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ARTICLE

The impact of physical activity for recovering cancer patients

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Abstract

Rationale: There is a growing body of evidence that supports the use of physical activity during and after cancer treatment, although activity levels for patients remain low. As more cancer patients are treated successfully and treatment costs continue to escalate, physical activity may be a promising adjunct to a person-centered healthcare approach to recovery.

Aim: The aim was to further understand how physical activity may enhance the recovery process for a group of mixed-site cancer patients.

Objectives: The research investigated longitudinal changes in physical activity and perceived quality of life between 2 and 6 month's post-exercise interventions. It also investigated support systems that enabled patients to sustain these perceived changes.

Method: The respondent cohort comprised 14 mixed-site cancer patients aged 43-70 (11 women, 3 men), who participated in a 2-phase physical activity intervention that took place at a university in the South West of England, UK. Phase 1 consisted of an 8 week structured physical activity programme; Phase 2 consisted of 4 months of non-supervised physical activity. Semi-structured interviews took place 3 times over 6 months with each participant. Grounded theory informed the data collection and analysis which, in turn, facilitated theoretical development.

Findings: Our findings propose 3 theories on the impact of physical activity for recovering cancer patients: (1) Knowledge gained through a structured exercise programme can enable recovering cancer patients to independently sustain physical activity to 4 month follow-up. (2) Sustaining physical activity for 6 months promotes positive changes in the quality of life indicators of chronic fatigue, self-efficacy, ability to self-manage and energy levels & (3) Peer support from patients facilitates adherence to a structured exercise programme and support from a spouse or life partner facilitates independently sustained physical activity to 4 month follow-up.

Conclusions: This study demonstrates that qualitative research can provide an evidence base that could be used to support future care plans for cancer patients. Our findings also demonstrate that a physical activity intervention can be effective at helping cancer patients recover from the side effects of their treatment and we recommend that physical activity should become an adjunct therapy alongside traditional cancer treatments.

Keywords

Cancer recovery, grounded theory, health, person-centered healthcare, physical activity, qualitative research, quality of life, support systems,

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Introduction

Physical activity is beneficial for cancer survivors health [1-6] enabling wide-reaching benefits during and after cancer treatment [5,7,8]. Despite these known benefits physical activity levels across the UK remain low with only 4000 (20%) out of a total of 2 million cancer survivors meeting the minimum recommended physical activity guidelines for sustaining an independent and

disability-free lifestyle [9]. Similar physical activity levels for cancer patients have been reported in Canada and the USA and have been shown to be as low as 37% and 27%, respectively [10,11].

The design of most physical activity interventions have tended to focus on single cancer types [4,12] and structured exercise [13]. Such programmes tend to focus on structured exercise to elicit improvements in fitness [14]. Programmes which adopt a multi-modal physical activity component designed to cater for all cancer types

have not been reported. The prohibitive cost of providing single cancer type programmes could explain the delay in exercise programmes becoming widely available. Furthermore, grouping patients according to cancer type gives prominence to the cancer rather than the individual. A further explanation for single cancer type physical activity interventions could be the kind of research undertaken in this area. For example, government research grants appear to favour a single site approach to research funding which may explain the number of single site studies [15].

As more people are being successfully treated for cancer, there is a need to consider a longer-term approach to addressing patients' health-related quality of life [16]. As cancer-related health problems can persist for many years following treatment, approaches to cancer survival should include the need to help patients self-manage their chronic conditions [17]. Self-management of a chronic condition has been defined as a person's ability to manage the symptoms, treatment and the consequences of living with it [18]. However, such longer-term approaches challenge what has traditionally been a paternalistic paradigm whereby clinicians would give advice and prescribe medication and patients would largely do what they were told [16].

The added value of group *versus* individual physical activity is exemplified by social support and this should be emphasised [19]. Nevertheless, patients can be reticent prior to starting group based programmes as recovery motives focus on personal desires to improve health rather than on a desire to build reciprocal supporting relationships. The effect of group support mechanisms has not been studied through the integration of mixed-site and mixed-stage cancer patients as existing interventions focus on only one type of cancer or disease. Now that patients are living well both with and beyond cancer [20], it could be argued that treatment options not performed in a clinical environment need to better reflect the experiences of daily life for improved community integration.

Cancer treatments have been shown to be cost effective in the USA at \$50,000 per quality adjusted life year (QALY) [21]. In the UK, the NHS has justified the cost effectiveness of new chemotherapy drugs at €73,520/QALY [22]. When this is considered in the context of exercise therapy, where healthcare costs avoided through physical activity have been shown to increase quality of life when compared to 'usual care', the net costs saved per QALY gained vary from £530 to £3,150 [23]. This would suggest that exercise as part of an adjunct therapy alongside cancer drugs could be a more cost effective approach.

By their nature, physical activity interventions that use qualitative methodologies to collect and analyse patient data for chronic disease such as cancer, fit well with the person-centered healthcare approach to health promotion [24]. Placing patients at the centre of the research and using their experiences to inform, improve and develop services further, not only serves to reduce the financial burden of chronic disease to the NHS, but has also been shown to have a positive impact on patient recovery [5,7,8,26]. Miles & Asbridge [24] have identified the

importance of the person-centered healthcare approach in enabling individual clinicians, clinical teams and healthcare systems to assist and accompany patients and their families along their chronic illness trajectories.

The socio-ecological model of health as developed by Dahlgren & Whitehead [25] places the patient at the centre of the healthcare process and builds systems around them to promote their health and wellbeing. This model has been used effectively to promote the health and wellbeing of chronic disease patients through the medium of physical activity generally and specifically for recovering cancer patients [5,7,8,26]. Therefore, the intention of this paper is to further examine the findings from 3 published studies [5,7,8] in order to draw out a series of key themes and ideas that might be used to inform and enhance the recovery process for cancer patients engaging with a physical activity intervention.

Method

Design

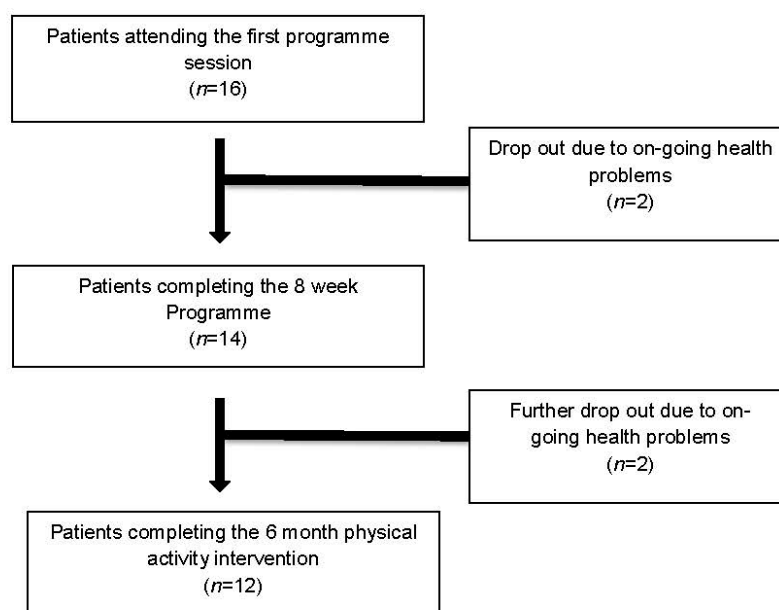
We used a grounded theory approach to analyse the support systems that enabled a group of recovering cancer patients to adhere to a physical activity intervention. The intervention consisted of 2 phases. Phase 1 was an 8 week structured physical activity programme while Phase 2 was 4 months of independently sustained physical activity. The data were collected using audio-recorded semi-structured interviews between March and October 2014 at a university located in the South West of England, UK. The study comprised 3 data collection and analysis stages over 6 months, and provided the opportunity to develop themes and ideas emerging from the first data collection stage at the outset of the study into lines of enquiry at 2 further points in time (4 and 6 months). This approach has provided some explanation of the support systems that enabled these recovering cancer patients to adhere to both phases of the 6 month physical activity intervention.

Study setting

The physical activity intervention evaluated in this paper is the result of a partnership project between a university and a Macmillan Cancer Support Centre in the South West of England, UK. Patients were referred to the programme by health professionals associated with the Macmillan Cancer Support Centre. The programme was delivered by university teaching staff and supported by students. The objective of the 8 week programme was to introduce and promote independent physical activity through home-based strengthening exercise, posture awareness and walking activities. These were incorporated into activities of daily living to promote long-term sustainability.

Patients attended a 2 hour session each week for a period of 8 weeks. The weekly 2 hour session introduced a variety of physical activities and provided the opportunity for informal discussions to support patients. The practical elements of the programme included walking; Nordic

Figure 1 Patients progression through the 6 month physical activity intervention



walking; home-based resistance exercise; swimming; badminton; table tennis; dance; Pilates; flexibility, balance and posture exercises and gym-based resistance and cardiovascular equipment. Tasks were agreed on a weekly basis and patients were encouraged to wear a pedometer to independently monitor daily physical activity.

Participants

Having agreed to take part in the programme, 16 patients volunteered to participate in the research. Patients were selected on the basis of a convenience sample, as is congruent with grounded theory research [27,28] and all were provided with an information letter and consented to being interviewed at 3 designated points over the 6 month data collection period. Data collection took place prior to the take-up of the 8 week programme, following completion of the programme, 4 months after programme completion. At the time of the research 2 patients were waiting to join the programme but were unable to do so because of on-going health problems. Therefore, 14 patients were interviewed on all 3 occasions over the 6 month period (42 interviews in total). Likewise, 14 patients attended the 8 week programme. Four of the 14 patients (negative cases) were unable to sustain independent physical activity due to on-going health problems (Figure 1). However, all 4 attended the final interview at the 6 month point and were included in the analysis to provide an alternative perspective [27].

Data collection methods

Semi-structured interviews were recorded on Olympus Digital Voice Recorders, transcribed *verbatim* and anonymised. The interviews took place on the university campus on all 3 occasions. To describe the study all patients were asked questions relating to their socio-demographic and morbidity characteristics at the start of the first interview (Table 1). The University Research Ethics Committee approved the research.

Table 1 Patients' socio-demographic, morbidity and pre-intervention diagnosis characteristics

| Characteristics | Patients Men ^a n (%) | Patients Women ^b n (%) |
|-------------------------------------|------------------------------------|--------------------------------------|
| Gender | 3 (22) | 11 (78) |
| Age in years [mean (SD)] | 68 (2.1) | 52 (9.7) |
| Ethnicity/Race | | |
| White | 3 (100) | 11 (100) |
| Cancer diagnosis | | |
| Breast | 0 (100) | 10 (90) |
| Prostate | 3 (100) | 0 (100) |
| Mouth | 0 (100) | 2 (20) |
| Kidney | 0 (100) | 1 (10) |
| Skin | 0 (100) | 1 (10) |
| Pre-intervention diagnosis in years | 7 (67) | 2 (75) |
| | 8 (33) | 3 (25) |

^a n=3 ^b n=11

Data analysis

The following data analysis techniques were applied to the 3 studies by Queen *et al.* [5,7,8]. The memoranda that emerged from the 3 previous coding processes were used

as the method for generating grounded theory in this study. We used the memoranda as a means of describing and explaining patient experiences of the support that they received to adhere to the programme and sustain their physical activity for 4 months. We manually analysed the data in order to understand fully the richness of the life experiences on offer [29]. To ensure a robust approach to the application of grounded theory, a number of critical characteristics were implemented throughout the data analysis. These included consecutive data collection and analysis over a 6 month time period. This enabled the analysis to cyclically inform the data collection process as is recommended in grounded theory studies [30]. Sequential analysis facilitated the development of concepts and categories from the data while at the same time allowing new possibilities to emerge from the data *via* subsequent data collection episodes. Detailed guidance for the initial data analysis (open and axial coding) was provided by the first author to the 3 members of the research team to enable a consistent approach. The first author checked the analysis for consistency and reviewed the concepts and categories from the data in order to assure the continuation of theoretical development. Memoranda were used to formulate questions for subsequent sets of interviews. The first author advanced theoretical development through selective coding and the application of the axial coding paradigm. For details, see Queen *et al.*, [5,7,8], the fourth author assisted by reviewing this process [27]. Memoranda were used to explore the different dimensions of the emergent themes from the axial coded data and the first author reviewed this process. The final analytical characteristic used to ensure a robust approach to grounded theory analysis was the construction of the end product of the research [30]. This involved the first author selectively coding the data [27] and developing a 'core story' from the axial coded memoranda. This, in turn, led to the development of the 3 conceptual models (see Queen *et al.*, [5,7,8]). This was followed by descriptive accounts of the findings, supported by evidence from the lived experiences of the patients in the study.

Traditionally, the rigour and quality of qualitative research has been judged through the application of a parallel perspective to the criteria of internal validity, external validity, reliability and objectivity as identified by Lincoln and Guba [31]. Their parallel perspective considered applying a range of trustworthy principles that included credibility, transferability, dependability and confirmability. However, this approach has come into question in recent years. For example, Sparkes and Smith [32] have directed a number of criticisms towards Lincoln and Guba's [31] trustworthiness perspectives which include: the lack of rationale for the criteria used; different interpretations of some of the techniques such as member checking; a lack of appropriateness of some of the techniques to establish trustworthiness and a sense of ambivalence and unpredictability around the originally devised criteria [32].

Therefore, to enhance the quality of the studies reviewed in this paper [5,7,8], the following principles of what constitutes excellence in qualitative research were adapted from Tracey [33] and applied throughout: (i)

worthiness of the topic and *significant contribution of the work* achieved *via* contribution to debates on support systems necessary to promote physical activity behaviour for patients with chronic diseases; (ii) *rich rigour* through the application of grounded theory techniques; (iii) *resonance* through the transferability of the findings to similar exercise programmes in similar situations and (iv) *sincerity* through the use of the participant voice. To enhance transparency, the study included an audit-trail of the data collection and analysis process including: audio recordings; transcripts; coding; the development of 3 theoretical frameworks and 3 conceptual models.

Results

As noted above, the following discussion comprises an analytical overview of the findings from 3 previous studies [5,7,8] concerning person-centered approaches to healthcare for a group of recovering cancer patients. The medium of physical activity enabled patient participants to start taking control of their recovery process which, until that point, had been largely controlled by those within the medical profession. The overview is presented in 3 sections. The first section explores longitudinal changes to physical activity [5]. The second examines the perceived changes to quality of life indicators [7]. The third section investigates the support systems that enabled these lifestyle changes to occur [8].

Longitudinal changes to physical activity

The aim of the first study was to examine the impact of an 8-week exercise programme for a group of recovering cancer patients on sustaining physical activity at 4 month follow-up [5]. Prior to engaging with the intervention only 20% of the patients perceived themselves to be physically active. Following completion of the programme, 84% of participants considered themselves to be meeting the guidelines of 150 minutes per week of moderate intensity activity. At the 4 month follow-up point this had reduced to 67%. The key themes emerging in relation to increased levels of physical activity were: motivation, measures to increase physical activity and physical activity outcomes.

Motivation

At the 4 month follow-up explanations for what had helped patients to sustain their physical activity included experiencing 'health and fitness gains' and taking ownership of their recovery through the 'application of knowledge' gained from the programme. For Patient 10, it was feeling the benefits of exercise that had motivated her to continue exercising:

"It motivates itself really. The more exercise you do, the better you feel and it spurs you on to continue to do more. The course [programme] actually did make a big difference to me. Purely it motivated me."

Similarly, Patient 4 expressed how she had developed an understanding of her exercise capability while on the programme and this had enabled her to continue to be physically active:

“The programme helped me to know my ability, what I could do. I was initially a bit nervous of what I could do. Doing the programme helped me to find my body and what I was really capable of again.”

For a number of patients, it was their ability to apply the knowledge gained from the programme that had proved something of a ‘benefit’ (Patient 3) and, in particular, how such knowledge had ‘motivated’ (Patient 12) them to ‘keep healthier’ (Patient 11).

Measures to increase physical activity

The majority of patients had increased the frequency of their physical activity over the 6 month data collection period. Patient 2 highlighted that while on the programme she had learnt how to walk for health and fitness gains. As she became fitter, she was able to increase her walking intensity:

“Because I can now walk properly I walk much more ... and now because I can do it, I will do it. I go for the hills and I can now get half way. I know where there is a gap in this particular hill and I can get up there without stopping.”

Most of the patients used their pedometers as a motivational tool to sustain physical activity to follow-up, considering them to be an effective means of self-monitoring their fitness gains. Pedometers gave them tangible feedback on their progress and consequently they were able to see how they had increased their physical activity. For the majority of patients their increased physical activity related to increasing their duration or frequency of walking. Prior to her diagnosis, Patient 4 only participated in one exercise class per week, yet over the 6 month data collection period she had increased her physical activity levels and had also changed the type of exercise from attending a gym to walking:

“I am doing more walking, say five out of the seven days. It’s usually about 40 minutes. I think it is just less than two miles. I think I’m doing more walking, because it’s compensating for not doing the gym in a way.”

Patient 3 also reflected upon how she had increased her physical activity over the duration of the 6 month data collection period. This related to how she had increased the number of times that she had used the pedometer:

“Then I was using it [the pedometer] I suppose about four days a week. I’m going out walking perhaps not so far but nearly every day, five or six times a week. I’m more aware that I need to keep it up which is something that the course [programme] has got me into. It makes you aware that you can’t just let these things go. It is a key message.”

Likewise, Patient 2 found that using a pedometer had helped to increase the duration and frequency of her walking since completing the programme:

“I reckon I’ve gone from 2,000 to 4,000 and some days I’ll do 6,000 steps which is massive. It does fluctuate but I’m walking for about four or five days a week now which has much improved.”

Patient 12 explained how he too had used a pedometer to help him increase his physical activity:

“When I started out, I used the pedometer 5,000 or 6,000 steps a day. I found ways of increasing that little by little and perhaps at a peak I can get 14,000 to 15,000 steps on the pedometer. But now I can keep it above 10,000 virtually all of the time.”

Physical activity outcomes

The majority of patients (67%) felt much better as a result of developing a physically active lifestyle. Patient 13 put this down to having a lot more energy than she had previously had:

“I am feeling much, much better. There is a lot of progress and a lot of energy building up. Before I was feeling a lot weaker, the following day I would be feeling low. But now I’m waking up every day and feeling much better.”

Patient 12 also reported feeling better and was able to say how his increased levels of fitness had enabled him to take regular walks:

“I can now do my trips across the moors to pick up my newspaper. I cancelled the delivery of my newspaper to encourage me. In myself I feel charged when I come back from it. I’m huffing and blowing a bit but by golly I’m up there you know, I really am. I feel fulfilled.”

Patient 8 expressed that she was feeling more energetic as a result of her increased levels of fitness, to the extent that she had returned to work:

“I’m feeling good. Energy levels are starting to come back a bit ... I think the fact that I had been doing exercise helped to increase my stamina, so I was more able to face going back to work. But, yeah, I’m feeling good.”

Patient 2 believed that it was her participation in the programme that had enabled her to continue getting fitter and feeling better:

“I am fitter, I am better ... and because of your course, I have accepted another course. It is not as sophisticated, neither is the equipment, but what the lady does is almost one to one. Your course [programme] encouraged me to say yes to hers and now I’m getting better and better.”

Contrary to these experiences, 33% of patients were unable to sustain post-intervention physical activity.

Explanations for such decreases included: new diagnosis a limited range of motion following surgery; returning to work and a lack of sessions at other times. For Patient 11 her lack of progress related to further medical complications:

“There is a slight problem that I have got lymphedema now, and that’s stopping me from doing a few things. Yes, so movement can be difficult and sometimes I am in quite a lot of pain.”

Similarly, the development of a new cancer had made it difficult for Patient 9 to continue being physically active:

“I initially had a peak and felt really positive and driven again but since then another cancer has been diagnosed. It has been cut out but it just was another blow.”

Patient 8 had not been able to do as much as she would have liked to due to her limited range of motion following surgery:

“My levels of physical activity have been a little bit complicated by the fact that I’ve had my reconstructive surgery, I’ve not been able to do as much as I wanted to.”

For the majority of patients, gym type activities had decreased. The main explanation given for this was not finding a suitable time to attend. Patient 10 stated how she would have liked the programme to have continued because it had enabled her to see a way forward following her recovery from cancer:

“It would have been nice if it had been longer but obviously I appreciate there is a cost to it and there are a lot of us out there who can benefit from it. It was good fun, the trainers are lovely and I would recommend that people do it because it really does give you that first jolt. You realise that there is life ahead, and there’s good life ahead, it’s not just plodding along.”

Similarly patient 13 also felt that the programme was too short and appeared to be at something of a loss now that it was over:

“The course seems so short after finishing the 8 weeks. It felt short and then when it’s finished you get a bit stuck. We just dispersed; maybe we should have made a plan together before we left. We used to share jokes, that really had an impact and made a difference, we all had a special understanding.”

Despite a reduction in the amount of gym type activities that were reported by the majority of patients, it was clear that their experiences of physical activity, along with the related knowledge and skills that they had developed while on the programme, were enough to motivate them to develop physically active lifestyles. To this end, all of the patients were of the opinion that their newly developed lifestyles had helped them with their recovery from cancer.

Perceived changes to quality of life indicators

The aim of the second study was to examine perceived changes to the quality of life for a group of recovering cancer patients, following 6 months of physical activity [7]. Two main themes emerged from these findings. The first related to how patients’ engagement with the physical activity intervention had enabled them to start taking control of their recovery. The second related to the perceived improvements to quality of life indicators which the patients believed were a result of their engagement with the 6 month physical activity intervention.

Taking control

All of the patients who had been able to sustain their physical activity up to the 6 month follow-up point believed that their engagement with the 6 month intervention had enabled them to start taking control of their recovery from cancer, which, up until that point, had been in the hands of the medical establishment. One of the ways in which patients felt empowered to regain control of their lives through physical activity was *via* learning about exercise, as Patient 4 explained:

“I’ve learnt that I can swim better using my arms and my legs. There are a few tips that I’ve picked up along the way. The exercises that we were given and the bit of homework we were given each week, it’s been helpful.”

Likewise Patient 10 had learnt that physical activity could be fun and that when it was, it was possible to be physically active without realising that you were actually doing it:

“The programme pointed the way to keeping fit while having fun such as badminton and table tennis. We even went out and played a tag game in the field, as well as orienteering and stuff like that. These were all ways of keeping fit without realising you’re doing it.”

A number of other patients identified that as they had become fitter, they were able to do more, which, in turn, made them feel like they were taking control of their recovery. Patient 2 explained that as she had become more active, she realised that she did not want to go back to a stagnant way of life:

“I’m doing more and I’m feeling good about doing more. That is my aim to keep going on. I don’t want to stagnate again, like I did before.”

Patient 10 said that since the programme she had been doing more, which was making her feel better:

“On the whole, there is definitely a link between me doing more and me feeling better within myself. It spurs me along as well.”

Such experiences also played out in relation to notions of ‘independence’. Patient 14 explained how she had

purchased some exercise equipment to enable her to become physically active independently of the programme:

“I bought one of those balls you can sit on in front of the TV, the bands, hoola-hoop and skipping rope. So I’m going to make time and they said even if it’s only 5 minutes now and 5 minutes later on, that’s 10 minutes you would have done.”

In the same vein, Patient 12 explained how he was developing his physical activity independently of the programme by exercising in his garage at a pace that he could manage:

“Now I am able to put a mat down in my garage at home, and go through those exercises, little by little at a speed that I can manage.”

Improved quality of life indicators

Having completed the 6 month intervention, the patients identified perceived improvements in a number of quality of life indicators. These related to: self-management, self-efficacy and chronic fatigue. Prior to taking part in the physical activity intervention, patients held differing views as to whether it would help them to self-manage their recovery from cancer. Some believed that it would help, while others did not.

The majority of the patients stated that they had low energy levels and were concerned that this would make it difficult for them to engage with the physical activity programme. Patient 10 said that she did not feel that she had enough energy yet to exercise:

“In general terms I am still very well off I mean I can do most things ... I just feel that, I haven’t quite got that energy back that I need to exercise.”

Patient 7 was anxious about having enough energy to exercise:

“I feel slightly anxious yes, because my energy levels are much lower than I like and I get tired very quickly.”

Similar explanations were given by many of the patients in relation to concerns about their levels of fatigue and how this might impact on their ability to complete the programme. Patient 10 was also anxious about whether she would be able to do the exercises and cope on the programme:

“A bit of nervousness of about what I will be able to cope with I suppose, I’m hoping that there will be people there telling me when I’m doing it right and when I’m doing it wrong.”

For Patient 8, her concerns related to the residual fatigue she was still experiencing following her treatment and how this made her feel tired the day after physical activity:

“I’m hoping it will help it. Improving my stamina because I do find that I fatigue quite easily. For example

we had quite an active day yesterday and I feel today, not overly but I just feel weary today, I get residual fatigue. If I have a busy day one day, I feel it the following day and I would like to think it would improve my energy level.”

Patient 14 hoped that engaging with the programme and becoming more physically active would give her more energy and motivation to start doing more, as the chronic fatigue associated with her treatment had prevented her from becoming active:

“I’m hoping it will make me more positive and give me a bit more get up and go, a bit more motivation. I think at the moment my lack of motivation is to do with the treatment but I’m hoping it will have a positive effect and give me the energy to go and do something.”

In turn, several patients perceived themselves to have low self-efficacy and several of them considered themselves to be depressed. Patient 1 explained how he felt weak as a result of his cancer treatment and how this had left him feeling frustrated:

“Yes, there’s a lot I can’t do and I get frustrated because I can’t do it. I just haven’t got the strength. I’ve been told not to use the word ‘can’t’, that’s the negative side, I’ve got to look on the positive side.”

Similarly for Patient 13, her lack of self-efficacy related to feeling weak and depressed as a result of her cancer diagnosis:

“Feeling weak, depressed, anxious and the thought of not trying to think I’ll not do anything again in my life, and the thought that this is the end and that it’s collapsing on top of me.”

In contrast to the depressive views expressed by some of the patients, Patient 8 was of the view that taking part in the programme would help her to continue self-managing her recovery:

“I think I self-manage quite well, I think it will give me a little boost a little bit of extra support, a bit more of an incentive to carry on.”

Likewise Patient 4 also thought that the programme would help her to continue to be physically active after she had completed it:

“I’m hoping it’s going to have quite a big impact and that I carry on. I do enjoy swimming but hopefully there’s going to be a few things that I would hopefully carry on.”

In contrast to those patients who thought that the programme would help them to self-manage their recovery, a minority were unsure if it would. Patient 13 did not feel that she was ready to self-manage as she was still undergoing medical treatment:

“I really need that kind of support at the moment as I am not at full recovery. I need the doctors to keep an eye on

me, of course there is need for medical support. Something could happen whilst I'm doing the exercises, so I have to check with the doctors that things are going well for me."

Patient 5 stated that he did not believe the programme would have any impact on his ability to self-manage in his current situation, as his wife would be able to support him if necessary. However, Patient 5 also believed that if this was not the case, the programme would help with his independence:

"It's a difficult one, me personally, it won't make any difference to me being independent. Because I'll never really be on my own to have to do it independently but if I was, it would be a marker to get up and do it."

Support systems enabling lifestyle changes

The aim of study 3 was to examine the support systems that enabled a group of recovering cancer patients to sustain physical activity for 6 months [8]. Two key themes emerged from the findings. The first related to support systems necessary to adhere to a structure physical activity programme while the other related to support systems for sustaining independent physical activity up to the 4 month follow-up point.

Support from exercise professionals has long since been seen as critical to patient engagement with such interventions and this programme was no exception. Patient 2 explained how the exercise professionals had been extremely supportive and that this had provided reassurance to patients:

"The three instructors were utterly devoted to us. There was somebody familiar for us to turn to if we needed. We had complete support from all the team involved and it made us all feel as if we were the only people they were looking after."

In the same way Patient 1 had a similar view about how supportive the team of exercise professionals were:

"It was the team, yes in all honestly I couldn't turn and say one did any more than the other, they were all brilliant."

There was a strong supportive group dynamic between the instructors and the patients. This enabled patients to help support each other as the group was empathetic, sociable and friendly. Patients also spoke positively about the support which they had received from each other during the 8 week programme. Patient 8 explained that she encouraged other patients to push themselves a little further when they were exercising on the treadmill:

"We would be trying to walk a certain distance, say half a kilometre and when we had done half a kilometre I would say shall we do a bit more. For the people that were finding it difficult I think I was of helping them, motivating them a little bit."

The establishment of friendship groups was similarly important. Patient 3 who was one of the quieter group members explained that the equipment layout in the gym, with the treadmills being side by side, made it easy to talk to other patients while exercising:

"I didn't make friends with many people on the course but I am quite a loner anyway. Chatting to a lady who was a runner enabled me to learn a bit more about using the equipment, although the staff did too. The walking machines were quite good for that because you were in a row and you could talk and get to know people."

Supportive for some was the competitive element that emerged between some of the older and younger patients in relation to their weekly pedometer scores, as Patient 9 explained:

"It becomes competitive, you want to do more than you did last week because that girl over there did 8000 steps and I only did 4000. There were a couple there who were a bit younger than me and I wanted to prove you didn't have to be young to be fit."

A contrasting perspective in relation to peer support was given by Patient 4 who explained how she found it helpful just being in a group with other recovering cancer patients. While not wanting to discuss her own cancer with other patients, she found that listening to other patients discuss their cancer was helpful:

"It was nice being in a group with the other people, you see for yourself that others are in similar situations. I'm the type of person that does not tend to talk very much about my cancer and a lot of them did, so I would sit and listen."

Of course, patients also relied upon a range of broader support mechanisms to sustain their independent physical activity up to the 4 month follow-up point. A variety of examples of support were provided that included friends, family, support group, self-support, peers, partners and spouses. The most common source of support came from the person closest to the patient, which was either their spouse or life partner.

Interestingly, the 2 patients who had not managed to sustain their physical activity up to the 4 month follow-up point did not have any support from either a partner or spouse. Patient 14 described how she found it hard to continue being physically active, as her husband worked away and was unable to support her to keep up her activity:

"It's difficult with my husband working, I have got friends but they have their own lives to live, and during the evenings they are out doing their own thing. So it is hard not having my husband here and I don't know if there is any other support people could give me."

Patient 9 explained how she had always been an active person until she had been diagnosed with cancer and that the programme had initially motivated her to become active. However, further health problems and a lack of

support had prevented her from sustaining her physical activity:

“I was always motivated, I did not need any drive, I have never needed a push until I got this cancer. It did knock me backwards but when I went on that program I thought crikey I can do more than I think. I really felt upbeat and then of course things happen in life and I’ve had a few knock backs.”

Prior to participation in the physical activity intervention the patients thought the support that would enable them to adhere to both of the physical activity phases would come from family and friends. Having completed Phase 1 (8 week programme), the majority of the patients identified that it was the exercise professionals and the peer support group they formed that motivated them to adhere to the programme. As we have seen, the patients also identified that the main person who supported them to sustain physical activity during Phase 2 (4 month follow-up), rather than coming broadly from friends and family as they predicted, came specifically from a spouse or life partner. Patient 1 explained how his wife encouraged him to “leave the car and walk”.

Similarly Patient 8 explained that her husband supported her by joining her on the walks:

“Hubby has been supporting me because we’ve been going out for walks in the evening after work. So I’m getting him back into exercise as well.”

Likewise Patient 2’s partner also joined her when she exercised by taking the dogs out for walks together:

“My partner has always been very keen to support me because she is very active. So when we can, we get out and take the dog for a walk together, which is terrific.”

Discussion

This research project had 3 objectives. Firstly, to examine the impact of an 8-week exercise programme for a group of recovering cancer patients on sustaining physical activity [5]. Second, to investigate the perceived changes to quality of life indicators for the patients following 6 months of physical activity [7]. Finally, to examine the support systems that enabled the patients to sustain physical activity [8].

One of the key motivational factors identified by the patients was their desire to become fitter and healthier. A desire to be fit and healthy has been highlighted by other studies [34,35] as well as patients wanting to take ownership and some personal responsibility for the recovery process [36]. By design, physical activity programmes necessitate patients being an active part of the treatment process rather than passive recipients. Determining whether patients take ownership can be shown by their continued involvement in physical activity after the programme has finished. In our 4 month follow-up, patients had remained physically active. This was attributed to having gained knowledge and understanding

about exercise during the programme that could apply to their personal circumstances. In addition to what they had learned they had also experienced the physical benefits first hand and realised they were capable without specialist support. Thus, the motivation patients had to start the programme, had been re-enforced through increased experience, knowledge and capability by the time the programme had finished, enabling sustained physical activity to the 4 month follow-up.

While physical activity has a role in improving self-reported quality of life for recovering cancer patients, the structure and design of a programme can also be of relevance [37]. Previous research has compared a group intervention to an individual approach to physical activity [38] finding that while quality of life improved in both groups of breast cancer survivors, only those in the individual intervention experienced a significant improvement compared to usual care [38]. The findings presented here are in contrast to those of others [38], in that they are group-based interventions and the majority of patients reported improvements in their quality of life. However, differences in study design and approach preclude detailed comparisons.

Improvements in self-efficacy have been associated with increased physical activity [39] at light to moderate intensity [40], supervised and not conducted at home [41]. The findings from our study are in agreement with others [39-41] as self-efficacy improved with 8-weeks of light to moderate physical activity. However, our findings also contrast to that of others [39,40], as the main explanation given for improved self-efficacy in our study related to the patients knowing that non-supervised or structured physical activity was possible for them.

Chronic fatigue has been reported as a significant barrier to physical activity participation for breast cancer survivors [42]. Prior to the take-up of the programme in our study half of the patients reported reduced mobility and chronic fatigue following surgery, chemotherapy or radiotherapy, as barriers that might prevent them from participating. Reductions in fatigue have been associated with increases in physical activity for recovering cancer patients [43]. Our study also found that most of the patients reported decreases in fatigue and increased energy levels following the 6-month physical activity intervention.

Our study has provided valuable insight into the support systems that enabled a group of recovering cancer patients with mixed-stage and mixed site cancers, to adhere to a 6 month physical activity intervention. The patients highlighted how being on a programme with other recovering cancer patients enabled them to gain a perspective on their own cancer. The support that the patients received from each other gave them confidence to engage with and adhere to the structured phase (8 weeks) of the intervention. This in turn gave the recovering cancer patients the confidence to continue with physical activity up to the end of second phase of the intervention to sustain physical activity levels independently. Physical activity was sustained with the support from their ‘life partners’ who provided the support to continue being physically active beyond the initial 8 week intervention. As reported

[5,7,8], physical activity was significant in the recovery process of the patients in this study.

This study supports the findings of others who have established that group-based exercise programmes can be beneficial for cancer patients [44-46]. The patients featured here also placed a great deal of importance on the support they received from group members that enabled them to adhere to the structured phase of the intervention. However, patients supported each other informally, as they got to know each other during the 8 weeks, without the pressure that can arise during a structured discussion group. Informal support during group exercise programmes has been shown to be a preferable option to more focussed group therapy sessions that patients would not have chosen to be part of [44]. As with the present study, the participants noted feelings of empathy and acceptance and found the groups were useful in terms of exchanging information and forming new friendships [44]. In a similar intervention, despite participants' initial motivation being the personal desire to improve their own health, the incentive to attend included a sense of group membership [46]. The patients in our study noted how they were able to make comparisons to others that led to increased understanding of different coping methods. This helped them to gain a perspective of their own cancer and in turn reduce their anxiety levels, as has been shown elsewhere [45].

In contrast to the internal aspects of support already identified [37,44,45], the participants in our study identified a range of external support factors that helped them to independently sustain their physical activity up to the 4 month follow-up. These factors were external to those directly associated with the implementation of the programme and included support from friends and family and self-support. However, we found that the most effective means of support for independent physical activity specifically came from a life partner, not from wider family or friends, which is where the patients originally expected support to come from.

This study adopted a person-centered healthcare approach [24] through adapting the socio-ecological model of health [25] that placed the patients at the centre of the research process. This process has provided further evidence of the positive impact of physical activity on the recovery process for cancer patients. While an economic impact assessment was not carried out as part of this study, patients reported many perceived improvements in quality of life indicators. Consequently, this would support the view that exercise as an adjunct therapy alongside other cancer treatments such as chemotherapy, should be considered as they could lead to a more cost-effective approach to cancer survivorship. This is pertinent to note when cancer drugs can be justified to the NHS at a cost of €73,520/QALY [22] and exercise therapy has been shown to improve quality of life compared to normal care at a cost of between £530 to £3,150 per QALY gained [23].

Conclusion

Our intention within this paper has been to consider the experiences of a group of 14 mixed site cancer patients during a 6 month period of physical activity. We have shown that qualitative research can provide an evidence base that could be used to support future care plans for cancer patients. This study demonstrates that a physical activity intervention can be effective at helping cancer patients recover from the side effects of their treatment and we recommend that physical activity should become an adjunct therapy alongside traditional cancer treatments. Through using a grounded theory approach we have developed and propose the following 3 theories on the impact of physical activity for recovering cancer patients:

- (1) Knowledge gained through a structured exercise programme, can enable recovering cancer patients to independently sustain physical activity to 4 month follow-up.
- (2) Sustaining physical activity for 6 months promotes positive changes in the quality of life indicators of chronic fatigue, self-efficacy, ability to self-manage and energy levels.
- (3) Peer support from patients facilitates adherence to a structured exercise programme and support from a spouse or life partner facilitates independently sustained physical activity to 4 month follow-up.

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