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'Just because I have prostate cancer doesn't mean that I can't do things' – men's experiences of the acceptability of an exercise intervention for prostate cancer during treatment

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Abstract

Background Structured exercise has an important role in mitigating the extensive side effects caused by ongoing prostate cancer treatments, specifically androgen deprivation therapy (ADT) and radiation therapy (RT). Little is known about men's experiences of, and preferences for, structured exercise programmes during active cancer treatment. This study aimed to inform the acceptability of a 6-month supervised intervention that emphasised increasing and varied intensities of aerobic and resistance exercise, by exploring the experiences of men who participated.

Methods Individual semi-structured interviews were conducted with an interviewer independent of the exercise study and data was analysed using a descriptive qualitative design.

Results Twelve prostate cancer patients were interviewed including participants who completed ($n=9$) and withdrew from ($n=3$) the intervention. Four main themes captured how men experienced the intervention: (1) Navigating the Unknown: Building confidence amidst vulnerability (subtheme- pushing the limits), (2) Building Trust: The credibility and approach of the exercise instructor (subtheme- appropriateness of supervised vs. independent exercise), (3) Flexibility in Delivery, (4) Finding Purpose: Exercise as a means of escapism and regaining control during treatment.

Conclusion While an initial lack of self-confidence can be a barrier to exercise participation, exercise programmes have the potential to provide psychosocial benefits, rebuild confidence and empower men throughout their cancer treatment and into recovery. Structured exercise is acceptable during treatment including RT and can offer a form of escapism and sense of control for men navigating their cancer journey. Trust building, flexible delivery and credibility alongside a challenging exercise prescription are important facilitators of acceptability for men. Strategies to embed

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exercise from the point of diagnosis through ADT and RT should reflect men's experiences of exercise during treatment.

Trial registration The trial has been registered on ClinicalTrials.gov as of the 14th of December 2021 (NCT05156424).

Keywords Exercise oncology, Cancer treatment, Confidence, Exercise instructor, Radiation therapy

Introduction

Prostate cancer has a 10-year survival rate of 98%, resulting in 3.1 million prostate cancer survivors in the United States alone [1]. This low mortality rate is mainly due to advancements in detection and treatment modalities but has in turn resulted in a large number of individuals living with the side effects of prostate cancer and its treatment [2]. For those with intermediate and high-risk prostate cancer a common treatment option is radiation therapy (RT) in conjunction with androgen deprivation therapy (ADT). The side effects from this treatment combination are vast and include body composition changes, loss of physical function, gastrointestinal symptoms, rectal bleeding, urinary incontinence, erectile dysfunction, increased psychological distress and fatigue [3–5]. Men experience a decline in quality of life (QoL) during and following a prostate cancer diagnosis [2], which may be due to the cancer diagnosis, current comorbidities as well as treatment-related side effects [6]. There is a growing need for accompanying therapies to combat the side effects experienced by men with prostate cancer. [7].

Exercise has shown promise, through all stages of the cancer continuum, at combating associated side effects such as anxiety, fatigue, and declines in physical function and quality of life [8]. The evidence-base established has led the American Society of Clinical Oncology to publish guidelines stating that oncology providers should recommend regular aerobic and resistance exercise during active treatment with curative intent [9]. There is a growing call for the integration of exercise as an adjunctive therapy within the conventional cancer care pathway [10]. Despite these recommendations, men with prostate cancer remain largely inactive, with studies reporting as little as 12% achieving sufficient exercise levels post active therapy [11]. The period following a cancer diagnosis and during active therapy is also recognised as a challenging phase of a patient's cancer journey to remain physically active [12, 13]. One barrier identified for the underutilisation of exercise as a therapy pertains to the absence of appropriate referral programmes [14]. Research is required to develop effective strategies and programmes to support physical activity or structured exercise throughout the cancer journey.

For the implementation of programmes to be effective in prostate cancer, it is vital to ensure that programmes are acceptable to men [15]. In order for acceptability to be understood, intervention design should consider the

psychosocial barriers men may face when engaging with health and exercises services [16], and how prostate cancer may undermine their sense of self and masculinity [16, 17]. Gaining a deeper understanding of men's experiences, challenges and preferences could potentially aid recruitment into, retention in and acceptability of exercise interventions for men with prostate cancer, and more broadly, the translation of exercise interventions into practice [18]. Qualitative findings may also uncover intervention impacts not otherwise captured through other assessment methods or enhance quantitative findings [19]. Therefore, examining the experiences of men with prostate cancer participating in an exercise intervention that spans across multiple stages of their cancer journey is valuable.

Some qualitative studies have explored the views of men with prostate cancer on exercise and their experience of various interventions [20–23]. These include experiences of a recreational football programme [20], a physical activity and yoga programme [22], a combined exercise and nutrition lifestyle management programme [23] and a structured exercise only intervention [21]. Findings from these studies have highlighted the perceived physical and psychological benefits experienced by participants taking part in an exercise intervention. Facilitators such as a knowledgeable instructor and peer support from fellow prostate cancer patients have also been highlighted [20–23]. While previous research has highlighted the importance of exercise interventions, there is limited exploration of the male experience and how such interventions may impact men specifically. Indeed, there is a lack of research of men's experience with navigating the cancer care continuum generally [24].

In line with reports for the importance of supervised and progressive exercise, tailored to individual participants with variety in intensities and volumes [25], we implemented a 6-month supervised intervention that emphasised increasing and varied intensities of aerobic and resistance exercise, utilising a 1-to-1 or small group delivery format. Unlike other studies, the majority of men were commencing active treatment, both ADT and RT. This study aims to explore the experience of these men and their views on the acceptability of supervised and progressive exercise during this challenging treatment period.

Methods

Study design

A qualitative descriptive design was employed. This design was chosen as it aims to stay close to and describe the participant's experiences and perceptions [26, 27]. A qualitative descriptive design recognises the subjective nature of the collective experience and is particularly relevant in healthcare research which is concerned with how patients experience illness and associated healthcare interventions [27]. Furthermore, this approach helps to identify the specific barriers and facilitators men face in accessing and adhering to health interventions [27], such as exercise programmes during prostate cancer treatment, and the impacts of cancer on men [24]. The research team comprised of individuals with varied backgrounds, which helped to provide a broader perspective and reduce individual biases. The team consisted of KM who has a background in RT and led the development and implementation of the exercise intervention as part of her PhD in exercise oncology. It included MH, BK and CF who are exercise physiologists with a background in exercise interventions for clinical cohorts, CF having specific expertise in prostate cancer research. It included SD who is a qualitative researcher with a background in health, mental health and cancer research and AMcG, an active qualitative researcher with experience using multiple approaches, who has a background in the study of men's health. DH, a radiation oncologist with a special interest in urologic oncology, acted as medical advisor to the study. This study is reported according to the Standards for Reporting Qualitative Research (SRQR) [28].

Participants

Patients with intermediate and high-risk prostate cancer undergoing ADT and RT with curative intent were recruited to a randomised feasibility trial. All patients had been prescribed ADT and RT with curative intent as part of their cancer treatment and had the option to join the trial at the initiation of their ADT treatment or at one-month post-RT.

Inclusion criteria for the trial was ≥ 18 years of age with a histologically diagnosed prostate cancer, prescribed ADT and RT, self-reporting not to be taking part in regular structured exercise and medically cleared to exercise by their oncologist. Exclusion criteria included prior exposure to ADT > 12 months, prior hypogonadism, established metastatic bone disease or established osteoporosis. Patients were recruited through a single hospital site in the South East of Ireland.

Trial details

The research formed part of a mixed methods feasibility trial. The two-arm randomised feasibility trial compared an aerobic-emphasised (AE) with a

resistance-emphasised (RE) exercise intervention in men with prostate cancer undergoing ADT and RT. The trial intervention has been described in detail elsewhere [29]. Briefly, participants were randomised to the AE or RE group after completing baseline testing, at a ratio of 1:1. Both groups attended supervised, twice-weekly gym-based exercise sessions for 24 weeks. Patients were offered one to one or small group sessions depending on their preference. Group sizes were limited to five participants to optimise progression and ensure effective monitoring during higher intensity exercises. Specifically, 77% of the sessions were conducted on a one-to-one basis, while 23% were conducted in group settings. These sessions involved a combination of aerobic and resistance exercises performed at moderate and vigorous intensities. The key distinction between the groups lay in the volume of aerobic and resistance exercises undertaken. Each session was one hour in duration. At intervention end, participants were made aware of facilities and classes available in their local area.

Data collection

Trial participants were invited to take part in a qualitative interview after they completed exit outcome measures or following official trial withdrawal. Sample size was based on theoretical saturation. This was achieved by conducting data analysis alongside data collection [30]. Individual semi-structured virtual interviews based on an interview guide, including initial questions and follow-on probes, were used to collect data (see Appendix 1). This interview guide has also been previously published in a protocol paper [29]. The interview guide was semi-structured in nature, where questions were designed to explore concepts related to acceptability of the intervention, while remaining open to capturing the experiences of participants. All interviews were performed by an interviewer independent to the trial to reduce bias and allow the interviewees to be as honest as possible about their experiences. The interviewer was a researcher working in the field of exercise and chronic illness and has extensive experience working with cancer survivors in a community exercise setting. All interviews were audibly recorded using Zoom, a secure online platform and transcribed verbatim.

Data analysis

While reflexive thematic analysis was considered as an approach to data analysis, it was not applied because the primary author did not conduct the interviews, thereby limiting the depth of personal engagement and reflexivity essential for this approach [31]. However, researcher subjectivity played an important role at analysis stage due to the primary author's (KM) direct involvement in delivering the intervention. This involvement provided

valuable insights and a deep understanding of the intervention context, which is recognised as an important resource for knowledge production [32, 33]. Following discussion from the research team, the principles of thematic analysis were applied [34]. Thematic analysis was chosen as it is a commonly used technique in qualitative descriptive research designs, which can provide a purely qualitative account of data that is rich and detailed [27]. The process commenced with initial data familiarisation, which included iteratively listening to the entire dataset, transcribing it, and identifying initial patterns. Transcripts were imported into NVivo 12 (QSR International, Doncaster, UK), and initial codes were generated through a thorough analysis of each line. Two researchers (KM and AMcG) worked to identify discrepancies in the coding approach and establish major concepts, with extensive discussions involving co-authors as the analysis progressed from coding to defining and naming themes and producing the report. This approach involved six phases [34] and was performed in a non-linear manner, moving back and forth through the phases as the analysis progressed. Any points of disagreement were initially discussed between KM and SD. If consensus was not reached, the issue was escalated to the entire research team, with final judgment rendered to MH. In addition to the inductive approach, a deductive lens was also applied to the work as per the recommendations of the National Cancer Institute White Paper on Qualitative Methods in Implementation Science [35], to consider domains that relate to the implementation outcome acceptability (satisfaction with various aspects of the innovation, such as

content, complexity, comfort, delivery, and credibility) [36].

Results

A total of 24 men with prostate cancer were randomised to one of the two feasibility trial arms. Of these, the first 13 participants were invited to take part in the exit interviews, twelve consented and one declined to participate due to health issues. Data saturation was achieved after the 10th interview. However, a decision was made to complete the next two interviews so that there was an even distribution of interviewees between the two trial arms. Interviews took place between June 2022 and January 2023, with a mean interview duration of 60 ± 18 min. Nine interviewees joined the trial at the initiation of their ADT treatment and therefore undertook the exercise intervention during their RT. Three interviewees joined one month after their RT was completed as the trial had not begun when they commenced their ADT treatment. Nine of the interviewees completed the 6-month intervention in its entirety, while three withdrew. Reasons for withdrawal were health issues unrelated to the trial (66%) and travel commitment (33%). Interviewee characteristics can be found in Table 1.

Four overarching themes capture how men experienced and viewed the acceptability of the exercise intervention: (1) Navigating the Unknown: Building confidence amidst vulnerability (subtheme- pushing the limits), (2) Building Trust: The credibility and approach of the exercise instructor (subtheme- appropriateness of supervised vs. independent exercise), (3) Flexibility in Delivery and (4) Finding Purpose: Exercise as a means of escapism and regaining control during treatment.

Table 1 Participants characteristics

	Mean (SD)
Age (years)	71.8 (7.7)
Weight (kg)	89.5 (20.9)
BMI (kg/m ²)	29.6 (4.9)
Number of medications	2.8(1.9)
Number of comorbidities	2.1 (1.2)
Marital status, n (%)	Married: 8 (66.7) Divorced: 2 (16.7) Widowed: 1 (8.3) Single: 1 (8.3)
Tertiary education, n (%)	2 (16.7)
Current smoker, n (%)	2 (16.7)
Employment status, n (%)	Retired: 6 (50) Full-time: 1 (8.3) Part-time: 5 (41.7)
Gleason score	7.7 (0.8)
Prostate Cancer Stage, n (%)	Stage II: 5 (42) Stage III: 7 (58)
Radiation during intervention, n (%)	9 (75)
Number of radiation fractions (treatment days)	30.1 (8.8)

Theme 1: Navigating the Unknown: Building confidence amidst vulnerability

Subtheme- pushing the limits

This theme and subtheme combination capture the essence of building self-efficacy in relation to the exercise intervention, highlighting the journey of overcoming fear and facing the interplay between masculinity and vulnerability, where initially confidence was a barrier but over time men became empowered to challenge themselves, aided by the social support within the intervention.

Participants reflected on the fear of navigating unknown territory in relation to the exercise intervention in terms of what to expect, while self-confidence may have been low due to their cancer diagnosis and while undergoing RT:

I'm normally an optimistic person but when you get news like that (cancer diagnosis) it's an undermining of your confidence. P2

I didn't know what it really consisted of so I was just a bit iffy about it and who was gonna do it and what were they like. P3

They discussed how they had to navigate feeling vulnerable in terms of their fitness levels and in relation to group exercise, where they feared an inability to be able to compete with other men in the programme:

When I first started, I could only do five minutes of them [exercise machines]. I was getting breathless... that was when I was thinking to myself, I am not going to be able to do this. P8

He's looking at me and I'm not able to do this you know. P5

And then you feel like you're reached your limits and you see other fellas charging on and that challenges you, are you medium or are you normal you know what I mean, so in that sense it's more competitive in nature. P2

Over time where social influences initially acted as a barrier in this regard, as fear of the unknown dissipated, participants reported feeling empowered by the sense of togetherness:

I'd say it was to see other people in the same position as myself, that I wasn't on my own. That's where if I hadn't have done the programme, you'd be at home sitting, thinking about this the whole time, thinking like can I do this, can I do that or is the man down the road feeling the same way I'm feeling. P5

Because there was a few more people as well and you come down and you meet people and you talk to people, and that's the one nice thing about it as well, you know. You're not on your own. P7

As self-efficacy increased, acceptability of the intervention grew, where men commented on the usefulness of the intervention and the sense of reward gained from challenging their ability:

As time went on, I found that I was able to kind of up my skill set, I knew how to handle the machines and I got more confidence, I wanted to go a little bit further than they set down. P2

Definitely fitness wise I was getting better and because of that I think I felt more positive you know. P12

I found each week was that little bit better and I wanted to do that bit more. P5

Having the ability to engage in high intensity exercise was also reported to boost the participants self-confidence and satisfaction with the content of the programme:

But I'd say from a point of goodness I would say that the heavier the better, under control. I knew I had the confidence. I knew that I wouldn't be stretched too far, so I'd like to be stretched as much as needed. P10

I preferred the harder ones. Using the muscles more, for my own benefit. I suppose if you were just doing the continuous (exercise), I suppose it would be sort of boring. P4

Theme 2: Building Trust: The credibility and approach of the exercise instructor

Subtheme- appropriateness of supervised vs. independent exercise

This theme explores the significance of the exercise instructor's credibility and approach in fostering trust among participants. It describes how the instructor's expertise and investment in the men in the intervention contributed to a safe and motivating environment for exercise during prostate cancer treatment. The subtheme explores participants perceptions of the appropriateness of an unsupervised exercise option, which emphasises preference for the presence of the instructor.

All participants reflected on the crucial role of the instructor in facilitating acceptability and satisfaction with the intervention. The instructor was central to instilling a sense of safety within the environment while motivating the participants to reach their exercise goals:

It's very important. For one thing, it gives you more confidence. Yeah, and then you know you are in good hands. P10

She has the ability to shove you that little bit further in fairness to her. She was very very good, she just, if you were flagging a little bit, she knew the right words to say if you know what I mean. P12

Participants also commented on the importance of the positive relationships with the instructor where feeling invested in and not judged created a sense of support, limited feelings of vulnerability and enhanced adherence:

Her basic optimistic cheerful personality just shone through...I'd be forever grateful to her for that. That was a big part of sticking to it. P2

Being asked to do it your age didn't come into it. I'm 80, and all of a sudden Jeez someone thinks I can do it. Someone thinks something of me. That's another thing you feel good, somebody can say right we want

you to participate in this, the age barrier is gone... that was a great boost to me. P11

You'd be saying to yourself she knows what she's doing anyway, she's going to put you on the right road if she can. Which she was, she was great. P9

Uniquely this programme's instructor had an extensive cancer care background working as a radiation therapist. Having knowledge around the patient's cancer treatment greatly enhanced the credibility, according to participants. This was particularly evident in men who took part in the programme before and during their RT. The welcoming and open atmosphere created by the instructor allowed participants to ask questions about their treatment and fostered a sense of reassurance and support:

You'd be happy coming out of it. I don't know, I think if you were just going for the treatment, it would get in on your mind a bit more. The fact that you can ask her anything, she will explain it to you... you can ask her about it like and the problem is solved kind of thing. P3

It's like everything else when you come out from treatment there is always maybe some questions you'd like to know, maybe, something you know why this or why that. She would be able to explain that because she had that knowledge, different things like how many treatments, why you were having it, different things like that. I suppose it just gives you peace of mind. P4

It definitely gave me a better outlook and attitude through the whole lot. There's nothing as bad as thinking of something on your own and not getting an answer. Whatever I asked anyone or asked the instructor when I came down you know, should I be doing this or should I be doing that and there was days that I came down and I wouldn't be in great form but the minute you'd walk out the door after being here for that hour everything seemed to be that little bit lighter. P5

In relation to the subtheme, participants were asked to consider possible variations to the programme in order to make it more appealing to future men, such as an unsupervised home-based format to help overcome possible barriers to exercise. Although many stated the expense of travel as a potential barrier to the current programme, all but one stated they would prefer a supervised gym-based programme due to the additional guidance and accountability, highlighting the crucial role of the instructor in facilitating acceptability:

I think if it was left to me, on my own, I probably wouldn't do it. I probably need a bit of a push...I was

being monitored the whole time as well, so every precaution was taken. It was great that way. P7

Some participants also expressed how they struggled to maintain physical activity when the supervised intervention ended and the accountability to the group and to the trial was removed. Several interviewees expressed intentions to enrol in another exercise facility to regain the accountability and motivation following the end of the trial.

I probably should join a gym and go, maybe I will. You just need a bit of encouragement and a bit of a push. P3

Theme 3: Flexibility in delivery

This theme describes the importance of flexibility and variation in the delivery of the intervention, which facilitated acceptability of the programme through ease of access, convenience and choice, which appeared to limit the complexity of delivery.

The men discussed how the flexibility of delivery was a crucial facilitator in terms of accessibility and adherence to the intervention. The informality and convenience of flexible delivery times was an important facilitator for men to engage:

You were straight in from the treatment...They were quite flexible with their times, which was good. P3

They were flexible. Now if they hadn't been flexible there would have been problems because I wouldn't have been wanting to be coming down in the morning for treatment and maybe the afternoon for exercise. P4

In particular, the ability of the programme to be compatible with RT treatment, in a nearby location, added another level of convenience which facilitated acceptability:

I was getting the treatment below, it is only a matter of walking out of one place and walking back into the gym. P12

The 39 radiation sessions, they worked in a gym session on those days, so I was only going down once. P2

In terms of the number of sessions, the men also discussed the convenience of aligning this with their RT treatment, citing travel in the case of additional sessions as a potential barrier:

Yes, I think two (sessions) a week was grand. Yeah, I think I was satisfied anyway. If it was three a week I

would have to travel. That might be a little expensive for me. P10

Conversely, some participants had a preference for an additional session to maintain momentum and feelings of vitality gained from exercise:

I was saying that on the Monday you come in and you do your gym and that and then it'll be the Thursday. If they could make it a Monday, Wednesday and Friday. Because in the break between Monday and Thursday you kind of get, how can I put it, on the Monday when I walk out of the gym, I feel good and then like the Tuesday, Wednesday I kind of go down into a slump. P8

In terms of content, participants reported that they liked the mix of modalities (aerobic and resistance elements) and intensities (moderate and high intensity exercises). Preference leaned towards the resistance element. Having the ability to engage in high intensity exercise was reported to enhance benefits gained:

I enjoyed the two of them, but I preferred the ones where I was pushed that little bit extra. Because I got more out of it. P8

All participants experienced one to one and group-based sessions. While social support was a cited benefit gleaned from group sessions, participants preferred the one-to-one sessions as they facilitated more personalised support and reduced distraction:

I'd probably prefer it on my own. If you're on a machine and there's someone beside you, you may be inclined to be looking out the window you know and get carried away and not concentrate on what you were doing. P6

I would prefer one to one. I suppose it's like anything you get more attention that way, you get more detail. P3

Theme 4: Finding Purpose: Exercise as a means of escapism and regaining control during treatment

This theme describes how engaging in exercise during RT provided men with a renewed sense of purpose. It highlights how the intervention was viewed as a means of escapism and how exercise empowered participants to regain a sense of control, counteracting feelings of helplessness.

The majority of participants took part in the exercise intervention while undergoing RT treatment. While a relatively unique approach, generally, RT was not seen as

a barrier or deterrent to exercise by the men. All participants who engaged in the exercise intervention and RT together endorsed the experience and felt it was beneficial to perform both simultaneously:

If I had the treatment and then went into the gym and got an hour done, I found it much better for me altogether. Both mentally and physically. As I said you would walk out to the car, and you had the feel-good factor. P12

Well I'll put it this way if I hadn't had done it I don't know what I would have done without it. P5

Men also reflected on how the intervention was important in helping them to experience pride and satisfaction in their ability, renewing a sense of purpose and allowing them to assert strength, despite their cancer diagnosis:

I was more pleased with myself coming out, that I managed to complete them all. Completing them all was important to me in a way, that you know that there is life in the old dog yet. P2

I'd say that just because I have prostate cancer doesn't mean that I can't do things. P5

You have something to get up for. You have something to do. P8

The exercise intervention also facilitated a sense of control by instilling a sense of active involvement and personal agency in their treatment for men who participated, combating feelings of powerlessness:

It gives me the facility to be a part of my own treatment, I wasn't totally in the hands of the doctors or whoever you know. That I was, I was doing something myself. P2

Additionally, participants highlighted that by focusing on the exercise intervention, they benefitted from a form of mental escapism from their cancer diagnosis and treatment:

You'd be happy coming out of it. I don't know, I think if you were just going for the treatment, it would get in on your mind a bit more. P3

I would recommend it because it keeps your mind off things. I find that the exercise was a distraction to some extent. So, I wasn't dwelling on the whole thing of treatment and radiation. P11

You know there was a void then after the forty days of radiation, like what's going to happen now, and I was focusing on this then...it was something to look forward to, it gave me a goal if you like to put it that way. P5

Discussion

The purpose of this qualitative study was to understand the acceptability of a progressive and structured exercise intervention for men with prostate cancer undergoing ADT and RT. This feasibility trial uniquely compared two exercise prescriptions which incorporated both aerobic and resistance exercises at moderate and high intensities and emphasised progressive overload. It targeted men commencing active treatment.

This study revealed that fear of vulnerability and low self-efficacy acted as potential barriers to participation and caused concerns about the possible competitive nature of a group setting and the comparison to peers. The prostate cancer journey can challenge men's views of their masculinity, which can negatively impact their psychosocial health [37]. The complex interplay between vulnerability and masculinity can create barriers to men engaging with health services and seeking help [38, 39]. The initial knock in confidence from a prostate cancer diagnosis, particularly at the start of treatment, as illustrated in this study, may deter men from taking part in physical activity programmes. Yet, exercise-based interventions can be important facilitators that may be more appealing to men with prostate cancer compared to traditional support groups [23]. To the best of our knowledge the perception that a group setting could create a competitive environment, resulting in social comparison, has only previously been illustrated in men established on ADT [40]. Due to the unique side effects of prostate cancer and the associated effects on self-image and masculine identity, individuals within this patient demographic may be more susceptible to confidence related barriers at the initial stages of their cancer journey. However, the men also reported feeling encouraged and inspired by other men in the programme and felt reassured that others were going through a similar cancer journey. This aligns with existing research that emphasises the pivotal role that peer support and camaraderie plays in creating safe environments for men [41], in the context of cancer and the benefits of a group setting [42]. There is a need for instructor education programmes that address prostate cancer specific needs but also an understanding of gendered approaches [43] in order to help alleviate fears around group exercise and to create safe spaces [44]. Exercise opportunities in a group setting should be carefully presented to men with prostate cancer with these barriers and benefits in mind.

There was a high degree of acceptability amongst participants towards the exercise intervention as a whole and no difference in opinion between those who completed the programme and those who withdrew. Critically, all reported that they would recommend the programme to somebody about to go through a similar cancer journey, and half would have preferred an additional supervised

session weekly. Uniquely, participants expressed a preference towards higher intensity exercises due to enhanced enjoyment and a greater sense of achievement. To our knowledge, this is a novel finding in exercise studies of prostate cancer. This appeared to give men a renewed sense of purpose and strength amidst the challenges of their cancer journey, which are noted protective factors in men's health promotion [44]. It is testament to the acceptability of the approach and to the utility of the intervention to improve physical activity self-efficacy, fitness levels and sense of wellbeing for the men who participated. High intensity interval training, has also been shown to elicit greater enjoyment compared to moderate intensity exercise in other cohorts [45]. A recent systematic review examining the effects of exercise on masculinity, personal identity and body image in men with prostate cancer found that exercise-induced psychological benefits were not linked to specific forms of exercise but possibly other aspects of the exercise prescription [46]. Our findings suggest the ability to perform higher intensities through the exercise programme, both for the aerobic and resistance elements, could help men to recalibrate their masculinity and re-establish pre-diagnosis self-confidence levels. Those planning exercise interventions should therefore avoid excessively protecting this cohort as they enjoy testing and pushing their limits within a safe environment.

The concept that an exercise instructor plays a vital role in the success of exercise programmes for prostate cancer patients has already been established [21]. Knowledge around exercise and health care issues common in older adults have also been shown to be desirable attributes in an instructor [47]. Consistent with previous literature, this study also revealed the importance of a positive instructor-participant relationship. The instructor's support was seen as a major benefit to participation in the programme, particularly with regards knowledge on RT and the treatment process. Notably, the instructor's extensive background in RT, while beneficial for participants, could also pose scalability challenges for the programme. Nonetheless, some knowledge around the participants' cancer treatment is likely necessary to foster confidence and reassurance in the exercise programme and instructor themselves. A minimum level of oncology treatment knowledge is needed by exercise instructors in this space [48]. Establishing standardised instructor training has been highlighted as a priority in the implementation of exercise into standard care [49]. Moreover, credibility and establishing trust are noted gendered approaches to engage men, where a previous negative experience can act as a deterrent to engaging with health services [44]. Acceptability was also facilitated by the flexible delivery approach, namely the informality and convenience offered by the exercise intervention,

another recognised facilitator which effectively engages men [41]. Participants expressed a sense of loyalty to the instructor, stemming from the instructor's perceived role in supporting their cancer journey. Although this may act as an extrinsic motivator, potentially eliciting higher attendance, retention and even effort rates within the exercise classes, it could also lead to an over reliance on the instructor and possible regression in physical activity once the support of the instructor is removed at the end of the trial. This commitment to the instructor could in part explain the decline in exercise or a difficulty in maintaining exercise levels in the absence of supervision, as articulated by the participants. Exercise interventions for prostate cancer should consider a step-down approach to support the transition from supervised to independent exercise.

Despite the challenges of attending in person classes, the preference was for supervised in person sessions over a home-based programme. These findings highlight the importance of follow-on programmes in the community setting for those participants that need or want the accountability and additional coaching of a supervised programme [50]. Future trials could also consider a transition period of reduced contact after the trial end date, where the instructor may provide weekly or monthly check-ins to encourage physical activity and act as an accountability tool. Check-in phone calls have been utilised in prehabilitation exercise trials with good success in other cancer cohorts [51, 52]. In addition, embedding behaviour change techniques into future interventions or trials to assist in the transition to independent physical activity should be considered. Short-term programmes have proven beneficial in preventing or reversing cancer related side effects [53]. However, it is imperative for this group to remain physically active due to their high 5-year survival rate [54] and elevated mortality risks from non-prostate cancer related causes, especially cardiovascular disease [55].

The men who took part in the exercise intervention, reported numerous psychosocial benefits. These included improved mood, distraction from cancer and its treatment and enhanced self-esteem and self-confidence. These benefits are consistent with previous research which has demonstrated that increased physical activity not only elicits physiological but also psychological benefits in prostate cancer cohorts [21, 22]. However, the majority of research has been carried out in prostate cancer survivors who were established on treatment before joining the trial. The findings from this study extend existing literature by identifying similar psychological benefits before and during RT. The men reported a sense of empowerment from taking part in the exercise programme and stated that one of the main reasons they wanted to participate was to play a proactive role in their

treatment. Participation in physical activity has also been shown to offer a sense of control after experiencing a setback and therefore, can instil hope [56, 57]. As the first six months after a cancer diagnosis has been reported as a critical timepoint for cancer-related distress in other cancer cohorts [58] and the prevalence of depression stated to be at its highest during active cancer treatment [59], this is an important timepoint to target with regards supportive therapies. This study also highlights the supportive role exercise can play after RT has ended. Participants noted a "void" following the completion of RT and this aligns with previous literature indicating significant unmet needs post treatment and dissatisfied healthcare provider support [60]. Exercise programmes may have the potential to help address this gap by offering a supportive setting for men with prostate cancer entering the survivorship stage of their cancer journey.

Strengths and limitations

This qualitative study has a number of strengths and limitations that warrant mention. A notable strength of this study is its utilisation of a one-to-one interview structure, providing the interviewees an opportunity to freely voice their own opinion and personal experiences. The interviewer was also not a part of the research team and was unknown to the interviewees prior to the interviews which may have facilitated more honest responses. Additionally, interviewees who had withdrawn from the main feasibility trial were given the opportunity to participate in the exit interviews with the aim to consider their views as non-completers and so adding depth and understanding to the data captured.

Only one author listened to and transcribed the interviews, which is a study limitation. In addition, all interviewees having agreed to participate in an exercise intervention were motivated and willing to become more physically active. Their opinions and views may not represent the broader population of prostate cancer patients.

Conclusion

The findings of this qualitative study provide insights into the experiences and acceptability of a six-month exercise intervention for men with prostate cancer, as reported by trial participants who both withdrew from and successfully completed the programme. The majority of participants joined the exercise trial at the initiation of their ADT, subsequently completing their RT while taking part in the exercise intervention. This provided valuable insights into the feasibility of engaging in exercise regimes while undergoing RT.

While an initial fear of vulnerability and lack of self-confidence can be a barrier to exercise participation for men, exercise programmes that are flexible and incorporate high intensity exercises have the potential to provide

psychosocial benefits, rebuild confidence and empower men to regain a sense of control through their cancer treatment and into recovery. Strategies to embed exercise from the point of diagnosis through ADT and RT should reflect men's experiences of exercise during treatment.

Abbreviations

ADT	Androgen Deprivation Therapy
RT	Radiation Therapy
QoL	Quality of Life
SRQR	Standards for Reporting Qualitative Research
AE	Aerobic Emphasized
RE	Resistance Emphasised
BMI	Body Mass Index

Supplementary Information

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Supplementary Material 1

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Author contributions

KM: Conceptualization, Methodology, Investigation, Writing - Original Draft, Project administration. BK: Conceptualization, Methodology, Writing - Review & Editing, Supervision. SD: Conceptualization, Methodology, Writing - Review & Editing, Supervision. AMcG: Writing - Review & Editing. DH: Conceptualization, Resources, Writing - Review & Editing, Supervision. CF: Conceptualization, Writing - Review & Editing. MH: Conceptualization, Methodology, Resources, Writing - Review & Editing, Supervision, Funding acquisition.

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Data availability

The datasets generated and analysed during the current study are not publicly available due to the sensitive nature of the subject matter but are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from the Waterford Institute of Technology (now South East Technological University) Research Ethics Committee and the Health Services Executive South East Research Ethics Committee. The trial has been registered on ClinicalTrials.gov (NCT05156424). Written informed consent was provided by all participants and confirmed verbally before all interviews. This study was performed in accordance with the Declaration of Helsinki.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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