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Paice, Katherine, Hersant, Hannah, Anico, Shannah and Smith, Elizabeth (2024) *Assessing the effect of COVID-19 lockdown on perceived barriers and facilitators to physical activity among women in Southeast England*. *Women in Sport and Physical Activity Journal*, 32 (1). ISSN 1063-6161.

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1 **Abstract**

2 **Background:** The COVID-19 pandemic resulted in restricting daily physical activity (PA). Women's PA
3 levels have been disproportionately negatively affected by the pandemic, compared to men. It is
4 important to determine how women's PA has changed over the pandemic, and if new barriers to PA
5 participation exist since the release of restrictions. **Aims:** To assess how women in southeast England
6 changed their activity during- and post-pandemic, including how barriers and facilitators to activity
7 have changed. **Methods:** 330 females completed the first online questionnaire (during lockdown), and
8 139 completed the post-lockdown questionnaire. Questionnaires were designed from the General
9 Practice- and International Physical- Activity Questionnaires. Participants self-reported PA, and
10 barriers and facilitators to exercise. Eighteen females then participated in online semi-structured focus
11 groups. Descriptive and inferential statistical analysis were used for questionnaire data and focus
12 group transcriptions were thematically analysed. **Results:** Most females maintained PA levels
13 throughout the pandemic. Significant barriers to activity were lack of access to equipment/space, time
14 to exercise, social groups, finances, legal restrictions, safety concerns, gender, and childcare. Similarly,
15 significant facilitators were identified during- and post-lockdown for access to equipment, finances,
16 having more time to exercise, and exercising with a social group. Participants both expressed desires
17 to return to pre-lockdown PA habits, but also maintain new ones created. **Conclusion:** It is evident
18 that the pandemic affected and changed the barriers and facilitators to female PA participation.
19 Governments and industries in the sector should focus on providing services that address these
20 changing habits to improve activity levels in women.

21

22 **Keywords**

23 Motivation, exercise, female, sedentary, pandemic

24

25 **Introduction**

26 **COVID-19 pandemic**

27 In March 2020, a global pandemic of the SARS-CoV-2 respiratory virus led to governments across the
28 world restricting the free movement of the public. In England, this involved instructions to “stay at
29 home” and to reduce contact with other people as much as possible (GOV.UK, 2021). This naturally
30 included closure of gyms, pools, and leisure centres and cessation of all group activity, as well as
31 schools. Only essential activities, such as food shopping or exercising outdoors once a day within
32 household groups were permitted, with potential fines for those who left their homes unnecessarily.
33 People were able to attend gyms within their own social bubble from April 12th 2021 in England, but
34 free use of gyms, leisure centres, and group exercise was not permitted until 17th May 2021 (GOV.UK,
35 2021).

36 **Activity in women**

37 Regular physical activity (PA) is well known to reduce the risk of premature death from chronic
38 diseases, such as heart disease, hypertension, and diabetes (Booth et al., 2012; LaCroix et al., 2019).
39 There are also numerous other benefits, such as improved mental health, decreased anxiety and
40 improved social groups (Doré et al., 2016). Despite these benefits however, women repeatedly report
41 significantly lower physical activity levels than men in England, with 63% of men reporting themselves
42 as being “active” in November 2021 (achieving more than 150 minutes per week of moderate intensity
43 activity) versus 60% of women (Sport England, 2021). Sport England have been trying to address this
44 issue with campaigns such as “This Girl Can” (developed in 2015), and although Active Lives data
45 revealed a small increase in women’s activity levels from 60% in 2016, to 62% in 2019 (Sport England,
46 2022), the true effectiveness of this campaign remains unknown. Moreover, in 2019, 38% of women
47 in England were failing to exercise more than 30 minutes per week, versus 35% of men (Sport England,
48 2021)

49 The recent Covid-19 pandemic and government lockdown restrictions have raised further issues for
50 women’s physical activity levels, with women being disproportionately negatively affected by the

51 lockdown (Sport England, 2021a). Whilst both men and women had decreases in activity levels (-2.4%
52 and -1.4% relatively) over the pandemic, women's activity levels remained lower 12 months later
53 (Sport England, 2022). In addition to extra childcare responsibilities associated with home-schooling,
54 women make up 77% of the roles within the National Health Service. Common barriers before the
55 pandemic were lack of time, self-consciousness, and lack of enjoyment (Moreno & Johnston, 2014),
56 and women with young children found it particularly difficult to be active (Mackay et al., 2011).

57 Women from minority ethnic groups, particularly black and asian women, consistently show lower
58 activity (52.1 and 46.6% are physically active, respectively), than their white counterparts (61-65.6%)
59 (GOV.UK, 2022). Early data from the pandemic suggested activity levels in minority groups decreased
60 4% more than white women in England (GOV.UK, 2022). Southeast England (including the East, East
61 Midlands, South East and London) has the largest range of ethnicities and socioeconomic groups in
62 England. London is the most densely populated area in England and demonstrates the highest ethnic
63 diversity, yet the southeast regions of England outside of London have the highest proportion of white
64 ethnic groups. Moreover, south-eastern regions returned some of the highest response rates of all
65 assessed regions on the most recent Active Lives Survey (Sport England, 2021a) (South East England
66 having the highest response, East, East Midlands and London having the third, fourth and seventh
67 highest response rates respectively), with all of these areas seeing a significant increase in PA (>150
68 minutes p/week) in the last 12 months (Sport England, 2022). It was considered that this area would
69 allow assessment of the widest variety of the population.

70 Allowing activity levels in women to decline may ultimately result in poorer quality of life and
71 increased burden on health services. Considering the recurring pattern of lower activity levels in
72 women compared to men and the additional barriers they must overcome to be active, it is important
73 to identify if activity levels changed during lockdown and why. An arguably more significant focus is to
74 determine how women's physical activity levels, and perceived barriers to PA may have changed post-
75 lockdown. By recognising the changing landscape of physical activity in women, fitness industries and
76 governing bodies may be able to provide more appropriate support to improve physical activity in

77 women. The main aim of this study is to determine how physical activity levels, and barriers and
78 facilitators to being physically active have changed during- and post- lockdown in women in southeast
79 England.

80

81 **Materials and Methods**

82 An explanatory sequential mixed-methods design was carried out to assess the changes in activity
83 and the perceived barriers and facilitators to being active during and after a national lockdown in the
84 UK.

85 **Sample**

86 Women aged 18 ($n=539$) or over living in southeast England (London, Hampshire, Kent, Essex,
87 Berkshire, Buckinghamshire, Sussex, or Oxfordshire) were invited to participate in the study.
88 Participants were recruited using convenience and snowball sampling using social media (Twitter,
89 Instagram and Facebook). Post hoc sample size analysis using G* power analysis was carried out.
90 Goodness of fit tests (the equivalent power test for Chi Square) reported $\alpha = 0.05$ and $\beta = 0.99$ for a
91 medium effect size (Effect size $w = 0.3$). The study received institutional ethical approval. All
92 participants provided online informed consent before participating.

93 **Procedure**

94 *Quantitative Measures*

95 This study used the online survey platform *Qualtrics* to collect quantitative data. Two surveys with
96 nearly identical questions were asked at two time points during the Covid-19 pandemic lockdown. The
97 Lockdown Survey was completed between 22nd March and 11th April 2021, when leisure centres were
98 closed and social distancing restrictions were in place. The Post-Lockdown survey was completed
99 between May 24th and 23rd July 2021, when gyms and exercise classes had reopened. Out of 539
100 women who started the surveys, 469 surveys were completed and used for analysis (Lockdown survey,
101 $n=330$. Post-Lockdown survey, $n=139$). 70 surveys were excluded for not being complete or for not
102 providing consent. The average completion time for the survey was 6 minutes 30 seconds and was

103 available online using a link. It could be completed on mobile phones or computers. Contact details of
104 the research team were provided throughout.

105 ***** INSERT TABLE 1. Participant characteristics. *****

106 *Survey 1: Lockdown Survey*

107 All participants confirmed they were over 18 years old, female, and living in one of the counties being
108 assessed. They also provided their age category, ethnicity, employment status, education status, and
109 location (urban vs rural location, see table 1).

110 *Activity level*

111 The General Practice Activity Questionnaire is a validated questionnaire which is used to determine
112 physical activity levels in adults (GOV.UK, 2023). Participants were asked how many hours (none, less
113 than one hour, between 1 and 3 hours, 3 hours or more) they engaged in various activities (physical
114 exercise, cycling, walking, housework/childcare, gardening/DIY) in the last week per day. If
115 participants stated they took part in physical activity, they were asked if their exercising consisted of
116 free body exercise (resistance training) or aerobic exercise and whether they used equipment or not.
117 These questions were inspired by the Adult physical activity questionnaire but were shortened into
118 the current format to increase completion rates from the participants (Centre for Health Statistics,
119 1975). Part of the International Physical Activity Questionnaire was used to determine time spent
120 sitting on a typical weekday and weekend (almost all the time, most of the time, about half the time,
121 sometimes, never) and to estimate a value in hours that were spent sitting.

122 *Barriers and facilitators to activity*

123 Participants were asked to select what they considered as a barrier to being active during the
124 lockdown restrictions between 5th January and April 12th. Participants were given a selection of
125 answers (taken from (Farah et al., 2021a)) and could select as many as they wanted. The options were:
126 Lack of access to equipment/space, Religion/culture, family values on physical activity, financial
127 reasons, current laws (e.g. lockdown restrictions), safety concerns (e.g. spreading COVID-19), other
128 safety concerns (e.g. training in the dark), knowledge, not having time to exercise, gender, poor mental

129 health (e.g. lack of motivation), poor physical health, being unable to exercise with a social group and
130 'other', with a free text option. The same questions were then asked about factors that made it easier
131 to be active during lockdown: access to equipment/space, Religion/culture, family values on physical
132 activity, financial reasons (free or affordable online activities), current laws (e.g. making efforts to be
133 active because of restrictions), knowledge, having more time to exercise, gender, good mental health
134 (e.g. feeling motivated), good physical health, being able to exercise with one other person and
135 'other', with a free text option.

136 *Survey 2: Post-Lockdown survey*

137 The same survey was published on 24th May, 1 week after the lifting of lockdown restrictions and social
138 distancing. Gyms, leisure centres, and pools reopened and indoor group exercise and team sport were
139 allowed to continue.

140 Additional questions were included in the second survey to fully understand the changes in activity.
141 Participants were asked what activities they had taken part in between 12th April and 17th May (when
142 some restrictions were lifted, such as indoor gyms but only within a social bubble and outdoor team
143 sport). Possible answers were: outdoor team sport, outdoor swimming, outdoor exercise classes,
144 indoor gyms, my usual exercising at home, walking and/or running outdoors, other (with free text
145 option) and "I didn't do any activity". Participants could select as many answers as required.
146 Participants were also asked if they would continue to train at home, go back to the gyms/facilities or
147 continue to do a combination of both. If they stated they would continue training at home, they were
148 then asked why. Options were: it's cheaper, it's more convenient/flexible, it's safer, it's easier, I have
149 more privacy, I feel less pressure to be fit/look a certain way.

150 *Qualitative Measures – Focus Groups*

151 Of those who completed the survey, the option to provide contact details for focus groups was added.
152 Of these, 18 women volunteered to take part in a focus group to discuss their results and opinions
153 further. Four focus groups with up to five participants in each were held between 17th and 31st August
154 2021 and were led by a member of the research team with experience of running focus groups. Each

155 focus group was arranged online via Zoom and was stopped at 45 minutes or until no new information
156 was provided, whichever came first. The focus groups followed a semi-structured informal format
157 using themes drawn from the questionnaire analysis, with probing statements used throughout.
158 Phenological questions were used to seek detailed accounts of adults physical activity and exercise
159 experiences. Questions were phrased in an open-ended manner to encourage discussion and in-depth
160 responses, such as “tell me how...” or “please describe” (Sparkes & Smith, 2014). The focus groups
161 aimed to explore these key themes from the questionnaires in further detail providing lived
162 experiences of physical activity engagement and social interactions which may not be gathered
163 through questionnaires (Sparkes & Smith, 2014). At the beginning of the focus group, participants
164 were reminded their answers would be anonymised, that the researchers remained impartial and that
165 there were no right or wrong answers.

166 **Statistical Analysis**

167 *Qualitative analysis*

168 All focus groups were recorded and transcribed verbatim by the Zoom transcribing function. The focus
169 group transcriptions were read independently by two researchers who completed an inductive,
170 emergent thematic analysis of the transcripts. Member checking was completed and all participants
171 confirmed the responses were accurate.

172 *Quantitative analysis*

173 Descriptive statistical analysis was used using Microsoft Excel to determine overall patterns in the
174 survey data. Chi square test of independence was used to determine associations between the
175 responses for each variable between surveys 1 and 2, using SPSS (IBM Corp. Released 2021. IBM SPSS
176 Statistics for Windows, Version 28.0. Armonk, NY: IBM Corp).

177

178

179 **Results**

180 A total of 539 survey responses were collected (Lockdown survey, $n=382$. Post lockdown survey,
181 $n=157$). Of those that completed the survey, 18 volunteered to participate in the focus groups.

182 **Quantitative data**

183 Descriptive and inferential statistics were run to assess outcomes against all demographic variables
184 measured and none were significant or noteworthy. All relevant analysis is explained below.

185 *Types of Physical Activity*

186 The type and amount of activity remained the same between lockdown and post-lockdown, with most
187 women maintaining PA levels throughout and after lockdown. A chi-square analysis revealed no
188 significant associations ($p>0.05$) for any activities between during- and post-lockdown (Table 2). When
189 assessing some of the key descriptive statistics, walking was the most popular activity, with only 5%
190 and 3% of participants reporting doing no walking at all during lockdown and post lockdown,
191 respectively. Cycling, housework/childcare, and Gardening/DIY remained consistent at both time
192 points. Overall, participants doing more than 1 hour of physical activity per day increased post
193 lockdown from 50% to 59%. Participants doing no physical activity at all decreased from 27% to 20%
194 post-lockdown.

195 Exercising without equipment, such as running outdoors or exercise classes at home, were more
196 popular than exercising with equipment, both during and after the release of lockdown restrictions.

197 The use of equipment increased post-lockdown in both aerobic-style and free-body activity types
198 (figure 1).

199 *****INSERT TABLE 2. Types and duration of activity during and post-lockdown reported by
200 participants (***)*****

201

202 *****INSERT FIGURE 1 HERE. Percentage of types of activity.*****

203 *Barriers to activity*

204 Chi square analysis revealed significant associations ($p < 0.05$) between the during- and post-lockdown
205 responses for lack of access to equipment or space to exercise, lack of time to exercise, lack of social
206 groups, financial reasons, legal restrictions, safety concerns, sex-related issues and childcare/caring
207 responsibilities (Table 3). For financial reasons, lack of time and sex-related issues (i.e. female-only
208 spaces), a higher percentage post-lockdown found these to be barriers to participation. Conversely
209 for lack of access to equipment and space, legal restrictions (i.e. lockdown restrictions), safety
210 concerns (i.e. training in the dark), social groups and childcare/caring responsibilities, a higher
211 percentage during-lockdown found these to be barriers to participation.

212 This can further be demonstrated by looking at the key descriptives of these statistics (Table 3). For
213 lack of access to equipment or space, 64% reported this a barrier during-lockdown, dropping to 13%
214 post-lockdown. During-lockdown, 38% of participants reported they could not be active due to the
215 lockdown restriction laws in place, dropping to 17% post-lockdown. 30% reported not having time to
216 exercise, which increased to 46% post-lockdown. Safety concerns of training (such as training outdoors
217 in the dark) decreased from 23% during-lockdown to 7% post-lockdown, and similarly a lack of social
218 group decreased from 25% during-lockdown to 12% post-lockdown.

219 *****INSERT TABLE 3 HERE.Barriers to PA.*****

220 *Facilitators to activity*

221 Chi square analysis revealed significant associations ($p < 0.05$) between the during- and post-lockdown
222 responses for access to equipment or space to exercise, time to exercise, exercising with social groups,
223 and financial reasons (Table 4). For access to equipment and space to exercise and exercising with
224 friend/a social group, a higher percentage post-lockdown found these to be facilitators to
225 participation. Conversely for financial reasons and time to exercise, a higher percentage during-
226 lockdown found these to be facilitators to participation.

227 This can further be demonstrated by looking at the key descriptives of these statistics (see table 4).
228 Only 19% of participants reported that having access to space or equipment facilitated their activity
229 levels during-lockdown, which then increased to 37% post-lockdown. Similarly, for social groups, 26%

230 of participants reported being able to exercise with a social group was a facilitator during-lockdown,
231 which increased to 39% post-lockdown. 42% reported that lockdown gave them more time to be
232 active, and this dropped to 24% after restrictions were lifted. Similarly, for financial reasons, 18%
233 reported this to be a facilitator during-lockdown, dropping to 7% post-lockdown. 68% were
234 encouraged to exercise by government advice to be active.

235 ***INSERT TABLE 4 HERE. FACILITATORS TO EXERCISE***

236 *Training habits post lockdown*

237 42% of participants stated that they would continue to exercise completely from home, using their
238 current routine from lockdown. 34% said they would continue with their current routine at home but
239 would also return to the gym/local exercise facilities. Only 24% were going to completely return to
240 training using local facilities. Some key reasons for continuing to train at home rather than return to
241 the gym was convenience/flexibility (68%) and that it is cheaper (45%), easier (26%) and more private
242 (25%). There was no significant association between those who returned to the gym, those who
243 remained at home and those who did both, and their demographic information.

244 **Qualitative data**

245 All responses below are quote taken directly from one of the four focus groups, consisting of 18
246 participants.

247 **Pre-lockdown themes**

248 Before the first lockdown in England in March 2020, it was commonly reported that participants were
249 more active due to their main activities taking place at a gym:

250 *“So before lockdown was attending regular gym three to four times a week doing resistance training*
251 *weights”.*

252 Participants reported more active lifestyles, due to active commuting and more active jobs:

253 *“I was commuting, I would do about a 15 minute walk to the station and then I do like that in central*
254 *London... that instead of getting the tube I'd walk about half an hour. And then every lunch at our lunch*
255 *obviously I'd make sure I went out to eat quickly and I always go for most of my walk around central”*

256 *“And before lockdown I was almost 10,000 steps a day so in it was easier when before like the time*
257 *because you're going into work and walking around the campus”.*

258 **Lockdown themes**

259 During lockdown, all participants changed their physical activity habits with a variety of activity types
260 chosen. See table 5 for details of new activities reported. One main reason for the change in activity
261 was the lack of access to facilities and equipment:

262 *“used to go to a swimming pool regularly three times a week”.*

263 Although all participants tried to remain active throughout lockdown, a decline in the amount of
264 activity was a common theme. This was due to several themes that are presented in table 6.

265 **Post-lockdown themes**

266 Since lockdown has been easing in England from June 2021 onwards, it was commonly reported that
267 participants were eager to return to their old physical activity habits, with one main theme of returning
268 to the gym. See table 7 which highlights the themes reported for this return to the gym. Whilst the

269 majority reported returning to previous habits it was also reported that some activities/habits created
270 in lockdown will be kept:

271 *“Pools were closed, so I started open water swimming before the pools reopened last summer and I*
272 *started doing that, which I've continued”.*

273 Those who have continued working from home reported that they have continued the online classes
274 due to time:

275 *“Even when we came out a lockdown I tried going back to the gym but I couldn't fit all in I was too tired*
276 *to do those classes online and do go to the gym and so we've kept it up we're just walking and exercises*
277 *online.”*

278 Tables 8 and 9 report common themes of motivators and barriers towards physical activity,
279 respectively.

280 *****INSERT TABLES 5-9 HERE*****

281

282 **Discussion**

283 Overall findings suggest that there were no differences in the levels of activity and types of activity
284 from during to post-lockdown, however, there were a change in the types of activities that women
285 were participating in and physical activity habits. The majority of women would either completely or
286 partly continue with their activity at home, rather than return to the local facilities, due to
287 convenience, cost, and privacy.

288 **Physical Activity**

289 Physical activity remained consistent over time, with the types of activity remaining the same. Walking
290 remained very popular regardless of lockdown restrictions being in place. Physical exercise (such as
291 gym, running, classes, etc) was also popular during lockdown and increased further after the
292 lockdown, suggesting that many women wanted to return to their pre-lockdown routines. This pattern
293 has also been seen in Belgium, where most people (men and women) reported remaining as active
294 during lockdown as they had been before or after (Symons et al., 2021). However, in a Canadian study,
295 37.3% of women became more active during lockdown and 34.6% became less active (Nienhuis &
296 Lesser, 2020). It was suggested this was due to how women perceived the changing barriers to being
297 active, for example, with those with children under 15 having increased difficulty in finding time to be
298 active whereas others found increased time during lockdown (Nienhuis & Lesser, 2020). Sedentary
299 behaviour remained the same during and after lockdown, despite people being encouraged to return
300 to the workplace post-lockdown. This may be due to many businesses adapting to flexible working
301 practices.

302 Women who reported being active before lockdown appear to have maintained this activity
303 throughout- and post- lockdown, as walking, cycling, housework and gardening remained consistent
304 over time. Many values that women held regarding activity remained the same or were accentuated
305 during lockdown coinciding with research from Nienhuis & Lesser (2020), who reported that women
306 who enjoyed activity pre-lockdown were continuously more active throughout lockdowns and were
307 consequently more intrinsically motivated to be active than men. The social aspect of activity was a

308 primary theme that was raised and this was considered more important during distancing. The option
309 of streaming online live classes with their current personal trainers was valued highly and resulted in
310 maintaining or making new friendships. Social support is a reoccurring theme found in other studies;
311 it is regularly reported that women who reduced their activity or who became unmotivated to be
312 active were due to loss of these social groups. This is particularly apparent in middle-aged women; in
313 women aged 45-55 years old (Lum & Simpson, 2021) and those who already belonged to a fitness
314 community before lockdown (Carter & Alexander, 2021). Our findings support this by showing that
315 those who managed to maintain the social aspect of activity, albeit online, were more motivated to
316 remain active. This is further shown by the perceived barriers and facilitators reported by participants,
317 with chi square revealing significant associations for the social aspects as both a barrier and facilitator
318 during and post-lockdown. During-lockdown, more women found being unable to exercise without a
319 social group a barrier, and post-lockdown, more women found being able to exercise with a social
320 group to be a facilitator.

321 The planned, timetabled nature of reported online live sessions during-lockdown also provided
322 structure to many participants who were now spending the vast majority of their day at home. Women
323 have been reported to prefer activity with the same sex, supervised, with people of the same age and
324 at a fixed time, compared to outdoor, competitive or skill-based activity (van Uffelen et al., 2017).

325 Maintaining a healthy weight and body image was noted as a key theme as to why women were active
326 and this effect was emphasised by the perceived increased sedentary behaviour associated with stay-
327 at-home restrictions. Women using activity to maintain or achieve a certain body image is a well-
328 established correlation, with more activity being strongly associated with higher self-esteem (Ball et
329 al., 2000; Nienhuis & Lesser, 2020). It has been reported that whilst men tend to enjoy exercise more
330 and focus on competitive exercise, women are more likely to be active for aesthetic reasons, such as
331 fat loss or muscle 'toning' (Craft et al., 2014). Health and fitness are also key facilitating factors for
332 women remaining active, similarly to men, which is reflected in the feedback from the focus groups.
333 Craft et al. (2014) suggested that women who participated in regular low-intensity exercise reported

334 higher self-esteem than those who did regular high-intensity exercise. This correlates with our findings
335 that outdoor exercise, such as walking became very popular, mainly due to participants making
336 additional effort to be outside for a “*daily dose of sunshine*”. Figure 2 reveals the increased popularity
337 of exercise without weights and without equipment post-lockdown, suggesting some women
338 continued to exercise outdoors and without equipment due to maintenance of new habits, further
339 supporting the findings from (Nienhuis & Lesser, 2020). Furthermore, women who meet the activity
340 guidelines are highly likely to experience less depressive and anxiety symptoms and have a better
341 overall quality of life (Lum & Simpson, 2021; Nienhuis & Lesser, 2020).

342

343 **Facilitating factors to physical activity and how activity was easier during lockdown**

344 Some participants reported that it was easier to be active during lockdown, mainly due to having more
345 time in the day. More participants found time to be a barrier to exercise post-lockdown than during,
346 and 87% of women did not report time being a barrier to activity during lockdowns (Farah et al.,
347 2021b). Finances were also revealed to be a key facilitator to PA during-lockdown, and this is likely
348 due to more women exercising from home or outdoors without equipment. Baruth et al., (2014) found
349 that the high cost of gym memberships was a key barrier to individuals participating in PA, and with
350 lockdown restrictions leading to most people “freezing” gym memberships, money was no longer a
351 barrier to those who were finding ways to be active during-lockdown.

352 It should also be noted the impact of government advice during lockdown, which may have acted as
353 a facilitating factor. During this time, the UK government actively promoted for the public to use the
354 ‘one hour, once a day’ policy to be outside to be used to exercise (Malcolm & Velija, 2020). This was
355 brought in due to the associated improvements in mental and physical health when people remain
356 active. There was also a #StayInWorkout campaign by Sport England and considerable success for at-
357 home online workouts, such as Joe Wicks. In a study, 53% reported they were encouraged to exercise
358 by government guidance (Malcolm & Velija, 2020). Similarly, the present study found 68% of people
359 were encouraged by government advice.

360

361 **Barriers to physical activity and how activity was harder during lockdown, and what has changed**

362 Despite the majority of participants maintaining their activity during lockdown, there was a shift in
363 barriers to exercise. Being unable to exercise without a social group was reported as a key barrier to
364 exercise by participants. Although many participants expressed their enjoyment for online classes
365 during-lockdown, which allowed for this social element to an extent, it is clear that in this study
366 females value face-to-face contact when exercising. This is further supported by the theme of access
367 to space, equipment and facilities, with analysis revealing more women finding this to be a facilitator
368 post-lockdown. Farah et al., (2021) reported that many during lockdown did not see “the home” as a
369 suitable exercise location, so returning to gyms and leisure centres provided more suitable spaces for
370 exercise for participants. In addition, those exercising at home found home-distractions made it
371 difficult to train. This included pressures of housework and other people sharing the exercising space
372 etc. This is evidenced by 58% of participants reporting they wanted to return to the gym or exercise
373 locations to some capacity. Therefore, although gyms elicit more costs to exercise, it also allows for
374 more face-to-face contact with individuals, and more suitable spaces.

375 Some key themes from the focus groups revealed that some women had a fear of leaving the house
376 during-lockdown, due to the restrictions and risks of catching COVID-19. Lack of motivation and
377 structure were major barriers that made it difficult to be active. Many participants reported struggling
378 with laziness and difficulties to make themselves be active, particularly due to the lack of structure in
379 their day. This has been seen in women across cultures, with laziness and fatigue negativity affecting
380 activity levels in over half the women asked in Brazil (Farah et al., 2021b). The darker nights, colder
381 temperature, and wetter weather of the winter lockdown were reported to be a barrier in focus
382 groups, with participants stating they did not feel comfortable walking outside in the dark. Participants
383 considered the risks of walking at night to be worse as a female. Those who feel safe in their
384 environment have 27% greater odds of achieving higher physical activity levels (Rees-Punia et al.,
385 2017). Women are consistently reported to be more sensitive to safety (darkness, crime etc) and are

386 more likely to perceive a situation as dangerous than men (Rees-Punia et al., 2017). Excessive screen
387 time was also discussed as a problem, with participants wanting to avoid watching a class online,
388 having spent all day working and socialising online.

389 **Future changes to activity**

390 42% of the sample stated that they would not return to the gym and would continue to exercise
391 completely from home and 52% stated they would return to the gym in some capacity (34%
392 combination of exercising from home and gym, 24% wholly returning to the gym). The main reasons
393 for wanting to continue to exercise from home were the added convenience and flexibility of training
394 from home, as well as cost efficiencies. This aligns with other findings, that use of technology at home
395 allows flexibility whilst maintaining social aspects of activity (Nienhuis & Lesser, 2020). Many
396 participants reported that they would continue to do an activity they had discovered during the
397 lockdown, such as walking or swimming outdoors.

398 For those wanting to return to pre-lockdown PA habits, key facilitators for this were being able to
399 return to 'normal', to be able to socialise in classes again and to have access to equipment again.
400 Participants felt that their motivation was higher in the gym, that they worked harder and enjoyed it
401 more, and they considered training in the gym to be quicker and more efficient than training at home.
402 Financial contracts, such as gym memberships also provided a reason to remain active and attend the
403 gym regularly. These varied responses highlight the importance of an individual approach to physical
404 activity in women and the range of options that must be considered to promote activity.

405 **Strengths and limitations**

406 The authors consider this paper to contribute to our understanding of women's activity levels and
407 how lockdown may have changed them. Recruitment for the survey was carried out using
408 convenience, snowball sampling via word of mouth and social media platforms. It is recognised that
409 convenience sampling can be limited in research due to the lack of generalisability and therefore may
410 not accurately represent the target population; in our sample, minority groups were not fairly
411 represented. However, snow-ball sampling can allow for larger recruitment within similar

412 geographical areas, therefore this study also aimed to gather data on potential confounding variables
413 that may influence participants responses (e.g. employment status, age, ethnicity, education and
414 location (urban/rural)) which were considered in analysis. Due to lack of funding and time constraints
415 randomised approaches were not deemed to be feasible for the study. Efforts were also made to make
416 the questionnaire straight-forward and quick to complete in order to maximise completion and
417 accessibility from all demographic groups. Focus groups were added to provide additional depth and
418 further explanation of themes discovered in the survey.

419 It is acknowledged in this study that minority groups were under-represented. A direction for future
420 study could be to investigate if the outcomes of this paper correlate to minority populations, or
421 populations across the United Kingdom and to better understand how income, inequality and access
422 to facilities affect physical activity affect women across demographic groups. It would also be of
423 interest to see if women did eventually return to pre-lockdown habits or if these new habits stayed
424 long term. Weight management questions were also not directly asked to participants in this study.
425 However this theme did emerge in the focus groups and could be a study in the future.

426 **Remaining barriers, implications, and future direction**

427 The findings of this study show that the COVID-19 pandemic and associated restrictions have affected
428 women differently. The social aspects of exercise are repeatedly identified as one of the most
429 important factors in women's activity levels, and perhaps explains why many want to return to their
430 pre-pandemic routines. A fundamental change since lockdown is that many women continue to
431 exercise from home, whether increasing their walking or completing online exercise sessions. Results
432 also revealed that more women found sex-related issues to be a barrier post-lockdown. The
433 phenomenon of intimidation of women in exercising spaces, sometimes termed "gymtimidation"
434 (Turnock, 2021) can include gender segregation of weights areas, intimidation and harassment of
435 women and scrutiny of the physical appearance of women (Turnock, 2021), further highlighting the
436 issues faced by women considering returning to gyms. Whilst these are historic issues for women, with
437 the additional post-lockdown options of exercising from home, gyms must be able to adapt to make

438 exercise safer and more enjoyable for women if they are to return. It is these points, social, safe and
439 convenient exercise, that need more focus from government and the fitness industry.

440

441 Industries in this field may decide to continue their online provisions, to support individuals who would
442 prefer to continue exercising from home. For those who now regularly attend gyms and classes,
443 scheduling is an important factor. Industries in the field could look at running restricted group
444 sessions, offering more 1-1 opportunities for females or female-identifying individuals, or considering
445 the time in which sessions are run (i.e. not too late in the evenings). This should be in addition to
446 encouraging group activity, as before the pandemic. Affordable childcare options at gyms, such as
447 creches, can facilitate those with children to have the time to be active.

448 This study has demonstrated that time and motivation remain an issue for women, and this is more
449 so in women who do not enjoy exercise. Those who do enjoy it are more likely to find time to do this.

450 The results from this study would suggest that two key points could help improve activity in women
451 as we are still recovering post-lockdown; increasing exposure to new and different (and more
452 enjoyable activities) and increasing access to safe, group activity. The social aspect of activity appears
453 to be a dominant facilitating factor to improving and maintaining activity in women. Women typically
454 have less social support when it comes to finding time to be active; partners and families do not
455 facilitate time for women to be active, as much as men (Edwards & Sackett, 2016). Industries and
456 services within the sector can look to increase group sessions and activities or promote group sessions
457 of “bring along a friend” to encourage these women to exercise more whilst having a common
458 support.

459 **Conclusion**

460 This study aimed to determine how the COVID-19 lockdown in the UK influenced women’s perceptions
461 of physical activity and to determine how different variables were a barrier or facilitator to being
462 active. Women who were active before lockdown were able to adapt their habits to remain active
463 during lockdown. Time, motivation, access to social groups and safety remain key barriers to women

464 being active both during and post-lockdown. A key finding was that since the lockdown was released,
465 most women are now choosing to be active at home using online services, either in part or entirely,
466 which could be considered safer and more convenient. Those who do choose to return to gyms do so
467 for the social aspect and use of the facilities. To reduce the gender gap in physical activity, more focus
468 on group activity should be made to help improve activity, safety and motivation. Facilitators should
469 be put in place to encourage participation, including affordable childcare options, women-only safe
470 spaces in gyms and activity that has a focus on non-competitive enjoyment.

471

472 **Acknowledgments**

473 We would like to thank the women who took time to complete the surveys and who participated in
474 the focus groups to discuss their thoughts.

475 **Author Contributions**

476 Conceptualisation, X.X, X.X, X.X. Investigation, X.X, X.X, X.X. Focus groups, X.X, X.X, X.X. Writing, X.X,
477 X.X. Reviews and editing, X.X, X.X, X.X, X.X. Supervision, X.X. All authors have read and agreed to the
478 published version of the manuscript.

479 **Conflicts of Interest**

480 The authors declare no conflict of interest.

481

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