

Senior Recreational Golfers: A Survey of Musculoskeletal Conditions, Playing Characteristics, and Warm-up Patterns

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ABSTRACT

Purpose: This survey was initiated to obtain information about senior golfers relevant to physical therapists, including preexisting musculoskeletal conditions, injuries that participants linked directly to golf, and patterns of warm-up.

Method: One hundred members of two local golf courses, one public and the other private, volunteered to a request to fill out a survey. The minimum age was 50 years or older (sample = 45 women and 55 men; mean age = 69.9 ± 8.7 years). A self-report questionnaire regarding subject demographics, history of illness and injury, exercise patterns, golf ability, and golf behaviors relating to such factors as warm-up, power cart use, and frequency of play.

Results: Half of the 100 respondents reported having musculoskeletal conditions in the last 3 years that affected their golf game: 46% affecting the upper extremity, 40% in the lower extremity, and 34% involving the spine. The most common problem directly related to the sport was low back pain, which had been experienced by 42% following a round of golf. Two-thirds of the sample indicated that they regularly walked their course rather than used a power cart, but only 25% of golfers spent at least 5 minutes in warm-up and stretching activities before playing.

Conclusion: Although there are known health benefits to this popular physical activity among the older population, senior recreational golfers also reported a history of musculoskeletal conditions that interfered with participation in the sport. There is an apparent need for physiotherapy research on effective delivery of preventive educational strategies and golf-related therapeutic programs aimed at this age group.

Key Words: aging, fitness, golf, musculoskeletal system, sport medicine

Objectif : Cette enquête a été effectuée pour obtenir des renseignements sur les golfeurs âgés pertinents pour les physiothérapeutes, comprenant les affections musculo-squelettiques préexistantes, les blessures directement liées au golf, et les types d'exercice d'échauffement.

Méthodologie : Cent membres de deux clubs de golf locaux, un club publique et l'autre privé, se sont portés volontaires pour remplir un questionnaire d'enquête. L'âge minimum était de 50 ans ou plus (échantillon = 45 femmes et 55 hommes; âge moyen = 69,9 ± 8,7 ans). Un questionnaire d'auto-évaluation comprenant des données démographiques sur les sujets, les antécédents de maladies et de blessures, les types d'exercices pratiqués, les compétences dans la pratique du golf, et les comportements liés au golf tels que l'échauffement, l'utilisation de voiturette de golf à moteur, et la fréquence des parties de golf.

Résultats : La moitié des 100 répondants ont signalé qu'ils souffraient d'affections musculo-squelettiques depuis les 3 dernières années qui affectaient leur jeu : 46 % touchant les membres supérieurs, 40 % les membres inférieurs, et 34 % affectant la colonne vertébrale. Le problème le plus fréquent directement lié au sport était la lombalgie, dont souffraient 42 % des joueurs après une partie de golf. Deux tiers de l'échantillon ont indiqué qu'ils marchaient régulièrement, plutôt que d'utiliser une voiturette de golf à moteur, mais seulement 25 % des golfeurs faisaient des exercices d'échauffement et d'étirement pendant au moins 5 minutes avant de jouer.

Conclusion : Bien que ce jeu populaire offre des avantages connus pour la santé parmi la population des personnes âgées, les golfeurs pratiquant ce sport pour la détente ont également signalé souffrir d'affections musculo-squelettiques qui gênaient la pratique de ce sport. Il existe un besoin manifeste d'élaborer des stratégies éducatives préventives et des programmes thérapeutiques liés au golf visant ce groupe d'âge.

Mots clés: vieillissement, forme physique, golf, appareil locomoteur, médecine sportive

Palmer et al; Senior Recreational Golfers: A Survey of Musculoskeletal Conditions, Playing Characteristics, and Warm-up Patterns; Vol. 55, No. 2, 2003; pages 79-85.

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A poster presentation of this study given by Jennifer Palmer and Sandy Young was the recipient of the Ann Collins Whitmore/Physiotherapy Foundation of Canada Award for student presentations at the Canadian Physiotherapy Congress, Calgary, June 2001.

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It has been estimated that 1.8 million Canadians currently play the sport of golf, which puts this popular activity in the top rankings in the country for participation rate.¹ For those interested in health promotion efforts aimed at seniors, an important point is that this age group has an overrepresentation in the golfer population, quite unlike other sports for which participation levels drop

across the adult age range. Similar patterns are noted between Canada and the United States, where in the latter there were over 6 million senior golfers (senior defined as 50 years of age or older) in the year 2000, who accounted for greater than 25% of the total golf population.^{2,3} As with participation in any physical activity, there are associated health benefits and risks for golf, and both of these are accentuated in senior golfers owing to aging of their cardiovascular and musculoskeletal (MSK) systems. For example, the potential health benefits for those senior golfers who regularly walk the entire course (thus engaging in prolonged weight-bearing exercise) are numerous, including maintenance of bone density, improved cardiovascular strength and endurance, increased muscular strength and endurance, and better balance control.³⁻⁵

However, the risk of MSK injuries is also accentuated in senior golfers secondary to age-related changes in the body's tissues, such as decreased flexibility, strength, coordination, cardiovascular capacity, and an increased percentage of body fat.^{3,4,6-9} Pink and colleagues reported that strength, flexibility, and articular stability of the trunk and spinal structures in golfers may be the most important determinants for risk of injury.¹⁰ It is clear that as individuals age, there is a reduction in the total number of motor units as well as atrophy of the type II fast twitch muscle fibers^{4,9,11}; thus, the senior golfer has a smaller overall muscle mass with which to work. With respect to flexibility, studies have reported that both active and passive range of motion tend toward progressive reductions with increasing age in the older adult.^{4,9,12} Because the complexity of the normal golf swing requires movements that approach end range of motion in some of the key joints (eg, shoulder, wrists, and spine), limitations in flexibility will tend to cause deleterious changes in the healthy, effective swing pattern.

Osteoarthritis is a common condition that affects many individuals and becomes more prevalent in old age.^{3,6,13} For example, Thériault and Lachance noted that degenerative changes around the acromioclavicular and glenohumeral joints potentially lead to impingement syndromes as well as muscle imbalances affecting the shoulder joint.¹ Such conditions restrict the golfer's ability to make a complete "shoulder turn" in the backswing, which subsequently limits the total arc and maximum speed of the golf club. The full golf swing also requires individuals to subject themselves to repetitious twisting motions with a flexed spine; hence, there is a high incidence of low back pain problems reported for this sport in both recreational players and particularly professionals who practice extensively.^{1,4,10,13-18} Notable too are the reports of case studies in which older people with osteoporosis have sustained vertebral compression fractures.¹⁹

Several recent investigations have published data on the prevalence of golf-related injuries, including an analysis of the injury distribution by anatomic site.^{13,17,18,20-23} These studies have tended to be dominated by samples of young and middle-aged golfers, and for these age groups,

the most common location of MSK problems has been in the upper limb (particularly elbow and wrist), followed by the back/neck and then a relatively low occurrence in the lower limb (see the review by Lindsay and colleagues⁴). However, there has been no previous research that has specifically investigated senior golfers in detail as a separate group. This lack of information is surprising, given both the popularity of this sport for the older population and the anecdotal suggestions from the clinic setting that interference with golf is a common reason for patients to seek physiotherapy. Therefore, the purpose of this study was to identify demographic, exercise, and playing profiles of senior golfers and how they may differ between those who hold MSK conditions and those with no preexisting conditions affecting their participation.

METHODS

Participants

A convenience sample of male and female senior golfers, aged 50 years or older, was recruited at a local municipal public golf course and from the membership of a private golf club. Potential respondents, representing a community-based accessible population in the geographic location of London, Ontario, were invited via posted advertisements, newsletters, and direct contact from course staff to take a survey package from the club house.²⁴ This package included a letter of introduction, information regarding the purpose and informed consent, a self-addressed stamped envelope, and a five-page questionnaire. A total of 100 questionnaires were returned throughout the collection period during the spring and summer golf season, of which 55 were men and 45 were women. Group characteristics of the survey sample are shown in Table 1. Notable is the mean age of 69.9 years, with a long history of years played (31.5) and golf handicaps representative of recreational golfers with moderate skill levels.

Measurement Instrument

A questionnaire specifically tailored to capture information about MSK conditions in senior golfers was developed in a systematic manner for the purpose of this investigation.²⁵ Steps in item generation were based on previous reports in the literature regarding MSK injuries in golfers (as reviewed by Lindsay and colleagues⁴), in addition to expert opinion from sport medicine and golf professionals.²⁶ After pilot testing to establish user readiness, the questionnaire was refined as a mixture of 37 continuous (eg, golf handicap, minutes of warm-up) and categorical variables (eg, presence or absence of any injuries in the past 3 years while playing or practicing golf, which cause cessation or modification to the golf game for at least 2 weeks) and took approximately 10 minutes to complete.

Table 1 Characteristics of the Survey Sample

	<i>N</i>	<i>Age (yr)</i>	<i>Height (cm)</i>	<i>Weight (kg)</i>	<i>Years Played</i>	<i>Golf Handicap</i>
Males	55	71.5 (9.2)	179.9 (5.9)	81.8 (8.8)	42.0 (17.9)	17.3 (7.7)
Females	45	67.9 (7.5)	163.7 (4.5)	64.0 (9.2)	18.6 (14.0)	30.9 (8.8)
Combined	100	69.9 (8.7)	172.6 (9.7)	73.8 (12.6)	31.5 (20.0)	23.2 (10.6)

Values are mean (standard deviation).

Responses were shown to be highly reproducible in a test–retest study of the questionnaire’s reliability.²⁵ Initial demographic questions about items such as age, size, general health, and exercise patterns were followed by specific golf information in regard to experience, skill level, method of carrying clubs, frequency of playing and practicing, patterns of warm-up, and, finally, any history of MSK conditions that affected play (Appendix). The University of Western Ontario’s Research Ethics Review Board had given prior approval to the study, and all subjects provided informed consent prior to participation.

Data Analysis

Data were analyzed using *SPSS 9.0* and *SigmaStat 2.03* statistical software programs. The primary approach to the data analysis involved descriptive statistics of mean and standard deviations, or percentages of the sample,²⁶ conducted for variables such as gender, age, height, weight, number of years played, handicap, power cart use, minutes spent on preparticipation activities such as warming up and stretching, strengthening and cardiovascular programs conducted away from the golf course, presence of MSK conditions within the past 3 years that affected the respondents’ golf game, and symptoms of low back pain after playing golf. Because none of these variables were found to contain significant differences between the two samples arising from public and private golf courses ($p > .05$), the combined results for the two groups are reported here. As well, other than differences in body size and golf skill variables (eg, handicap and average shot distance), the groups of men and women had similar data and are not differentiated in the reporting of results. It was also of interest to investigate whether the presence of an existing MSK condition was related to the potential prevention behaviors of warming up and stretching prior to playing. Because the results for these variables were not normally distributed, Mann-Whitney rank sum tests were used to compare the amount of time spent warming up and stretching, as well as power cart use, between respondents who held MSK conditions and those without preexisting conditions affecting their participation.

RESULTS

Of the 100 respondents, 50 reported experiencing an MSK condition in the past 3 years that affected their golf game. The 50 respondents with MSK conditions were com-

posed of 32 males and 18 females. Of those reporting MSK conditions, 46% described upper extremity involvement, 40% described conditions affecting the lower extremity, and 34% reported conditions involving the spine. Those who identified an MSK condition affecting their golf game were also asked to answer an additional item to provide the medical name or diagnosis of the condition (if known). As shown in Table 2, among these respondents, the most commonly identified disease was a rheumatologic condition (eg, osteoarthritis, rheumatoid arthritis, gout), which is consistent with the advanced age of the survey sample.

Warm-up activities in preparation for a golf game were surprisingly limited. A considerable proportion of senior golfers—amounting to 16.6% of the total—reported doing warm-up activities for less than 1 minute, and 36.0% of the sample did stretching for less than 1 minute prior to playing a round of golf. Over 75% of the total sample spent no more than 5 minutes on these activities before commencing play (Figures 1 and 2).

Senior golfers reporting an MSK condition spent significantly more time warming up (6.4 ± 7.0 minutes) and stretching (3.8 ± 4.7 minutes) prior to play than those who did not have a preexisting MSK condition (4.8 ± 6.6 , 2.2 ± 2.7 , respectively) ($p < .05$) (see Figures 1 and 2). With regard to a specific question about whether the respondents experienced low back pain after playing a round of golf, 42% of the sample noted a positive finding.

Finally, golf as a potential fitness activity for this age group was also investigated. A total of 17% reported using a power cart each time they played golf, which would limit their physical exertion to brief bouts of walking, interspersed with several minutes of sitting. The majority of this group (71%) also reported having a preexisting MSK condition. However, two-thirds of the survey respondents indicated a clear preference for walking the golf course at least 50% of the time rather than using a power cart. Fur-

Table 2 Diagnoses Provided by Survey Participants in Relation to Presence of a Musculoskeletal Condition

<i>Condition</i>	<i>Total Reports (%)</i>
Rheumatologic ($n = 14$)	36.8
Tendinitis ($n = 7$)	18.4
Muscle strains ($n = 7$)	18.4
Vertebral/disk pathologies ($n = 4$)	10.5
Other individual conditions ($n = 6$)	15.8

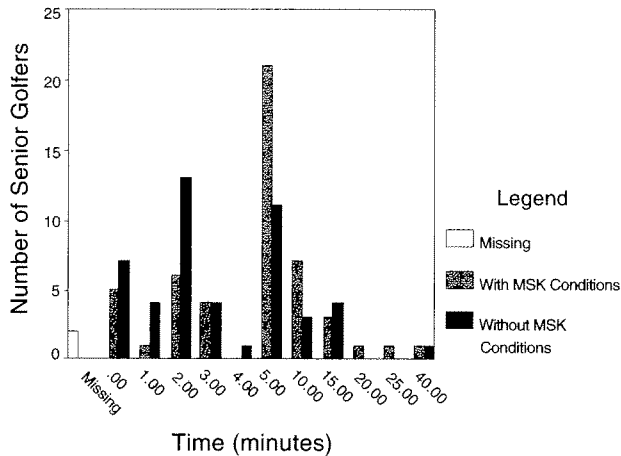


Figure 1 Time spent warming up prior to a round of golf by groups of senior golfers with musculoskeletal (MSK) conditions versus those without. Overall, the group with MSK conditions warmed up for a significantly longer period of time ($p < .05$).

thermore, about 40% of the respondents also reported engaging in regular strengthening, stretching, or cardiovascular programs away from the golf course. The courses that the participants played involved typical 18-hole layouts, which created a distance of about 5 to 6 km in direct distance from tee areas to greens. There was considerable additional walking while traveling between holes and across fairways and greens, and the total duration of a game was between 4 and 5 hours.

DISCUSSION

Consistent with previous information on the popularity of golf for the older population,^{1,2} this sample with a mean age of 70 years reported a high enthusiasm for playing the sport, with some participating as often as three or more times per week during the peak summer season. Despite the ready availability of power carts at these typical North American golf courses, two-thirds of respondents elected to walk the golf course at least 50% of the time and thus would gain the related conditioning benefits of moderate-intensity, long-duration exercise sessions.^{1,4,5}

Approximately 40% of the respondents also reported engaging in regular strengthening, stretching, and cardiovascular programs away from the golf course. According to data from the Canadian Fitness and Leisure Research Institute, only 18% of women and 25% of men over the age of 65 in the general population were active in 1998, indicating that the large majority of this age group are normally sedentary.² Thus, findings from this convenience sample of senior golfers may not be completely generalizable to the older age group segment as a whole, and it is noted that there may be some volunteer bias present.^{24,26} An effort was made to sample a wide range of ages within the senior category and to obtain data at both a private

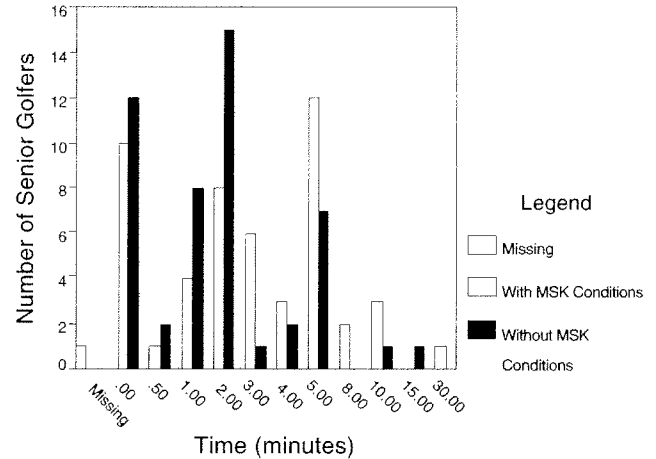


Figure 2 Time spent stretching prior to playing a round of golf by groups of senior golfers with musculoskeletal (MSK) conditions and those without. Overall, the group with MSK conditions stretched for a significantly longer period of time ($p < .05$).

golf club and a municipal course setting for greater variation in socioeconomic status. These two groups did not differ significantly in responses on the survey.

Although many of the respondents were apparently interested in exercise and a healthy lifestyle, few used an extensive warm-up and stretching routine prior to initiating a round of golf. Furthermore, it would be interesting in a future, more in-depth survey to examine the specific activities that they did perform during the warm-up period to investigate potential effectiveness.^{4,27} Some golfers might warm up by simply doing putting or alternatively going immediately to the practice range for full swings, but these activities could cause more harm than good. For instance, standing too long in the stooped putting posture can be strenuous on the lumbar spine owing to increased load on the vertebral structures.^{15,16,28} Similarly, beginning right away at the practice range could place golfers at risk for injury if they immediately start hitting the ball as hard and as far as they can. This activity would demand high-velocity, maximum muscle contractions without giving the muscles and joints a chance to warm-up.²⁷

Another important finding of this survey is that 50% of the respondents reported playing golf with a preexisting MSK condition. It was somewhat surprising that this large a percentage of the respondents, some of whom had conditions such as rheumatologic disease, continued to participate in the game over a long-term basis. With regard to the potential of this sport as a fitness activity for the older population, we note that there is a capability to keep people playing by introducing adaptations. The recreational golfer usually has several options for making variations in the type of swing used (eg, full or limited speed, restricted backswing and follow-through), the method of transport (for both clubs and players), and even to some extent the pace and total duration of play. This age group presents

more often with degenerative and inflammatory changes in the MSK system than young and middle-aged adults.^{3,4,7,21} The changes occurring in the MSK system are reinforced by the distribution of problem conditions by body site—in the upper limb, spine, and lower limb. These present observations are comparable to other distributions described for golfers in the literature, with the exception of somewhat higher than expected reporting of lower limb MSK conditions.^{1,13,17,18,20-22} Because all parts of the body need to work harmoniously to create a powerful yet efficient golf swing, it is clear that sport medicine personnel and golf teachers need to take a complete physical inventory of several joints when dealing with the older participant seeking advice on healthy playing.

Also notable was that those who reported an MSK condition spent significantly more time warming up prior to the game of golf versus those not reporting such problems, and the majority of the latter group spent 3 minutes or less, whereas the majority of the golfers with MSK conditions spent 5 minutes or more. The basis of this difference is not known at this time, and a future study with more in-depth interviewing techniques will help to sort out this issue.

Low back pain is a significant problem for many individuals, including golfers, so it was not surprising that some senior golfers experienced symptoms after playing.^{13,28,29} Factors contributing to golf-related low back pain may include overuse of the asymmetric golf motion, extreme spinal range of motion required for each full swing, delayed abdominal muscle recruitment patterns, and poor trunk muscle endurance.^{13,14-16,28,30} Trunk motion is a critical lever used in the golf swing to achieve maximum speed and distance, but Morgan and colleagues determined that older golfers have 50% less trunk rotational capacity compared with younger players.²⁹

There are many future avenues of research for dealing with the preventive and rehabilitation issues involved in sport medicine for golfers. Recently, for example, there has been considerable attention devoted to the MSK conditions in the hip, shoulder, and back locations that caused career interruptions for well-known professional golfers, such as Jack Nicklaus, Nancy Lopez, and Greg Norman. Today's current golf phenomenon, Tiger Woods, has so far avoided serious injury despite his extraordinary generation of clubhead forces and shot distance. This lack of injury likely reflects his relatively young age, superb swing technique, excellent physical conditioning, and careful warm-up routine.^{4,27} In a study involving extensive biomechanical analyses of the golf swing, Hosea and colleagues concluded that the complex, rapid, and intense nature of the spinal loads associated with the movement patterns reinforced the need for preparticipation conditioning, reasonable practice habits, and proper warm-up in preventing low back pain from golf.¹⁶

In conclusion, it was observed in a sample of senior recreational golfers that 50% reported a history of MSK conditions that interfered with their participation in the sport. Considerable proportions of senior golfers were also

found to spend a very limited amount of time warming up and stretching before making the high-velocity, intense muscular contractions of the golf swing. These results, as well as an observation that 42% of the sample had experienced symptoms of low back pain after playing golf, reinforce the need for physiotherapy research on the potential benefits of preventive educational strategies and therapeutic programs for senior golfers.

ACKNOWLEDGMENT

The authors would like to thank the management and senior golfers at The London Hunt and Country Club and Thames Valley Municipal Golf Course for their time and cooperation during this study.

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2. What is your height? _____
 3. What is your weight? _____
 4. Are you male or female? (circle the number of your answer)
 1. male
 2. female
 5. How many years have you been playing golf? _____
 6. Are you right or left handed? (circle)
 1. right
 2. left

Now we would like to ask you about your history of illness and injuries:

7. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor? (circle)
 1. yes
 2. no
 8. Do you feel pain in your chest when you do physical activity? (circle)
 1. yes
 2. no
 9. In the past month, have you had chest pain when you were not doing physical activity? (circle)
 1. yes
 2. no
 10. Do you ever lose your balance because of dizziness or do you ever lose consciousness? (circle)
 1. yes
 2. no
 11. Do you have a bone or joint problem that could be made worse by changes in physical activity? (circle)
 1. yes
 2. no
 12. Is your doctor currently prescribing drugs (eg, water pills) for your blood pressure or heart condition? (circle)
 1. yes
 2. no
 13. Do you know of any other reason why you should not do physical activity? (circle)
 1. yes
 2. no
- If yes, please specify: _____

Next, we would like to ask a few questions about your golf game:

14. On average, how many yards do you hit your driver?

15. On average, how many yards do you hit your 7 iron?

16. What is your golf handicap? _____
(Please give an approximate handicap if you do not have an official one.)

Now we would like to ask you about your golf swing:

17. Do you swing your golf club left or right? (circle)
 1. left

APPENDIX

University of Western Ontario Questionnaire for Musculoskeletal Conditions in Senior Golfers*

First, we would like to ask you a few questions about yourself:

1. What is your date of birth? _____
(day) (month) (year)

2. right

18. Are your golf clubs customized to fit your golf swing? (circle)
1. yes
 2. no

We would like to ask you how you get around the golf course:

19. On average, how often do you use a power cart around the course? (circle)

0% of the time

15% 30% 50% 65% 80%

100% of the time

20. On average, how often do you carry your clubs around the course? (circle)

0% of the time

15% 30% 50% 65% 80%

100% of the time

21. On which side of your body do you carry your clubs? (circle)

1. left
2. right
3. alternate
4. double strap

22. On average, how often do you pull your clubs around the course on a cart? (circle)

0% of the time

15% 30% 50% 65% 80%

100% of the time

23. On average, how often do you push your clubs around the course on a cart? (circle)

0% of the time

15% 30% 50% 65% 80%

100% of the time

24. On average, how often do you use an electronic cart to carry your clubs? (circle)

0% of the time

15% 30% 50% 65% 80%

100% of the time

We would like to know how much golf you play.

25. On average, how many rounds of golf do you play *in a single month* during the following times:

Early season (April–May) _____

Mid season (June–August) _____

Late season (September–October) _____

Off season (November–March) _____

26. On average, how many times *in a single month* do you go to the practice range during the following times:

Early season (April–May) _____

Mid season (June–August) _____

Late season (September–October) _____

Off season (November–March) _____

27. On average, how many times *in a single month* do you practice putting?

Early season (April–May) _____

Mid season (June–August) _____

Late season (September–October) _____

Off season (November–March) _____

28. On average, how many times *in a single month* do you take lessons from a golf professional?

Early season (April–May) _____

Mid season (June–August) _____

Late season (September–October) _____

Off season (November–March) _____

We would like to ask you about your warm-up.

29. On average, how much time do you spend warming up prior to playing or practicing? _____ minutes

30. How much of this warm-up time is spent stretching? _____ minutes

31. Once you have started a round, do you routinely perform any golf stretches while out on the course? (circle)

1. yes
2. no

Now just a few questions about other exercises you might do.

32. Do you routinely perform any of your golf stretches away from the course/practice range? (circle)

1. yes
2. no

33. Do you routinely do any strengthening exercises? (circle)

1. yes
2. no

34. Do you routinely participate in a cardiovascular conditioning program apart from golfing? (circle)

1. yes
2. no

Finally, we would like to ask about your golfing injuries.

35. Have you suffered **ANY** injuries in the past 3 years while playing or practicing golf that caused you to stop or modify your game for at least 2 weeks? (circle)

1. yes
2. no

If yes, please tell us which part(s) and side of your body were hurt _____ and the medical name or diagnosis of each injury, if you know it (eg, tennis elbow, low back strain) _____.

36. Typically, how often are you aware of low back pain after golfing 18 holes? (circle)

0% of the time

15% 30% 50% 65% 80%

100% of the time

37. Have you suffered **ANY** muscle or joint conditions in the past 3 years that affected your golf game? (circle)

1. yes
2. no

If yes, please tell us which part(s) and side of your body were hurt _____ and the medical name or diagnosis of each condition, if you know it _____.

End of questionnaire

*Can be self-administered or used as part of a clinical assessment.