



'If I Had Someone Looking Over My Shoulder...': Exploration of Advice Received and Factors Influencing Physical Activity Among Non-metropolitan Cancer Survivors

Sarah J. Hardcastle^{1,2} · Maddison Galliot¹ · Brigid M. Lynch³ · Nga H. Nguyen³ · Paul A. Cohen^{2,4} · Ganendra Raj Mohan⁵ · Niloufer J. Johansen⁴ · Christobel Saunders^{2,4}

Published online: 30 July 2019

© International Society of Behavioral Medicine 2019

Abstract

Background There are significant geographic inequalities in cancer survival with poorer survival rates in non-metropolitan areas compared to major cities. Physical activity (PA) can reduce cancer recurrence and prevent cardiovascular disease. However, few survivors participate in sufficient PA and the prevalence of inactivity is significantly higher in non-metropolitan survivors. The study investigated non-metropolitan survivors' recollections regarding PA advice received following cessation of active treatment, their knowledge of PA guidelines, and the factors that impact on PA behaviour change.

Method Sixteen individuals (14 women and 2 men) with breast ($n = 8$), endometrial ($n = 4$) or colorectal cancer ($n = 4$), with a mean age of 60 years ($SD = 12$) completed semi-structured interviews as part of a larger study to examine the acceptability and utility of wearable trackers to increase PA. Interviews explored survivors' recollections regarding the advice they received concerning PA following active treatment, knowledge of PA guidelines for cancer survivors and the influences on PA behaviour change. Interview transcripts were analysed using thematic analysis.

Results Four main themes emerged: (i) *insufficient knowledge of guidelines*, (ii) *support from the treating oncology team*, (iii) *external accountability*, and (iv) *barriers to PA*.

Conclusions Survivors' knowledge of PA guidelines was limited and they did not often recall their oncologists making specific recommendations concerning PA. Survivors' referred to the desire for accountability and monitoring in order to successfully change PA. Lack of motivation was the main barrier to PA participation. Other barriers included age, health status, and lack of facilities or exercise programs.

Keywords Oncology · Physical activity · Motivation · Behaviour change · Rural health

Introduction

Cancer is a leading cause of disease burden worldwide [1]. Effective physical activity (PA) interventions are essential to curb the growth in inactivity and prevent chronic disease in

cancer survivors [2, 3]. PA improves quality of life [4] and physical function in cancer survivors [5]. PA also prevents cardiovascular disease (CVD) [6, 7], can reduce the risk of cancer recurrence [8–11] and improve overall survival, yet few survivors meet the broad recommendation of at least 150-min per week of moderate-intensity exercise [12].

There are significant geographic inequalities in cancer survival [13, 14]. Survival rates for the third of Australians who live in non-metropolitan areas (i.e. all areas outside Australia's major cities, which are formally known as 'regional and remote') are poorer than for those living in major cities [15]. Cancer survivors living in non-metropolitan areas are often disadvantaged in relation to access to services, facilities and socioeconomic status and are more likely to be obese and physically inactive [16]. Similar findings have been found in the USA, where the prevalence of inactivity is significantly higher in rural cancer survivors [14]. Non-metropolitan survivors

✉ Sarah J. Hardcastle
sarah.hardcastle@curtin.edu.au

¹ School of Psychology, Curtin University, Perth, WA, Australia

² School of Medicine, University of Western Australia, Crawley, WA, Australia

³ Cancer Epidemiology and Intelligence Division, Cancer Council Victoria, Melbourne, VIC, Australia

⁴ St John of God Hospital, Subiaco, Subiaco, WA, Australia

⁵ Hollywood Private Hospital, Nedlands, WA, Australia

represent an underserved population and are also one of the most understudied groups of cancer survivors. Effective, distance-based PA interventions are essential in order to reduce such geographic inequalities in health and survival.

A greater understanding of PA knowledge and the factors that impact PA in non-metropolitan survivors is required to inform such interventions. In the few studies that have explored the barriers to PA in non-metropolitan survivors, lack of motivation or willpower were cited as the main barriers to PA [17, 18]. In a study of rural US breast cancer survivors, a ‘lack of discipline’, ‘procrastination’ and ‘exercise not a priority’ were the most common barriers, whereas ‘cost of exercising’, ‘fear of injury’ and ‘no facilities or space’ were the least commonly reported PA barriers [18]. In a study of rural Canadian breast cancer survivors, the most common sources of PA information were family and friends, physicians and magazines [19]. The only other studies in non-metropolitan cancer survivors have explored exercise preferences [19–22] and reported a preference for moderate-intensity exercise, primarily walking [20–22]. Most non-metropolitan survivors would like to receive PA counselling [19, 21, 22], either from a PA specialist, family doctor, oncologist or nurse [22]. Non-metropolitan cancer survivors also preferred face-to-face [18, 19, 22] or Internet-delivered interventions [19].

Little is known about how to effectively promote PA to non-metropolitan survivors. Previous research with non-metropolitan survivors has been limited to North America and such findings may not necessarily transfer to non-metropolitan survivors living in other continents with different climates, cultures and geography. Also, different challenges and barriers to PA participation may exist between metropolitan and non-metropolitan survivors (e.g. physical environment, climate, access to facilities, social norms); therefore, it is possible that different interventions may be required to overcome these barriers and facilitate long-term PA engagement.

Qualitative approaches are advantageous because they enable participants to raise topics that researchers may not have considered a priori and researchers to further explore specific issues raised by participants to gain a deeper understanding of factors that influence behaviour [23]. No study has previously investigated factors influencing PA engagement among non-metropolitan cancer survivors residing in Western Australia. Given the cultural and geographic differences between Australia and North America and lack of research in the field, we thought it is timely to conduct the current qualitative study.

Further, previous studies have not explored non-metropolitan survivors’ knowledge of the PA guidelines, support from the treating oncology team (which is important given the distance that separates patients and their healthcare teams and how such support might be delivered to non-metropolitan cancer patients), or the dimensions affecting PA engagement. Non-metropolitan survivors’ knowledge of the PA recommendations may be poorer than metropolitan

survivors due to less exposure to PA messaging. They may also perceive less support from their treating oncology team because allied health programs (such as the ‘Life Now’ supervised exercise program) offered at no cost to survivors, by the state-based not-for-profit cancer organization, Cancer Council Western Australia, rarely operate outside of the metropolitan areas. Dimensions affecting PA engagement may differ in regional and remote areas due to unique aspects including geographic diversity, limited access to facilities and the burden of travel distances [14]. Previous research in non-metropolitan survivors has been limited to exploring PA barriers and preferences. The present study contributes to this gap by (i) investigating survivors’ recollections regarding the content of PA advice received following cessation of their active treatment, (ii) exploring their knowledge of the PA guidelines and (iii) exploring the factors that impact PA engagement among Australian non-metropolitan cancer survivors.

Methods

Participant Recruitment

The study was granted approval by the St John of God Healthcare Human Research Ethics Committee (reference # 1157). Participants were purposely selected from the databases of breast and gynaecologic oncologists in Perth, Australia, and from a list of patients who expressed their interest in future research from previous cancer studies (colorectal and endometrial). Patients were eligible to participate if they (i) had completed active treatment for cancer within the preceding 5 years and were deemed to be in remission; (ii) were insufficiently physically active (i.e. not meeting the recommended 150-min of moderate to vigorous intensity PA (MVPA) per week [12]; and (iii) resided in a non-metropolitan area of WA (i.e. with a postcode of 6041–6044; 6083–6084; 6123–6126; 6200–6799) [24]. All areas outside Australia’s major cities are classified as inner and outer regional (‘regional’) and remote or very remote (‘remote’) under the Australian Statistical Geography Standard (ASGS) [25]. The ASGS allocates one of five categories of remoteness (i.e. major cities, inner regional, outer regional, remote, very remote) based on its distance from a range of population centres and access to services. Relative remoteness is assessed in an objective way using the Accessibility and Remoteness Index of Australia (ARIA) [26]. ARIA defines five categories of remoteness based on road distance to service centres. Major cities are defined as highly accessible, inner regional as accessible, outer regional as moderately accessible, remote as very restricted and very remote areas defined as very little accessibility of goods, services and opportunities for social interaction [25]. As a guide, the proportion of the Australian population residing in each ASGS area is 72% in major cities, 18% in inner regional, 8% in outer regional and 1%

respectively for remote and very remote areas [25]. The ARIA lookup tool (www.pocog.org.au/aria/default.aspx) was used to classify postcode according to the ASGS remoteness classifications [27]. Exclusion criteria were: (i) age < 25 and > 90 years, (ii) currently using a wearable tracker and (iii) inability to speak and comprehend English. Those under 25 were excluded because cancers in young adults are uncommon [28] and there is increasing recognition that young adult cancer survivors have distinct psychosocial and information needs [29, 30].

Procedure

Patients meeting the study inclusion criteria were invited to participate by their treating oncologist via mail. Patients registered their interest in participating in the study via email or telephone and subsequently received a telephone call from a research assistant (RA) to arrange a convenient time to conduct a telephone screening questionnaire to determine PA status and eligibility, using the Active Australia questionnaire [31]. Participants provided written, informed consent and gave permission for the interviews to be audio-recorded.

The present study formed part of a larger study that involved using five commercially available wearable activity trackers (WATs) (Fitbit Alta, Garmin Vivofit 2, Garmin Vivosmart, Polar loop 2 and Polar A300) to assess the acceptability of and utility of wearable technology to increase PA in non-metropolitan cancer survivors [32]. In brief, participants were provided with the operating manual for each device trialled which guided them on how to operate the device, its basic features (step counts, sitting alert) and associated app (how to sync). Participants trialled a minimum of two devices, each device for 2 weeks, followed by a 1-week washout period between devices. All participants that trialled the WATs ($N=16$) completed an interview. Interviews took place as soon as possible following trial cessation to explore experiences, acceptability and preferences of WATs. Questions also explored the utility of devices to increase PA and/or reduce sedentary behaviour (SB) and comfort with the technology. The interviews also covered material presented in the present study outlined below.

Data Collection

Semi-structured interviews lasting up to 60-min were conducted by authors MG and/or SJH. SJH (PhD) is a senior research academic with a wealth of experience in qualitative design, data collection and analysis. MG was a research assistant co-ordinating the project, for her Honours project in Psychology and received training in interviewing skills from SJH. Participants were given information concerning the rationale for the research in the information sheet and in liaison with the research assistant, learnt that the study also formed

MG's psychology Honours project. Interviews took place either at a mutually convenient, quiet location chosen by the participant (e.g. café) or via telephone interview. Interviews were conducted with only the researcher and participant present. An interview guide was used with questions concerning survivors' recollections regarding the content of PA advice received following cessation of active treatment, their knowledge of the PA guidelines and influences on PA behaviour change. Interviews were digitally recorded (audio) and transcribed verbatim. Data saturation was determined following analysis and occurred at the point when no new information was gained to develop or broaden themes [33].

Data Analysis

Data were analysed by hand using inductive thematic analysis with themes being derived from the data rather than a priori [34]. Thematic analysis involved several steps. The first step involved *immersion* and involved carefully reading transcripts several times to identify participants' meanings. The second step involved attaching codes to salient text segments. The third step involved the identification of themes at a broader level and examining whether codes may be combined to form an overarching theme. The final step involved reviewing themes, cross-checking for overlap and differences and finally defining and classifying themes. To broaden data interpretation, a second researcher read and independently coded all transcripts. Following this process, the researchers met to discuss the identified themes and sub-themes, with discrepancies resolved through consensus and themes finalized. The analysis offered is one interpretation of the interviewees' experiences and we acknowledge that other interpretations are possible. Nevertheless, we aimed to offer a credible and trustworthy interpretation that captures participants' perceptions and experiences. For example, we provide 'thick description' via the use of extensive and direct quotations so that the reader can evaluate the interpretation [35].

Results

Seventy-seven cancer survivors were invited to participate in the study. Of these, seven (9%) expressed interest to participate in the study but were ineligible because they were sufficiently active. Twenty cancer survivors were recruited (26%) and 16 completed the study and were interviewed. Of the 20 participants recruited, three withdrew prior to trialling the WATs and one dropped out during the trial on account of illness. Sixteen individuals (14 women and 2 men) completed the study and were interviewed including breast ($n=8$), endometrial ($n=4$) and colorectal ($n=4$) survivors with a mean age of 60 (SD = 12) years. There were no significant differences in

mean age (60 vs 59) between participants that completed the study, and those who declined participation or dropped out respectively, ($t(73) = -0.24, p = 0.81$), or mean months since end of treatment (22.9 (SD = 15.7) vs 28.2 (SD = 15.3) for participants that completed the study and those who declined participation or dropped out respectively ($t(66) = 1.17, p = 0.25$). Participant characteristics are summarized in Tables 1 and 2. Those that completed the study resided primarily in inner regional areas ($n = 9$), outer regional ($n = 2$), remote ($n = 2$) and very remote areas ($n = 1$). Those who declined participation or were ineligible also resided in primarily inner and outer regional area ($n = 32$ and $n = 16$) respectively, followed by remote ($n = 2$) and very remote ($n = 2$).

Analysis of the data identified four main themes: (i) *insufficient knowledge of PA guidelines and health benefits*, (ii) *support from the treating oncology team*, (iii) *external accountability* and (iv) *barriers to PA*. Pseudonyms are used throughout the manuscript.

Table 1 Participant characteristics

Age (years)	
Mean	59.75
SD	11.94
Range	35–78
Marital status	
Married/living together	13
Separated	2
Not married	1
Widowed	0
Highest completed education	
Primary	1
Secondary/high school	1
Post-school vocational	6
University	4
Not reported	4
Annual household income	
< AUSS\$ 20,000	1
AUSS\$ 20,001–\$ 39,999	2
AUSS\$ 40,000–\$ 59,999	4
AUSS\$ 60,000–\$ 79,999	1
AUSS\$ 80,000–\$ 99,999	2
AUSS\$ 100,000+	1
Not reported	4
Employment	
Full-time	6
Part-time	3
Retired	6
Homemaker	1
	33.82 (SD 10.40)

1 AUSS\$ = approximately 0.70 US\$

Insufficient Knowledge of PA Guidelines and Health Benefits

Only two participants could accurately cite current PA guidelines for cancer survivors (e.g. those published by the American Cancer Society [12]) and such information came from clinicians (e.g. ‘I was told (by oncologist) initially to try and walk at least 5 times a week...5 half hours’ (Sue, aged 78). Most participants did not refer to MVPA when asked about the guidelines, but instead referred to steps: ‘I’ve heard from various sources that 10,000 is recommended’ (Carol, aged 68) and ‘If you could do 10,000 steps a day, it was good’ (Elsa, aged 78). Although many participants referred to ‘10,000 steps’, others lacked any knowledge of the recommendations: ‘I have no idea’ (Miriam, aged 67) and ‘No idea about the guidelines at all’ (Sandra, aged 68).

Most participants (75%) trialled the Fitbit Alta, as part of the larger study; however, none were aware that the thunderbolt icon on the device represented continuous bouts of at least 10-min of MVPA as per the PA guidelines for cancer survivors [12]: ‘I did see it but I didn’t know what it was’ (Linda, aged 51). This in part could be explained by the fact that the manual does not define active minutes according to MVPA. The lack of awareness in relation to active minutes appears to be also due to awareness of the ‘steps’ message, combined with step count constituting the primary feature on the trackers: ‘You could reset that if you knew that MVPA was meant to be the primary goal...I’m happy to shift that. These immediately come up with steps and you figure that those are the primary thing’ (Fiona, aged 50) and ‘Right...Okay, my focus is on the steps, I thought I needed to do 5,000 or 6,000 a day’ (Sandra, aged 68).

There was also some confusion concerning what counts as meeting the PA guidelines in terms of sporadic PA in comparison to planned bouts of PA:

I am cleaning the house, doing this and that, does any of that count as exercise? The answer was ‘No because the only exercise that counts is deliberate exercise for that purpose’...To me that is nonsense, how does your body know the exercise you’re doing is purely for exercise sake? (Sue, aged 78)

Others thought that a lower step count was sufficient for their age: ‘I read somewhere that for older people, those who only do 4,000 to 5,000 steps a day...that their health was a lot better than those doing 10,000–12,000 steps a day’ (Linda, aged 51) or that cleaning the house was of sufficient intensity: ‘I heard that even cleaning your house was really good vigorous exercise’ (Fiona, aged 50). One participant dismissed the PA guidelines and the evidence supporting PA for cancer recurrence:

I don’t believe there’s a statistical correlation between how far you walk and necessarily how healthy you are,

Table 2 Overview of participants

	Participant	Age	Remoteness classification	Cancer type	Treatment	Number of months since treatment completion
1	Emma	50	IR	Uterine	SU + CH + RA	26
2	Paul	52	IR	Colorectal	SU + CH	15
3	Carol	68	IR	Colorectal	SU + CH	56
4	Maureen	65	IR	Breast	SU + CH + RA + HT	6
5	Diane	67	Missing	Colorectal	SU	7
6	Fiona	50	Missing	Ovarian	SU + CH	11
7	Lisa	49	VR	Breast	SU + CH + RA + HT	25
8	Miriam	67	IR	Breast	SU + CH	18
9	Sue	78	IR	Breast	SU + CH + RA + HT	55
10	Linda	51	R	Breast	SU + CH + RA + HT	16
11	Elsa	78	OR	Breast	SU + RA + HT	24
12	John	69	IR	Colorectal	SU	Missing
13	Anna	35	R	Breast	SU + CH	5
14	Karen	51	IR	Breast	SU + CH	36
15	Helen	59	IR	Endometrial	SU + CH + RA	20
16	Sandra	67	OR	Endometrial	SU + RA	24

IR inner regional, OR outer regional, R remote, VR very remote SU surgery, CH chemotherapy, RA radiotherapy, HT hormone therapy

there's too many people who don't fit that mould...I have come off a long line of people who have lived in their 90s and 100s and never did any cardio their whole life...I also know quite a few very cardio fit individuals that drop dead in their 40s...Oh this will decrease your chances of getting cancer and I thought you can't say that, there's no statistical evidence for a lot of the things they say (Diane, aged 67, referring to the nurses delivering the 'Healthy Living after Cancer' program (a lifestyle intervention in Australia).

For the only survivor that appeared to be aware of the importance of PA for recurrence, this knowledge was gained through the media rather than their oncologist: 'I picked that up through watching things on TV...Yeah I don't want it (the cancer) to come back, so I'm exercising' (Miriam, aged 67).

Support from the Treating Oncology Team

Support from the treating oncology team involved participants' desire to receive PA information and advice from their oncologist and trust in their advice as an authority figure. Support from the treating oncology team contains two sub-themes that were closely associated: (i) minimal oncologist-delivered PA advice or referral and (ii) authority of oncologists and clinicians.

Minimal Oncologist-Delivered PA Advice or Referral

Most participants did not recall receiving PA advice from their oncologists following cessation of active treatment: 'My oncologist never said a word' (Fiona, aged 50) and 'No recommendation, just "Okay, everything is fine. See you in 6 months"' (Diane, aged 67). For the few who recalled receiving advice, it was mentioned only briefly, without specific prescriptions: 'I think they just say try to be more active...They don't ask me about exercise' (Linda, aged 51) and 'Dr xxx mentioned it... nothing specific...Just to see the weight loss doctor, because apparently the weight can cause the cancer to return...I think it would help if they did. There was no specific plan' (Helen, aged 59). Only one participant reported receiving specific advice from their oncologist, which was not well received: 'He wanted me to walk an hour a day and I just don't have an hour to walk in a day...I felt absolutely judged' (Sue, aged 78).

Despite the minimal advice received, participants desired to receive lifestyle information from their oncology team: 'I know I need to do more exercise but if it's coming from a professional who is an expert in that area...Telling you that doing this exercise is going to help you get better, I think it would perk your ears up for sure' (Paul, aged 52). Anna desired further rehabilitation:

With cancer, there's no real follow up...There's no sort of rehabilitation...If you have, like, a heart attack, generally you're followed up with physio and education... From my experience, you get the tick from the

oncologist, tick from the surgeon, and then you're free to go. But it would be good to have some sort of rehabilitation program where you do get a bit more education and physical activity goal (Anna, aged 35).

Authority of Oncologists and Clinicians

The authority of, and trust in, the oncologists represented a sub-theme. Participants referred to receiving the invitation letter from their treating oncologist. The oncologists' seal of approval was important for encouraging participation: 'The letter from [surgical oncologist], and obviously he is supporting the research...The letter was very encouraging' (Diane, aged 67) and 'Yeah, that's what got me going [letter from surgical oncologist]' (Elsa, aged 78) and 'When I got the letter, saying that she was asking people to do this, I would do anything for her, partly because I'm alive because of what she did for me, but also I like her' (Sue, aged 78). In addition to her respect for her oncologist, Sue trusted her and liked her communication style: 'Her manner is conducive to getting you to follow what she's suggesting...It was her sense of confidence and optimism, I believed her'.

The way in which lifestyle information is communicated by clinicians was deemed important. John referred to the ineffectiveness of fear tactics: 'If he had started telling me if you don't do this then the sky will fall in...If someone's trying to get me to do something through fear, it wouldn't really work' (John, aged 69 in reference to PA and cancer recurrence). Diane indicated her trust in clinicians: 'If the doctors said to me Diane there's something wrong with your heart and you need to increase your heart rate, then I'd think about it' (Diane, aged 67).

External Accountability

The need for external accountability to persist with PA behaviour change represented another theme. Most participants indicated a desire for external accountability:

When you are not accountable, it's easy just to go oh I have not got time today...To be accountable to someone else for a period of time until it becomes a habit, that would be helpful, because I'm not an exerciser...If someone's watching over the back fence, you want to keep your backyard tidy (Linda, aged 51)

Accountability was viewed as a helpful facilitator of behaviour change. Linda went on to say WATs are a 'Great idea for cancer survivors, if you had to be accountable for what was on them...You would make more effort'. Helen echoed the same sentiment: 'If an external force could see what I'm doing...that would help you get more motivated. If you weren't doing what you're supposed to you'd be really embarrassed. If I had

someone else looking over my shoulder I'd be more motivated' (Helen, aged 59) as did Fiona (aged 50): 'Get a bit more accountability'.

Barriers to Physical Activity

The main PA barrier concerned motivation. For Sandra: 'It comes down to motivation...I've got the will but not the power' (Sandra, aged 68) and 'Laziness, no motivation, but it's the letter that got me started' (Elsa, aged 78). Several referred to the importance of prioritizing PA: 'It has to be a high priority in your own mind...Sometimes I intend to do it but get distracted, the only time I do it always is like I've set it as a very high priority' (Paul, aged 52) and 'It's just one of the things I need to make a priority' (Linda, aged 51).

Other barriers that were less commonly reported included age, health status, and lack of facilities or exercise programs. Several participants referred to their age as a barrier to PA: 'As we get older the ability to exercise vigorously becomes less. I think that to ask someone my age to sort of go the gym...I simply can't, I've got arthritis' (Sue, aged 78) and 'You realise you're getting old. Sure, you can try to make yourself young again and do vigorous exercise, both are not very wise either...People my age who exercise very hard are more likely to die than I would' (John, aged 69).

A lack of PA programs for survivors was conveyed: 'Nothing for cancer patients, no' (Elsa, aged 78) and 'She (GP) doesn't have that package for post chemo, unlike diabetes, there's nothing there' (Diane, aged 67). Others described the lack of nearby facilities and challenging physical environment:

I'm on a remote farm...there's not that many places... There's not a gym around the corner or anything. We have a lot of flies and that sort of thing so it's not like going for a walk around Lake Monger (a very attractive lake close to the city) (Anna, aged 35).

Others who lived on a farm experienced a more attractive environment: 'I get out and do more walking, we've got 6 acres so I have to walk...We've got a dam so I take the dog for a walk' (Karen, aged 51). Helen described the lack of facilities but recognized other options: 'I prefer to swim but the nearest pool is Margaret river (40-minute drive)...But there are plenty of walking tracks nearby and bush trails' (Helen, aged 59).

Discussion

This is the first study to explore experiences of PA promotion, knowledge of PA guidelines and the factors influencing PA behaviour change in non-metropolitan cancer survivors in Australia. We found that knowledge concerning PA guidelines for cancer survivors was limited, with only two participants

able to accurately cite the guidelines, consistent with previous studies in metropolitan cancer survivors [36–38]. Most were also unaware of the importance of PA for reducing CVD risk and cancer recurrence and one was dismissive of the evidence. Educating patients about the PA guidelines and providing a strong rationale for PA are priorities, because they are prerequisites to an individual's motivation to participate in regular PA [39]. Such information is likely to be more effective if received from the treating oncologist or general practitioner [40].

Consistent with previous research in metropolitan cancer survivors [36–38, 41–43], most participants did not recall receiving PA advice following treatment. Although it could be argued that survivors up to 5-year post-treatment may not accurately recall PA advice, the present study was focused primarily on PA support offered post-treatment and during the follow-up period. Given the time since treatment completion (mean months 22.9, SD 15.7), most participants were still attending follow-up consultations and therefore may reasonably recall any PA advice or support provided. Only one participant was advised to walk for an hour per day by their medical oncologist. A lack of information or not knowing what to do was identified as a significant barrier to PA participation among survivors in a recent review [44]. This is discouraging, since non-metropolitan cancer survivors would like to receive PA counselling [19, 21, 22], and survivors who receive PA advice from their specialists may be more likely to engage in sufficient PA [40, 41, 45].

Barriers to PA promotion among medical specialists include lack of time, knowledge, patient motivation, exercise referral pathways and availability of exercise programs [46–49]. Many of these perceived barriers may be modifiable. For example, patients desire information concerning PA from their oncologist [19, 21, 22, 36, 37, 50]. Lack of knowledge is modifiable. Lack of time is less modifiable; however, interventions that include brief advice have demonstrated promise [41, 45, 51]. Oncologists review their patients regularly and in many instances for several years after diagnosis. Non-metropolitan survivors travel to metropolitan areas for follow-up every 6 or 12 months. Therefore, treating oncologists are in a position to promote the uptake of PA.

The present study also reinforces previous work concerning the importance of relational techniques [40] and motivational climate [52, 53] in the rationale for and delivery of PA advice to individuals. In relation to the interpersonal context, one participant referred to ineffectiveness of 'fear' induced messages, another felt obligated to exercise and felt 'judged' and another dismissed the importance of MVPA, citing 'no evidence'. According to self-determination theory, PA motivation arises from the social context and the extent to which the environment satisfies basic psychological needs for autonomy, competence and relatedness [52]. A supportive environment expressing non-judgemental understanding and empathy is likely to foster a greater sense of autonomy and

more autonomous motivation towards PA participation. However, the present study identified instances where there was deemed to be a lack of choice or where the environment was perceived as controlling, which resulted in the thwarting of psychological needs and resistance to change. These findings are important since the degree to which the interpersonal context is perceived as autonomy supportive (rather than controlling) is likely to influence the satisfaction of basic psychological needs that foster intrinsic motivation [53].

The authority of, and trust in, the oncologists represented an important theme. Indeed, the oncologists' seal of approval (by way of signed invitation letter) was identified as important for encouraging participation in the present study. Given that PA motivation arises from the social context [52], PA messages should be relayed in a neutral and empathic manner and in a way that is likely to support perceptions of choice, autonomy and competence. For example, practitioners could start by providing a meaningful rationale for PA engagement. Secondly, practitioners could explore PA options and emphasize choice, to support the need for autonomy. Thirdly, a practitioner's expression of empathy, understanding of the patient's position and avoidance of judgement will support the need for relatedness. Encouragement concerning ability and realistic goal setting will support the need for competence. Together, the satisfaction of these needs (competence, autonomy and relatedness) is likely to foster increased self-determined motivation to engage in PA and result in increased adherence [54]. Identified forms of regulation may be fostered by targeting the personal instrumental value of PA for health and well-being [54]. Therefore, researchers and practitioners will need to focus on both the 'content' of PA recommendations (i.e. importance of continuous MVPA, evidence for PA reducing fatigue, CVD, recurrence) in addition to the 'relational' techniques in order to reduce resistance and enhance intrinsic motivation for behaviour change [55, 56].

Suggestions concerning how PA promotion could be implemented in practice by treating clinicians have been proposed [40]. For example, the oncologist could give the patient a printed exercise prescription and a brief rationale concerning the importance of exercise in preventing functional decline and reducing fatigue, cardiovascular disease risk and cancer recurrence. Oncology specialists could also be trained to deliver brief motivational interviewing to reduce resistance and enhance motivation for behaviour change [55]. Motivational interviewing has been shown to be a promising approach for promoting PA in primary and secondary care [57–59]. Given that clinicians have limited time with patients, an additional intervention could involve oncologists forming referral pathways with not-for-profit organizations, whereby more intensive distance-based PA programs could be offered (e.g. telehealth). Although the most effective interventions are likely to require behaviour change specialist support (i.e. not solely conducted by oncologists), oncologists are likely to be

actively involved in exercise promotion if we are to reach and increase PA in many non-metropolitan cancer survivors [60]. Given that, presently, many survivors receive neither advice or exercise referral as part of routine practice, there is a place for brief interventions, including written exercise prescriptions and other distance-based telehealth interventions, which could promote independent PA.

The desire for external accountability observed in the present study has been described previously in rural [61] and in urban cancer survivors [36]. External accountability appeared to be related to the main PA barrier encountered by participants in the present study: lack of motivation. Psychological barriers including lack of motivation or willpower were cited as the main barriers to PA change in the only other studies exploring influences on PA in non-metropolitan cancer survivors [17, 18]. Whilst it is recognized that external accountability and the desire for monitoring may help facilitate behaviour change in the short term, such externally driven motivation is unlikely to lead to prolonged engagement in PA [52]. The challenge for interventions will be to strike a balance between the provision of support and monitoring in the early stages of behaviour change, whilst fostering more internally driven motivation that will sustain adherence to a physically active lifestyle once external supports are removed.

Age was articulated as a perceived barrier to exercise by a few participants and has been noted elsewhere [62]. However, age as a barrier appeared to be tied somewhat to inaccurate beliefs concerning the intensity of PA necessary to achieve health benefits (i.e. that it had to be vigorous) and/or the belief that vigorous exercise posed health risks. Previous work with rural older adults also found that some doubted their ability to engage in PA or considered PA to be potentially harmful [63]. These age-related beliefs may be reinforced by insufficient patient education, facilitating the view that exercise is not important for a healthy survivorship trajectory. Such age-related beliefs identified in the present study contribute to the literature on cancer survivors where, to date, such beliefs have not been acknowledged as a prominent barrier to PA engagement [44]. Future work will need to consider participants' beliefs regarding ageing and PA and target these in interventions. Such interventions could emphasize the age-related health benefits associated with PA, as well as address concerns regarding overexertion and potential harm.

The lack of PA programs and nearby exercise facilities specifically for cancer survivors was noted by a few. However, lack of programs was one of the least commonly experienced PA barriers in non-metropolitan survivors consistent with one previous study (i.e. [17]) and in contradiction with another [22]. It is somewhat surprising that lack of programs or facilities was noted by few survivors residing in non-metropolitan areas. However, given that the preferred mode of exercise among non-metropolitan cancer survivors is home-based, unsupervised, at moderate intensity, that is primarily

walking [20–22], it is perhaps less surprising that lack of facilities is perceived to be a barrier to participation. These exercise preferences for home-based exercise are not unique to non-metropolitan survivors. Recent reviews report that moderate-intensity walking, after completion of treatment, is the preferred mode of exercise by cancer survivors [44, 64]. It is noteworthy that although the difficult geographical landscape was referred to, such environmental factors may not necessarily be a barrier when self-efficacy and motivation are high. Therefore, interventions for non-metropolitan survivors may do well to focus more on motivational concerns and age-related beliefs rather than environmental barriers.

Clinical Implications

Since most participants were unaware of the PA guidelines (or held erroneous beliefs concerning the intensity required) and the importance of PA for future health, educating survivors about PA guidelines and providing a strong rationale for PA, are priorities. Such information is likely to be more effective if received from the treating oncologist or general practitioner, given the authority of, and trust in the oncologist, evidenced in the present study. It is likely that training is required to help oncology specialists deliver effective brief interventions, such as brief motivational interviewing [40]. Given that motivation was the main barrier to PA, interventions that are matched to exercise preferences, target self-regulation, promote intrinsic motivation and provide regular monitoring are likely to be worthwhile.

Strengths and Limitations

Our study has certain limitations including a low response rate (26%), which may have introduced biases affecting interpretation of findings. Although the response rate was discouraging, it is consistent with previous similar studies in non-metropolitan cancer survivors [18, 20, 22]. Additionally, only two participants were men, and only three participants were from remote and very remote areas, with the majority residing in inner regional suburbs, thereby limiting generalizability of our findings to male and rural cancer survivors. Future work should endeavour to recruit survivors residing in remote and very remote areas to explore whether factors influencing PA engagement differ to those living in regional and metropolitan areas. Further, accurate recollection of oncologist advice concerning PA could also be compromised given the lapse of time since treatment at the time of interview. Finally, we restricted the sample to those insufficiently physically active, thereby precluding comparison to physically active survivors in non-metropolitan areas. The strengths of the study are the recruitment of underserved survivors living in

regional and remote areas from a range of cancer types. This is the first study to investigate knowledge of the PA guidelines, PA advice received from treating clinicians and factors influencing PA behaviour change in non-metropolitan survivors.

Conclusion

Non-metropolitan survivors recalled that their oncologists rarely made specific recommendations concerning PA following active treatment. Knowledge of the PA guidelines was limited with very few survivors aware of the importance of MVPA. Survivors referred to the desire for accountability and monitoring in order to successfully change PA behaviour. Lack of motivation was the main PA barrier. Other barriers included age, health and lack of facilities or exercise programs. Further research is needed to explore factors influencing PA behaviour change in remote and very remote areas to ascertain if there are differences associated with increasing remoteness. Given the findings concerning support from the treating oncology team, future interventions would do well to directly involve oncologists in educating survivors about the PA guidelines and providing a strong rationale for PA. Interventions that promote autonomous motivation and self-regulation are likely to benefit survivors lacking in motivation and warrant further investigation in prospective clinical trials. Future work should explore the efficacy of brief interventions with cancer survivors, such as motivational interviewing and exercise prescription and the feasibility of implementing these approaches as part of routine follow-up care.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

References

- International Agency for Research on Cancer: World Cancer Report 2014. <http://publications.iarc.fr/Non-Series-Publications/World-Cancer-Reports/World-Cancer-Report-2014>.
- Friedenreich CM, Neilson HK, Farris MS, Courneya KS. Physical activity and cancer outcomes: a precision medicine approach. *Clin Cancer Res.* 2016;22:4766–75.
- Keats MR, Cui Y, Grandy SA, Parker L. Cardiovascular disease and physical activity in adult cancer survivors: a nested, retrospective study from the Atlantic PATH cohort. *J Cancer Surviv.* 2017;11:264–73.
- Koutoukidis DA, Knobf MT, Lanceley A. Obesity, diet, physical activity, and health-related quality of life in endometrial cancer survivors. *Nutr Res.* 2015;73:399–408. <https://doi.org/10.1093/nutrit/nuu063>.
- Fong DYT, Ho JWC, Hui BPH, Lee AM, Macfarlane DJ, Leung SSK, et al. Physical activity for cancer survivors: meta-analysis of randomised controlled trials. *BMJ.* 2012;344:e70. <https://doi.org/10.1136/bmj.e70>.
- Stewart J, Manmathan G, Wilkinson P. Primary prevention of cardiovascular disease: a review of contemporary guidance and literature. *JRSM Cardiovasc Dis.* 2017;6:2048004016687211.
- Sattelmair J, Pertman J, Ding EL, Kohl HW, Haskell W, Lee IM. Dose response between physical activity and risk of coronary heart disease: a meta-analysis. *Circulation.* 2011;124:789–95.
- Meyerhardt JA, Heseltine D, Niedzwiecki D, Hollis D, Saltz LB, Mayer RJ, et al. Impact of physical activity on cancer recurrence and survival in patients with stage III colon cancer: findings from CALGB 89803. *J Clin Oncol.* 2006;24:3535–41.
- Friedenreich CM, Wang Q, Neilson HK, Kopciuk KA, McGregor SE, Courneya KS. Physical activity and survival after prostate cancer. *Eur Urol.* 2016;70:576–85.
- Dieli-Conwright CM, Lee K, Kiwata JL. Reducing the risk of breast cancer recurrence: an evaluation of the effects and mechanisms of diet and exercise. *Curr Breast Cancer Rep.* 2016;8:139–50.
- Hamer J, Warner E. Lifestyle modifications for patients with breast cancer to improve prognosis and optimize overall health. *CMAJ.* 2017;189:E268–74.
- Rock CL, Doyle C, Demark-Wahnefried W, Meyerhardt J, Courneya KS, Schwartz AL, et al. Nutrition and physical activity guidelines for cancer survivors. *CA Cancer J Clin.* 2012;62:243–74.
- Tervonen HE, Aranda S, Roder D, You H, Walton R, Morrell S, et al. Cancer survival disparities worsening by socio-economic disadvantage over the last three decades in New South Wales, Australia. *BMC Public Health.* 2017;17:691–6.
- Weaver K, Foraker R, Alfano C, Rowland J, Arora N, Bellizzi K. Cardiovascular risk factors among long-term survivors of breast, prostate, colorectal and gynaecologic cancers: a gap in survivorship care? *J Cancer Surviv.* 2013;7:253–61.
- Australian Institute of Health and Welfare (AIHW). *Australians' health.* Canberra: AIHW; 2014.
- Australian Institute of Health and Welfare. *Cancer in Australia: an overview 2017.* Canberra: AIHW; 2017.
- Fazzino TL, Sporn NJ, Befort CA. A qualitative evaluation of a group phone-based weight loss intervention for rural breast cancer survivors. *Support Care Cancer.* 2016;24:3165–73.
- Olsen EA, Mullen SP, Rogers LQ, Courneya KS, Verhulst S, McAuley E. Meeting physical activity guidelines in rural breast cancer survivors. *Am J Health Behav.* 2014;38:890–9.
- Vander Meer L, Vallance JK, GDC B, Johnson ST. Examining lifestyle information sources, needs and preferences among breast cancer survivors in Northern British Columbia. *Can J Dietetic Prac Res.* 2017;78:212–6.
- Rogers LQ, Markwell SJ, Verhulst S, McAuley E, Courneya KS. Rural breast cancer survivors: exercise preferences and their determinants. *Psycho-Oncology.* 2009;18:412–21.

21. Stevinson C, Capstick V, Schepansky A, Tonkin K, Vallance JK, Ladha AB, et al. Physical activity preferences of ovarian cancer survivors. *Psycho-Oncology*. 2009;18:422–8.
22. Vallance JK, Lavalley C, Culos-Reed N, Trudeau M. Rural and small town breast cancer survivors' preferences for physical activity. *Int J Behav Med*. 2013;20:522–8.
23. Witcher C, Holt NL, Spence JC, Cousins SO. A case study of physical activity among older adults in rural Newfoundland, Canada. *J Aging Phys Act*. 2007;15:166–83.
24. ASGS. Australian Statistical Geography Standard, Remote areas. Canberra: AIHW; 2011.
25. Australian Bureau of Statistics. Australian Statistical Geography Standard (ASGS): volume 5—remoteness structure. Cat. no. 1270.0.55.005. Canberra, 2013: AIHW.
26. Australian Department of Health. Accessibility Remoteness Index of Australia (ARIA) remoteness area. Canberra: AIHW; 2011.
27. Psycho-Oncology Co-operative Research Group. ARIA Lookup tool user guide. University of Sydney, 2018: Chris O'Brien Lifehouse.
28. Australian Institute of Health and Welfare. Cancer in adolescents and young adults in Australia. Cancer series no.62. Cat. No, CAN 59. Canberra, 2011: AIHW.
29. Bleyer A. Adolescent and young adult (AYA) cancers: distinct biology, different therapy? *Cancer Forum*. 2009;33:4–10.
30. Palmer S, & Tomas D. A practice framework for working with 15–25 year old cancer patients treated within the adult health sector. Melbourne, Australia, ontrac@peterMac Victorian adults and young adults cancer service. 2008. <http://www.1.petermac.org/ontrac/pdf/AYA-practice-Framework-pdf>.
31. Brown WJ, Burton NW, Marshall AL, Miller YD. Reliability and validity of a modified self-administered version of the Active Australia physical activity survey in a sample of mid-age women. *Australia and New Zealand J Public Health*. 2008;32:535–41. <https://doi.org/10.1111/j.1753-6405.2008.00305>.
32. Hardcastle SJ, Galliot M, Lynch BM, Nguyen NH, Cohen PA, Mohan GR, et al. Acceptability and utility of, and preference for wearable activity trackers amongst non-metropolitan cancer survivors. *PLoS One*. 2018;13(12):e0210039. <https://doi.org/10.1371/journal.pone.0210039>.
33. Sparkes AC, Smith B. *Qualitative research methods in sport, exercise and health*. London: Routledge; 2014.
34. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006;3:77–101. <https://doi.org/10.1191/1478088706qp063oa>.
35. Hardcastle SJ, Tye M, Glassey R, Hagger MS. Exploring the perceived effectiveness of a life skills development program for high-performance athletes. *Psychol Sport Exerc*. 2015;16:139–49.
36. Hardcastle SJ, Maxwell-Smith C, Zeps N, Hagger MS, Platell C. A qualitative study exploring health perceptions and factors influencing participation in health behaviors in colorectal cancer survivors. *Psycho-Oncology*. 2017;26:199–205.
37. Hardcastle SJ, Glassey R, Salfinger S, Tan J, Cohen PA. Factors influencing participation in health behaviours in endometrial cancer survivors. *Psycho-Oncology*. 2017;26:1109–4.
38. Hardcastle SJ, Maxwell-Smith C, Kamarova S, Lamb S, Millar L, Cohen PA. Factors influencing non-participation in an exercise program and attitudes towards physical activity amongst cancer survivors. *Support Care Cancer*. 2018;26:1289–95.
39. World Health Organization. Health education: theoretical concepts, effective strategies and core competencies. Cairo, 2012:1–82. doi: <https://doi.org/10.1177/1524839914538045>
40. Hardcastle SJ, Cohen PA. Effective physical activity promotion to survivors of cancer is likely to be home-based and require oncologist participation. *J Clin Oncol*. 2017;74:6032.
41. Fisher A, Williams K, Beeken R. Recall of physical activity advice was associated with higher levels of physical activity in colorectal cancer patients. *BMJ Open*. 2015;5:e006853. <https://doi.org/10.1136/bmjopen-2014-00685>.
42. Karvonen KH, DuBose KD, Carney B. Promotion of physical activity amongst oncologists in the US. *J Support Oncol*. 2010;8:35–41.
43. Smith L, Croker H, Fisher A, Williams K, Wardle J, Beeken RJ. Cancer survivors' attitudes towards and knowledge of physical activity, sources of information, and barriers and facilitators of engagement: a qualitative study. *Eur J Cancer Care*. 2017;26:e12641.
44. Clifford BK, Mizrahi D, Sandler CX, Barry BK, Simar D, Wakefield CE, et al. Barriers and facilitators of exercise experienced by cancer survivors: a mixed methods systematic review. *Support Care Cancer*. 2018;26:685–700.
45. Jones LW, Coumeya KS, Fairey AS, Mackey JR. Effect of an oncologist's recommendation to exercise on self-reported behavior in newly diagnosed breast cancer survivors: a single-blind randomized trial. *Ann Behav Med*. 2004;29:105–13.
46. Hardcastle SJ, Kane R, Chivers P, Hince D, Dean A, Higgs D, et al. Knowledge, attitudes, and practice of oncologists and oncology health care providers in promoting physical activity to cancer survivors: an international survey. *Support Care Cancer*. 2018;26:3711–9.
47. Nadler M, Bainbridge D, Tomasone J, Cheiftz O, Juergens RD, Sussman J. Oncology care provider perspectives on exercise promotion in people with cancer: an examination of knowledge, practices, barriers, and facilitators. *Support Care Cancer*. 2017;25:2297–304.
48. Spellman C, Craike M, Livingston PM. Knowledge, attitudes and practices of clinicians in promoting physical activity to prostate cancer survivors. *Health Educ J*. 2014;73:566–75.
49. Park JH, Oh M, Yoon YJ, Lee CW, Jones LW, Kim SI, et al. Characteristics of attitude and recommendation of oncologists toward exercise in South Korea: a cross sectional survey study. *BMC Cancer*. 2015;15:249–57.
50. O'Leary KA, Estabrooks CA, Olson K, Cumming C. Information acquisition for women facing surgical treatment for breast cancer: influencing factors and selected outcomes. *Patient Educ Couns*. 2007;69:5–19.
51. Park JH, Lee J, Oh M, Park H, Chae J, Kim DI, et al. The effect of oncologists' exercise recommendations on the level of exercise and quality of life in survivors of breast and colorectal cancer: a randomized controlled trial. *Cancer*. 2015;121:2740–8.
52. Deci EL, Ryan RM. *Intrinsic motivation and self-determination in human behavior*. New York: Plenum Press.
53. Williams GC, McGregor HA, Zeldman A, Freedman ZR, Deci EL. Testing a self-determination theory process model for promoting glycaemic control through diabetes self-management. *Health Psychol*. 2004;23:58–66.
54. Teixeira PJ, Carraca EV, Markland D, Silva MN, Ryan RM. Exercise, physical activity, and self-determination theory: a systematic review. *Int J Beh Nutr Phy*. 2012;9:78–107. <https://doi.org/10.1186/1479-5868-9-78>.
55. Miller WR, Rollnick S. *Motivational interviewing: preparing people for change*. 3rd ed. New York: Guilford Press; 2013.
56. Hardcastle SJ. Interpersonal style should be included in taxonomies of behaviour change techniques. *Front Psychol*. 2016. <https://doi.org/10.3389/fpsyg.2016.00894>.
57. Hardcastle S, Taylor A, Bailey M, Castle R. A randomised controlled trial on the effectiveness of a primary health care based counselling intervention on physical activity, diet and CHD risk factors. *Patient Educ Couns*. 2008;70:31–9.
58. O'Halloran PD, Blackstock F, Shields N, Holland A, Iles R, Kingsley M, et al. Motivational interviewing to increase physical activity in people with chronic health conditions: a systematic review and meta-analysis. *Clin Rehabil*. 2014;28:1159–71.

59. Barrett S, Begg S, O'Halloran PD, Kingsley M. Integrated motivational interviewing and cognitive behaviour therapy can increase physical activity and improve health of adult ambulatory care patients in a regional hospital: the Health4U randomised controlled trial. *BMC Public Health*. 2018;18:1166. <https://doi.org/10.1186/s12889-018-6064-7>.
60. Hardcastle SJ, & Cohen PA. Reply to S.C. Adams et al, C. Lopez et al, and R.U. Newton et al. *J Clin Oncol*. 2018;36:928–930. <https://doi.org/10.1200/JCO.2017.76.8218>.
61. Frensham LJ, Zarnowieci DM, Parfitt G, King S, Dollman J. The experiences of participants in an innovative online resource designed to increase regular walking among rural survivors: a qualitative pilot feasibility study. *Support Care Cancer*. 2014;22:1923–9.
62. Maxwell-Smith C, Zeps N, Hagger MS, Platell C, Hardcastle SJ. Barriers to physical activity participation in colorectal cancer survivors. *Psycho-Oncology*. 2017;26:808–14.
63. Witcher CSG, Holt NL, Young W, Blanchard C, Murnaghan D, Spence JC. Physical activity perceptions and influences among older adults in rural Nova Scotia. *Can J Aging*. 2016;35:115–29.
64. Wong JN, McAuley E, Trinh L. Physical activity programming and counseling preferences among cancer survivors: a systematic review. *Int J Beh Nutr Phy*. 2018;15:48. <https://doi.org/10.1186/s12966-018-0680-6>.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.