the way you have been treated, you may contact the Secretary, University Human Research Ethics Committee, Victoria University of Technology, PO Box 14428 MCMC, Melbourne, 8001 (telephone no: 03-9688 4710).

We thank-you for your participation in this study and we hope that it has been a pleasurable experience.

Sincerely,

Patrick McLaughlin BAppSc, MAppSc
Brett Vaughan B.Sc (Clinical Sc), M.H.Sc (Osteo).
Nicholas Harrison B.Sc. (Clinical Sc.)

Golf Injury Questionnaire

This questionnaire is designed to evaluate the injuries that a golfer may develop as a direct relation to actually playing or practicing the game. For the purpose of this study we ask that you include all injuries that you could possibly relate to golf, be they as simple as a blister on the toe, to a serious injury like a broken arm or concussion from a trauma. We thank you for your participation in this study.

1) Please indicate your age:

- | | |
|---|--|
| <input type="checkbox"/> Less than 15 years | <input type="checkbox"/> 36-45 years |
| <input type="checkbox"/> 15-25 years | <input type="checkbox"/> 46-55 years |
| <input type="checkbox"/> 26-35 years | <input type="checkbox"/> Greater than 55 years |

2) Please indicate your gender:

- | | |
|-------------------------------|---------------------------------|
| <input type="checkbox"/> Male | <input type="checkbox"/> Female |
|-------------------------------|---------------------------------|

3) Please indicate your approximate height, in centimeters:

- | | |
|---|---|
| <input type="checkbox"/> Less than 150 cm | <input type="checkbox"/> 171-180 cm |
| <input type="checkbox"/> 150-160 cm | <input type="checkbox"/> 181-190 cm |
| <input type="checkbox"/> 161-170 cm | <input type="checkbox"/> Greater than 190cm |

4) Please indicate your approximate weight (in kilograms):

- | |
|--|
| <input type="checkbox"/> Less than 45kg |
| <input type="checkbox"/> 46-60kg |
| <input type="checkbox"/> 61-75kg |
| <input type="checkbox"/> 76-90kg |
| <input type="checkbox"/> Greater than 90kg |

5) Are you right- or left-handed? Right Left

6) What is your current AGU or club handicap? _____

7) How long have you been playing golf for?

- | | |
|--|--|
| <input type="checkbox"/> Less than 2 years | <input type="checkbox"/> 8-10 years |
| <input type="checkbox"/> 2-4 years | <input type="checkbox"/> 11-13 years |
| <input type="checkbox"/> 5-7 years | <input type="checkbox"/> Greater than 14 years |

8) How many hours per week (on average) would you spend training that is, training time not spent on the golf course?

- | | |
|--|---|
| <input type="checkbox"/> Less than 2 hours | <input type="checkbox"/> 6-8 hours |
| <input type="checkbox"/> 3-5 hours | <input type="checkbox"/> Greater than 8 hours |

Please turn over!

9) How many rounds of golf (18 holes) would you play in one week (on average)?

- | | |
|------------------------------------|---|
| <input type="checkbox"/> None (0) | <input type="checkbox"/> Five (5) |
| <input type="checkbox"/> One (1) | <input type="checkbox"/> Six (6) |
| <input type="checkbox"/> Two (2) | <input type="checkbox"/> Seven (7) |
| <input type="checkbox"/> Three (3) | <input type="checkbox"/> Eight (8) |
| <input type="checkbox"/> Four (4) | <input type="checkbox"/> Greater than eight (8) |

10) On average, how many total hours per week would you spend playing golf?

- | | |
|--|--|
| <input type="checkbox"/> Less than 4 hours | <input type="checkbox"/> 16-18 hours |
| <input type="checkbox"/> 5-7 hours | <input type="checkbox"/> 19-21 hours |
| <input type="checkbox"/> 8-10 hours | <input type="checkbox"/> 22-24 hours |
| <input type="checkbox"/> 11-13 hours | <input type="checkbox"/> 25-28 hours |
| <input type="checkbox"/> 13-15 hours | <input type="checkbox"/> Greater than 28 hours |

11) Do you warm-up before playing golf?

- | | |
|------------------------------------|---|
| <input type="checkbox"/> Never | <input type="checkbox"/> Most of the time |
| <input type="checkbox"/> Sometimes | <input type="checkbox"/> Always |

12) If you do warm-up before playing golf, how long do you spend warming-up?

- | | |
|--|--|
| <input type="checkbox"/> Less than 5 minutes | <input type="checkbox"/> 16-20 minutes |
| <input type="checkbox"/> 6-10 minutes | <input type="checkbox"/> 21-25 minutes |
| <input type="checkbox"/> 11-15 minutes | <input type="checkbox"/> Greater than 25 minutes |

13) Have you suffered from an injury related to participating in the game of golf from March 2004 to March 2005?

- Yes No

If **NO**, please do not answer any further questions on this survey. Thank-you for your participation.

If **YES**, please continue to Question 14 below.

14) How many golf-related injuries have you suffered from in the period March 2004 to March 2005?

- | | |
|------------------------------------|---|
| <input type="checkbox"/> One (1) | <input type="checkbox"/> Four (4) |
| <input type="checkbox"/> Two (2) | <input type="checkbox"/> Five (5) |
| <input type="checkbox"/> Three (3) | <input type="checkbox"/> More than five (5) |

Please turn over!

15) Please identify the location of your injury. If you have suffered more than one injury between March 2004 and March 2005 please ensure you indicate these in the appropriate region.

- | | |
|--|--------------------------------------|
| <input type="checkbox"/> Head | <input type="checkbox"/> Eyes/face |
| <input type="checkbox"/> Neck | <input type="checkbox"/> Shoulder |
| <input type="checkbox"/> Upper Arm | <input type="checkbox"/> Forearm |
| <input type="checkbox"/> Elbow | <input type="checkbox"/> Wrist |
| <input type="checkbox"/> Hand | <input type="checkbox"/> Fingers |
| <input type="checkbox"/> Upper back | <input type="checkbox"/> Lower back. |
| <input type="checkbox"/> Hips/pelvis/buttock | <input type="checkbox"/> Thigh |
| <input type="checkbox"/> Knee | <input type="checkbox"/> Lower leg |
| <input type="checkbox"/> Ankle | <input type="checkbox"/> Foot |
| <input type="checkbox"/> Toes | |

16) From the above injuries mentioned please detail the nature of the injury (for example, was it a blister, bruise, torn muscle, broken bone, etc).

.....

17) Has your injury or injuries prevented you from playing golf?

- Yes No

If **YES**, for how long has the injury or injuries prevented you from playing golf?

- | | |
|--|--|
| <input type="checkbox"/> Less than 1 week | <input type="checkbox"/> 2 months to 6 months |
| <input type="checkbox"/> 1 week to 1 month | <input type="checkbox"/> Greater than 6 months |

18) Did your injury require treatment?

- Yes No

If **YES**, what form did the treatment take?

- | | |
|--|--|
| <input type="checkbox"/> Physiotherapy | <input type="checkbox"/> Chiropractic |
| <input type="checkbox"/> Osteopathy | <input type="checkbox"/> Massage |
| <input type="checkbox"/> General Practitioner. | <input type="checkbox"/> Other (please specify)..... |

Thank-you once again for your participation!

Faculty Human Research Ethics Committee

MEMORANDUM

TO: Mr Patrick McLaughlin, Dr Brett Vaughan, * Nicholas Harrison
Principal Investigator
School of Health Sciences
Faculty of Human Development

FROM: Assoc Prof Tony Kruger
Chair
Human Research Ethics Committee
Faculty of Human Development

DATE: January 22, 2008

SUBJECT: **Approval of application involving human subjects with minor amendments.**

At its meeting on 7 April 2005, the Faculty Human Research Ethics Committee considered an application for the project titled **A study of injuries associated with Golf**. The Committee thanks you for this interesting research project application.

It was resolved to **approve** application HRETH.FHD.021/05. This approval was granted on the condition that the following **minor amendments** are made prior to the commencement of data collection and the revisions submitted to the Faculty Ethics Officer for final approval.

The following amendments to the research protocol were stipulated:

Discuss questionnaire with Professor Colin Torrance

Please be aware that amendments made in one Item of the application may also need to be reflected at other items. It is your responsibility to ensure that this occurs.

When you have addressed the stipulated amendments, you are required to:

- a) **Submit a revised application to the Faculty Ethics Officer (there is no need to submit a new declaration page) and,**
- b) **Attach a covering letter/memo detailing each amendment and its corresponding item within the application.**

Recruitment of participants and data collection cannot commence until the revised application is submitted to the Ethics Officer and given final approval

Please note that the Faculty Human Research Ethics Committee needs to be informed of any changes to the approved research protocol and project time-lines. In the event of any changes, researchers must immediately cease all data collection until the Committee has approved the changes.

The Committee wishes you all the best for the conduct of the project.

If you have any queries, please do not hesitate to contact me on 9747 7486.

Assoc Prof Tony Kruger
Chair
Human Research Ethics Committee
Faculty of Human Development

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Victoria University

Instructions for Contributors

Contributors are invited to submit their manuscripts in English to the Editor for critical review. The *Journal of Science and Medicine in Sport* considers for publication: original research, review papers, opinion pieces, short reports, methodological/technical notes and letters in the subdisciplines

of anthropometry, biochemistry, biomechanics, clinical medicine, dentistry, epidemiology, motor behaviour, nutrition, psychology, physiology, physiotherapy, podiatry, public health, sociology, and others having an interdisciplinary perspective with specific applications to sport and exercise and its interaction with health.

It is the authors' responsibility to ensure that manuscripts submitted to the Journal have not been published elsewhere or are not being considered for publication elsewhere and that the research reported will not be submitted for publication elsewhere until a final decision has been made as to its acceptability by the Journal.

Manuscripts submitted to the Journal must conform to the style and submission instructions (particularly concerning word and reference counts) outlined here, or they will be returned without review.

All manuscripts must be submitted electronically. The Editor and Editorial Board do all they can to ensure the integrity of documents submitted electronically.

Refereeing

The refereeing process will consist of reviews by at least two independent reviewers and an Associate Editor. Contributors should suggest the names and full contact details of 2 possible reviewers. They will be forwarded to the Associate Editor. The Associate Editor may (at her or his discretion) choose no more than 1 of those suggested. The reviewers will be blinded to the authorship of the manuscript. The Associate Editor will make a recommendation to the Editor regarding the manuscript. The Editor will make a final decision about the manuscript, based on consideration of the Associate Editor's recommendation and referees' comments.

Style of manuscript

Original research papers

Original research papers should describe original research, be no more than 3700 words long (including references but excluding title page, abstract and tables, figures and graphs). They can include up to a total of six tables, figures or graphs. References must be limited to 30.

Short reports and methodological/technical notes

Short reports and methodological/technical notes should describe pilot study work, small scale studies, new methods, technical procedures or preliminary research findings. The Journal does not typically publish case reports, but may consider them if they are of topical interest. Short reports and technical notes should contain no more than 1700 words (including references but excluding title page, abstract and tables, figures and graphs). They can contain up to two tables, figures or graphs. References must be limited to 6.

Opinion pieces

Opinion pieces should be no more than 1700 words (including references but excluding abstract and title page) and generally do not contain any tables, figures or graphs.

Review articles

Review articles should be both concise and in-depth and have no more than 4000 words (including up to 40 references but excluding title page, abstract and tables, figures and graphs).

Letters

Letters should be no more than 300 words, with no more than four references and no tables or figures.

Submission of manuscripts

All submissions must be electronic. They should be addressed to the Production Editor at jsms@sma.org.au. Only Microsoft Word files can be accepted. For reviewing purposes, articles should be submitted in a single file containing title page, abstract, paper and references, with figures, tables and other illustrations embedded. Papers not submitted in this format, or not conforming to these guidelines (especially those referring to the word count, referencing and table/figure limits), will be returned to authors without review.

All papers MUST be accompanied by the cover page and the Mandatory Submission Form, both as specified below.

Mandatory Submission Form

A completed mandatory submission form, which includes the signatures of all authors, must be provided with every submitted manuscript. From 2005, this will include a checklist that must be completed to indicate that the manuscript conforms to the Journal's requirements. The manuscript will not be sent for review until this is received. Copies of the form are published in each issue of the Journal and on the website of Sports Medicine Australia, the publisher, at www.sma.org.au/publications/JSMS/submission_of_manuscripts.asm. Please fax/mail the

completed form to the Production Editor at 61-2-6230-5908 or jsms@sma.org.au.

Format of manuscripts

Manuscripts must be typed, double spaced with 3 cm-wide margins for A4-size paper. Pages must be numbered.

In general, all manuscripts should follow the conventional form: title page, abstract, introduction, methods and procedures, results, discussion and conclusion.

Acknowledgement should be made of any research grant source. Acknowledgements should be placed between the end of the text and before the references.

Tables and illustrations must be provided on separate pages with an identifier and their positions indicated in the text.

Open punctuation must be used in Latin shortened forms (for example, eg, et al, ie), contractions (Dr, ACL) and initials (Fox EL). Abbreviations should first be spelt out, followed by the abbreviation in parenthesis. Thereafter, the abbreviation alone will suffice.

Tracked changes must be removed from articles.

The Endnote Referencing System must not be embedded and active in submitted manuscripts because this leads to formatting problems.

Clarity of expression should be the objective of all authors. The whole emphasis of the paper must be on communication with a wide international multi-disciplinary readership.

Ethics statement

All investigations involving humans must conform to the Code of Ethics of the World Medical Association (Declaration of Helsinki) and this conformity must be stated in the article. In the case of investigations involving animals, authors should indicate whether or not the institutional and national guide for the care and use of laboratory animals has been followed and report any anaesthetic drug and dosage.

Mandatory cover page

Submitted articles must have a cover page containing the following information:

the full title of the article,

names of all authors given as first name, middle initial and surname

institutional affiliations of authors (but no degrees or titles),

contact details of corresponding author (postal/email address, phone/fax numbers),

type of paper (eg, original research, short report, etc),

category of paper (eg, biomechanics, medicine, public health, etc),

the names and full contact details of 2 possible reviewers,

word count (inclusive of references but excluding the title page, abstract, tables/figures),

number of references,

number of tables,

number of figures,

number of graphs, and

date of submission.

This cover page will be removed from the manuscript before it is reviewed.

Title page

The title page must contain only the full title of the article (in sentence case only) and up to four keywords/phrases. It should not contain names or any material which can identify authors or affiliations.

Abstract

A one paragraph informative abstract must accompany each article. It should contain no more than 250 words on a separate page following the title page and must not include references. The abstract must be suitable for use by abstracting journals without rewording and should state what was done, what was found and what was concluded. For a review article, the abstract should be a concise summary. The number of words in the abstract should be stated.

References

Authors are responsible for the accuracy of references.

Conference and other abstracts should not be used as references. References to articles

accepted but not yet published should be described as "in press". References to articles

submitted but not yet accepted are not encouraged but, if necessary, should only be referred to in the text as "unpublished data".

References should be numbered consecutively within square brackets in normal text where they occur in the text, tables, etc, before the full point in the sentence in which they occur, and listed numerically at the end of the paper under the heading 'References'. All authors should be listed

where there are three or fewer. Where there are more than three, the reference should be to the

first three authors followed by the expression "et al". Book and journal titles should be in italics.

No more than three references should be used to support a specific point in the text.

Footnotes are unacceptable.

For guidance on abbreviations of journal titles, see Index Medicus at www.nlm.nih.gov/tsd/serials/lji.html.

Book references

Last name and initials of author, italicised title of book, edition (if applicable), editor, translator (if applicable), place of publication, publisher, year of publication, eg:

Bruckner P, Khan K, Bradshaw C. Shin Pain, Chapter 26, in *Clinical Sports Medicine*, 2nd ed. Sydney. The McGraw Hill Companies, Inc. 2000.

Journal references

Last name and initials of principal author followed by last name(s) and initials of co-author(s), title of article (with first word only starting in capitals), abbreviated and italicised title of journal, year, volume (with issue number in parenthesis if applicable), inclusive pages, eg:

Bishop D, Spencer M, Duffield R et al. The validity of a repeated sprint ability test. *J Sci Med Sport* 2001; 4(1):19-29.

Tables and figures

Keep the use of tables, figures and graphs to a minimum. Each table or figure should have a caption which is self explanatory without reference to the text. Tables should not duplicate material in the text or in illustrations and must be relevant to the paper. Vertical lines in tables should be omitted. Tables and figures must not be created in PowerPoint. Tables and figures should not be submitted in separate files in first submissions. A maximum of a total of six tables, figures or graphs is permissible.

In final submissions:

- photographs and other illustrations should be submitted in final submissions in a separate file, not embedded in Microsoft Word. They must be in black and white or greyscale only, created at larger than published size (122 mm = column width) and saved as either tiff or jpeg (minimum 300 dpi; minimum width 122 mm)

- graphs, pie charts, etc, must be submitted in final submissions in black and white only and created at least at 122 mm. Where 3 shades of black are required, only 30%, 60% and 100% should be used. A large pattern should be used when more groups are needed.

Failure to format documents correctly may delay publication. For further guidance, contributors should contact publishing@achper.org.au.

Illustrations

The number of illustrations, particularly photographs, should be kept to a minimum. Refer to illustrations as figures in the text. Illustrations should not be created in PowerPoint.

Formulae, equations and statistical notations

Structural formulae, flow-diagrams and complex mathematical expressions are expensive to print and should be kept to a minimum.

Present simple formulae in the line of normal text, where possible. Use a slash (/) for simple fractions rather than a built up fraction. Do not use italics for variables.

In statistical analyses, 95% confidence intervals should be used, where appropriate.

Experimental design should be concisely described and results summarised by reporting means, standard deviations (SD) or standard errors (SE) and the number of observations. Statistical tests and associated confidence intervals for differences or p-values should also be reported when comparisons are made. Only use normal text for statistical terms: do not use bold, italics or underlined text.

Headings

All headings (including titles) should be in sentence case only and not in capital letters. Authors should indicate, where necessary, whether each heading is 1st, 2nd or 3rd in importance.

Scientific terminology

To enable consistency, authors should generally follow the technical guidelines of *Medicine & Science in Sports & Exercise*, unless otherwise stipulated in these Instructions. Following are some examples of the Journal style in the most basic cases and some general SI unit guidelines.

Mass: 10 g, 2 kg

temperature: 20° C

distance: 10 cm, 4 m, 20 km

time: 10 s, 20 min, 2 hr, 5 wk, 1 y

power: 10 W

energy: 400 J, 10 kJ.

The centigrade scale (° C) and the metric units (SI) must be used, except in the case of heart rate (beats per min: bpm), blood pressure (mmHg) and gas pressure (mmHg).

Lowercase letters are used for unit abbreviations

Exceptions:

kilogram

kelvin
ampere
litre
joules
watts
Kg
k
a
l
j
w
kg
K
A
L
J
W

Symbols are not followed by a period
Exception: end of a sentence

mole
mol.
mol

Symbols are not to be pluralised

minutes
mins
min

Names and symbols are not to be combined

moles per
litre
moles·L⁻¹
mol·L⁻¹

Use Arabic numerals and symbols for units for quantities

60 minutes
four kg
ten seconds
60 min
4 kg
10 s

A space should be placed between the number and the unit

30s
30 s

A half-high dot is used to signify the multiplication of units

344 m x s⁻¹
344 m·s⁻¹

One solidus (/) per expression unless parentheses are used.

mmol/L/s
mmol/(L·s)

An object and any quantity should be distinguished

A mass of 2 g
A body of mass 2 g

Information should not be mixed with unit symbols or names

50 mL H₂O·kg⁻¹
H₂O content = 50
L·kg⁻¹

Make it clear to which unit symbol a numerical value belongs

10 x 20 cm
10 cm x 20 cm

A zero should be placed before a decimal

.05
0.05

Decimal numbers are preferred to fractions

$\frac{3}{4}$

50%

0.75

0.50

Units and numbers are generally written in roman type.

20 min

20 min

Variables and quantity symbols are in italic type

t = 20 min

t = 20 min

Superscripts and subscripts are in roman type if they are descriptive.

Energy cost

of running

C_R

C_R

They are in italic type if they represent variables, quantities, or running numbers.

Energy cost

of a

theoretical

activity

C_x

C_x

When opening a sentence, numbers should be expressed in words, eg:

Forty seven patients were contacted by phone...

The 24 hr clock should be used.

Proofs

After a manuscript has been formally accepted for publication, it will be prepared for publication at a later stage. Corresponding authors will be notified of this when the publication date has been confirmed (normally a couple of months before publication of the issue in which it will appear). Proofs will be faxed or emailed to the author. These should be checked against the original manuscript, and formatting errors indicated clearly.

Other changes of text in the proofs will be made only at the author's expense. Please return proofs promptly via fax or email. The page numbers shown on the proofs may not correspond to those in the final journal. Authors should therefore not use these to reference their papers in press.

Copyright

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Correspondence

All correspondence about the submitted manuscript must quote the reference number allocated to it. If authors have not received any correspondence from the Journal within three months of the date of submission, they may contact the Production Editor to check on the manuscript's progress at jsms@sma.org.au.

Further information

In case further information is needed, the contact details for the Production Editor are:

Email jsms@sma.org.au

Phone 61-2-6230-4650

Fax 61-2-6230-5908

Raw Data.

Figure 1 Statistics. Hours of practice/play.

Hours	Responses	%
<4 hrs	26	24.5283
5 to 7	35	33.01887
8 to 10	25	23.58491
11 to 13	11	10.37736
13 to 15	2	1.886792
16 to 18	1	0.943396
19 to 21	0	0
22 to 24	2	1.886792
25 to 28	1	0.943396
>28	3	2.830189
	106	100

Figure 2 Statistics. Location of injury for both male and females

Site	Number	%	Male	Female
Head	0	0	0	0
Neck	5	8.62069	4	1
Upper Arm	0	0	0	0
Elbow	5	8.62069	2	3
hand	4	6.896552	1	3
Upper Back	3	5.172414	3	0
Hips etc	3	5.172414	3	0
Knee	3	5.172414	2	1
Ankle	1	1.724138	1	0
Toes	0	0	0	0
Eyes/face	0	0	0	0
Shoulder	7	12.06897	6	1
Forarm	0	0	0	0
Wrist	5	8.62069	4	1
Fingers	1	1.724138	0	1
Lower back	18	31.03448	16	2
Thigh	2	3.448276	2	0
Lower leg	0	0	0	0
Foot	1	1.724138	1	0
	58		45	13

Figure 3 Statistics. Injury type for both male and females.

Injury Type	Number	%	Male	Female
Muscle Tightness	18	36.73469	15	3
Strain muscle	25	51.02041	20	5
Tendonitis	3	6.122449	2	1
Disc bulge	3	6.122449	1	2
ligt strain	3	6.122449	2	1
Ganglia	1	2.040816	1	0
Dislocation	1	2.040816	1	0
Osteoarthritis	1	2.040816	0	1
Bruise	1	2.040816	0	1
Neorological	1	2.040816	1	0
Capsular tear	1	2.040816	1	0
	58		44	14

Figure 4 Statistics. Treatment by health care professionals.

	Number	%
Physio	21	55.26316
Osteo	8	21.05263
GP	1	2.631579
Chiro	0	0
Massage	5	13.15789
Other	0	0
Orthopaedic review	2	5.263158
Yoga	1	2.631579
	38	100

Correlations: Pearson's r values:

Age vs Injury location	- 0.11
Age vs injury type	0.09
Injury location vs Handicap	- 0.044
Injury type vs Handicap	0.525
Years playing golf vs injury type	- 0.271
Years playing golf vs injury location	- 0.04
Hours per week playing vs injury location	- 0.025
Hours per week vs Injury type	- 0.005
Warm up vs injury location	0.055
Warm up vs injury type	- 0.28
Warm up vs Injury rate	- 0.159
Time of warm up vs injury location	0.059
Time of warm up vs injury type	- 0.14
Injury location vs time out of the game	0.166
Injury vs treatment option	0.17

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