Cherwell EIP Submission by David S B Young on behalf of GreenWayOxon.

Matter 4 North Oxford

"If 4,400 is the correct apportionment, and the strategy is soundly based, are the individual sites chosen in (a) North Oxford (Draft Policies PR6b and PR6c) reasonable?

PR6b

1. I should emphasise here, that notwithstanding the statement by the Executive Director for Place and Growth (para 3.187 Report to Council 26 February 2028) at no time before or during the Plan Preparation or Consultation did the Council members or officers consult or even speak with NOGC.

Green Belt.

2. The Adopted Local Plan Policy (ESD 14) is clear that the Oxford Green Belt boundaries will be maintained in Cherwell to meet all 5 purposes of Green Belt.

3. GreenWay is also quite clear that the Green Belt is devalued by any encroachment into it, and the overriding aim should be to protect the Green Belt as a whole.

4. The PR6 sites lie in a critical part of the GB separating Oxford and Kidlington, and the continuing existence of the golf course on its current site is critical to the integrity of the whole Green Belt. Indeed, Para B 260 in the Adopted Local Plan highlights the importance of the 'Kidlington Gap'.

5. GreenWay believes that the triangle of land that the course occupies, matches precisely the NPPF purposes of the Green Belt, and in separating Oxford and Kidlington is arguably the most important piece of the most critical part of the Oxford GB.

6. The golf course is an exemplary use of GB land – and an important green lung. Pollution monitoring stations at nearby Wolvercote and Cutteslowe roundabouts have NO2 levels already just above the legal limit.

7. The course was founded in 1907. It has played a huge role in the local area from an environmental viewpoint. A public footpath runs east west across the middle of the course and over the railway by footbridge. The course is a mature parkland course. Though small, it supports a rich biodiversity of flora and fauna, including some rare species, and the course maintenance is carried out to encourage wildlife wherever possible.

8. Photographs of the course are on the Club website www.northoxfordgolf.co.uk However, **it is very important that the Inspector visits the course**.

Promoting Healthy Communities

9. NPPF 2012 stresses the importance to health and well being of social and recreational facilities. Para.74 says that recreational space should not be built upon unless

- An assessment has been undertaken which has clearly shown the open space, buildings or land to be surplus to requirements, or
- The loss resulting from the proposed development would be replaced by equivalent or better provision in terms of quantity and quality in a suitable location …

10. Policy BSC 10 in the Adopted Plan states that

'The Council will encourage partnership working to ensure that sufficient quantity and quality of, and convenient access to open space, sport and recreation provision is secured through the following measures

- Protecting existing sites
- Addressing existing deficiencies in provision through qualitative enhancement of existing provision, improving access to existing facilities or securing new provision, and
- Ensuring that proposals for new development contribute to open space, sport and recreation provision commensurate to the need generated by their proposals.

11. It is very clear that, in relation to the golf course (with which as I say there was no contact until after the end of the consultation - and that was a meeting with the embryo GreenWay at its suggestion), the actions of the Council fall far short of the commitment in that Policy. Moreover, it is also clear that the Policies under 6b are in effect a direct negation of that Policy.

12. Policy BSC 11 refers to Cherwell's standards for golf course provision. Whereas Oxford (Southfield) course is within the 12 km standard distance from North Oxford, the three other nearest courses (Studley, Hinksey Heights and Kirtlington are just outside that margin – and at most times of the day, none of the four, given current levels of congestion, would be within the 15 minutes travel time standard. Over 50% of North Oxford's membership comes from the OX1, OX2, OX3 and OX 5 (Kidlington) postcodes. The removal of this course would be in breach of the standards, and (see para 16 below) have a devastating impact on health and wellbeing. It would also have an impact on health and pollution for reasons adduced in that paragraph.

Course

13. The course fulfils all the rationale which lies behind NPPF Health and Recreation policies. It is a thriving social hub, close to local football and tennis clubs, very much

a community course with a variety of activity. It is also convenient for public transport and visitors and members are able to use this and, as many live locally, cycle or walk. Each year, as well as some 3000 green fee payers and around 100 societies, there are over 5000 visitors on over 400 occasions to the clubhouse for yoga/pilates, bridge, training courses and a variety of social functions, including lunches and dinners – often for other sports clubs. This is a club truly integrated into its community. It raises over £10,000 every year for local charities.

14. Savills' representations (PR-C-0775) on the Alteration, referring to the Golf Club are a distortion, and are refuted by the text of this submission. NOGC membership in 2018 was upwards of 460. This is roughly average for an English course and the course flourishes – despite the existential threat to its survival. A relatively central course, it is chosen to host many regional golfing events. Oxford Sports Council (Rep PRC 1321) takes the view that there is no sense in removing this successful recreation facility, and 'strongly object' to the proposal to develop the course for housing. They make the point that 'the idea of developing on the existing course and then setting up a new course half a mile away makes no sense'.

National and Local Survey evidence

15. The Sports Marketing Survey 2018 for England Golf shows that nationally club membership is stabilising; the sport has diversified and overall participation (post 2016 Olympics) shows a small increase. A particular rise in over 65s participation is a reflection of the acknowledged benefits of playing golf to physical, mental and emotional health.

16. The course is particularly suitable for older golfers, as it is fairly short, (relatively) flat and sheltered, and has the advantage of 7th 9th and 13th holes returning close to the clubhouse. Over one third of members are over 65. Given the distribution (see para 12 above) and this relatively elderly demographic, my estimate (as a past Chair of the Club) if the course were to have to close, is that maybe half of the total membership might transfer to other Clubs, with a quarter each playing only occasionally or giving up altogether – just what the Health professionals are advising against (see para 12 – 22). Those moving, would create greater pollution, whereas those giving up would statistically be likely to suffer greater physical and mental health problems.

17. Though the course has an obvious appeal to an elderly demographic, putting in a low scores is as challenging as anywhere in the County.
The England Golf survey in 2018 demonstrates that in the Oxford area, there are a high number of people interested in golf, a high number of potential players, and a high number of golf players in the local demographic – and that there is precisely not an oversupply of golf courses in the area.

Health – a critical factor

18. Arguably, some of the biggest challenges in society - and to the NHS in particular - are Obesity and Type 2 Diabetes. 18 holes of golf played once a week slightly exceeds the minimum WHO level of physical activity for over 65s. Golf is the fifth largest participation sport in UK, can be played by all ages and is excellent both for maintaining and recovering good health.

19. Much of the science of this is set out by A Murray et al 'The relationship between golf and health' BJSM 2016 (a BMJ peer reviewed journal). I have submitted this under separate cover. The best available evidence suggests that playing golf may contribute to reduced mortality and increased life expectancy of c.5 years regardless of gender or socioeconomic status. There is increasing evidence that golf is associated with positive impacts on mental wellness, facilitating opportunities for intergenerational interaction.

20. The social impact of golf is arguably as important as its physical value. For instance, nearly half of a thriving ladies membership at North Oxford lives alone. There are countless examples of support at times of need by golfing colleagues, and as visiting golfers often attest, it has a true and inclusive 'family' atmosphere.

21. It is unsurprising then that the England Golf and Health report 2017, estimates significant savings to the NHS for active golfers. As far as I know, this has not been peer reviewed, but by extrapolation, it would not be unreasonable to assume savings of the order of £100 m (and possibly considerably more) every year. (I place no great reliance on this figure – particularly as it may be a lot higher; I am simply seeking to put potential health savings from golf into some context.) There is also evidence that golf can be important in treating debilitating disease. The Club pioneered with NHS, offering golf on prescription for diabetics and has explored working with the Parkinsons' Society. GreenWay has had letters of support from health professionals on the basis of its contribution to health and social welfare.

22. At the other end of the membership spectrum, the Club is seeking to widen take up by young golfers with a new collaboration with Club Energy, piloting arrangements initially with 4 local primary schools.

Finally

23. The irony is that were there in the event to be any development in the wider local area, the need for the Golf course would be even greater. The Cherwell Local Plan allocations would generate pro rata well over 100 golfers, and the growth in the current crop of Local Plans around Oxford, would generate a need for between at least one and possibly two additional courses.

24. Were site 6b after all, to be retained in the Local Plan, my submission under 6c demonstrates that there would need to be changes to Policy PR6b in line with Para 74 of 2012 NPPF and to take account of paragraph 97 of the 2018 NPPF (now in force for decisions on individual applications) as follows;

18 The application shall be supported by sufficient information to demonstrate that the tests contained in paragraph 97 of the revised NPPF (2018) are met to enable development of the golf course …

20. The application(s) shall be supported by a Delivery Plan demonstrating how the implementation and phasing of the development shall be secured comprehensively and how individual parcels, including the provision of supporting infrastructure will be delivered…

22 A programme for the submission of proposals securing the development and occupation of land at a suitable and close by location, as a replacement 18 hole golf course making equivalent or better provision in terms of quantity and quality (of greens, fairways, clubhouse facilities and access/parking) so as to be planted and established at least 5 years in advance, before development requires interruption of play on the existing course on the land west of Oxford Road.

25. GreenWay hopes fervently that this will never need to happen

Matter 4

PR 6c

1. NPPF para 74 says that recreational space should not be built on unless

- An assessment has been undertaken which has clearly shown the open space, buildings or land to be surplus to requirements, or
- The loss resulting from the proposed development would be replaced by equivalent or better provision in terms of quantity and quality in a suitable location …

2. We do not believe that Cherwell carried out in advance the assessment required by Para 74. I need to reiterate that at no time during Plan preparation or consultation did they approach the Golf Club.

3. The identification of Frieze Farm was clearly very late (and probably an afterthought) in the Plan process. This is demonstrated by significant modifications from late consultation responses from several consultees (including the Oxfordshire CC and Environment Agency).

4. The owners, Exeter College, have represented they want it for housing. Even were it to be available, one might reasonably question the point of moving an established course across a busy road.
However, in any event this piece of land is smaller than the North Oxford Course and **without question, totally unsuitable** for an 18 hole course.

5. I am submitting a letter from international Golf Course Architects and Consultants, Hawtree Ltd which concludes unequivocally that the land would not be suitable as a replacement 18 hole golf course complying with Para 74.

6. In summary it points out;

- many site constraints (listed farmhouse, biodiversity, high voltage line/pylons, dome shaped, flood risk assessments, and a range of access requirements) which would reduce the effective land area.

- the prime reason is of course the limited size of the site, and safety considerations alone would rule the site out as compliant with Para 74; not least the difficulty of providing safe access off heavily trafficked roads.
- they are unaware of any recent course and clubhouse acquisition and construction for a figure of less than £10m.
- lead times for any replacement course would be between 5 and 10 plus years, with 20 years required to begin to replicate the conditions of an established parkland course like NOGC.

7. Clearly Frieze Farm is not a suitable alternative.

8. **However, in case the golf course was, after all, to be lost to development, and in the light of the above points and in particular the Hawtree report, we have suggested an amendment to the Policy under 6b. Anything less could not in our view comply with (2012) para 74, in future (2018) para 97.**

OPEN ACCESS

The relationships between golf and health: a scoping review

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ABSTRACT

Objective To assess the relationships between golf and health.

Design Scoping review.

Data sources Published and unpublished reports of any age or language, identified by searching electronic databases, platforms, reference lists, websites and from consulting experts.

Review methods A 3-step search strategy identified relevant published primary and secondary studies as well as grey literature. Identified studies were screened for final inclusion. Data were extracted using a standardised tool, to form (1) a descriptive analysis and (2) a thematic summary.

Results and discussion 4944 records were identified with an initial search. 301 studies met criteria for the scoping review. Golf can provide moderate intensity physical activity and is associated with physical health benefits that include improved cardiovascular, respiratory and metabolic profiles, and improved wellness. There is limited evidence related to golf and mental health. The incidence of golfing injury is moderate, with back injuries the most frequent. Accidental head injuries are rare, but can have serious consequences.

Conclusions Practitioners and policymakers can be encouraged to support more people to play golf, due to associated improved physical health and mental well-being, and a potential contribution to increased life expectancy. Injuries and illnesses associated with golf have been identified, and risk reduction strategies are warranted. Further research priorities include systematic reviews to further explore the cause and effect nature of the relationships described. Research characterising golf's contribution to muscular strengthening, balance and falls prevention as well as further assessing the associations and effects between golf and mental health are also indicated.

INTRODUCTION

The objective of this scoping review is to map the literature on golf and health and to examine the relationships and effects of golf on physical and mental health.

Golf is a sport usually played on a large open-air course, in which a ball is struck with a club, with the aim of taking the lowest number of shots possible to get the ball into a series of holes in the ground. Golf is played by around 55 million people[1] in 206 countries worldwide[2] representing 1/127 of the global population. This global reach, and appeal to persons of all ages and abilities has seen golf reintroduced in 2016 to the Olympic Games, with efforts ongoing to secure Paralympic status for disability golf. Further information about golf is shown in online supplementary appendix 1.

Health is influenced by a range of individual behaviours and characteristics, and the physical, social and economic environment that people are subject to.[3] There is compelling evidence that regular physical activity has longevity, physical and mental health benefits for people of all ages, genders, geographical and socioeconomic backgrounds, and can deliver economic benefits for communities, as well as national and international policymakers.[4–6]

Golf has potential to provide physical activity, and thus health and social benefits to persons of all ages. Golf is particularly popular among middle-aged and older adults, who are generally less active than younger adults.[7 8] To date the review evidence on this topic is limited. Previous reviews,[9 10] including a systematic review,[11] have been undertaken to consider the relationships between golf and health with many of these focusing on the subject of golf-related injuries, while a further review of undocumented methodology[12] focused on health benefits only. A recent systematic review of health benefits related to sport suggested that evidence was conclusive only for football (soccer) and running, noting further evaluation and research looking at other sports, including golf, was required.[13] A clear need exists to comprehensively review the relationships between golf and health. We therefore undertook a scoping review that maps available evidence, in order to identify the existing gaps in evidence and document impacts of golf on health where these data were available.

METHODS

We adopted the established five-stage scoping review process proposed by Arksey and O'Malley, incorporating adaptions from Levac *et al*, and the Joanna Briggs Institute[14–16] as per our published protocol.[17] The following summarises our approach to each stage.

Stage 1: Identify the research question

Considering the populations, concepts and contexts of interest enabled a broad research question to be formulated:

> What is known about the relationships and effects of golf on physical and mental health?

Stage 2: Identifying relevant studies

The following explicit inclusion and exclusion criteria were developed through researcher discussion and expert consultation:

▸ http://dx.doi.org/10.1136/bjsports-2016-096866

To cite: Murray AD, Daines L, Archibald D, *et al*. *Br J Sports Med* 2017;**51**:12–19.

Inclusion criteria:

- Research articles not limited by geographical location, language or setting.
- All age groups and both sexes of participants.
- Research that considers the general population, as well as specific population groups (with a specific physical or mental illness or condition).
- All forms of golf (including but not limited to 18 holes, 9 holes, driving range, spectating).
- Any physical and/or mental health condition.
- Sources of information, including primary research studies, reviews, systematic reviews, scoping reviews, meta-analyses, guidelines, as well as grey literature to include unpublished and ongoing trials, annual reports, dissertations and conference proceedings.

Exclusion criteria:

- Opinion pieces/opinions, magazine and newspaper articles, case reports, papers with no data.
- Health and safety/occupational issues not related to playing or watching golf.
- Studies focusing on biomechanics, or improved performance in golf.

Search strategies and databases

Step 1: An initial limited search

An initial limited search (September 2015) of SPORTDiscus and Google Advanced Search for review articles and ProQuest for dissertations was conducted as detailed in the published protocol.[17]

Step 2: Identify key words and index terms

The title, abstract and index terms used to describe the articles identified in step 1 were analysed. The research team identified golf as the only primary research term. For the health-focused databases, namely MEDLINE and PsycINFO, 'golf' was used as the only search term to maximise inclusivity. Secondary search terms included a broader set of keywords for SPORTDiscus, Web of Science and Google Scholar. Boolean terms AND and OR were used to extract relevant studies. All relevant articles from SPORTDiscus and Web of Science were reviewed, with the same search strategy applying to Google Scholar. A pragmatic decision to review only the Google Scholar articles with these terms in the title was taken following consultation with a research librarian.

A similar strategy was applied to the grey literature. The same search terms used for SPORTDiscus, Web of Science and Google Scholar were applied to search for theses in the ProQuest database. 'Golf' as the only search term was used for the WHO International Clinical Trials Registry Platform. The advanced search function on Google was used to look for relevant reports and articles from the World Golf Foundation, the Royal and Ancient, the *British Journal of Sports Medicine*, The American College of Sports Medicine and the Faculty of Sports and Exercise Medicine while representatives of these organisations were contacted for further information.

Step 3: Further searching of references and citations

A search was conducted of the reference list of the most relevant identified articles while authors of relevant primary comprehensive, scoping or systematic reviews were contacted for further information.

The complete final search strategy is shown in online supplementary appendix 2.

Stage 3: Study selection

Relevant titles and abstracts were evaluated against the eligibility criteria by one reviewer (ADM). A second reviewer (LD) completed the same process on a random sample of 10% of titles and abstracts, with concordance >97% regarding inclusion/exclusion decision. Where a consensus was not reached, the study proceeded to full-text review.

Scoping reviews are typically iterative, as reviewers become increasingly familiar with the research and evidence.[14] We wished to focus on the relationships and effects of golf on physical and mental health. To enhance this focus, 'studies focusing on biomechanics, or improved performance in golf' was added to the existing exclusion criteria stated in the scoping review protocol.[17]

Full-text articles meeting the inclusion criteria were sourced. Translations by University staff and associates who were fluent speakers of Chinese, French, German, Italian, Japanese, Korean, Spanish and Thai to English were undertaken. Despite searching the University of Edinburgh library databases, using interlibrary loans and contacting authors, 3[18–20] of 365 papers could not be found and were excluded.

Stage 4: Charting the data

Extracting the results

Charting tables to record and assimilate extracted data from included studies were developed. *A priori* categories were charted as were emergent themes. Three reviewers (ADM, LD and EJ) undertook data extraction duties. A sample data extraction form is shown in online supplementary appendix 3. ADM extracted data from 90% of included studies and LD/EJ extracted data from 10% of studies. LD/EJ checked 10% of ADM's data extractions for accuracy and vice versa. Any discrepancies were discussed at group meetings. Concordance was >97% regarding inclusion/exclusion.

Data extraction categories

A. Author(s).
B. Year of publication.
C. Origin (where the study was published/conducted).
D. Aims/purpose.
E. Study population and sample size (if applicable).
F. Methodology/methods.
G. Intervention type, comparator, details of these.
H. Duration of the intervention.
I. Outcomes and details of these (eg, how measured).
J. Key findings that relate to the scoping review research questions.

Stage 5: Collating, summarising and reporting the results

Methods employed in the protocol[17] enabled us to collate existing knowledge on this broad topic and summarise and report as

1. A descriptive analysis, mapping the data, showing distribution of studies by period of publication, country of origin, study method and theme/focus.
2. A thematic summary, describing how identified research relates to the research question and aims, and the main findings from these organised by theme.

In this study, we aim to:

A. Map the evidence and key concepts available for golf and health.
B. Summarise and share existing research findings in a useful way for policymakers, practitioners and other relevant stakeholders.
C. Identify research gaps in the existing literature on golf and health.

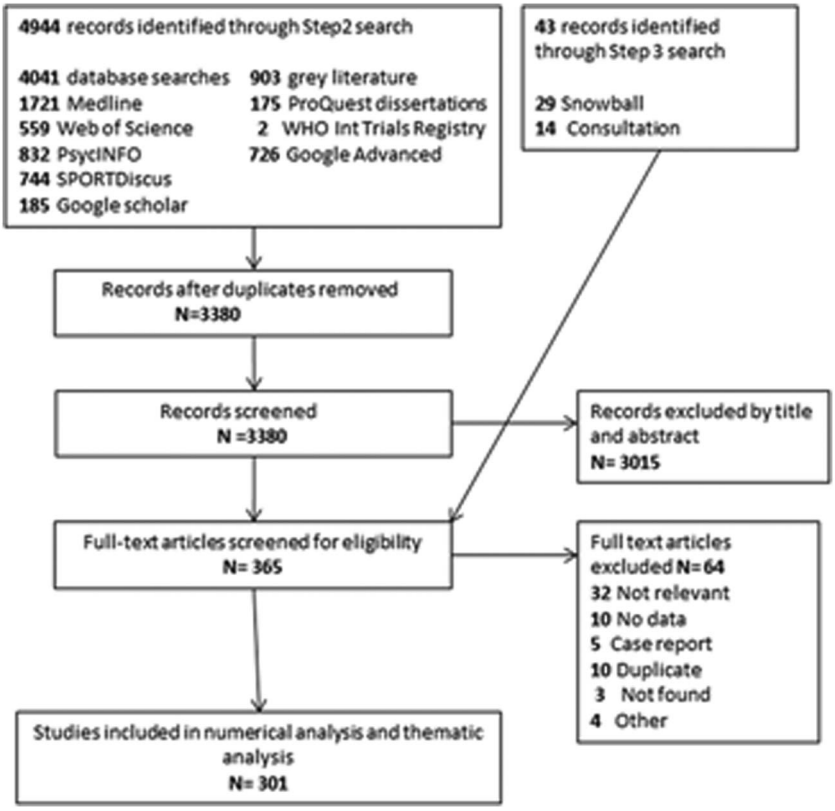

Figure 1 Scoping review flow chart.

RESULTS AND DISCUSSION

Descriptive analysis

A review flow diagram (see figure 1) details the results from the search, and study selection processes.

Our initial search identified 4944 studies. Of these, 4041 were identified searching databases/search platforms, and 903 from grey literature. After duplicates were excluded, 3380 records remained. A further 43 eligible studies were identified by snowballing or via expert consultation during the step 3 search.

In total, 362 articles underwent full-text screening, 3015 records being excluded after abstract screening with a further 3 articles excluded as full text was unavailable.

Overall, the scoping review identified 301 eligible studies relevant to the aims and research question 'What is known about the relationships and effects of golf on physical and mental health?' and these are included in the analysis.

Included studies by year of publication

In keeping with wider bibliometric trends in sport and health research, figure 2 highlights a substantial chronological increase in the number of papers relating to golf and health, with an associated increase in the range of study designs and research questions.

Geography of included studies

Research studies were identified from 24 countries and in 9 languages. Table 1 demonstrates the percentage of included studies per country. The majority (53.8%) of included studies were from the USA, where almost half of the world's golfers live.[2] Studies from North America (57.1%), Europe (22.3%) and Oceania (10.0%) are relatively well represented, as they are generally for research publications on physical activity.[21] There were fewer included studies per golfing facility (eg, golf course, driving range and practice facilities) from Asia (10.0%) and Africa (0.3%), and none included from South America.

Type of study

Study design

The studies varied considerably in terms of study design and primary focus. No formal quality assessment of included studies was performed as scoping reviews are intended to provide a map of what evidence has been produced as opposed to seeking only the best available evidence to answer a narrow policy or practice-related question.[15] A taxonomy of research designs included by the scoping review is shown in figure 3.

One hundred and seventy-eight (59.1%) were primary research, while 89 (29.5%) were secondary studies and 34 (11.3%) were grey literature.

Of the primary literature, 118 (66.3%) studies had a cross-sectional design, with 14 (7.9%) longitudinal and 46 (25.8%) experimental. The majority of the experimental studies quantified golf parameters, for example, steps taken or calories burned while playing golf. Overall 16 of 301 studies conducted a primary assessment of health outcomes in relation to golf, while only 4 conducted interventions principally aiming to promote behaviour change in relation to golf and health.

The vast majority of secondary studies were reviews. Only six of these were systematic reviews. The systematic reviews each focused on a narrow aspect of the broad topic of golf and health.

The grey literature comprised 17 published conference proceedings, 11 theses and 6 organisational reports.

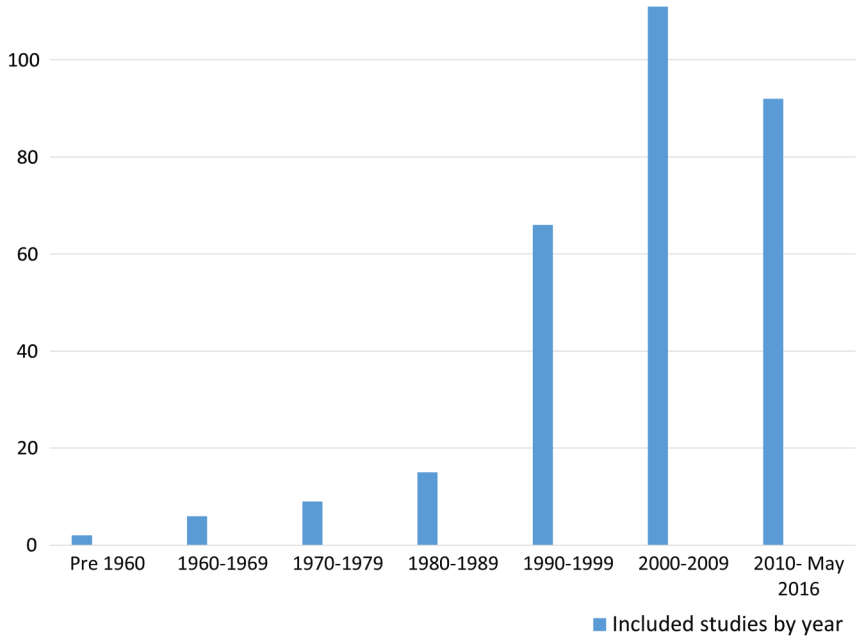

Figure 2 Included studies by year of publication.

Table 1 Geography of included studies

Country	No. of studies	Percentage of studies
USA	162	53.8
UK	38	12.6
Australia	27	9.0
Japan	12	4.0
Canada	10	3.3
South Korea	10	3.3
Germany	8	2.7
China	4	1.3
Sweden, Norway, New Zealand, Switzerland, Spain, France	3 each	1.0 each
Finland, Austria, Thailand	2 each	0.7 each
India, Singapore, the Netherlands, South Africa, Italy	1 each	0.3 each
All	301	99.9

Theme of the study

The primary focus of the included studies fitted broadly into four key themes, namely

1. Physical activity and golf (N=49).
2. Golf and physical health (non-injury/accident) (N=49).
3. Golf and injury/accident (N=135).
4. Golf and mental health/wellness (N=29).

These themes were formed from merging of the *a priori* categories identified. Additional studies from emergent themes were classified into a further category 'other and general' (N=39) to include studies of golf participation, implications for policy, legal implications or studies that focus evenly on more than one of these areas. Articles focusing on injuries and accidents relating to golf were the most frequent, comprising nearly 44.9% of included studies despite the exclusion of articles with a biomechanical/performance focus. Figure 4 shows the primary focus of included studies.

THEMATIC SUMMARY

Key concepts and evidence available

Participation

Golf is a sport played by 55 million people in 206 countries, by males and females across the life-course.[1 2] Globally, this compares to 250 million direct participants in football (soccer),[22] 75 million tennis[23] and 5 million rugby union players.[24] Gaining health benefits and exercise are powerful motivators for persons to play sport, and golf in particular.[25–27] Golfers more frequently continue to play into middle age compared with participants in sports like football and rugby.[28 29] Golf is played by people of all backgrounds, but participation is stronger in males,[8 30] higher socioeconomic groups[7] and more affluent countries.[2]

Golf and physical activity

Golf can contribute to physical activity as a leisure time or recreational activity, while work and occupation yields physical activity for modest numbers of professional players and caddies.[31]

The relative contribution of golf to population physical activity increases in older adults,[27 31] a group that are typically less physically active than younger adults,[32] but for all ages remains considerably less than recreational walking, which is highly accessible and often bears zero cost.[31]

Individual differences in energy expenditure can be large, depending on individual and golf-related factors, but golf can provide moderate intensity physical activity. Moderate intensity physical activity is recommended for children, adults and older adults for the longevity, physical and mental health effects it brings.[33–35] Golf typically involves a mixture of exercise intensities. Golf can help persons and populations meet, and exceed minimum health and government recommendations for Moderate to Vigorous Physical Activity.[36 37]

Studies quantifying golf by Metabolic Equivalent of Task (MET) value generally agree it offers moderate intensity aerobic activity,[36 38–46] although with a wide range of MET values quoted (2.5–8.0) some studies classify it as low intensity[47 48] or high intensity.[49 50] The mean of the range of estimates is 4.5 METs. Figure 5 shows MET values attributed to different

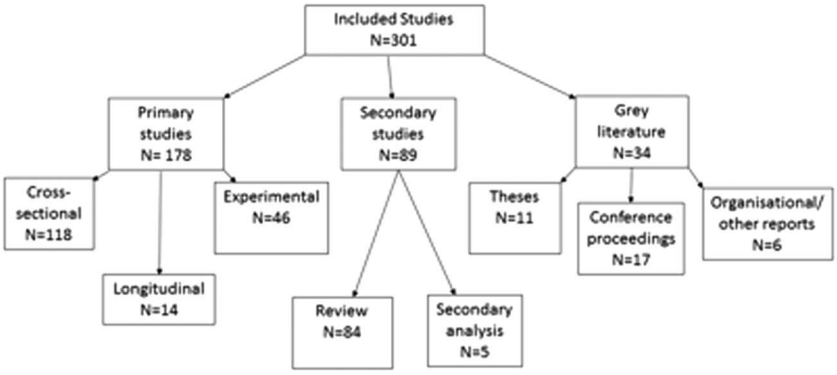

Figure 3 Taxonomy of research designs for included literature.

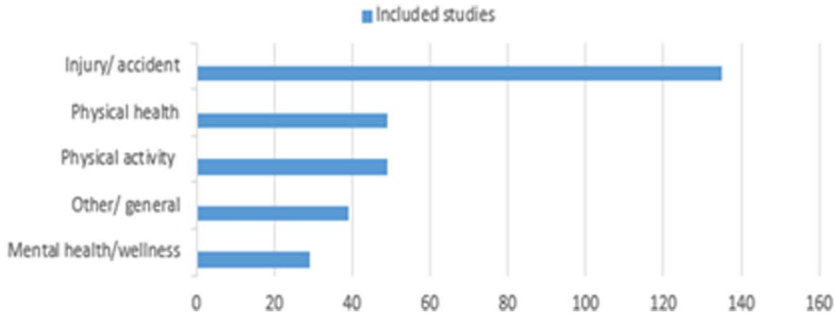

Figure 4 Primary focus of included studies.

modes of golf and, for comparison, other physical activities suitable for all ages, by the Compendium of Physical Activity.[38]

Studies assessing calorie expenditure during golf typically classify golf as a moderate intensity physical activity with energy expenditure of 3.3–8.15 kcal/min,[41 42 51–56] 264–450 kcal/hour[51 52 56] and a total energy expenditure of 531–2467 kcal/18 holes.[36 42 43 47–49 51–53 56–59] Golfers walking 18 holes take between 11 245 and 16 667[36 49 60 61] steps, walking 4–8 miles,[36 48 49 51 57 60 62] while those playing and riding a golf cart accrue 6280 steps[61] or just under 4 miles.[51] There is poor agreement in the literature assessing intensity of golf by heart rate, with a majority classifying golf as low intensity,[47 58 63–65] but others quantifying it as moderate to high intensity.[36 57 66 67]

Intensity of physical activity playing golf is higher for those walking rather than riding a golf cart,[51 58 59 65 68] those playing a hillier course,[55 67] older adults,[66] heavier players,[49 56 69] males[36] and those of low baseline fitness. Intensity further varies depending if a player is swinging a club, walking or standing.[69]

Knowledge of the contribution of golf to muscle strengthening and to the balance aspects of physical activity recommendations is limited, and a priority for a review and further primary research. Studies suggest that golf may improve proprioception, balance, muscle endurance and function particularly in the elderly,[57 70–74] while in younger players, no increase in muscle mass or bone mineral density has been seen.[75]

Sedentary behaviour is characterised as 'any waking activity characterised by an energy expenditure over 1.5 METs and a sitting or reclining posture'.[76] Time playing golf without riding a golf cart is non-sedentary time,[36 38–45 47–49] and although golfers riding a golf cart do gain some health-enhancing physical activity, golfers walking the course gain more.

Unlike most other sports, golf spectating offers the opportunity to walk around the field of play, rather than being restricted to a seat. Spectators from North America and South Korea have highlighted 'exercise' as a reason for attending golf events, which can attract in excess of 500 000 spectators per week.[77–79]

Golf and longevity

Physical inactivity is a determinant of excess mortality, killing >3 million,[5] and perhaps in excess of 5 million people annually.[4] The 2010 Global Burden of Disease study highlights that physical inactivity is one of the top five causes of death in North America, Western Europe and in Australasia,[5] three regions where golf is frequently played.[2]

The best available evidence suggests that playing golf may contribute to reduced mortality and increased life expectancy. When a Swedish study compared 300 818 golfers to non-golfers, they found a 40% lower mortality rate, although the study design and limitations meant that this could not be directly attributed to golf-related physical activity.[80] The authors of that study speculate that this corresponds to a 5-year increase in life expectancy regardless of gender, age or socioeconomic status. This increase will also have further contributing factors, including other lifestyle factors. Playing sport several times per week is likely to benefit health more than playing one to two times per week.[81] An association, but not causal relationship, is demonstrated between golf and life expectancy in Swedish and US studies.[80 82]

Golf and physical health

In providing moderate intensity physical activity, it is biologically plausible that golf could be expected to have beneficial effects in the prevention and treatment of chronic diseases, including ischaemic heart disease, type 2 diabetes, stroke, and colon and breast cancer.[4 83] A review commissioned by the World Golf Foundation concluded that participating in golf can 'yield a number of positive health and fitness effects'[12] although methods were not stated and only health benefits were described. Frequent golfers perceive their physical health to be better than infrequent golfers.[84]

Cardiovascular system

Golf is associated with improvements in known risk factors for cardiovascular disease, including physical inactivity,[38] blood

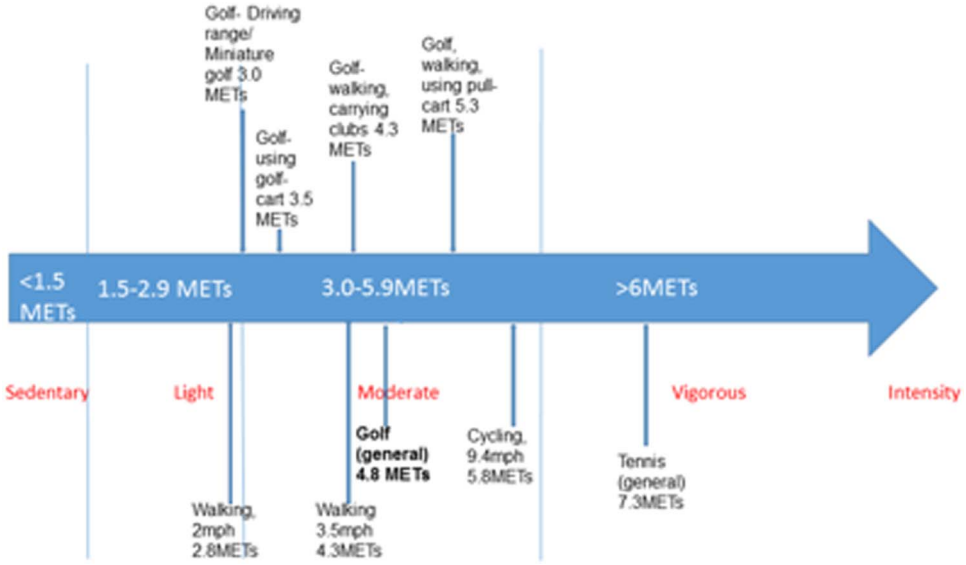

Figure 5 MET values attributed to different modes of golf and other physical activities. MET, Metabolic Equivalent of Task.

lipid and insulin–glucose levels,[57 66 85] body composition[57 85] and aerobic fitness,[57] although direct evidence and longitudinal trials assessing the medium-term and long-term impact of golf on coronary heart disease or cerebrovascular disease are lacking. Golf is reported as providing suitable exercise for patients with cardiac[43 86 87] and stroke rehabilitation.[88]

Golf can provide a sufficient stimulus to improve aerobic fitness, but higher intensity exercise generates significantly improved cardiovascular adaption compared to playing golf.[43 57 69] The effects of a season of golf on systolic blood pressure showed no significant difference in a controlled trial,[57] while no consistent effect has been found measuring blood pressure during golf.[64 67 86]

There is an increased incidence of acute cardiac events during participation in sport[89] and golf in particular.[90–92] Golf players with new or unstable cardiac symptoms should consult a doctor.[90] There is contradictory and inconclusive evidence regarding the effectiveness and cost-effectiveness of automatic external defibrillators situated at golf courses.[93–96] An extremely rare mechanism of ischaemic stroke linked to golf has been described.[97]

Respiratory system

Regular participation in golf may improve lung function and maintain it in older adults.[69 98] Separate golf and swimming interventions decreased hospital admission rates and symptom severity, while improving quality of life and parent satisfaction in a randomised trial of children with asthma.[99]

Metabolic health

Quasi-experimental studies are united in describing overall positive effects on lipid profile.[53 57 67 85] Statistically significant effects of a season of golf on body composition (body weight, body mass index, waist-to-hip ratio and some skinfold thicknesses) are described in controlled trials,[57 85] while a smaller study showed no effect on body composition.[69] Blood glucose levels decreased during golfing activity in Swedish and Japanese studies.[53 66]

Cancer risk

An inverse relationship is demonstrated regarding physical activity and colon/breast cancer.[4] Five ultraviolet radiation dosimetry studies report exposures that place golfers at higher risk of skin cancer than non-golfers.[100–104] A cross-sectional study of female professional and amateur golf players highlighted increased numbers of non-melanoma skin cancers.[105] Appropriate sunscreen, protective clothing and shade availability are suggested.[100 106]

Musculoskeletal health

Golf is associated with musculoskeletal benefits as well as accident and injury. Older golfers may gain improved balance,[70 71 73] muscular function[72] and strength[74] compared to controls, but no lower limb bone mineral density increase was found in male professional golfers.[75] Female caddies show better bone health than the general female population.[107 108]

Golf and injury

Injuries and accidents related to golf comprise the largest group of studies identified by the scoping review. A 2009 systematic review and other reviews describe golf as overall a moderate risk activity for injury compared to other sports.[11 26]

Prospective and retrospective epidemiological studies quote the incidence of injury in amateur golfers annually to be between 15.8% and 40.9%[109–114] and lifetime injury incidence between 25.2% and 67.4%.[10 115–118] Prospective longitudinal studies report very low injury rates compared to other sports, at 0.28–0.60 injuries per 1000 hours in amateurs.[57 109 119] Professionals play more, and are injured more frequently, with annual injury rates of between 31.0% and 90.0%,[115 120] and quoted lifetime incidence of 60.0–88.5%. Overall, the incidence of injury is moderate, and the rate of injury per hour played is low.

The most frequent cause of injury in amateur and professional golfers is volume of repetitive practice,[113 114 116 117 121] while suboptimal swing biomechanics are a frequent[115–117 122] and perhaps even leading[109] cause in amateurs. Attention to these factors, and to an adequate warm up,[26 123–128] and physical conditioning[11 26 129 130] reduces risk of injury.

Regarding limb injuries, the lead side (the left arm and leg in a right-handed golfer) is more often injured than the trail (right side in a right-handed golfer).[11 26 113 131 132] The mean length of missed practice or competition quoted is 4.0–5.2 weeks.[116 117] The spine and particularly the lower back

account for the greatest overall incidence of injury in amateur golfers (18.3–36.4%).[109 115–117 133] The elbow (8.0–33.0%), the wrist and hand (10.0–32%) and shoulder (4.0–18.6%) are other frequently injured anatomical regions in amateur golfers.[10 11 109 110 115–117 133]

Golf is an infrequent cause of head and particularly ocular injury, but these injuries can be severe particularly in children.[134–145] Injuries in children most often occur when struck by a club,[134 140–142] while adults are more frequently hit by a ball. Most paediatric golf-related injuries occur away from a golf course[134 143] with authors urging preventative strategies targeting improved education and supervision of children and safe storage of golf equipment.[11 134 135 138 140]

Although still infrequent, golf is reported to be the sport with the highest incidence of lightning strike in the USA[146] with deaths,[147 148] and prevention strategies for players and courses outlined.[147]

Golf cart-related injuries, including from falls, collisions or limb entrapment, can occur[11 149 150] and can be severe.[139 149–152] The US National Safety Council reports over 15 000 golf cart-related injuries per year, noting that not all are related to golf.[149] Authors suggest regulation and instruction around safe golf cart use,[150 151] as well as improvement and standardisation of safety features—for example, speed limiters, seat belts and front wheel brakes.[149 150]

Golf and mental health/wellness

No consistent evidence for the associations or effects of golf on mental illness was reported. Golf is associated with positive impacts on mental wellness.[35 153 154] A wide range of methodologies, including qualitative interviewing, cross-sectional surveys and longitudinal studies, were used.

Mental health

A small experimental study enrolling nine persons with severe and enduring mental illness tentatively reported a number of mental and social benefits for participants.[155] There is conflicting evidence relating to the effect of golf and other sports on mood and anxiety, with positive[156] and negative[62] mood changes noted. Improvement in stress and anxiety was reported by two studies[156 157] highlighting stress-busting qualities, verbalised as a 'sense of cool control' and a 'release of aggression'.[157] Conversely, studies describe anxieties relating to performance on the golf course.[62 157] Increased heart rates are noted prior to tournament play, consistent with prematch tension.[86]

Mental wellness

Quantitative and qualitative studies have described benefits related to self and group identity[157–161] and social connections, many of which have been cultured long term.[84 161 162] Golf facilitated opportunities for intergenerational interaction,[163 164] and created opportunities to rebuild social connections[86 161] and confidence[165] during and post illness.

Self-efficacy, self-worth and physical activity levels improved after a golf intervention in 814 participants with a disability in the USA.[166] In addition, self-worth in golfing populations[158 161] and self-esteem[156 167] in sporting populations that include golfers show positive change. An initial analysis of 'The First Tee'—an at-scale US sport-based development programme—suggests that participants and parents noted improved confidence, interpersonal skills and emotional control.[168] Finally, sunshine, fresh air and kinaesthetic pleasure were identified through qualitative interview responses as contributing factors to potential wellness[162] benefits related to golf.

Table 2 Research priorities related to golf and health

Research priority relating to golf	Comment	Why required
Mental health and illness	Physical activity has an overall positive impact on wellness and mental ill health, but robust, controlled studies with objective measures are required in relation to golf	Weight of evidence low
Systematic reviews relating to golf and health	To explore cause and effect nature of the relationships described	Scoping review methods cannot answer these specific questions, but have been able to map the evidence landscape and indicate where more focused study is required
Muscle strengthening/strength and balance/musculoskeletal benefits	Research on the contribution of golf to muscle strengthening/strength and balance, and potential effects in relation to osteoporosis and osteoarthritis could be important to golfers, practitioners and policymakers looking to provide advice to patients and populations	Weight of evidence low/knowledge gap
Golf carts	Research is needed exploring how health effects/relationships differ between golf played while riding a golf cart and golf played walking the course	Weight of evidence low
Spectating	Research assessing useful physical activity accrued spectating is required. Opportunities exist to shape health behaviours among spectators on course and in daily life using the experience as a 'teachable moment'	Knowledge gap
Health behaviour change	Research is needed addressing how golfers and potential golfers can be influenced to take part and maintain golfing activity, and investigating and improving knowledge and behaviours related to golf injuries, illnesses and accidents	Weight of evidence low
Economic effects	Research investigating cost savings to health and other services associated with golf, and opportunities to make golf more accessible and affordable for all will inform policy	Weight of evidence low
Specific populations	Research addressing associations between golf and health in (1) disabled and (2) older adult populations may highlight specific benefits/disbenefits	Weight of evidence low

In summary, a number of qualitative and quantitative studies describe improved wellness in golfers, but there are few controlled studies looking at golf and mental health.

Further research priorities

This study has identified research gaps in the existing literature on golf and health with future research priorities outlined in table 2.

Limitations

Scoping reviews are comprehensive, but not exhaustive in identifying literature[16] recognising the balance between the breadth and depth of analysis.[169] Our search was subject to older but relevant sources being less available via databases, search platforms and search engines. Scoping reviews are broad in nature and provide an overview of existing literature regardless of quality, providing a broader and more contextual overview than systematic reviews. Formal assessment of methodological quality is not undertaken when conducting a scoping review,[14 15 169] and synthesis of the literature quantitatively, nor demonstration of a cause and effect nature for the found relationships is not possible. Golfers are likely different to non-golfers in many ways, with confounding factors a challenge to identify and adequately control. Documented attempts were made throughout the design and conduct of this study to appraise and report evidence in an objective way.[17] Rigorous and reproducible methods have been applied and authors are committed to publish all findings whether findings were positive, negative or not significant.

CONCLUSIONS

This scoping review identified over 300 studies investigating the relationship between golf and health. Golf has been shown to provide moderate intensity aerobic physical activity and therefore could be expected to have the same beneficial effects on longevity, physical health, mental health and wellness associated with physical activity.[170] The scoping review cannot demonstrate causative effects, but reports evidence that is biologically plausible and relatively consistent, highlighting positive associations between golf and physical health, and mental wellness. The best available evidence suggests that golf may contribute to reduced mortality. The existing evidence supports efforts to promote golf as a sport with overall health benefits. To maximise health benefits, golfers should walk the course rather than riding a golf cart.

Research assessing golf's contribution to muscle strengthening recommendations, the relationships of golf on mental health, golf spectating and health, and the influencing of health behaviours in golfers, have been identified as priorities for further study. Systematic reviews to further explore health effects of golf on specific conditions are also required.

What is known?

- Scoping reviews provide a useful framework to collate and summarise information on a broad topic.
- Golf is played by over 50 million people of all ages worldwide.

What this study adds?

- Playing golf can provide moderate intensity physical activity and has overall positive associations with physical health and mental wellness, while golf may contribute to increased longevity.
- Disbenefits include (mostly overuse) injuries; accidents are rare, but deleterious consequences of them can be high.
- Priority areas for future research include the associations and effects of golf on mental health, golf's contribution to muscle strengthening, balance and falls prevention, and influencing health behaviours among golfers and potential golfers. Systematic reviews to further explore the cause and effect nature of the relationships described are merited.

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Contributors All authors have contributed to the development of the research questions and study design. AM, EG and NM identified the method, whilst AM and DA identified existing scoping review frameworks to develop this scoping protocol. AM and LD developed and conducted the search strategy and data extraction. All authors developed the first and subsequent drafts of the manuscript. All authors reviewed and approved the manuscript.

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The relationships between golf and health: a scoping review

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HAWTREE LTD -

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09 July 2018

Mr David Young
[redacted]

Dear Mr Young,

Cherwell Local Plan Partial Review Policy PR6c – Land at Frieze Farm.

You have commissioned Hawtree Ltd. to give a professional opinion as to the suitability of the provisional reservation in this Draft Local Plan, of **c. 30 ha**. of land at Frieze Farm, for 'the potential construction of a golf course should this be required as a result of development of Land to the West of Oxford Road under Policy PR6b' – i.e. the existing North Oxford Golf Club.

You have confirmed that the total land area (PR6c) is somewhat smaller than the Land comprising North Oxford Golf Course, currently proposed for housing in Policy PR6b. We are familiar with the North Oxford Golf Course and know it to be a healthy and vibrant 18-hole Course, serving a local and wider community.

We have not carried out a site survey of the land at Frieze Farm, but it is easily identifiable from the 1:25,000 OS map and is bounded to the SW by the A44, the SE and E by A4260, to the west by the Oxford Canal, and by Stratfield Brake to the north.

We understand that between the original Proposed Plan and the document submitted to the Department for Communities and Local Government, the District Council made several changes and additions to PR6c, which seem to be the outcome of consultations at a late stage, inter alia, with Historic England, BBOWT, Oxfordshire County Council and the Environment Agency. These relate to the protection of the Grade 2 listed Farmhouse, the biodiversity of the site, flood risk assessments, and a range of access requirements.

We know that there is a public footpath over the southern part of the site, much of which is over the access road to the listed Farmhouse. There is a high voltage overhead power line and pylons in the northern part of the site. You have told us that there may be other services over the land. The land is somewhat dome-shaped, sloping to the roads to the south and the canal to the west, in which area there is risk of flooding.

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We can say without reservation that this land would not be suitable as a replacement 18-hole golf course complying with Para 74 of the NPPF.

The prime reason for saying this is the limited size of the provisionally allocated site. A modern-day golf course when completed occupies a footprint surface area of at least **75 ha**, to include access, clubhouse building and parking, practice range, maintenance buildings, etc. Safety considerations alone would rule out Frieze Farm as compliant with Para 74. Given the shape and other constraints of the site mentioned above – and not least the difficulty of providing safe access off highly trafficked roads – it might even be tricky to provide a satisfactory course of 9 holes.

You also asked us for a rough minimum conceptual cost of an 18-hole course to replace North Oxford. Without knowledge of a suitable site, it is almost impossible to give a ball-park figure, but we are unaware of any recent course and clubhouse acquisition and construction for a figure less than £10 million. You would also need to consider lead and construction times were an alternative site to be identified. These would rarely be less than between 5 and 10 years – and it would be a further 2-3 years before the course was able to withstand regular use without damage because of maturity after seeding the new golf course. North Oxford is an established mature course and any new course would take over 20 years to replicate the conditions of a mature parkland course.

I hope I have covered the questions that you asked.

Yours sincerely,

Russell Talley
For and on Behalf of Hawtree Ltd.