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Sorbie, Graeme, Beaumont, Alexander

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1 **The Impact of the Closure and Reopening of Golf Courses in the United Kingdom on**
2 **Wellbeing during the COVID-19 Pandemic: A Multi-Study Approach**

3

4 **Graeme G. Sorbie^{1*}, Alexander J. Beaumont², Ashley K. Williams¹, Jonathan Glen¹, Scott**
5 **M. Hardie¹, and David Lavallee¹**

6

7 ¹**Division of Sport and Exercise Sciences, School of Applied Sciences, Abertay University,**
8 **United Kingdom,**

9 ²**School of Science, Technology and Health, York St John University, York, United**
10 **Kingdom**

11

12 *** Correspondence: to Dr. Graeme Sorbie, School of Applied Sciences, Sport and Exercise,**
13 **Abertay University, United Kingdom; Dundee, DD1 1HG, Email:**
14 **g.sorbie@abertay.ac.uk, Tel No: +44 (0)1382 308015, ORCID ID: 0000-0002-3362-267X.**

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19

20 **Abstract**

21 The purpose of this multi-study was to assess what impact the closure and reopening of golf
22 courses had on: personal competence; sense of belonging; enjoyment; self-esteem; self-
23 confidence; resilience; social connections; wellbeing and life satisfaction (hereafter referred to
24 collectively as ‘key variables of interest’) during the COVID-19 pandemic. Golfers (Study 1:
25 $n = 298$, Study 2: $n = 124$) ≥ 16 years old residing in the UK participated in this study which
26 collected data using online surveys. Study 1 was conducted during a period of quarantine
27 restrictions (4 – 12th May 2020), whilst study 2 took place following the easing of the COVID-
28 19 quarantine restrictions (6 – 14th July 2020). Within study 1 and study 2, key variables of
29 interest levels were also collected to investigate the association with golf related activities. The
30 findings of study 1 highlighted that negligible and non-significant correlations were observed
31 between golf physical and sedentary activities and key variables of interest ($r < 0.3$, $p > 0.05$)
32 except sense of belonging and sedentary golf activities ($r = 0.178$, $p = 0.003$). Study 2
33 highlighted that sense of belonging, enjoyment and wellbeing were significantly associated
34 with outdoor golf course activity ($r = 0.186 - 0.252$, $p \leq 0.05$). Furthermore, when comparing
35 study 1 and study 2, sense of belonging and life satisfaction significantly improved ($p \leq 0.05$,
36 $d = 0.2$). Based on these findings, playing golf on outdoor golf courses appears to be positively
37 related to sense of belonging, enjoyment and wellbeing. Also, with the reopening of golf
38 courses life satisfaction improved which, together, highlight the beneficial impact that outdoor
39 golf can impart.

40

41

42 Introduction

43 Golf is played in 206 countries worldwide (The Royal & Ancient, 2019), including the
44 United Kingdom (UK) with 870,996 registered golfers (Lange, 2019). Golf is normally played
45 outdoor on 9 or 18-hole courses and requires individuals to perform intermittent bursts of
46 walking and multiple golf shots of varying distances (Versteegh et al., 2008). As a result of
47 these aspects, golf is a popular sport across varying age groups and enables individuals with
48 varying levels of fitness and mobility to participate (Arkkari et al., 2000; Murray et al., 2017).

49 Golf provides individuals with opportunities to increase or maintain light to moderate
50 intensity physical activity (PA) levels (Luscombe et al., 2017). Golf is predominantly
51 recognised as a moderate intensity activity, with a general metabolic equivalents (METs) of
52 4.8 (Ainsworth et al., 2011). Accordingly, golf can provide possible health benefits for those
53 individuals who participate (Murray et al., 2017; Sorbie et al., 2020b), whilst also facilitating
54 the opportunity to improve mental health and wellness (Murray et al., 2017; Breitbarth and
55 Huth, 2019). Specifically, golf offers the prospect to improve social relations, sense of
56 belonging, self-esteem, life satisfaction, personal competence and personal wellbeing (Stenner
57 et al., 2016; Wheatley and Bickerton, 2017; Sorbie et al., 2020b). In addition to the above, golf
58 is normally played outdoors, which can also promote life satisfaction due to the outdoor
59 environment (Zhang et al., 2014; Silva et al., 2018).

60 On March 23rd 2020 golf courses in the UK closed for between 8 – 10 weeks (the
61 variation was dependent on different UK countries) as a result of the COVID-19 pandemic
62 caused by SARS-CoV-2 coronavirus (United Kingdom Government, 2020). Although golf
63 courses were closed, it was possible for individuals to perform golf-related activities within
64 their home environment. We recently reported on golf-related engagement pertaining to
65 physical (e.g. practising full golf swings, chipping and putting) and sedentary (e.g. watching
66 TV and online tutorials and listening to podcasts) activities during an 8-day period of restricted
67 movement as a result of the COVID-19 pandemic (Sorbie et al., 2020a). Forty-eight percent of
68 golfers completed physical golf-related activities within the home environment during a period
69 of quarantine (4 – 12th May 2020). The most commonly-performed sedentary golf activity was
70 watching golf on television (71%). Whilst informative, the implications of these activities
71 during a period of restricted movement are not known, particularly in relation to personal
72 competence, sense of belonging, enjoyment, self-esteem, resilience, social connections and
73 wellbeing. Indeed, behavioural strategies to alleviate the impacts of psychosocial stresses
74 during quarantine restrictions have recently been recommended (Ricci et al., 2020). Moreover,
75 the reopening of golf courses within the UK on 13 – 29th May 2020 enabled the opportunity to
76 investigate the association between markers of personal wellbeing and golf-related activity
77 both at home and on outdoor golf courses, importantly within the same individuals.

78 Taken together, the closure and reopening of golf courses during a unique and
79 unprecedented period presented an opportunity for insightful implications for golf to be
80 realised. Therefore, the overarching purpose of this multi-study was to assess what impact golf-
81 related engagement during the COVID-19 quarantine restrictions had on: personal competence;
82 sense of belonging; enjoyment; self-esteem; self-confidence; resilience; social connections;
83 wellbeing and life satisfaction (hereafter referred to collectively as ‘key variables of interest’).
84 In order to achieve this, we conducted studies within two distinct and significant time periods
85 during the COVID-19 pandemic:

86 Study 1 aimed to ascertain the correlations between golf-related activities performed within the
87 home environment and the key variables of interest during the COVID-19 quarantine

88 restrictions (4 – 12th May 2020). It was hypothesised that home-based golf activity (physical
89 and sedentary) would be positively associated with all key variables of interest.

90 Study 2 aimed to first ascertain the correlations between golf-related activities performed on
91 golf courses and driving ranges/practice areas and the key variables of interest following the
92 easing of the COVID-19 quarantine restrictions (6 – 14th July 2020). It was hypothesised that
93 home-based (physical and sedentary) golf activities and those on golf courses and at driving
94 ranges/practice areas would be positively associated with all key variables of interest.
95 Secondly, study 2 aimed to compare key variables of interest between studies 1 and 2 with
96 hypothesised improvements.

97 **Methods**

98 **Participants Inclusion Criteria**

99 In order to be eligible for the present studies, participants were required: to be 16 years of age
100 or older; to consider themselves either a social, handicap or professional golfer; to reside within
101 the UK and have played at least 2 rounds of golf in 2019. A minimum of 2 rounds of golf in
102 2019 was added within the eligibility criteria to ensure golfers could be categorised as a social
103 golfer. Full ethical approval was granted from Abertay University School of Health Sciences
104 prior to data collection.

105 **General Methodological Procedures**

106 The same methodological procedures were used for both studies 1 and 2. Online surveys were
107 used to collect data between 4 – 12th May 2020 (Study 1) and then subsequently between 6 –
108 14th July 2020 (Study 2). The surveys contained questions relating to three strands. Firstly,
109 participants answered questions relating to what golf activities they performed during these
110 two time periods. Golf-related questions included: what physical golf activities (i.e., full golf
111 shots, chipping, putting, physical virtual reality golf games, participating in golf coaching
112 sessions) were performed and what sedentary golf activities (i.e., reading golf magazines,
113 listening to golf related podcasts or audiobooks, watching golf on TV) were engaged with. The
114 days per week and time spent participating in these activities in the previous seven days were
115 recorded. Only activity bouts of at least 10 minutes were recorded. Specific to study 2, in
116 accordance with re-opening of golf-courses, questions were asked relating to golf activity on
117 courses, driving ranges and practice areas between 6 – 14th July 2020. Data were also collected
118 pertaining to the days per week and time spent participating in these activities in the previous
119 seven days.

120 Secondly, PA was measured using the International Physical Activity Questionnaire short form
121 (IPAQ-SF). Although the recommended age range for using the IPAQ-SF is 15 – 69 years of
122 age, we elected to use this assessment tool for older adults given the anticipated range in ages
123 relating to golfers. The IPAQ-SF has previously been shown to have acceptable reproducibility
124 (Craig et al., 2003), including older adults (Tran et al., 2013). We intended to use PA data
125 derived from IPAQ-SF as a potential covariate to golf-related activity, depending on associated
126 changes in PA from study 1 to study 2. In addition to the standard example, we supplied
127 additional exemplar activities with a focus on typical behaviours likely to be experienced
128 during restricted movement conditions to guide participants in accordance with known
129 metabolic equivalents (METs) for each category of intensity (Ainsworth et al., 2011).
130 Similarly, we calculated golf-related PA on outdoor courses and at driving ranges/practice
131 areas using a 7-day recall in line with the IPAQ-SF.

132 Thirdly, participants completed a total of 18 questions relating to: personal competence
133 (McAuley & Duncan, 1989); sense of belonging (Postmes et al., 2013); self-esteem (Robins
134 et al., 2001); self-confidence (Bandura, 2006); resilience (Ungar and Liebenberg, 2011); social
135 connections (Perlman and Peplau, 1981); wellbeing (Abdel-Khalek, 2006) and life satisfaction
136 (Office of National Statistics). These questions have been commonly used within the respected
137 areas, are validated measures and were answered on a 5-point scale, which ranged from
138 strongly disagree (1) to strongly agree (5). Internal consistency was determined for variables
139 of interest which were derived from multi-item questions, including personal competence
140 (Cronbach's alpha = 0.80), resilience (Cronbach's alpha = 0.83) and social connections
141 (Cronbach's alpha = 0.81).

142 **Data Analysis and Qualification of Activity**

143 Physical activity data were processed in accordance with IPAQ-SF recommendations for each
144 of the three intensities (vigorous, moderate and walking) in order to calculate the MET.min⁻¹.week⁻¹.
145 Total activity was then calculated to represent the sum of all intensities. For an
146 extended and detailed method of data processing used in these studies, see supplementary
147 material 1. The same processes were used to determine golf MET.min⁻¹.week⁻¹ on golf courses
148 and at driving range/practice areas within the last 7 days. The METs of general golf on golf
149 courses were deemed to be 4.8 and at the driving range/practice area, 3.0.

150 **Statistical Analysis**

151 Statistical analyses were performed using Jamovi (Version: 1.2.12) (The jamovi project, 2019).
152 All data were measured for normality using the Shapiro-Wilk test. For study 1 and 2, all data
153 were not normally distributed; therefore, non-parametric Spearman's Rank Correlations were
154 conducted to determine relationships between golf-related activity and key variables of interest.
155 Correlation coefficients of 0 – 0.3 were categorised as negligible, 0.3 – 0.5 low, 0.5 – 0.7
156 moderate, 0.7 – 0.9 high and 0.9 – 1 very high (Hinkle, 2009). Based on data collected in study
157 1, Cronbach's alpha was used to assess internal consistency for personal competence, resilience
158 and social connections which had multi-item questions.

159 For study 2, all data were not normally distributed; therefore, non-parametric Spearman's Rank
160 Correlations were conducted to determine relationships between golf-related activity
161 conducted on golf courses or driving ranges/practice areas and key variables of interest. In
162 addition, non-parametric Wilcoxon signed-rank tests were carried out to compare golf-related
163 engagement within the home environment, PA, and key variables of interest between study 1
164 and study 2. All data are presented as mean ± standard deviation (SD), p-value and effect sizes
165 using Cohen's d (Cohen, 1988). Effect sizes of < 0.2 were considered negligible, 0.2 – 0.5
166 small, 0.5 – 0.8 medium and > 0.8 large (Cohen, 1988). In all instances, $p \leq 0.05$ was considered
167 to be statistically significant.

168 **Results and Discussion**

169 The results for study 1 are presented below, followed by a relevant discussion for study 1.
170 Study 2 is presented in the same format as study 1. Following the results and discussion for
171 study 1 and study 2, a general discussion is presented at the end of this section.

172 ***Study 1 - Results***

173 A total of 298 golfers (14% Females; 86% Males) volunteered to participate in study 1. Golfers
174 ranged in age from 16 – 89 years (Mean ± SD: 53 ± 15 years). Ninety-five percent had a
175 handicap index; 3% were social golfers and 2% were professional golfers. The handicap index
176 ranged from 0 – 50 (Mean ± SD: 14 ± 8 handicap index). At the time of the restricted movement

177 period (4 – 12th May 2020), 34% were not working, 30% were working from home, 18% were
178 working as normal and 18% were retired. Of the included golfers for study 1, individuals had
179 completed 73 ± 26 (range 2 – 250) rounds of golf in 2019. Of the included golfers for study 2,
180 individuals had completed 82 ± 47 (range 2 – 250) rounds of golf in 2019. All golfers provided
181 informed written consent before participating in study 1 and study 2. Of the included golfers
182 for study 1, individuals had completed 73 ± 26 (range 2 – 250) rounds of golf in 2019.

183 Table 1 provides Spearman's correlation coefficients and p-values for correlations between
184 golf-related engagement questions and key variables of interest. Negligible and insignificant
185 correlations were observed between physical golf activities and all key variables of interest (r
186 = -0.084 – 0.088, $p > 0.05$). Sedentary activities within the home environment were
187 significantly associated with sense of belonging ($r = 0.178$, $p = 0.003$). Negligible and
188 insignificant correlations were observed between all other key variables of interest and
189 sedentary golf activities ($r = -0.115 – 0.079$, $p > 0.05$). For extended descriptive data relating
190 to the key variables of interest and physical and sedentary activities, see supplementary
191 material 2.

192 **INSERT TABLE 1 NEAR HERE**

193 ***Study 1 - Discussion***

194 As a result of the majority of the correlations between golf-related activity and key variables
195 of interest being negligible and non-significant, the hypothesis for study 1 was rejected. This
196 contrasts with existing work, where it has been previously reported that golf offers the prospect
197 to improve social relations, sense of belonging, self-esteem, life satisfaction and personal
198 competence which, in turn, can lead to an overall enhancement in personal wellbeing (Stenner
199 et al., 2016; Wheatley and Bickerton, 2017; Sorbie et al., 2020b). Initially it was assumed that
200 our disparate findings to others could be a result of the strict quarantine restrictions that were
201 in place during the data collection period of study 1 (United Kingdom Government, 2020).
202 However, we recently reported that the common physical golf activities performed within the
203 home environment included full golf swings, chipping and putting (Sorbie et al., 2020a).
204 Although these physical golf activities form a part of the game of golf, these skills do not
205 replicate the outdoor environment that golf courses offer, as they do not include the walking
206 element of the sport and the social interactions the sport provides. These aspects have been
207 shown to promote personal wellness (Fox, 1999; Silva et al., 2018); therefore performing these
208 physical golf activities within the home environment could aid skill development, but is
209 unlikely to impact key variables of interest investigated within this study.

210 Moreover, we observed that sedentary golf activity and sense of belonging were significantly
211 and positively associated. This suggests that those who engaged in sedentary golf activities for
212 longer periods of time presented with a greater sense of belonging, even during a time when
213 significant quarantine restrictions were imposed. We recently reported that the most
214 commonly-performed sedentary golf activities during the COVID-19 quarantine restrictions
215 were watching golf on television and watching online tutorials (Sorbie et al., 2020a). In
216 support, it has been shown in other sports that spectating through media such as television can
217 increase or create a sense of belonging for individuals (Williams, 2007). Whilst engagement in
218 sedentary activities may provide a sense of belonging, these activities are likely conducted
219 without face-to-face interaction, which was reduced given the concurrent movement
220 restrictions. Accordingly, this may provide some insight to the lack of association observed
221 between sedentary golf engagements and social connection. These results suggest that
222 engaging with golf on television or through online tutorials can provide individuals with a sense

223 of belonging during a period of strict quarantine restrictions and with limited social
224 interactions.

225 ***Study 2 – Results***

226 A total of 124 golfers (17% Females; 83% Males) volunteered to participate in study 2. These
227 golfers were recruited from the same pool of golfers that participated in study 1. Golfers ranged
228 in age from 20 – 89 years (Mean \pm SD: 54 \pm 15 years). Ninety-four percent had a handicap
229 index; 5% were social golfers and 1% were professional golfers. The handicap index ranged
230 from 0 – 50 (Mean \pm SD: 14 \pm 9 handicap index). Of the included golfers for study 2,
231 individuals had completed 82 \pm 47 (range 2 – 250) rounds of golf in 2019.

232 Table 2 provides Spearman's correlation coefficients and p-values for correlations between
233 golf-related engagement questions and key variables of interest obtained from study 2. In
234 relation to golf activity on golf courses (MET.min⁻¹.week⁻¹), sense of belonging ($r = 0.186$, p
235 = 0.041), enjoyment ($r = 0.234$, $p = 0.010$) and wellbeing ($r = 0.252$, $p = 0.005$) were
236 significantly associated with these types of golf activity. All other key variables of interest and
237 golf activity on golf courses (MET.min⁻¹.week⁻¹) and golf practice (MET.min⁻¹.week⁻¹)
238 performed at the driving range/practice area were negligible and not significantly related ($r =$
239 $-0.084 - 0.171$, $p > 0.05$).

240 Physical and sedentary golf activities within the home environment were significantly
241 associated with sense of belonging ($r = 0.226$, $p = 0.014$, $r = 0.277$, $p = 0.002$). Negligible and
242 insignificant correlations were observed between physical and sedentary golf activities within
243 the home environment and all key variables of interest ($r = -0.032 - 0.116$, $p > 0.05$) (Table 2).

244 When comparing key variables of interest between studies 1 and 2, sense of belonging ($p =$
245 0.044 , $d = 0.167$) and life satisfaction ($p = 0.026$, $d = 0.223$) significantly increased. No
246 statistical significance was reported for all other key variables of interest between studies 1 and
247 2 ($p > 0.05$) (Table 3).

248 Physical golf activities within the home environment significantly reduced when comparing
249 studies 1 and 2 ($p < 0.001$, $d = 0.425$), whereas no significant difference was observed between
250 sedentary golf activities between studies 1 and 2 ($p = 0.550$, $d = 0.126$) (Table 4). Furthermore,
251 moderate and vigorous PA significantly reduced between studies 1 and 2 ($p < 0.001$, $d = 0.181$,
252 $p = 0.024$, $d = 0.203$), whereas no significant difference was reported for light PA between
253 studies 1 and 2 ($p = 0.342$, $d = 0.048$). For extended descriptive and statistical data relating to
254 PA, see supplementary material 2.

255 **INSERT TABLE 2 NEAR HERE**

256 **INSERT TABLE 3 NEAR HERE**

257 **INSERT TABLE 4 NEAR HERE**

258 ***Study 2 - Discussion***

259 Due to multiple correlations observed between golf-related activity and key variables of
260 interest, the original hypotheses for study 2 were partially accepted. Specifically, study 2
261 reported significant and positive correlations between golf course activity (MET.min⁻¹.week⁻¹)
262 and enjoyment, wellbeing and sense of belonging. This demonstrates the advantages of
263 spending more time on golf courses playing golf. These positive findings are in agreement with
264 existing research that has investigated the impact that golf has on various psychosocial markers
265 of health (Murray et al., 2017; Breitbarth and Huth, 2019). Collectively, these findings
266 reinforce the importance of engaging with golf activities on outdoor golf courses. Further

267 support for actually playing golf on outdoor courses as the mediator is clear when considering
268 that practice/driving range activity ($\text{MET}\cdot\text{min}^{-1}\cdot\text{week}^{-1}$) was not associated with any markers
269 of belonging, enjoyment, competence, resilience, social connections, wellbeing or life
270 satisfaction. Therefore, although practice area/driving range activities provide opportunities to
271 enhance skill level and increase PA levels, these types of activities were not related to key
272 variables of interest herein.

273 Importantly, there were also insignificant correlations between golf course activity ($\text{MET}\cdot\text{min}^{-1}\cdot\text{week}^{-1}$)
274 and other key variables of interest, including social connections, personal competence
275 and self-confidence. It has been previously highlighted that golf is associated with increased
276 social connections (Berlin and Klenosky, 2014); however, the disagreement in this study may
277 be a result of the partial restrictions imposed on the return of golf during the time of study 2.
278 For example, social distance, playing with a limited number of golfers and no hand shaking at
279 the end of a round (England Golf, 2020). This may provide a plausible explanation as to why
280 social connections and golf course activity were not significantly associated.

281 In relation to personal competence and self-confidence, these measures were not significantly
282 associated with golf course activity ($\text{MET}\cdot\text{min}^{-1}\cdot\text{week}^{-1}$). These results could be due to the
283 extended period that golf courses were closed, which resulted in golfers being unable to play
284 on outdoor courses. Specifically, during the initial restrictions set by the UK government, golf
285 courses were closed for 8-10 weeks (United Kingdom Government, 2020). It is possible that
286 this absence from golf courses may have imposed a negative effect on personal competence
287 and self-confidence upon returning to the sport. Although under different conditions, this is
288 supported by previous literature that highlights athletes' competence and confidence is
289 adversely impacted when injured for a prolonged period of time (Clement et al., 2015).

290 **General Discussion**

291 The aim of this multi-study was to investigate the impact of golf-related engagement on:
292 personal competence; sense of belonging; enjoyment; self-esteem; self-confidence; resilience;
293 social connections; wellbeing and life satisfaction during the COVID-19 pandemic within a
294 cohort of golfers. The principle findings were that: (1) during quarantine restrictions (study 1)
295 there were negligible correlations between golf activity within the home environment and key
296 variables of interest.; (2) Following the reopening of golf courses (study 2), positive
297 correlations were observed between golf course activity ($\text{MET}\cdot\text{min}^{-1}\cdot\text{week}^{-1}$) and sense of
298 belonging, enjoyment and wellbeing; (3) When considering both studies and the transition from
299 quarantine restrictions to being able to play outdoor golf, significant improvements were
300 observed in sense of belonging and life satisfaction. Taken collectively, this multi-study
301 provides insight into golf-related activities during an unprecedented time during a global
302 pandemic and how these can facilitate superior perceptions of sense of belonging, wellbeing
303 and life satisfaction when golf is conducted on outdoor courses.

304 When considering both studies and the transition from having quarantine restrictions in place
305 to being able to play golf on golf courses, small yet significant improvements were observed
306 in relation to sense of belonging. Although many golfers during studies 1 and 2 were able to
307 engage in physical golf activities within their home environment, these skills do not fully-
308 reflect the sport of golf. This is supported by the lack of correlations between physical and
309 sedentary golf activities within the home environment and key variables of interest in both
310 studies 1 and 2. In particular, the skills that were being performed within the home environment
311 do not reflect the outdoor environment that golf courses offers, including the element of
312 walking and the competitive nature of the sport; accordingly, it is likely attributed to the act of
313 play on outdoor golf courses, which agrees with previous research. Specifically, Stenner et al.,

314 (2016) reported that golf, within the natural golf environment, can have a positive impact on
315 an individual's sense of belonging; therefore, the reopening of golf courses most likely explains
316 the significant increase in sense of belonging between studies 1 and 2.

317 Additionally, life satisfaction also increased between studies 1 and 2. The reopening of golf
318 courses alongside less-restrictive quarantine measures may have facilitated this improvement.
319 Playing golf on courses enables individuals to play the sport in a natural environment, which
320 is known to increase life satisfaction (Zhang et al., 2014). Whilst we cannot completely
321 disentangle PA from physical golf activity, we are confident that the improved life satisfaction
322 reflects the re-opening of golf courses and less-restrictive measures, as opposed to changes in
323 PA levels. Indeed, total PA ($\text{MET}\cdot\text{min}^{-1}\cdot\text{week}^{-1}$) levels (which did not include golf activity)
324 significantly reduced, therefore, the previously reported psychological benefits of increased PA
325 (Hartfiel et al., 2011) would not appear to be a principle factor in the enhancement of life
326 satisfaction; Although the contrary is also true, and it must be recognised that concomitant
327 alterations in social interaction could have contributed. Nonetheless, this observation may
328 indicate a situational change in life satisfaction, with concurrent increases in outdoor golf
329 course activity being performed. The positive association between golf course activity
330 ($\text{MET}\cdot\text{min}^{-1}\cdot\text{week}^{-1}$) and wellbeing, as reported in study 2, however, may better reflect that
331 specific time period of being able to play golf. Therefore, when taken together we recommend
332 that, where possible, golf should be played on outdoor courses even if there are future strict
333 quarantine restrictions put in place by governments to ensure improved life satisfaction, and
334 individuals should be encouraged to spend more time on golf courses ($\text{MET}\cdot\text{min}^{-1}\cdot\text{week}^{-1}$) for
335 an association with greater wellbeing. These findings may also be comparable to other sports
336 that display similarities to golf in regards to the required METs score between 4.0-5.0 for
337 activities that include but are not limited to, archery, basketball shooting, cricket, table tennis,
338 track & field throwing events and doubles tennis (Ainsworth, 2011).

339 When comparing both studies, no significant differences were observed in all other variables
340 of interest. However, social connections tended to increase from study 1 to study 2 (Table 3).
341 Although we would expect that the reintroduction of golf courses would significantly enhance
342 social connections based upon previous research (Berlin and Klenosky, 2014), strict restriction
343 measures were still in place when golf courses reopened. These restrictions included restricted
344 locker room and clubhouse access (England Golf, 2020). Although golfers were able to play
345 on golf courses with other golfers, these strict restrictions may help to explain why the social
346 connections between studies 1 and 2 were not statistically significant, yet a small effect was
347 observed. It would be of interest to see if social connections are enhanced if and when all
348 restrictions are removed. The presents findings may be applicable to other sports that are
349 dependent on the closure and reopening of sporting facilities.

350 No significant differences were found in personal competence, enjoyment, self-esteem and
351 self-confidence when comparing studies 1 and 2. We feel that these findings could be a result
352 of golfers being unable to play on golf courses for an extended period of time. As a result, this
353 time away from the sport may have impacted on performance levels, which may have resulted
354 in no change being observed in personal competence, enjoyment, self-esteem and self-
355 confidence. Indeed, when comparing the present findings with previous research, time away
356 from sporting competition in sports such as football and baseball has been previously shown
357 to have an impact on these measures (Clement et al., 2015). Future research may be required
358 in order to measure the impact that personal competence, enjoyment, self-esteem and self-
359 confidence can have when golfers have been playing for an extended period without an
360 unanticipated time away from the sport.

361 Strengths of this multi-study include the timeframe that the surveys were implemented. This
362 ensured that the UK government guidelines in relation to golf were captured at similar levels
363 for all individuals across the two studies. In addition, the golfers within this multi-study are
364 representative of the numbers of registered golfers in the UK, including age (Sorbie et al.,
365 2020b), golf handicap index (Golf Care, 2016) and gender (Lange, 2019). In relation to gender,
366 81% of registered golfers in the UK are male and 12% are female (Lange, 2019). This
367 distribution in gender is representative of golfers that participated within this multi-study
368 (Study 1: 86% Male and 14% Female, Study 2: 83% Male and 17% Female). Additionally, an
369 important and novel aspect of this multi-study is the follow-up nature and collection of data
370 within the same individuals during an unprecedented time.

371 As a result of this multi-study being conducted during the COVID-19 pandemic, the findings
372 should be contextualised as a result of the methodological limitations. Specifically, there were
373 significant relaxations in quarantine restrictions during the data collection of study 1 and study
374 2, such as increased contact with family and friends (United Kingdom Government, 2020);
375 therefore, it remains unclear to what degree golf participation contributes to the improvements
376 in the measures within this study. In addition, the significant and positive correlations observed
377 within studies 1 and 2 were categorised as negligible or small; however, we do anticipate that
378 other uncontrollable factors associated with the pandemic may have influenced these
379 relationships.

380 At the time of writing, it is uncertain if or when the COVID-19 pandemic will recede, and there
381 may be a need for quarantine measures to be reintroduced at some stage. If this were to happen,
382 there would likely be an impact on many sports. Based on the current findings, however, we
383 would recommend that on-course golf activity should be introduced at an early stage of any
384 restrictive period, with safety measures already having been put in place by governing bodies
385 responsible for golf. In addition, the current study focused on the psychosocial benefits of
386 participating in golf, which is a low to moderate PA, during the COVID-19 pandemic. Whilst
387 we did not investigate age related differences, future research may wish to do so based on the
388 different exercise intensities of walking an 18-hole golf course is experienced by young, middle
389 and elderly golfers (Broman et al., 2004). In addition, future research is required to investigate
390 if the benefits of participating in this type of activity are translatable to other sports with similar
391 intensities, as well as to investigate whether or not higher intensity sports further enhance
392 psychosocial measures during an unprecedented period.

393 **Conclusion**

394 The principle findings of this multi-study were that there were negligible correlations between
395 golf activity within the home environment and key variables of interest. Following the
396 reopening of golf courses, positive correlations were observed between golf course activity
397 ($\text{MET}\cdot\text{min}^{-1}\cdot\text{week}^{-1}$) and sense of belonging, enjoyment and wellbeing. When considering both
398 studies, significant improvements were observed in sense of belonging and life satisfaction,
399 which may be crucial during the current pandemic, or even future pandemics. Accordingly,
400 this study has provided insight during a global pandemic with regards to the association
401 between golf activity conducted indoors and on outdoor courses, and the benefits of the latter
402 on sense of belonging and life satisfaction.

403

404 **Conflict of Interest**

405 The authors declare that the research was conducted in the absence of any commercial or
406 financial relationships that could be construed as a potential conflict of interest.

407 Author Contributions

408 All authors listed have made substantial, direct and intellectual contribution to the work, and
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415 Data Availability Statement

416 The original contributions presented in the study are included in the article/supplementary
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418 References

- 419 Abdel-Khalek, A. M. (2006). Measuring happiness with a single-item scale. *Soc. Behav.*
420 *Pers.* 34, 139–150. doi:10.2224/sbp.2006.34.2.139.
- 421 Ainsworth, B. E., Haskell, W. L., Herrmann, S. D., Meckes, N., Bassett, D. R., Tudor-Locke,
422 C., et al. (2011). 2011 compendium of physical activities: A second update of codes and
423 MET values. *Med. Sci. Sports Exerc.* 43, 1575–1581.
424 doi:10.1249/MSS.0b013e31821ece12.
- 425 Arkkari, J., Natri, A., Kannus, P., Mänttari, A., Laukkanen, R., Haapasalo, H., et al. (2000).
426 A controlled trial of the health benefits of regular walking on a golf course. *Am. J. Med.*
427 109, 102–108. doi:10.1016/S0002-9343(00)00455-1.
- 428 Bandura, A. (2006). *Guide for constructing self-efficacy scales.*
- 429 Berlin, K. L., and Klenosky, D. B. (2014). Let me play, not exercise!: A laddering study of
430 older women's motivations for continued engagement in sports-based versus exercise-
431 based leisure time physical activities. *J. Leis. Res.* 46, 127–152.
432 doi:10.1080/00222216.2014.11950316.
- 433 Breitbarth, T., and Huth, C. (2019). A stakeholder marketing perspective: golf's potential to
434 (re-)position as a health sport. *Ger. J. Exerc. Sport Res.* 49, 351–355.
435 doi:10.1007/s12662-019-00590-5.
- 436 Broman, G., Johnsson, L., and Kaijser, L. (2004). Golf: a high intensity interval activity for
437 elderly men. *Aging Clin. Exp. Res.* 16, 375–381.
- 438 Clement, D., Arvinen-Barrow, M., and Fetty, T. (2015). Psychosocial responses during
439 different phases of sport-injury rehabilitation: A qualitative study. *J. Athl. Train.* 50, 95–
440 104. doi:10.4085/1062-6050-49.3.52.
- 441 Cohen, J. (1988). *Statistical power analysis for the behavioral sciences.* 2nd ed. Erlbaum.
- 442 Craig, C. L., Marshall, A. L., Sjöström, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E.,
443 et al. (2003). International physical activity questionnaire: 12-Country reliability and
444 validity. *Med. Sci. Sports Exerc.*, 1381–1395.
445 doi:10.1249/01.MSS.0000078924.61453.FB.

- 446 England Golf (2020). Play Safe Stay Safe - A Framework for Playing Golf.
- 447 Fox, K. R. (1999). The influence of physical activity on mental well-being. *Public Health*
448 *Nutr.* 2, 411–418. doi:10.1017/S1368980099000567.
- 449 Golf Care (2016). UK golf survey results.
- 450 Hartfiel, N., Havenhand, J., Khalsa, S. B., Clarke, G., and Krayner, A. (2011). The
451 effectiveness of yoga for the improvement of well-being and resilience to stress in the
452 workplace. *Scand. J. Work. Environ. Heal.* 37, 70–76. doi:10.5271/sjweh.2916.
- 453 Hinkle, D., W, W., and SG, J. (2009). *Applied Statistics for the Behavioral Sciences*. 5th
454 Editio. Boston.
- 455 Lange, D. (2019). *Golf in the United Kingdom (UK) - Statistics & Facts*. Statistica.
- 456 Luscombe, J., Murray, A. D., Jenkins, E., and Archibald, D. (2017). A rapid review to
457 identify physical activity accrued while playing golf. *BMJ Open* 7, 1–9.
458 doi:10.1136/bmjopen-2017-018993.
- 459 McAuley E, Duncan T, T. V. (1989). Psychometric properties of the Intrinsic Motivation
460 Inventory in a competitive sport setting: a confirmatory factor analysis. *Res. Q. Exerc.*
461 *Sport* 60, 48–58. doi:doi:10.1080/02701367.1989.10607413.
- 462 Murray, A. D., Daines, L., Archibald, D., Hawkes, R. A., Schiphorst, C., Kelly, P., et al.
463 (2017). The relationships between golf and health : a scoping review. *Br. J. Sports Med.*
464 51, 12–19. doi:10.1136/bjsports-2016-096625.
- 465 Perlman, D., and Peplau, L. (1981). *Toward a Social Psychology of Loneliness*. London
466 doi:10.1037/0003-066X.41.2.229.
- 467 Postmes, T., Haslam, S. A., and Jans, L. (2013). A single-item measure of social
468 identification: Reliability, validity, and utility. *Br. J. Soc. Psychol.* 52, 597–617.
469 doi:10.1111/bjso.12006.
- 470 Ricci, F., Izzicupo, P., Moscucci, F., Sciomer, S., Maffei, S., Di Baldassarre, A., et al. (2020).
471 Recommendations for physical inactivity and sedentary behavior during the Coronavirus
472 disease (COVID-19) pandemic. *Front. Public Heal.* 8, 1–4.
473 doi:10.3389/fpubh.2020.00199.
- 474 Robins, R. W., Hendin, H. M., and Trzesniewski, K. H. (2001). Measuring global self-
475 esteem: Construct validation of a single-item measure and the Rosenberg Self-Esteem
476 Scale. *Personal. Soc. Psychol. Bull.* 27, 151–161. doi:10.1177/0146167201272002.
- 477 Silva, R. A., Rogers, K., and Buckley, T. J. (2018). Advancing Environmental Epidemiology
478 to Assess the Beneficial Influence of the Natural Environment on Human Health and
479 Well-Being. *Environ. Sci. Technol.* 52, 9545–9555. doi:10.1021/acs.est.8b01781.
- 480 Sorbie, G., Beaumont, A., Richardson, A., Glen, J., Hardie, S., and Lavallee, D. (2020a).
481 Data Report: Golf-related engagement during COVID-19 quarantine restrictions (4-12th
482 May 2020). *Front. Sport. Act. Living* 2.
- 483 Sorbie, G., Richardson, A. K., Glen, J., Hardie, S., Taliep, S., Wade, M., et al. (2020b). The
484 association of golf participation with health and wellbeing : A comparative study. *Int. J.*
485 *Golf Sci.*
- 486 Stenner, B. J., Mosewich, A. D., and Buckley, J. D. (2016). An exploratory investigation into

- 487 the reasons why older people play golf. *Qual. Res. Sport. Exerc. Heal.* 8, 257–272.
488 doi:10.1080/2159676X.2016.1148773.
- 489 The jamovi project (2019). Jamovi.
- 490 The Royal & Ancient (2019). New Golf Around the World Report Published.
- 491 Tran, D. V., Lee, A. H., Au, T. B., Nguyen, C. T., and Hoang, D. V. (2013). Reliability and
492 validity of the International Physical Activity Questionnaire-Short Form for older adults
493 in Vietnam. *Heal. Promot. J. Aust.* 24, 126–131. doi:10.1071/HE13012.
- 494 Ungar, M., and Liebenberg, L. (2011). Assessing resilience across cultures using mixed
495 methods: Construction of the Child and youth resilience measure. *J. Mix. Methods Res.*
496 5, 126–149. doi:10.1177/1558689811400607.
- 497 United Kingdom Government (2020). Coronavirus (COVID-19): What You Need to Do.
- 498 Versteegh, T. H., Vandervoort, A. A., Lindsay, D. M., and Lynn, S. K. (2008). Fitness,
499 Performance and Injury Prevention Strategies for the Senior Golfer. *Int. J. Sports Sci.*
500 *Coach.* 3, 199–214. doi:10.1260/174795408785024162.
- 501 Wheatley, D., and Bickerton, C. (2017). Subjective well-being and engagement in arts,
502 culture and sport. *J. Cult. Econ.* 41, 23–45. doi:10.1007/s10824-016-9270-0.
- 503 Williams, J. (2007). Rethinking sports fandom: The case of European soccer. *Leis. Stud.* 26,
504 127–146. doi:10.1080/02614360500503414.
- 505 Zhang, J. W., Howell, R. T., and Iyer, R. (2014). Engagement with natural beauty moderates
506 the positive relation between connectedness with nature and psychological well-being. *J.*
507 *Environ. Psychol.* 38, 55–63. doi:10.1016/j.jenvp.2013.12.013.
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514 Table 1

515 Spearman's correlation coefficients (r) and p-values for golf-related engagement questions when measured against key variables of interest in
 516 study 1 (during the covid-19 quarantine restrictions).

Golf-Related Questions	Correlation Analysis	Key Variables of Interest								
		Personal Competence	Sense of Belonging	Enjoyment	Self-Esteem	Self-Confidence	Resilience	Social Connections	Wellbeing	Life Satisfaction
Physical Golf Activities	Spearman's <i>r</i>	0.047	0.088	0.071	-0.058	-0.084	-0.054	-0.007	0.004	-0.025
	<i>p</i> - value	0.436	0.114	0.242	0.334	0.161	0.370	0.908	0.943	0.682
Sedentary Golf Activities	Spearman's <i>r</i>	0.069	0.178	0.067	0.011	0.079	-0.001	-0.013	-0.019	-0.093
	<i>p</i> - value	0.244	0.003	0.264	0.848	0.185	0.992	0.833	0.754	0.123

517 **Bold** values indicate statistical significance. Significance granted at $p < 0.05$.

518

519 Table 2

520 Spearman's correlation coefficients (r) and p -values for golf-related engagement questions obtained from study 2 (following the easing of
521 COVID-19 quarantine resections) when measured against key variables of interest.

Golf-Related Questions	Correlation Analysis	Key Variables of Interest								
		Personal Competence	Sense of Belonging	Enjoyment	Self-Esteem	Self-Confidence	Resilience	Social Connections	Wellbeing	Life Satisfaction
Golf activity (MET.min ⁻¹ .week ⁻¹)	Spearman's r	0.091	0.186	0.234	0.093	0.026	0.148	0.138	0.252	0.171
	p - value	0.314	0.041	0.010	0.305	0.775	0.102	0.128	0.005	0.059
Golf practice (MET.min ⁻¹ .week ⁻¹)	Spearman's r	-0.069	-0.042	-0.028	-0.084	-0.034	0.091	-0.021	-0.083	-0.046
	p - value	0.470	0.667	0.773	0.376	0.726	0.340	0.826	0.384	0.629
Physical Golf Activities	Spearman's r	0.056	0.226	-0.013	0.053	0.049	0.083	0.041	-0.001	-0.013
	p - value	0.541	0.014	0.885	0.566	0.592	0.365	0.655	0.995	0.855
Sedentary Golf Activities	Spearman's r	0.076	0.277	0.027	0.092	0.048	0.116	0.027	-0.032	0.073
	p - value	0.405	0.002	0.767	0.312	0.599	0.203	0.772	0.729	0.424

522 **Bold** values indicate statistical significance. Significance granted at $p < 0.05$.

523

524

525 Table 3

526 Key variables of interest between study 1 and study 2 using a 5-point Likert scale with p-values and Cohen's d effect sizes.

Key Variables of Interest	Study 1	Study 2	p-value	Effect size ⁵²⁷ (Cohen's d) ⁵²⁸	
Personal competence (n= 124)	2.77 ± 0.83	2.85 ± 0.77	0.162 ^a	0.1	529
Sense of belonging (n= 120)	3.50 ± 1.08	3.67 ± 1.01	0.044^a	0.2	530
Enjoyment (n= 120)	4.42 ± 1.07	4.34 ± 0.99	0.332 ^a	0.1	531
Self-esteem (n= 124)	3.55 ± 1.14	3.55 ± 1.03	0.938 ^a	0.0	532
Self-Confidence (n= 123)	3.83 ± 1.07	3.90 ± 1.00	0.387 ^a	0.1	533
Resilience (n= 124)	3.66 ± 0.85	3.59 ± 0.74	0.093 ^a	0.1	535
Social connection (n= 124)	3.65 ± 0.91	3.80 ± 0.92	0.057	0.2	536
Wellbeing (n= 122)	3.68 ± 0.99	3.78 ± 0.94	0.508 ^a	0.1	537
Life Satisfaction (n= 121)	3.52 ± 1.11	3.79 ± 0.91	0.026^a	0.2	538
					540

541 Data are mean ± SD. **Bold** values indicate statistical significance. ^a Non-normally distributed analysis. Significance granted at p<0.05.

542

543 Table 4

544 Golf-related activities between study 1 and study 2.

Golf-related Activity	Study 1	Study 2	p-value	Effect size (Cohen's d)
Physical (min.week ⁻¹) (n= 113)	88 ± 166	27 ± 54	< 0.001 ^a	0.4
Sedentary (min.week ⁻¹) (n= 117)	151 ± 217	200 ± 367	0.550 ^a	0.1

545 Data are mean ± SD. **Bold** values indicate statistical significance. ^a Non-normally distribute analysis. Significance granted at p<0.05.

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