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1 **Abstract**

2 Limited literature exists on attitudes towards, knowledge of and where cancer survivors
3 seek information on physical activity. This study aimed to address these gaps in the
4 literature. Interviews were conducted with 19 UK-based adult cancer survivors. Interviews
5 covered participants' knowledge of the relationship between physical activity and cancer,
6 sources of information, and attitudes towards physical activity following their cancer
7 treatment. Data were analysed using Thematic Analysis. Key themes included "physical
8 activity is good for you," "desire to be more physically active," "limited guidance on
9 participation in physical activity," "multi-dimensional barriers and facilitators of physical
10 activity." Participants thought physical activity was good for them, and felt they should be
11 more physically active. Participants reported receiving little information from oncology
12 health professionals, as well as a desire for more guidance. Tiredness/ fatigue was an
13 important reported barrier to physical activity participation, as were situational constraints.
14 Social support and structured exercise programmes were reported to facilitate physical
15 activity. Health professionals should be encouraged to direct patients to appropriate
16 sources for guidelines on physical activity for cancer survivors. Multi-component
17 interventions to increase physical activity behaviour that consider tiredness/ fatigue and
18 incorporate components of social support could be explored.

19

20 **Key Words:** Physical Activity/ Cancer Survivor/ Qualitative/ Barriers/ Facilitators

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30 **Introduction**

31 There are approximately two million cancer survivors, across all cancer types, in the UK and
32 this figure is expected to rise to four million by 2030 (Maddams et al. 2012). Cancer
33 survivors are at increased risk of secondary primary cancers as well as other non-
34 communicable diseases (eg, diabetes, osteoporosis and disease of the cardiovascular
35 system; see eg, Schaapveld et al. 2008 & Nuver et al, 2002). Physical activity may reduce
36 these risks and there is evidence linking physical activity with improved survival (Lahart et al.
37 2015). Furthermore, physical activity interventions have been found to improve functional
38 quality of life and self-esteem, and to reduce anxiety for cancer survivors (Speck et al. 2010
39 & Fong et al. 2012). The American College of Sports Medicine has provided guidelines for
40 physical activity in cancer survivors. These state that survivors should follow the physical
41 activity guidelines for the general population but with specific exercise programme
42 adaptations based on disease and treatment related adverse effects. However, no formal
43 guidelines for cancer have been published in the UK. The British Association of Sport and
44 Exercise Sciences state “unless advised otherwise, cancer survivors should follow the health-
45 related physical activity guidelines provided for the general UK population” and “all cancer
46 survivors including those with existing disease or who are undergoing difficult treatments
47 should be encouraged, as a minimum, to avoid being sedentary” (Campbell et al. 2012).

48 Little is known about cancer survivors’ awareness of the benefits of physical activity for their
49 long-term health and well-being. A qualitative study with breast cancer survivors identified
50 the main factors influencing physical activity to be body image, weight issues, vitality, mood
51 and the desire to carry on as normal (Whitehead & Lavelle 2009), with no mention of
52 potential health benefits. Similarly qualitative work with colorectal cancer survivors has
53 identified gaps in both patient and professional knowledge about the importance of physical
54 activity for disease reduction and long-term health (Anderson et al. 2010).

55 This lack of awareness may in part explain the low levels of physical activity reported by
56 cancer survivors. A recent survey of 15,254 UK colorectal cancer survivors found that 45% of
57 patients reported doing at least some brisk activity but just 22% met the guidelines for
58 physical activity, and 33% reported doing none. Cancer patients who recalled receiving
59 physical activity advice from a health care professional after diagnosis had higher levels of

60 physical activity (at two to three years post diagnosis) compared to those who did not recall
61 receiving advice. Moreover, only a third of patients recalled receiving such advice (Fisher et
62 al. 2015). This is in line with a recent study of UK oncology health professionals, which found
63 that only 51% reported giving physical activity advice to the majority of their patients, with
64 many (36%) unaware of any lifestyle guidelines for cancer survivors and around half (49%)
65 aware of physical activity guidelines (Williams et al. 2015). Lack of patient interest was a
66 commonly endorsed barrier to giving advice; however this is inconsistent with studies
67 suggesting survivors would welcome advice. For example, in a recent study examining
68 physical activity preferences in 175 early-stage lung cancer survivors, the majority of
69 respondents (62%) reported a desire to receive advice regarding physical activity (Philip et
70 al. 2014). In another study, in a sample of 307 cancer survivors, 84% expressed desire for
71 exercise counselling at the same point during their cancer treatment (Jones & Courneya
72 2002).

73 Insufficient professional advice, coupled with a desire for information leads some cancer
74 survivors to seek out information about physical activity themselves. This was found in a
75 recent qualitative study of colorectal cancer survivors in the UK, where several people
76 reported actively trying to seek out further information about lifestyle (Anderson et al.
77 2013). Cancer survivors may therefore particularly seek guidance on appropriate physical
78 activity (ie, quantity, duration, physical activity type), and how to be physically active
79 following diagnosis (Philip et al. 2014). However, a recent review of the availability of
80 information about lifestyle for cancer survivors in England from statutory and charitable
81 sector organizations and from cancer centres, found that most did not provide adequate
82 information and advice about lifestyle for cancer survivors (Williams et al. 2015). This risks
83 cancer survivors turning to less reliable sources of information, and feeling unsupported to
84 make changes post-diagnosis.

85 Research exists on barriers to physical activity participation in cancer survivors. A cross-
86 sectional survey of 456 cancer survivors found the main reported barriers to physical activity
87 were predominantly owing to health or treatment related factors, such as illness/other
88 health problems, joint stiffness, pain, weakness, and fatigue (Blaney et al. 2013). Courneya
89 et al. (2005) investigated barriers to exercise participation in a group of colorectal cancer
90 survivors and found that the three most common barriers reported were lack of time/ too

91 busy, non-specific treatment side effects, and fatigue. Ottenbacher et al. (2011) investigated
92 barriers to exercise in breast and prostate cancer survivors and the commonly reported
93 barriers to exercise were “too busy” and “no willpower.” Rogers et al. (2007) administered
94 surveys to 23 breast cancer patients during treatment and found that common exercise
95 adherence barriers (i.e. lack of priority, self-discipline, procrastination, and fatigue)
96 demonstrated significantly negative associations with exercise. Some data on facilitators of
97 physical activity in cancer survivors also exists. In a recent review (Midtgaard et al. 2015) of
98 qualitative studies on physical activity and cancer survivorship, it was identified that cancer
99 survivors were motivated to exercise to protect themselves from disease recurrence
100 (McGrath et al. 2011) and the motivational aspect of the group setting was noted as
101 important (Emsile et al 2007, Midtgaard et al 2006). Blaney and colleagues (2011)
102 investigated exercise facilitators, using postal surveys, in a mixed sample of cancer survivors.
103 The main reported physical activity facilitators were: fun, includes a variety of exercises,
104 exercise progresses gradually, flexible, involves personal goal setting, includes good music,
105 tailored to the individual, includes feedback, and approved by an oncologist or GP. Further
106 qualitative research is required to investigate barriers and facilitators to physical activity
107 participation in cancer survivors to provide context to current findings and to capture
108 further expressive information.

109 A clear understanding as to cancer survivors’ awareness of the importance of physical
110 activity post-diagnosis, and sources of information on physical activity is needed. Moreover,
111 in depth knowledge as to why cancer survivors do not participate in physical activity, and
112 what might facilitate participation, is required. Understanding these concepts may aid in
113 the development of successful interventions to increase physical activity in this population.
114 The present study therefore aimed to explore cancer survivors’ attitudes towards and
115 knowledge of physical activity, sources of advice, and potential barriers and facilitators of
116 engagement. For the present study a qualitative methodology was chosen because we were
117 not seeking to test a hypothesis, but rather sought to obtain a rich source of information to
118 better understand physical activity behaviour, or the lack of, in cancer survivors (Holliday,
119 2010).

120

121 **Method**

122 *Participants and recruitment*

123 The study was advertised on Cancer Research UK's 'Cancer Chat' online forum and by
124 posters and flyers displayed in the University College Hospital Macmillan Cancer Centre,
125 these adverts contained details on how to contact the study team to check eligibility. Our
126 inclusion criteria were UK-based adult (>18 years) cancer survivors (defined as not currently
127 undergoing any active treatment for cancer); we excluded individuals who had a cancer
128 develop in childhood. We chose to interview a range of survivors because this meant we
129 would be representing a wide range of views, applicable to the wider survivorship
130 population as opposed to focusing on a more specific group. Interviews were chosen over
131 focus groups as we were interested in hearing about patients' individual beliefs and
132 experiences, rather than determining a group consensus. We did not want individuals'
133 unique beliefs and experiences be influenced by group discussions or concerns that others
134 might view their beliefs to be 'incorrect'. Those interested in the study and eligible were
135 given an information sheet and told that the aim of the study was to help us to learn more
136 about what people who have had cancer think about lifestyle (including activity) and their
137 long-term health. They were given the opportunity to ask questions and we then obtained
138 signed informed consent. Ethical approval was granted by the University College London
139 Research Ethics Committee, reference 0793/004.

140

141 *Data Collection*

142 Consenting participants were interviewed by trained research staff. No participants were
143 excluded based on where they lived in the UK, for logistical reasons either face-to-face or
144 over the telephone interviews were offered. In addition, participants were mailed a
145 questionnaire to provide information on demographics. This was sent in advance to
146 minimise participant burden and to enable participants to complete this aspect of the study
147 in their own time, and privately. This also permitted the interview to be focused on the topic
148 guide as opposed to more quantitative questions about participants' background. For
149 pragmatic reasons and to accommodate participant preferences for timing of the

150 interviews, these were carried out by three researchers (all female and working in health
151 research) between March and July 2013 and were recorded and transcribed verbatim.
152 Interviews followed a topic guide (Table 1), developed by three researchers and informed by
153 existing literature, to explore cancer survivors' views of lifestyle factors and the risk of
154 cancer recurrence or chronic disease development. The guide covered participants'
155 knowledge about the relationship between physical activity and cancer, sources of
156 information, and opinions of physical activity including barriers and facilitators following the
157 cancer diagnosis. Participants were asked to talk about each topic in the guide, with
158 interviewers trained to have minimal verbal input and prompt only when appropriate. The
159 topic guide was piloted with two participants whose data were included because no
160 substantial changes were required. Interviews lasted 52 minutes on average (range: 26-76
161 mins). Emerging themes were discussed during the data collection period, and data
162 collection continued until it was felt saturation had been reached.

163

164 *Analysis*

165 Data were analysed using Thematic Analysis, a qualitative method for identifying, analysing,
166 and reporting themes (Braun and Clarke, 2006). Thematic analysis was chosen to provide a
167 rich description of the data, and to identify themes at an explicit level using a realist
168 approach (Braun and Clarke, 2006). The first three transcripts were reviewed independently
169 by three researchers who each generated an initial list of codes. These lists were then
170 amended and refined through discussion between the researchers until a single list was
171 agreed. A researcher entered the list of codes into NVivo version 10 (QSR International Pty
172 Ltd, 2012) and coded all the transcripts, with codes added to the list where necessary. Once
173 the coding had been agreed, LS and RB reviewed the coded transcripts to search for
174 common themes specifically related to physical activity. These themes were reviewed and
175 refined, named and each given a written description.

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179 **Results**

180 A total of 24 participants enquired about the study, 19 agreed to take part in interviews (see
181 Table 2 for participant characteristics), but five declined. Five of the interviews were carried
182 out face-to-face and the rest over the telephone. After 15 interviews researchers discussed
183 whether saturation had been reached, it was believed this was the case, but a further four
184 interviews were carried out for confirmation. All participants reported being white, 68%,
185 53% and 58% reported being married, working in some capacity, and having a higher
186 education qualification, respectively. Breast cancer was the most common diagnosis (37%)
187 and the majority of participants had been diagnosed in the past five years (63%).

188 *Themes*

189 Four themes emerged from the data: (i) physical activity is good for you, (ii) desire to be
190 more physically active, (iii) limited guidance on participation in physical activity, (iv) multi-
191 dimensional barriers and facilitators of physical activity. There were no obvious differences
192 in responses by cancer type or gender, so results are presented from the whole sample.

193 *Physical activity is good for you*

194 Participants described physical activity as generally being a good thing for overall well-being,
195 “I think that makes a lot of difference, keeping happy and keeping reasonably active” (104,
196 Male, 69 years, prostate cancer). Physical activity was viewed as important for weight
197 management, for example, “And the weight management, I assumed that once I was eating
198 healthily, I might...but I think I am aware now that I actually need to take more exercise”
199 (103, Female, 62 years, breast cancer and NHL). Others mentioned it was important for
200 cardiovascular health “I’ve just recently bought a bike and I really enjoy the cycling,...it is
201 more to do with blood pressure and heart stuff than cancer, in a way” (115, Female, 63
202 years, breast cancer).

203 Participants also discussed how the benefits of physical activity relate more specifically to
204 cancer. For example, some were aware that physical activity could improve recovery,
205 “There’s now reasonably strong evidence that it aids recovery from that [breast cancer] to
206 make lifestyle changes, lower-fat diet, do more exercise. There’s really good evidence now
207 that that’s [physical activity] certainly a good idea” (107, Male, 50 years, melanoma), “It

208 seems that today's thinking is exercise is good for you. I don't think there's any doubt about
209 that anyway and it's particularly good in recovery from cancer, I gather" (116, Male, 68
210 years, lung cancer). Others thought it would reduce the risk of cancer returning, for
211 example, "One of the things my oncologist said to me at the end of my treatment was,
212 'exercise has been proven to be a factor in reducing the risk of it coming back, that's
213 proven'" (106, Female, 50 years, breast cancer).

214 *Desire to be more active*

215 In line with their views that physical activity is beneficial, participants spoke of their desire
216 to be more active following their cancer diagnosis, and of their efforts to achieve this, for
217 example, "I did think I should be taking more exercise and I did start various things" (103,
218 Female, 62 years, breast cancer and NHL), "I want to do more [physical activity]" (106,
219 Female, 50 years, breast cancer), and "but I think I am aware now that I actually need to
220 take more exercise. I think I need to maybe start... "(103, Female, 62 years, breast cancer
221 and NHL). However participants also acknowledged that any changes in physical activity had
222 been modest or that they were not currently doing enough physical activity, for example, "I
223 slightly increased the amount of exercise" (107, Male, 50 years, melanoma), and "I try to
224 have a walk each day but I think I need to up the pace. I think a leisurely stroll to the shops
225 possibly doesn't count." (103, Female, 62 years, breast cancer and NHL). Participants were
226 not clear on how much physical activity they should be doing other than 'more,' for
227 example, "I would say I am conscious that I should do more exercise" (111, Female, 63
228 years, thyroid cancer).

229 *Limited guidance on physical activity participation*

230 Although participants described good "evidence" and talked about "today's thinking"
231 relating to the role of physical activity in cancer survivorship, it was not clear where this
232 information came from. Some mentioned receiving some information from health
233 professionals, for example, "My GP has, on numerous occasions, discussed with
234 me...encouraging me to try and take exercise as a means of stress management, and also try
235 and get to a healthier weight" (103, Female, 62 years, breast cancer and NHL). Others
236 sought advice from personal trainers "Whatever you have had wrong with you, he [personal
237 trainer] will devise method things for you to do. And he's brilliant" (119, Female, 67 years,

238 melanoma), and “This guy [personal trainer] did work with me and developed a programme
239 of exercises which was a combination of running machine but also lots of weights...And it
240 was completely magical” (106, Female, 50 years, breast cancer). However, participants also
241 described how little professional advice was given in the oncology context, for example,
242 “well, shamefully, I wasn’t given much information” (111, Female, 63 years thyroid cancer),
243 and “I think it would be useful for most if there was opportunities to...encourage you to
244 adapt your diet or adapt your exercise levels and things like that.”

245 Several participants mentioned that they had researched information about physical
246 activity themselves. Some had used the internet to do this, for example, “they gave me a
247 website to have a look and I had a look at it, a thyroid cancer site. I’ve looked at all of them”
248 (111, Female, 63 years thyroid cancer), and “I read , as well, on some of the sites, I mean,
249 they were American sites, and the Americans go jogging when they have chemotherapy”
250 (110, Female, 51 years, breast and bladder cancer).

251 Participants also mentioned reading about lifestyle in the media such as newspapers and
252 magazines, for example, “if there’s an article in the newspaper, I’ll read that, on cancer
253 prevention” (118, Female, 64 years, breast cancer), “I’ve read magazines and stuff and it
254 says you should exercise three or four times for a half an hour a week and I think if you
255 don’t work up a sweat, you are not doing yourself any favours” (109, Male, 77 years, colon
256 cancer), and “Because I keep an eye on reports and media [relating to physical activity], I
257 suppose, if it’s in the media. If it’s in the media, I see it. I suppose the people who don’t have
258 much media input, it’s probably more difficult” (116, Male, 68 years, lung cancer).

259 *Multi-dimensional barriers and facilitators of physical activity*

260 Health-related barriers

261 The side-effects of cancer or cancer treatment were reported to negatively influence
262 physical activity behaviour. Fatigue was commonly mentioned, for example, “And the
263 tiredness is the biggest, it’s the biggest problem, it’s the biggest factor of the whole thing”
264 (102, Male, 38 years, Hodgkins disease), “When I went out I use to buzz around anyway.
265 Now I get a bit more tired” (111, Female, 63 years, thyroid cancer), and “I do keep active,
266 but I do get very tired” (114, Female, 74 years, breast cancer).

267 Some participants felt that having cancer had left them unfit, for example, “I am fatter, I am
268 not as healthy, I am not as fit, I don’t do as much because of my cancer treatment” (102,
269 Male 38 years, Hodgkins disease), and “...And I am still disabled from the therapy...it
270 damaged my heart muscle, so my heart function is weak and I’m quite breathless at times”
271 (101, Male, 60 years, NHL). Others mentioned arthritis “Oh yeah I gained weight and I
272 couldn’t walk very well because I have got arthritis, which is caused by the chemotherapy. I
273 couldn’t walk and I used to like to walk before” (110, Female, 51 years, breast and bladder
274 cancer), and peripheral neuropathy “The peripheral neuropathy I’ve got is a permanent
275 legacy of one of the therapy drugs, so walking is difficult” (101, Male, 60 years, NHL). For
276 others the side effects of cancer were discussed in more general terms, for example, “So
277 since then I have had more difficulty keeping things going. I still do the cycling but it’s not as
278 regular as I want” (117, Male, 65 years, testicular cancer).

279 *Situational barriers*

280 Other reported barriers to physical activity predominantly related to the climate, for
281 example, “I am waiting for the weather to get better so I can actually walk” (106, Female, 50
282 years, breast cancer), and “Well, I should be doing a lot more walking than I’m doing, to be
283 honest. I mean, the one problem is that, just lately, the weather’s been so cold, and last
284 year, it was so damp” (104, Male, 69 years, prostate cancer). Other barriers related to time
285 restraints and priorities, “It’s just not always possible to always fit it in” (106, Female, 50
286 years, breast cancer), and “I think I am a bit of a perfectionist as a teacher...I found that I put
287 that first rather than maybe continuing at the gym or my aerobics class” (103, Female, 62
288 years, breast cancer and NHL).

289 *Social support*

290 Several people talked about how their physical activity was positively influenced by those
291 around them, for example, “Loads of my friends are doing it and we’re, sort of, saying, ‘we
292 could start dancing’ so we make sure we do a bit more” (106, Female, 50 years, breast
293 cancer), “We’d visit her [daughter] and she’d probably be on her treadmill. And I suppose
294 we talked about it and I think she probably encouraged me that it’s something I should do”
295 (109, Male, 77 years, colon cancer).

296 Participants also reported that social aspects facilitate physical activity, for example,
297 “Keeping fit is also keeping fit in a social thing. I am not the sort of person who likes, say,
298 walking by myself or jogging or any of that. I like the company. Two things, really: a group
299 thing, yeah, and I have made a lot of friends and everything” (112, Female, 69 years, NHL),
300 and “Well, meet local people; meet local people and a bit of exercise” (111, Female, 63
301 years, thyroid cancer).

302 *Structured exercise*

303 Gyms were often discussed as a place to facilitate activity, for example, “First of all, I hired a
304 personal trainer. And I go to the gym fairly often” (113, Female, 47 years, thyroid cancer),
305 and “I had never been into a gym before...This guy did work with me and developed a
306 programme of exercises which was a combination of running machine but also lots of
307 weights...” (118, Female, 64 years, breast cancer). Participants also reported being part of
308 “sports” clubs, for example, “I joined a running club and entered my first Race for Life in
309 2010” (106, Female, 50 years, breast cancer), and “I also belong to a walking group. Every
310 month we do five or seven miles. I walk quite a lot” (116, Male, 68 years, lung cancer).

311 Exercise DVDs were mentioned as an aid to be physically active with, for example, “I haven’t
312 done any exercise for a while and I got a DVD out and spent an hour doing some exercise on
313 that” (106, Female, 50 years, breast cancer), and “I have got an exercise video...and I do,
314 sort of, you know, I have started doing that regular and try and tone my body up and that”
315 (110, Female, 51 years, breast cancer and bladder cancer).

316

317 **Discussion**

318 *Main finding of this study*

319 The present study aimed to explore cancer survivors’ attitudes towards and knowledge of
320 physical activity, sources of information, and potential barriers and facilitators of
321 engagement. In this qualitative study of British cancer survivors, most participants were
322 aware that physical activity is good for general health and some mentioned the benefits of
323 physical activity specifically relating to cancer and other chronic conditions, such as

324 cardiovascular disease. Most participants had a “desire” to be more active, which is
325 encouraging. However, little information was given from oncology health professionals on
326 how to achieve adequate levels of physical activity and many participants sought
327 information via other methods, such as, through media and websites. Reported barriers to
328 physical activity were predominantly related to health, such as, side effects to treatment,
329 fatigue and arthritis. Other reported barriers included time restraints and the weather.
330 Reported facilitators to physical activity were predominantly social, such as a positive
331 influence by others, and being part of a “sports” group. Moreover, gyms and exercise DVDs
332 were used to assist in being physically active.

333 *What is already known on this topic and what this study adds*

334 Although participants had a desire to be more active most participants acknowledged any
335 changes made to physical activity behaviour had been modest. This supports previous
336 research which has shown only approximately 21% of cancer survivors incorporated new
337 physical activity into their lives (Patterson et al. 2003). These modest changes in physical
338 activity levels may be partially explained by reporting tiredness and feeling unfit, as side-
339 effects of cancer treatment. Previous research has found similar findings; Richardson and
340 Ream (Richardson & Ream 1996) found in a sample of 129 participants, that 90% suffered
341 from fatigue. Moreover, Curt et al. (2000) found that fatigue decreased the quality of life in
342 88% of the patients (n=379) and 75% of those employed (n=177) had to adapt their
343 professional activity due to fatigue. This fatigue/ tiredness is likely owing to a combination
344 of a long-lasting increase in heart rate and respiratory work, less effective energy
345 production, and metabolic acidosis, as a result of cancer and its treatment. Interestingly,
346 participation in physical activity has been shown to reduce this fatigue and tiredness in
347 cancer patients (eg see, Dimeo. 2001 & Dimeo et al. 1999), but participants in our study did
348 not appear to be aware of this or at least did not mention it in their discussions. Cancer
349 survivors may benefit if health professionals are trained to educate them on the potential
350 benefits of physical activity for tiredness/ fatigue.

351 Participants reported searching for information on physical activity themselves via the
352 internet and media. While these can be useful sources of information, evidence suggest
353 science may get misinterpreted by journalists and website authors and consequently the

354 information provided may not always be accurate nor evidence-based (see eg, Goldacre.
355 2009). Oncology health care professionals should be encouraged to supply cancer survivors
356 with reliable and trustworthy websites to access for information on physical activity.
357 Participants also reported seeking activity advice from healthcare professionals and
358 personal trainers. However, participants described how little professional advice was given
359 in the oncology context. Previous research has reported similar findings (see e.g. Fisher et al.
360 2015, Williams et al. 2015). This is of concern, receiving physical activity advice after a
361 cancer diagnosis from a health care professional is associated with higher levels of physical
362 activity (Fisher et al. 2015).

363 In line with previous research, participants reported that their physical activity behaviour
364 was positively influenced, by those around them and they often used gyms or “sports”
365 groups to facilitate exercise. In a recent systematic review by Barber (2012) on social
366 support and physical activity engagement in cancer survivors 50% of studies (n=22) showed
367 a significant relationship. The review concluded that additional research is needed to
368 develop social support strategies that will increase physical activity engagement in this
369 population. The present study suggests that the utilisation of gyms or “sports” groups is one
370 strategy that could be explored.

371

372 A review by Midtgaard et al. (2015) synthesized qualitative studies on cancer survivors’
373 experiences of participation in exercise-based rehabilitation. The findings from the review
374 suggest that the potential of rebuilding structure in everyday life, creating a normal context
375 and enabling the individual to re-establish confidence and trust in their own body and
376 physical potential constitutes substantial qualities. Moreover, the review identified that
377 exercise appears to serve as a means to achieve a sense of continuity whereby the individual
378 may feel less alienated from themselves, their friends, and family. The review also identified
379 reasons why cancer survivors were motivated to exercise; some cancer survivors were
380 motivated to exercise to protect themselves from disease recurrence (McGrath et al. 2011)
381 others emphasized the motivational aspect of the group setting (Emsile et al 2007,
382 Midtgaard et al 2006). The present study adds to this review by identifying specific barriers
383 (e.g. situational) and facilitators (e.g. “sports” clubs, gyms, exercise DVDs) that can be

384 utilised in the development of interventions to encourage physical activity participation in
385 this population.

386 The present study supports previous work in cancer survivors (modest changes made to
387 physical activity levels, barriers to physical activity including tiredness and feeling unfit). This
388 is important as if consistent findings are observed by different persons in different places
389 with different samples this strengthens the likelihood that the observed findings are “true,”
390 reproducible, and therefore may be considered in intervention design.

391

392 *Limitations of this study*

393 The sample included participants who survived a broad range of different cancers thus
394 physical activity beliefs between participants could not be compared. To our knowledge
395 there are no tailored physical activity recommendations for survivors of different cancers,
396 this paper aimed to understand opinions of physical activity in general, as opposed to
397 physical activity needs specific to certain cancers/treatments, we therefore sought to recruit
398 a range of cancer survivors. In the present study current and previous physical activity levels
399 were not considered. Those interested in our study may be those with a long term interest
400 in physical activity, or those who have become interested since diagnosis. We did not ask
401 about pre-diagnosis activity levels except in the context of how things had changed post-
402 diagnosis. To be geographically inclusive this study used a combination of face-to-face and
403 telephone interviews. However, mixing such methods can also be viewed as a limitation
404 (Irvine 2011). It has been found that telephone interviews are typically shorter than those
405 conducted face-to-face. Moreover, in telephone interviews participants and researchers
406 speak for less and greater time, respectively (Irvine 2011). This may result in a loss of data
407 (breadth of coverage/ depth of detail).

408 In a semi-structured interview the interviewer has a list of questions or series of topics to
409 cover, but there is flexibility in how and when the questions are put and how the
410 interviewee can respond. The interviewer can probe answers, pursuing a line of discussion
411 opened by the interviewee, and a dialogue can ensue. When using multiple interviewers, as
412 in the present study, variations between interviewers approaches may lead to variation in

413 level of detail disclosed by the interviewee. For example, if the interviewee feels
414 comfortable and relaxed with the interviewer they may discuss personal topics (e.g. side-
415 effects of cancer treatment); some interviewers may be more effective at achieving this
416 than others. Interview transcripts were not returned to participants for comments and/or
417 corrections after the interviews, which would have given participants the opportunity to
418 verify the content and quality of the transcripts.

419

420 **Conclusion**

421 In this sample of cancer survivors most participants were aware that physical activity was
422 good for health and participants wanted to take part in physical activity. Oncology health
423 professionals should be encouraged to direct patients to appropriate sources for guidelines
424 on physical activity for cancer survivors. Structured, multi-component interventions to
425 increase physical activity behaviour in cancer survivors that consider tiredness/ fatigue and
426 incorporate components of social support should be explored.

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428 **Conflicts of interest**

429 None declared.

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440 **References**

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566 Table1. Topic guide for qualitative interviews

Topics		Prompts
Introductions and background	Introductions	Who we are and aims of study Check length of interview (45-60 mins) okay
	Cancer history	When diagnosed Type of cancer Recovery
	Social context	Brief overview of family set up and any support received/ receiving in relation to cancer diagnosis/ treatment/ recovery
Beliefs about factors involved in causing cancer and in keeping healthy in the future	Causal factors	Any particular things related to diet or physical activity? Anything else (e.g. smoking, alcohol, stress, weight)?
	Keeping healthy in the future (e.g. reducing risk of cancer recurrence or of long-term health condition such as heart disease or diabetes)	Any particular things related to diet or physical activity? Anything else (e.g. smoking, alcohol, stress, weight, supplements)
Experiences with making changes to behaviour since recovering from cancer	Have you tried anything/ doing anything different from before your diagnosis?	Any particular things related to diet or physical activity? Anything else (e.g. stopping smoking, cutting down alcohol, reducing stress, losing weight, taking supplements)? Reasons for doing this and whether think helping? Plan to continue?
Sources of information regarding lifestyle and long-term health	Who from	Have doctors/ other health professional/ anyone else talked about this? Any other sources of information?
	How received	How did you feel about getting this information – was it welcome?
	Other information wanted	Any other information you wanted or that you have tried to access?
		If so, what type of information, when and from whom would you prefer it?
Anything else?		

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570 Table 2: Socio-demographic and health characteristics

Socio-demographic details	Total sample (n=19)
Gender: n (%)	
Male	8 (42.1)
Female	11 (57.9)
Age (years): mean ± SD (range)	59±13.11 (24-77)
Ethnicity: n (%)	
White British	19 (100.0)
Marital status: n (%)	
Single/never married	2 (10.5)
Married/living with partner	13 (68.4)
Married separated from partner	1 (5.3)
Divorced	3 (15.8)
Highest educational status: n (%)	
Degree or higher degree	9 (47.4)
Higher education below degree	2 (10.5)
Secondary school qualifications	5(26.3)
No formal qualifications	1 (5.3)
Other	2 (10.5)
Employment status: n (%)	
Employed full-time	5 (26.3)
Employed part-time	2 (10.5)
Self-employed	3 (15.8)
Retired	8 (42.1)
Disabled or too ill to work	1 (5.3)
Cancer diagnosis*: n (%)	
Breast	7 (36.8)
Colorectal	1 (5.3)
Prostate	1 (5.3)
Lung	1 (5.3)
Thyroid	2 (10.5)
Non Hodgkin lymphoma	3 (15.8)
Hodgkin lymphoma (Hodgkin disease)	1 (5.3)
Testicular	1 (5.3)
Bladder	1 (5.3)
Melanoma	2 (10.5)
Neuroendocrine tumour (NET)	1 (5.3)
Date of diagnosis: n (%)	
< 5 years ago	12 (63.2)
5-10 years ago	4 (21.1)
11-20 years ago	2 (10.5)
>20 years ago	1 (5.3)

571 *Total comes to >100% as two people had been diagnosed with more than one type of cancer

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