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Exploring the acceptability of three time-matched exercise interventions for increasing fitness in women living with obesity: A mixed-methods evaluation of the EXOFFIT study

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Abstract

Background: The EXOFFIT study compared the effectiveness of three time-matched exercise interventions in women with obesity for improving cardiorespiratory fitness. To best inform future research, evaluation of the interventions' acceptability is needed. Previous research has been inconsistent with methods and reporting of acceptability. Thus, the theoretical framework of acceptability (TFA) can be utilized to ensure that all aspects of acceptability are evaluated. No study to date in women with obesity has utilized the TFA in conjunction with quantitative data (i.e., frequencies of themes) to highlight the aspects of interventions that may be most important for participants.

Objective: This study aimed to examine the acceptability of the EXOFFIT program and gain insight into the participants' experience of participation, their perspective on the acceptability of trial procedures and interventions and gather their feedback on program changes.

Methods: A mixed-methods approach was employed. Thirty-eight participants who completed the exercise interventions were interviewed and completed a self-reported exit questionnaire. Interviews were transcribed verbatim and analyzed in three phases: emergent themes were agreed upon, then mapped to the TFA constructs and the frequencies of each construct and theme were presented as counts. Data collected from the exit questionnaire were collated and reported using descriptive statistics.

Results: All seven TFA constructs were identified in the analysis. The EXOFFIT program was found to have a high level of acceptability, with affective attitude, perceived effectiveness and self-efficacy being the most reported constructs. The burden and opportunity costs associated with the program were mainly related to family commitments and support needed to participate. Any negative impact of participation was noted to be outweighed by the perceived benefits.

Conclusions: The results of this study will inform the development of future programs with women with obesity and support the consideration of the TFA constructs from the outset of study design.
Clinical Trial Registration Number: ISRCTN13517067

KEYWORDS
acceptability, exercise, obesity, women

1 | INTRODUCTION

Improving cardiorespiratory fitness (CRF), through exercise and physical activity (PA), has been shown to largely attenuate obesity-induced health effects, even without any weight loss.[1] Globally, however, young women are significantly more inactive than their male counterparts, with at least one third of women not meeting PA guidelines for aerobic (AE) and resistance (RE) exercise.[2] Though research suggests that combined training (COM = AE + RE) is most effective for increasing CRF in adults with obesity,[3] it is unclear how the physiological differences between sexes might influence their individual exercise responses.[4] Given the lack of exercise literature in women with obesity and the predominance of research focused upon improving body composition and AE interventions,[5] the EXOFFIT (Exercise for Obesity in Females to increase Fitness) study investigated the efficacy of different exercise training types on CRF in women with obesity.

The EXOFFIT pilot trial was conducted at the University College Dublin (UCD) between September 2021 and December 2022. The study aimed to evaluate the feasibility, efficacy and acceptability of three progressive, time-matched exercise interventions (AE, RE, COM) compared with a non-exercise control (CON) in women living with obesity.[6,7] All exercise sessions were conducted in a private gym and supervised by the trial coordinator (female PhD researcher and physiotherapist [BSc, MSc] with a postgraduate diploma in cardiac rehabilitation) with and without the assistance of trainee physiotherapists. Sixty-seven participants were recruited (see Supporting Information S1: Table S1 for eligibility criteria) and block randomized to either CON or one of the three 12-week exercise interventions outlined in Supporting Information S1: Table S2. Of the 67 participants, 14 were lost to follow-up (n = 11 dropouts, n = 3 could not complete all aspects of post-intervention testing). Reasons participants were lost to follow-up included: participants did not commence intervention (n = 3), ill health (n = 7) or change in personal circumstances (including lack of time; n = 4). The protocol for EXOFFIT and results of the feasibility and efficacy evaluation have been published elsewhere.[6,7] Briefly, results indicate that while all interventions (AE, RE and COM) were feasible (high attendance, high adherence and nil adverse events), RE interventions alone or in combination (COM) were found to be most effective for improving physical (CRF, strength, body composition) and self-reported (i.e., quality of life, pain, etc) outcomes.

This paper reports the third facet of the evaluation process of EXOFFIT: the acceptability of the trial and its exercise interventions. While previous acceptability research has employed a variety of measures (i.e., adherence, enjoyment, completion rate of outcome measures), there is inconsistency across the literature.[8–10] The theoretical framework of acceptability (TFA) devised by Sekhon and colleagues[9] provides a standardised multi-faceted guide by which the acceptability of interventions can be assessed. The TFA suggests that acceptability comprises seven constructs: affective attitude, burden, ethicality, intervention coherence, opportunity costs, perceived effectiveness and self-efficacy (Table 3). These seven constructs informed the design of the EXOFFIT acceptability interview schedule, whereas previous literature only utilized the TFA in post hoc framework analyses and thus did not get to report on all constructs.[11,12] In addition, this study incorporates quantitative analysis by including frequency of constructs and themes, providing clear data regarding the most reported construct by participants and potentially the most important when considering changes to the program to improve acceptability.

Hence, informed by the TFA framework, this study aimed to examine the acceptability of the EXOFFIT program using a mixed-methods approach (qualitative data from interviews [i.e., themes, illustrative quotes]; quantitative data from questionnaire and interview [i.e., frequency of themes]) to (i) gain insight into the participants' experience of taking part in the study and the interventions, (ii) explore participants' perspective on the overall acceptability of trial procedures and interventions and (iii) gather their feedback on changes that could be made to improve content or delivery.

2 | METHODS

2.1 | Study design

A mixed-methods approach involving semi-structured interviews, and a self-reported exit questionnaire was employed to evaluate the acceptability of a feasibility pilot randomized controlled trial. All research procedures were approved by UCD Research Ethics Committee (LS-21-49-Davis-ODonoghue). The study was registered with ISRCTN (ISRCTN13517067). This study is reported as per the consolidated criteria for reporting qualitative research (COREQ) checklist (Supporting Information S1: Table S5).[13]

2.2 | Recruitment

All 38 participants who were randomized to the exercise interventions and completed the EXOFFIT program participated in interviews and completed the questionnaires (Figure 1). Written consent was obtained prior to study commencement and all participants were informed of the purpose of the study and the trial's coordinator role and motivations as the PhD researcher on this study.

2.3 | Data collection

2.3.1 | Semi-structured interview

Participants were interviewed alone by the trial coordinator (M.E.D.) either face-to-face in the EXOFFIT gym (private space in UCD, only accessible to EXOFFIT participants) or on Zoom, based on the participant's preference. All interview sessions were audio recorded. Interviews were structured and guided by the interview schedule (Table 1), which was designed by the research team (M.E.D., G. O'D., C.C. and C.B.) prior to the study commencement. All members of the research team have qualitative and mixed methods experience, including qualitative design, analysis and interview techniques. Prior to commencing any interviews, the trial coordinator (M.E.D.) received extensive training from two members of the research team (G. O'D. and C.C.) who are both very experienced qualitative researchers.

The interview schedule comprised open-ended questions to explore thoughts and feelings around the acceptability of the EXOFFIT interventions. The interview schedule was informed by the TFA and a systematic literature search of previous research evaluating acceptability,[9] and included topics such as participants' feelings and opinions on study participation and exercise interventions, experience of and satisfaction with the interventions, their exercise self-efficacy and the likelihood of continued exercise participation and the impact of program participation (including changes to lifestyle, etc.) whether positive or negative.

Given that the trial coordinator (M.E.D.) conducted all interviews, due to limited project staffing, the research team were cognizant of the impact of the client relationship between the participants and the coordinator and the risk of acquiescence bias. Hence, this was considered in the study design and implementation of the interviews. In line with the principles of reflexivity,[14] several steps were taken in this process with the aim of minimizing potential biases. The trial coordinator engaged in reflective practice throughout the research process to minimize potential sources of personal and interpersonal bias, including her experience with coordinating the study and how the dynamic might influence interactions prior to and during the interviews. Acknowledging the potential power dynamic, participants were reminded of their invitation to interview prior to completing the final week of the program and were reminded of the option to opt-out of this process without impacting any other aspect of their participation in the EXOFFIT study or client relationship with the coordinator. Participants were also assured that all feedback (negative or positive) would be equally valued and welcomed in order to best evaluate the interventions and determine what changes would need to be made. The trial coordinator followed a standard script (including the interview schedule) for all interviews and was careful to ensure that language was neutral throughout all interviews. Additionally, contemporaneous field notes and post-interview reflective notes were made for each interview. Finally, the independent coding of the interviews by the research team and collaborative analysis of themes (as detailed in data analysis) were also performed to reduce biases further.

2.3.2 | Exit questionnaire

Participants were provided with a hard copy of an "exit questionnaire" to fill in anonymously (Supporting Information S1: Table S3). Developed by the research team, this questionnaire consisted of five sections (28 questions) focused on specific elements of the exercise interventions, exploring the following: program structure and design, program length and time, supervision, barriers and facilitators and satisfaction. These elements were chosen with the aim to complement the interview findings and capture participants' impression of specific program parameters that might not be recalled in the interview (i.e., intensity of sessions) so as to best evaluate acceptability and inform future research and/or practitioners. Twenty-six questions were tick-box Likert scale style questions and two were open-ended questions to explore potential modifications to improve program design and make it easier to complete sessions.

2.4 | Data analysis

Interview recordings were transcribed verbatim and deidentified using participants' unique participant number, but still allowing for grouping of data by AE, RE, or COM exercise interventions. The data from the interviews were managed using NVivo 12 (QSR International Pty Ltd). Although the interview schedule was guided by TFA constructs, a combination of inductive and deductive analysis was utilized to ensure that the participants' voices were not constrained by the pre-existing framework. The data were analyzed across three phases (Figure 2). In phase one, interviews were read and re-read by one researcher (M.E.D.) to ensure familiarity with the data. This was supported by the audio recordings to ensure accuracy of the transcriptions. Using 25% of interview transcripts (n = 9), initial inductive themes were derived. These initial themes were then shared with co-researchers (GO'D, CC) and emerging interpretations were discussed and challenged as appropriate to ensure that the data were accurately reflected in the emerging themes. Upon analysis of an additional 25% of transcripts (n = 9), these themes were again reviewed by the same authors and any disagreements resolved. Final emergent themes were agreed upon and then employed to analyze the remaining transcripts (n = 20).

TABLE 1 Interview schedule for semi-structured interviews.

Main question	Additional question probes
Why did you join the EXOFFIT study?	What appealed to you about EXOFFIT? Was there anything else about EXOFFIT that you found attractive? What were you looking to achieve? Did you having any concerns prior to taking part that made you second guess taking part or caused you to hesitate? What encouraged you to take part?
How was your overall experience of the EXOFFIT study and program?	How did you find it? What did you like about it? How was it coming three times per week? How did EXOFFIT compare to other exercise you have done before? How did you feel being given an exercise program? Would you have preferred to have more choice with your exercise?
Were you clear on the purpose of EXOFFIT?	Would you have liked more information? What additional information would have been good/would you give to people signing up to the programme?
Before you started, what did you expect to achieve from this program?	Were you optimistic that it would work for you?
Did you achieve what you expected to achieve from this program?	Do you think the program worked for you? Did you notice any changes?
Do you think taking part in EXOFFIT has made a difference to your lifestyle in any other ways?	N/A
Was EXOFFIT a good fit for you?	Was it what you wanted? Do you feel EXOFFIT was appropriate for women with overweight/obesity?
Did you ever feel like dropping out of EXOFFIT?	What made you want to drop out? What kept you going?
Did you have to sacrifice or give up to take part in EXOFFIT?	Did taking part in EXOFFIT stop you from doing anything else in your life or fulfilling any other commitments? Did taking part cause any disruption to your life or add any extra pressure on your life? If you had to sacrifice something, do you think it was worth it?
Now that you have finished the program, has your confidence about doing exercise changed?	Were you able to do more than you previously thought you could? Did you learn anything about exercise by taking part?
Do you think you will keep going with exercise now that you have finished the program?	What will help you to keep going? Is there anything that might make it difficult to keep going?
Do you have any feedback or comments on the EXOFFIT program?	Is there anything you would change about the program? Was the level of supervision appropriate? How did you feel about having trainee physiotherapists involved

Phase two focused on mapping the emergent themes to the TFA constructs. One of the researchers (M.E.D) initially allocated themes to the appropriate TFA construct. GO'D then reviewed the allocation, and any disagreement was resolved by discussion with CC. Following allocation to the constructs, exemplar quotes for each theme were extracted. Phase three employed a quantitative approach to provide details in relation to the frequency of the themes in the interview data. Frequencies for each theme and construct were presented as counts.

For the exit questionnaire, data collected were inputted into a Microsoft Excel database with participants' unique participant number. Each question was inputted in a separate column and the overall percentage of participants who selected specific statements was reported. The statements from the open-ended questions were also summarized and reported in conjunction with changes to the program suggested by participants during the semi-structured interviews.

3 | RESULTS

Thirty-eight participants who completed the three EXOFFIT exercise interventions were invited to participate in individual semi-structured interviews and complete a self-reported exit questionnaire. All 38 participants (AE = 14, RE = 9, COM = 15) accepted the invitation (Figure 1). Mean age was 36.2 (8.9) years and mean BMI was 38.5 (6.9) kg/m^2. Participants' baseline characteristics are presented in Table 2. The mean duration of the interviews was 20 min (range: 10–37 min).

TABLE 2 Baseline demographics of participants.

Participant baseline characteristics	Mean ± SD (range) or N (%) AE (n = 14)	RE (n = 9)	COM (N = 15)
Age (Years)	37.2 ± 8.2 (22–49)	34.2 ± 9.9 (19–50)	36.5 ± 9.2 (22–48)
Baseline BMI (kg/m^2)	39.9 ± 6.2 (31.1–54.5)	37.2 ± 8.1 (30.7–57.2)	38.0 ± 7.0 (30.0–58.9)
Obesity severity (by EOSS)			
Stage 0	2 (14.3%)	2 (22.2%)	2 (13.3%)
Stage 1	5 (35.7%)	0	9 (60.0%)
Stage 2	7 (50.0%)	7 (77.8%)	4 (26.7%)
Obesity class (by BMI)			
Class I	1 (7.1%)	5 (55.6%)	5 (33.3%)
Class II	8 (57.1%)	3 (33.3%)	6 (40.0%)
Class III	5 (35.7%)	1 (11.1%)	4 (26.7%)
Ethnicity			
White	13 (92.9%)	9 (100.0%)	14 (93.3%)
Asian	0	0	0
Black	1 (7.1%)	0	1 (6.7%)
Nationality			
Irish	12 (85.7%)	7 (77.8%)	12 (80.0%)
Other European	0	1 (11.1%)	0
Other	2 (14.3%)	1 (11.1%)	3 (20.0%)
Education[a]			
Second level education or below	4 (28.6%)	3 (33.3%)	1 (6.7%)
Third level education (level 6)	1 (7.1%)	1 (11.1%)	1 (6.7%)
Third level education (level 8)	3 (21.4%)	2 (22.2%)	7 (46.7%)
Third level education (level 9)	5 (35.7%)	1 (11.1%)	4 (26.7%)
Third level education (level 10)	1 (7.1%)	2 (22.2%)	2 (13.3%)
Employment			
Full-time Employment	11 (78.6%)	4 (44.4%)	10 (66.7%)
Part-time Employment	0	2 (22.2%)	1 (6.7%)
Looking after home/family or carer	1 (7.1%)	0	1 (6.7%)
Student	2 (14.3%)	3 (33.3%)	3 (20.0%)
Marital status			
Single	6 (42.9%)	2 (22.2%)	4 (26.7%)
Have a partner/married (without children)	4 (28.6%)	2 (22.2%)	2 (13.3%)
Have a partner/married (with children)	4 (28.6%)	4 (44.4%)	8 (53.3%)
Separated/Divorced (with children)	0	1 (11.1%)	0
Single Parent	0	0	1 (6.7%)
Number of children			
None	9 (64.3%)	4 (44.4%)	6 (40.0%)
1–2	1 (7.1%)	2 (22.2%)	2 (13.3%)
3 or more	4 (28.6%)	3 (33.3%)	7 (46.7%)
Had bariatric surgery			
Yes	1 (7.1%)	0	2 (13.3%)
No	13 (92.9%)	9 (100.0%)	13 (86.7%)

[a]Third Level Education: Level 6 (Diploma/Certificate, Level 8 (Honors Degree), Level 9 (Masters Degree), Level 10 (PhD).

3.1 | Semi-structured interviews

The interview findings are presented according to the TFA constructs and the final themes agreed upon during the analysis. For each theme, illustrative exemplar quotations were selected to support the data descriptions and are presented in text and in Table 3. The frequencies of each TFA construct and theme are also outlined as counts in Table 3. Additional counts for sub-themes within each theme and suggested program changes are also presented in Supporting Information S1: Table S4. The main participant suggested program changes from the interviews and questionnaire are reported in text.

3.1.1 | Affective attitude

This construct refers to participants' feelings toward taking part in EXOFFIT both before and after participating. Themes within this construct were reported by all participants and three themes emerged for this construct: perceived benefits, exercise apprehension and program appeal.

Perceived benefits

Participants described overall positive feelings toward participating in EXOFFIT and perceived several benefits. Over half of the participants reported either a returned or new sense of exercise enjoyment. Participants were optimistic that participation would encourage them to get physically active or help them get back to being active after years of being inactive and nearly all thought participation would benefit their health outcomes (i.e., improve their strength, fitness, etc.). On program completion, most participants reported that EXOFFIT participation positively impacted their health and function, with some commenting how it improved their energy levels to do more things and ability to perform functional activities (i.e., lifting heavy items into the car). Only one participant

TABLE 3 Frequency of TFA constructs and themes with illustrative quotes from interviews.

Theoretical framework of acceptability (TFA) construct and themes	Construct definition/illustrative quotes	Construct/theme frequency	No. of interviews with construct/theme
Affective attitude	**Anticipated affective attitude: How an individual feels about the intervention, prior to taking part.** **Experienced affective attitude: How an individual feels about the intervention, after taking part.**	**684**	**38**
Perceived benefits	*"But I think it also just in the way I feel, I do know that body composition, like shifting, I feel stronger with certain things. I feel just in general, I've felt like just in general a better, more positive. Like, yeah, I can do this. I think also it's the environment. Exercising with ladies around and being able to talk and chat and stuff, it's been easy, but been very upbeat. I feel like a lot of positive changes."*	321	38
Exercise apprehension	*"I got injured about two years ago. Since then, I haven't been able to… I haven't felt comfortable to exercise. I've been afraid to exercise. I've just got more and more afraid and into myself in relation to exercising. I always just really enjoyed exercising, and I love it. Much just that fear of it, and it just was getting me down, basically, not being able to do it…..Just the fact that I was afraid that I would injure myself more or that I wouldn't be able to do it."*	61	30
Program appeal	*"Because it was free as well, after signing up, it wasn't a… You were feeling like you were investing a huge amount of money and I felt that because you're a physiotherapist and because it was a study for a trial that there was definitive outcomes that you were trying to hit…. You weren't just fitting into what everyone else's or what a personal trainer's idea of fitness was. It was like, well, this is being designed for people who are overweight, so it'll take you at a pace or there'll be exercises that you can do because you can bend that way or all that sort of stuff."*	355	38
Perceived effectiveness	**Anticipated effectiveness: The extent to which the intervention is perceived to be likely to achieve its purpose.** **Experienced effectiveness: The extent to which the intervention is perceived to have achieved its intended purpose.**	**248**	**38**
Physical, social and psychological effect	*"I definitely felt my mental health improved a lot. I was a lot calmer, happier. I was more productive, more efficient. I think I said to you and probably other people, the time investment, you actually get back the time cause you have more energy…. I'm doing more things in a day than I would ever have done. It's actually not that you're giving up two hours coming over and back because you get that time back. Not being slouched around and not to have a motivation."*	171	37
Knowledge and skills	*"The biggest takeaway from me is to not make exercise last. Before if I was trying to lose weight or get healthier, I would have gone on some diet or something and gone, well, I can't exercise until I lose the weight. Now I've switched that around. The food nutrition comes hand-in-hand with the exercise at the same time. I'll never put exercise to the last again."*	79	37
Intervention coherence	**The extent to which the participant understands the intervention and how it works.**	**57**	**38**

TABLE 3 (Continued)

Theoretical framework of acceptability (TFA) construct and themes	Construct definition/illustrative quotes	Construct/theme frequency	No. of interviews with construct/theme
Clear understanding of study	*"I think [the coordinator] were very upfront with everything, and it was all explained why it was being done. The options, the control group, the different groups that you could possibly get into, the reason behind them, the randomness of it. No, it was all very well explained and all outlined and everything….I think everything was outlined. [The team] outlined a lot on [the] little flyer. Then when you're tracked in, [the coordinator is] explaining all the purpose, the data you're going to be collecting, the student that's going to be there. There was no surprises. There was nothing that was like, 'Oh God, you didn't tell me this.'"*	57	38
Ethicality	**The extent to which the intervention has good fit with an individual's value system**	**102**	**38**
Good fit	*"Overall, experience is very positive. It was really, really good. It's really worked for me. It very much met my needs. As I said, if you go to a gym, or you go to a class and everyone else is really fit and you feel like you're falling behind, then you're not going to want to do that. I feel like if you just blend in, sometimes that works for people. But for me, I feel like I needed something a bit more personalized. It was just coincidence that I happened to see the poster and I'm very, very glad I did. As I said, I end up making progress, which is much better. I feel like I've done lots of different programs and stuff over the years. I've bought plans online and you just ended up feeling crap at the end of it. That it just didn't work. This was a very, really positive experience overall…. It was better because, as I said, I bought online plans for €200 euro and everyone gets the same thing, and everyone's promised the same results when it doesn't really work like that because everyone is very different. But then this study was aimed at a particular group."*	102	38
Burden	**Anticipated burden: The perceived amount of effort that is required to participate in the intervention. Experienced burden: The amount of effort that was required to participate in the intervention.**	**84**	**31**
Social support required to facilitate participation	*"[No commitments] that weren't easily facilitated by other people. There were commitments I was used to doing. But my husband was just as easily able to pick the kids up. My [business] partner was just as easily able to come in for the last 30 min of work as I do because she goes to the gym all the time. So I'd often have been the person who stayed and she'd go. Not that wasn't easily facilitated by others."*	13	7
Integration into daily schedule	*"Just that sometimes if you're at work and something blows up at the end of the day, then you're under pressure to get here, but that's all, just means you have to do some work when you get home…. But like you said, there was stress and that you'd have to go home and do work. But the benefits of this, I wait."*	58	29
Travel	*"To be honest, it was getting a bit of a trek. It was nearly 2 h out of the day. It was tough for me because it's the Mon, Wed, and Thu. It was that short space of time to get the three sessions in that it was taking so long. But I knew it was at UCD when I started it."*	16	12
Self-efficacy	**The participant's confidence that they can perform the behavior(s) required to participate in the intervention**	**167**	**38**

(Continues)

TABLE 3 (Continued)

Theoretical framework of acceptability (TFA) construct and themes	Construct definition/illustrative quotes	Construct/theme frequency	No. of interviews with construct/theme
Exercise performance	*"My confidence around weights has [changed]. I've always been afraid to touch them, not knowing what to do, or afraid I'd hurt myself. That certainly has. I guess it's this horrible thing where women are made feel like they shouldn't be strong. But women can be strong, and we don't necessarily end up bulky just because we're strong. I guess what really surprised me in the whole program if I was to pick up on the route, I was a lot fitter than I thought I was right on starting. Because of that first session and finding out that I was a lot stronger than I thought I was, really made me go, "I can do this. I can completely do this. I am in a way better place than I thought I was." I got to the point where I'd given up. Then I was like, "Well, no, hang on a second. Actually, I'm not so bad. If I do some work on myself, I can be really good." Maybe I've just been spending my whole life doing the wrong type of thing."*	62	36
Sustaining exercise	*"I'm going to keep up going to the gym and then I also want to try different things as well. I don't want to put a box myself into just doing one type and that you have to stick with it forever. But I absolutely will. I feel like I'm more confident going into the different exercises. I've done them before, I know how to do them now."*	102	36
Opportunity costs	**Anticipated opportunity cost: the extent to which benefits, profits, or values must be given up to engage in the intervention** **Experienced opportunity cost: the benefits, profits, or values that were given up to engage in the intervention**	**139**	**35**
Social cost (family, friends and work)	*"I probably have seen my husband a lot less. Because I'm going to bed earlier and I'm up earlier and I'm gone. I know it's only three mornings a week, but I've got into the habit now where I now at the weekends, get up at maybe half seven or eight. I never did that. I'd say I've been spending a bit less time with my husband…. But I definitely felt that pinch that like. I'm not saying. It was probably, it is worth it still for 12 weeks. Is it worth it as a forever lifetime change? I don't know. I'd want him to do some changes then. It's like we're living polar opposites."*	14	11
Importance of women making time for themselves	*"Because I have spoken to loads of people since they have noticed my changes and they're like, "What are you doing?" I said, 'Well, I'm in an exercise group as well." They're have said 'How've I got time because I've got kids.' But I think that it's right to make time for yourself, especially being a woman…. but [my family] know what I want to do, so I'm going to do it because I think their lives are more beneficial if I'm here"*	41	17
Discomfort associated with taking part	*"You have to acknowledge that you're overweight to be part of the trial…. So that's a big thing…. Then the measurements and all of that stuff that can be very difficult as well. It would have been a hesitation, but not enough to not do it. But it could stop other people from doing it…. The fitness stuff and the strength is fine. It's more the body shape, and that sort of stuff. Because that's what you're always measured on. When you go to the GP, when you go to the doctor, when you go to hospital, when you have a baby, all of that stuff. Then they show you the big chart where you're terrible. You're dead inside."*	26	16

TABLE 3 (Continued)

Theoretical framework of acceptability (TFA) construct and themes	Construct definition/illustrative quotes	Construct/theme frequency	No. of interviews with construct/theme
No cost or positive impact of taking part	*"It was fine. I think it was manageable. Obviously, I know myself, I'm very, very busy, so it can be hard to fit in, but most of the time I managed it…. because you had a bit of a choice and if you couldn't make one session, you were able to do another one. That was another thing that did make it easier for me…. It definitely did add more to my day. But there was nothing I apologized out of because of this. Most of the time, I just my day started earlier. That's a good thing. It's not good to get an early start. Nothing, I didn't give up anything else…. It didn't, it didn't disrupt my life, but it did add extra pressure. I just knew that I'd said I'd be here and I wanted to be here. If there was a normal gym session, I feel like it'd be very easy just cancel and not go. No one was going to ask. But I definitely did feel pressure, not necessarily bad pressure, but I definitely did feel like it was an expectation for me to be here because I said I would do it. But most of the time that was a good thing. It was encouraging to come."*	63	26

reported observing no perceived benefit from participation on account that no changes in body composition had been achieved as had been personally desired.

> My experience at gyms were I would go and not really gain anything in terms of health or fitness or weight loss. But this has been a different experience because I have definitely gained mobility. I feel stronger. I feel healthier. I feel I have lost inches. I just really enjoy it. I suppose maybe it's the thing about being able to give yourself an hour me time in the gym, having the chats while you're exercising. I really enjoy that.

Exercise apprehension

Most participants reported feelings of fear and anxiety upon first enrolling in EXOFFIT. While some described being concerned that they would either injure themselves or feel pain with exercise, others described being concerned that they would not be able to perform the interventions and expressed anxious feelings of being less fit or able than other women who were taking part. A few expressed concerns when starting the program that they would be self-conscious exercising around others in a gym relating this to fear that they would be judged for their weight or compared with people that were deemed slimmer or fit the gym stereotypical physique. All participants who expressed feelings of apprehension related to exercise pre-EXOFFIT participation reported that these fears had been alleviated upon starting the program with some participants describing the EXOFFIT gym as a safe space.

> I think it's a really good, small… Because if there's a load of people there, you're going to get real nervous being like 'I don't really want to go under your barbell in front of all these people and make a fool of myself.' So it's a really good way for people who have never really done much exercise and might be a little help, with a little bit of obesity to come in and learn and get familiar with everybody.

Program appeal

Several aspects of the program appealed to participants and contributed to their exercise enjoyment. Most described appreciating the exercise supervision and support offered by the coordinator and a feeling of an increased sense of determination to exercise and commit to the program in order to avoid disappointing the supervisory team. Some reported that the program was physiotherapist-led and encouraged a sense of confidence and trust in the participants to join EXOFFIT, where otherwise apprehensions regarding starting exercise (i.e., fear of injury, lack of knowledge, etc.) were barriers. Most reported feeling content in the tailoring of the exercise prescription and happy with the choice and guidance that was received. Most did not feel overwhelmed as they might have been in a regular gym set-up. In this respect, we also reported that the exercises chosen were appropriately challenging and suited for the women who participated in EXOFFIT (i.e., machines that were accommodating for size and mobility, exercises such as burpees excluded). Over half of the participants described feeling motivated and capable because of the social support associated with the program, either from fellow participants during exercise sessions or external people who encouraged them to participate and/or continue with the programs. Some participants were happy that the interventions were women-only and that they were surrounded with women similar to themselves in a small private gym-space where they felt safe from judgment. Others described how the accessibility of the EXOFFIT

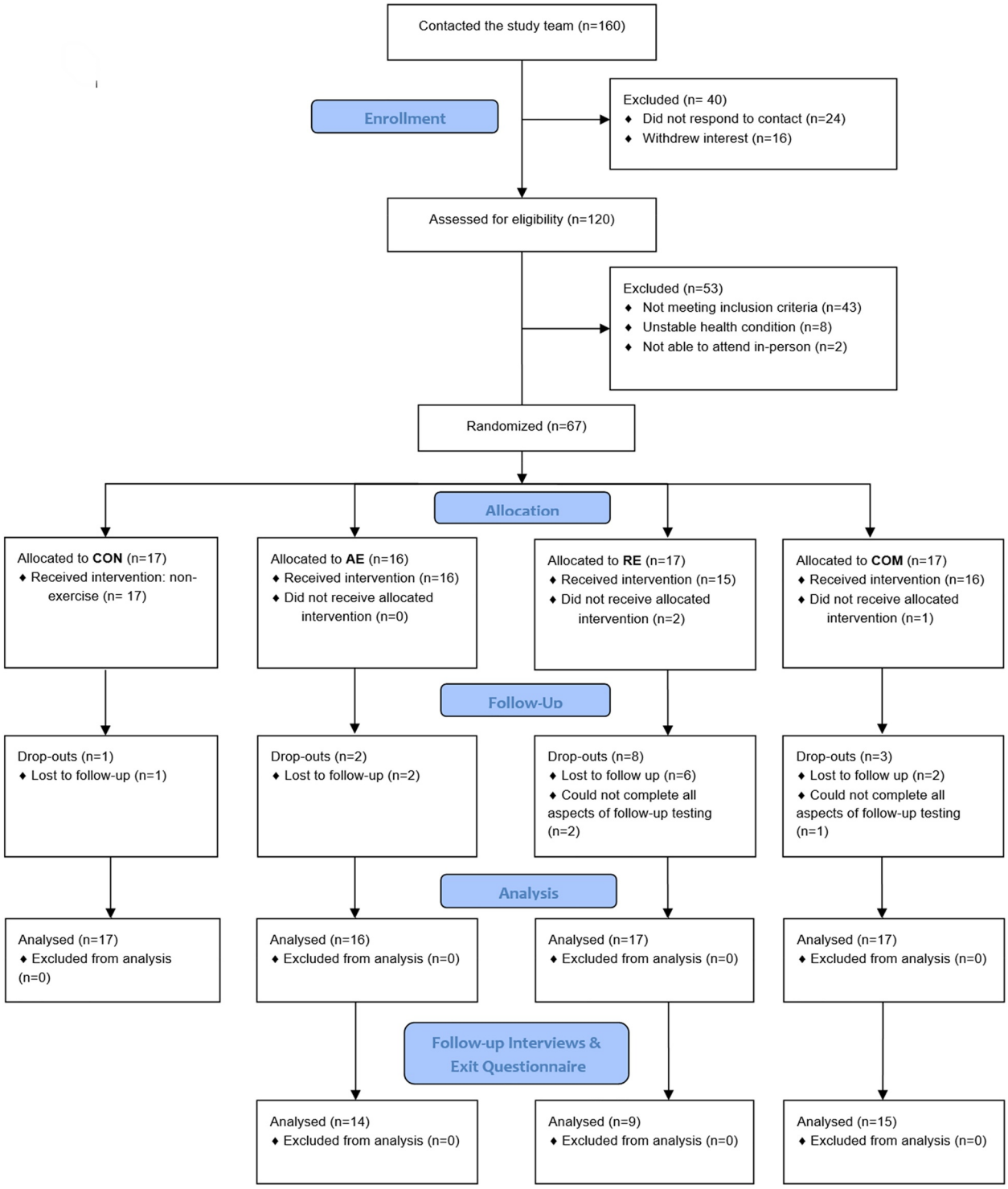

FIGURE 1 Consort flow diagram.

gym made participation easier and less stressful. Finally, some participants described a sense of satisfaction that they were able to contribute to research and that taking part could potentially improve things for women with obesity in the future.

> That it was for women, basically. I didn't feel comfortable going to the gym. That was full of men. Big muscles and stereotypical gym rats. I just didn't feel comfortable, I wanted something that was for women.

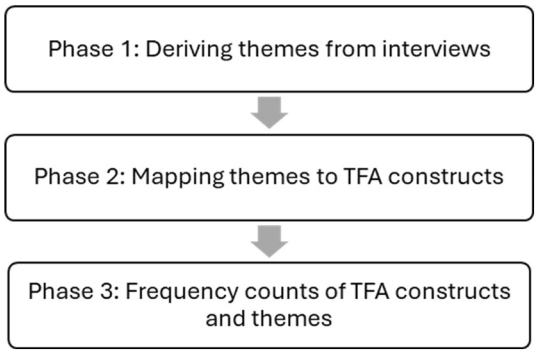

FIGURE 2 Phases of data analysis for semi-structured interviews.

3.1.2 | Perceived effectiveness

This construct refers to the participants' perceptions and understanding of program effectiveness and the extent to which the interventions were perceived to have achieved the intended purpose. This construct was reported by all participants and two themes emerged for this construct: physical, social and psychological impact and knowledge and skills.

Physical, social and psychological impact

Participants reported that EXOFFIT resulted in several positive health effects. Most participants reported physical improvements in strength, fitness, sleep quality, energy levels and body shape. Some described an improvement in pain and mobility, feeling that program participation made it easier to be more active in their normal day-to-day life, with a few participants commenting on how exercising impacted their dietary habits, that they had a reduced appetite or were less inclined to eat calorie dense foods. Over half of the participants described positive psychological impacts of participation, reporting that with exercise they felt more content in themselves, less stressed and anxious and overall experienced an improved mood. Some participants also described how EXOFFIT benefitted them socially by giving them another interest that they could discuss with family members and friends.

> I feel fitter and stronger. That's boosted my mood…. I like the fact that every week we were maybe doing more minutes or had targets…. It was like every week I was improving. It was like I could see it getting better.

Knowledge and skills

Most participants reported that they had acquired some new exercise knowledge or skills by participating in EXOFFIT, describing how participation increased their knowledge of different exercises and how to perform them effectively with good form. Some participants reported how they gained an understanding of exercise intensity and appropriate exercise pacing. Others described that they gained knowledge of the benefits of different exercise modalities and an understanding of how their body worked and the muscles that were engaged in different movements.

> I love the learning part. I loved learning how my body works and why it works that way and things that made sense, obviously, at the end of it. I loved all of the different equipment and learning how to use that. I'm all like, for it if it teaches you something. That seems really basic, but it's actually learning what heart rate you should be at, learning that, and how to increase.

3.1.3 | Intervention coherence

This construct refers to the extent to which participants understood the interventions and how they worked. This construct was reported by all participants and one theme emerged for this construct: a clear understanding of the study.

Clear understanding of the study

Most participants described the purpose of EXOFFIT and were clear on the aim of the study for improving fitness in women with obesity. Most described that understandable information was available via the website, flyer or speaking with the research coordinator (MED). While over half of the participants reported an understanding of the three exercise interventions involved in EXOFFIT, some participants described areas they would have liked more information. These included additional information detailed in advance regarding the interventions (e.g., progression plan, number of participants per session) or randomization process and advice regarding external factors they needed to consider (i.e., appropriate clothing or shoes for exercise, when to eat around exercise session, etc.)

> I think you're trying to look at a particular cohort of women…. with a BMI of a certain amount. I think it was over 30. You're trying to see what types of interventions lead to the best health outcomes for these cohorts of women. You're doing that by creating a baseline at the beginning, having a program, and then comparing final results to the original baseline. You're doing that across three cohorts.

3.1.4 | Ethicality

Within this construct, the program was viewed by participants as a good fit for their personal values system.

Good fit

Most participants reported the program to be a good fit for them, with all advising that the program was appropriate for women with

obesity. Most commented on how much they valued the design of the interventions (i.e., the exercises and machines selected, easy low intensity intervention start, gradual progression) and how they felt they were suitably challenged without feeling incapable, embarrassed, or lacking confidence in their ability. Some participants observed how they appreciated training with only women and described how it was pleasant for them to train with those similar to them as they did not feel so alone. Indeed, participants described liking the social support when several participants trained together. Other participants commented on how the improved knowledge of obesity gained through EXOFFIT participation helped change their mindset from a negative self-stigmatizing and self-critical perception of themselves.

> I actually wouldn't change anything about it. I think it's very well set up and I think it's accommodating to all levels. That's nice that people who are starting from zero, didn't feel overwhelmed by it. That's actually a really nice aspect of it. I didn't think I would change anything.

3.1.5 | Burden

This construct refers to the participants perspectives on the effort that they perceived was required to participate in EXOFFIT. Three themes were identified by 31 participants: the required social support to facilitate participation, the challenge of integration into daily schedule and travel burden.

Social support to facilitate participation

Only a few participants described the support they needed from their family or co-workers in order for them to participate in EXOFFIT. Indeed, they commented on the fact that they needed their family to take on more responsibility with respect to childcare (i.e., transport of children to/from school, preparing meals, putting children to bed or getting them up, etc.). For one participant, co-workers facilitated them to finish work slightly early some days so they could come to an exercise session. While for a few others, participation impacted them meeting with their partners and spending evenings together.

> My husband helped a lot. Like he'd put the kids to bed and all that which it was. It was hard on him so I could see… It was more. I wasn't really giving up something, but I suppose he was facilitating me doing this. It was hard that I was missing family dinner, bath time, story time, those kind of things… Everybody sort of helped me get here. So Thursday… my husband works Thursdays. So [my sister], whose coming, minded my kids. That was kind of a commitment from her. But I really appreciated that… I suppose I'd have had to get babysitter.

Integration into daily schedule

Some participants commented on the time burden, wherein some had to get up earlier and lost time sleeping, or others attended evening sessions which extended their day beyond work. Nearly half of the participants described having to fit exercise sessions in around other daily commitments, having to move other commitments to accommodate a session, or having to delay completing work outputs to another day or out-of-hours. While some found accommodating three in-person sessions into their schedule a challenge, others described the need to be organized ahead of exercise sessions (i.e., making sure they had clothes to exercise in, prepare meals in advance for family/themselves) in order to incorporate the sessions into their week. All participants described the burden of integrating EXOFFIT into their schedules to be worthwhile and in some ways, beneficial (see opportunity costs).

> I think the time that I was coming here three times per week and I could change the time based on the needs, it actually gave structure to my day. I had to know that I have to leave work at a certain time to be able to be on time and then collect [my child].

Travel

Some participants described commuting challenges (i.e., traffic, public transport) and the time taken to get to and from an EXOFFIT session. Others commented on how they would get up earlier or get home later in the evening. However, all participants who described the travel burden stated that it was worth it to them, and all felt that the benefits of the program far outweighed this burden. One participant even described learning to enjoy the time spent commuting as "alone time" for themselves.

> It didn't stop me from doing anything. Like you lose a massive chunk of your evening just getting here and getting back again. I'm looking forward to getting some of that back, get to the gym in the mornings. But no, it didn't stop me from doing anything.

3.1.6 | Self-efficacy

This construct refers to the participants' confidence in their ability to perform the behaviors required to participate in the program and continue to perform these behaviors post completion of the program. All participants described this construct and two themes emerged for this construct: exercise performance and sustaining exercise.

Exercise performance

Most participants reported confidence in performing the exercise interventions. Most described that understanding how to train and knowing their capability to perform certain exercises at three weekly

sessions greatly influenced their confidence. A few commented on a changed perspective toward what they as women with obesity are capable of (i.e., stereotype that people with obesity can't be fit or perform certain exercises) and toward strength training (i.e., strength training is masculine, could make women bulky) and how this influenced their confidence to exercise.

> Even just knowing that I can sit on a bike and cycle for 25 minutes at a high pace. Because I would have given up before. I'm like, 'Oh, I'm tired.' Now I'm like, 'No, this is okay. I'm achieving. My heart rate's fine. I'm not dying.' All of that stuff.

Sustaining exercise

Most participants described feeling confident to independently continue with exercising post EXOFFIT, with the majority outlining their plans to join a gym (or having joined a gym) or to train at home. While some reported a desire to try other types of exercise, others commented on their plans to schedule in sessions into their week as they had in EXOFFIT. Most perceived some challenges to sustaining exercise, which included intrinsic motivation and accountability without supervision, needing to continue to protect time for exercise in their week and concerns about finding a similar program or space where they feel comfortable exercising without judgment or embarrassment.

> Like I said, there was no way I would even looked at weights like that before. I hate that. I've already signed up to a gym to keep things going and I'm determined to not go backwards. It's changed how I view my fitness.

3.1.7 | Opportunity costs

This construct refers to the extent to which participants sacrificed any benefits, profits or values to engage in EXOFFIT and was described by 35 participants and four themes emerged for this construct: social cost, importance of making time for themselves, discomfort associated with taking part and no cost or positive impact of taking part.

Social cost

Some participants described the impact of participation on the time with family and friends. A few reported how participation cost them time with their partners and/or children where they felt they got to see their family members less during the program. Others commented on how participation impacted their social time with friends or colleagues (i.e., meeting for lunch) or occasionally having to decline social get togethers. All participants describing a social cost reported that this cost was outweighed by the benefits of participation.

> It did interfere with making friends the first few weeks, just because people would ask me out and I have to go to the EXOFFIT. Then after half hour, I'm like, 'Oh, sorry, guys, I can't make it.' Eventually it did work out. I was able to manage my time more and just switch up the schedule so I can have an equal amount of social life and also do the exercise.

Importance of women making time for themselves

Nearly half of the participants commented on the importance of women prioritizing time for themselves. They stated that participation in EXOFFIT meant they were doing something just for themselves that was not related to caring for others or work and some felt selfish with their time in participating. While some participants advised that this time benefitted them by giving them space to manage stresses, others reported that their family members also benefitted as it made them less dependent on trivial things. A few described feeling a sense of personal satisfaction by participating and putting aside the time for themselves to exercise.

> I love that I was able to achieve something for myself. Cause everything I do is for others. This is for me. Just for me. My time.... I was achieving something just for me.... I just, it was my time and I loved that. I loved that I was able like 'I'm going to the gym. Do whatever. This is my hour.'

Discomfort associated with taking part

Less than half of the participants commented on discomfort they experienced by taking part in EXOFFIT. A few acknowledged that they were bothered personally by the fact that they had to see themselves as living with obesity to partake in EXOFFIT or that a BMI cut-off was the main criterion for study inclusion. Others explained that they found either the measurement of CRF or body composition uncomfortable, either because of the equipment or challenge involved or because of the intimate measurements of waist circumference or weight. Some commented on their uneasiness with trainee physiotherapists who acted as exercise instructors at different points of the program delivery. Participants advised that at times they felt uncomfortable with the presence of these instructors for a few reasons: some were male and they did not feel comfortable exercising with men; others were young compared to participants, which made conversing awkward; some participants perceived the students as being fit and slim and were worried about judgment or stigma; or some participants felt the students over supervised and impeded upon their space and exercising.

> The day of the assessment though, I was a bit overwhelmed when I did all the measurements and everything and I found it a bit uncomfortable, the whole thing, because I think because the physio students felt

> very uncomfortable as well. I did notice that and for a few minutes I was thinking why did I do this? I genuinely did think that why am I here? But I did get over that. I'm very glad I did. Once I started the exercises, I never came to my head again at that point. I was very glad I was here. I'm very glad I did it overall. But that was very uncomfortable to be honest.

No cost or positive impact of taking part

Most participants felt that participation in EXOFFIT did not impact their ability to satisfy personal commitments. Some commented on how flexibility of scheduling sessions meant that they did not feel any extra pressure associated with the sessions despite having busy schedules. A few participants reported a positive impact of the sessions being added to their weekly schedule in that it forced them to be more organized in daily life with planning their week and commitments or more energetic in the evenings where otherwise they would have been sedentary.

> It actually was better because it gave me space to relieve. It did the opposite. If I was constantly studying, never taking breaks. By signing up to this, I had another commitment that allowed me to have space for myself to recover. Even though I was working out.

3.2 | Exit questionnaire

Detailed results from the questionnaire are presented in Table 4. Most participants found the program design (76.3%), session pace and length (94.7%), session supervision (100%) and overall program intensity (100%) to be just right for them. Most participants preferred having a small number of participants (2–3) exercising together (97.4%) and liked having three supervised sessions per week (86.8%). Over half of the participants favored the program length of 12 weeks (55.3%), while 44.7% would have liked a longer program (12–52 weeks). There was overall agreement that supervision made it easier for them to perform (97.4%), progress (100%) and modify (100%) exercises and reach prescribed targets (100%). Though most participants reported some confidence that they could progress their program unsupervised, the number who reported being somewhat or very confident to keep up exercising decreased marginally over time post intervention (one week: 89.5% vs. 12 weeks: 81.6% vs. 12 months: 78.9%). Most participants were satisfied with the program (94.7%), would recommend the program to others (92.1%) and would do the program again (92.1%). The main barriers to program participation were family (47.4%), work (57.9%) commitments and illness (50.0%). The main facilitators were private gym space (89.5%), timing of sessions (86.8%) and exercise interventions being tailored to the individual (84.2%).

3.3 | Changes to the program

The most common changes suggested were additional machines or equipment, change to session frequency (gym open more days including weekends) and/or choice to do a session unsupervised occasionally, more variety in exercises, more reps/sets and combining the exercise program with another component (i.e., diet, psychological, etc).

4 | DISCUSSION

Based on the authors' knowledge, this is the first study to employ a mixed methods approach using both an exit questionnaire and semi-structured interviews to evaluate the acceptability of supervised exercise training in women living with obesity. This is also the first study in this cohort to use the TFA constructs, presenting the data qualitatively and quantitatively.

Overall, participants had positive feelings about the interventions. Within the construct of affective attitude, feelings of both anticipatory apprehension toward the programs and experienced contentment were apparent. Similar to previous research, most participants described some feelings of fear related to commencing exercise, especially fear of injury or pain, fear of judgment or embarrassment and fear of not being capable or fit enough.[15–17] Indeed, a review[15] examining fear-related barriers to PA in adults with overweight and obesity reported that the main fear categories observed in the literature were fear of embarrassment, stigma and injury. This fear has been reported as a major barrier to exercise engagement in adults with obesity and could lead to exercise avoidance.[16] This may contribute to understanding as to why three participants who were enrolled in EXOFFIT did not commence following randomization. Furthermore, given that all of those randomized that did not start were allocated to a resistance-based program (RE and COM), exercise apprehension perhaps fueled by a lack of knowledge in or negative beliefs about strength training could have resulted in exercise avoidance in this instance.[18,19]

Several factors were identified by participants that helped them overcome this exercise apprehension and are perhaps significant components to consider in future intervention design. Participants really valued exercise supervision for the support it provided and the fact that it acted as an external motivator for their commitment to the program. This aligns with previous research, which indicates that supervised exercise, due to the sense of accountability to others and being under observation, positively influences participant's behavior and overall program engagement.[20,21] For those with exercise apprehension, the interventions being led by a physiotherapist were particularly important, as was being women-only and the similarity of those exercising with them (i.e., only women with obesity). These findings align with previous literature where a women-only environment and exercising with peers and the social support provided were noted facilitators of PA in women with and without

TABLE 4 Exit questionnaire results.

Question and responses			n (%)
The EXOFFIT program exercises were clearly provided to you in a structured way (i.e. you were given a set program to do). What do you think about this?			
Program was just right			29 (76.3%)
Had enough choice with my programme			7 (18.4%)
Would have preferred more choice (too structured)			2 (5.3%)
In general, I liked the exercises included in my program			
Agree			32 (84.2%)
Neutral			5 (13.2%)
Disagree			1 (2.6%)
I think the intensity of the sessions in…			
	…the first few weeks was	…the middle weeks was	…the last few weeks was
A bit too hard	4 (10.5%)	2 (5.3%)	4 (10.5%)
Too easy	10 (26.3%)	2 (5.3%)	34 (89.5%)
Just right	24 (63.2%)	34	0
I think the intensity of the sessions overall across the entire program was			
Just right			38 (100%)
I think the session pace was			
Too slow			1 (2.6%)
Just right			36 (94.7%)
Too fast			1 (2.6%)
How did you feel about the number of women exercising together?			
I liked having 2–3 women exercising together			37 (97.4%)
I liked exercising by myself			1 (2.6%)
Three sessions per week			
Manageable			33 (86.8%)
would have liked more			5 (13.2%)
The length of the sessions progressed during the program to 50-min of exercise. How would you rate the length of the sessions?			
Too long			1 (2.6%)
Just right			36 (94.7%)
Too short			1 (2.6%)
In terms of sessions per week, which would you prefer			
Two longer sessions (2 × 75 min sessions)			3 (7.9%)
Four shorter sessions (4 x 40 approx. minute sessions)			2 (5.3%)
I liked the three sessions per week as they were)			33 (86.8%)
You have completed a 12-week program. What do you think about the length of the program in terms of committing to the program? I think it would be better for the program to be…			
Longer (12–26 weeks)			14 (36.8%)
Much longer (24–52 weeks)			3 (7.9%)
Just right (12 weeks)			21 (55.3%)
The level of supervision provided during sessions was			
Just right			38 (100%)

(Continues)

TABLE 4 (Continued)

Question and responses	n (%)
How did you feel about your exercise(s) (reps/sets) or intensity (i.e. heart rate) being monitored and recorded for you?	
I don't mind either way if my reps/sets or heart rate are monitored/recorded	20 (52.6%)
I prefer to have my reps/sets or heart monitored and recorded for me	18 (47.4%)
Having supervised sessions made it easier to perform the prescribed exercise(s)	
Agree	37 (97.4%)
Neutral	1 (2.6%)
Having supervised sessions made it easier to reach the targets prescribed for each week (time, heart rate, reps/sets, etc.), to progress my exercise(s) and to modify my exercise(s) (i.e. for pain, etc.)	
Agree	38 (100%)
How long did it take you to feel confident that you could complete your sessions independently?	
1–2 Weeks	8 (21.1%)
3–4 Weeks	8 (21.1%)
5–6 Weeks	6 (15.8%)
7–8 Weeks	11 (28.9%)
9–10 Weeks	5 (13.2%)
How confident would you feel that you could progress your program unsupervised?	
Neither	2 (5.3%)
Somewhat confident	23 (60.5%)
Very confident	13 (34.2%)

Now that you have completed 12 weeks of supervised exercise, how confident do you feel that you will be able to keep up exercising three times a week for 150 min for…

	… the next week?	…. the next 6 weeks?	… the next 12 weeks?	… the next 6 months?	… the next 12 months?
Not at all confident	1 (2.6%)	1 (2.6%)	1 (2.6%)	1 (2.6%)	2 (5.3%)
Not so much	2 (5.3%)	2 (5.3%)	2 (5.3%)	5 (13.2%)	4 (10.5%)
Neither	1 (2.6%)	0	4 (10.5%)	2 (5.3%)	2 (5.3%)
Somewhat confident	18 (47.4%)	20 (52.6%)	19 (50.0%)	22 (57.9%)	23 (60.5%)
Very confident	16 (42.1%)	15 (39.5%)	12 (31.6%)	8 (21.1%)	7 (18.4%)

All exercise sessions were supervised. Would you have preferred anything different?	
Yes, 2 supervised sessions and 1 unsupervised session elsewhere (i.e. at home) each week	4 (10.5%)
N/A, liked having three supervised sessions each week	34 (89.5%)
How confident are you that you would have adhered to the three sessions per week throughout the 12 weeks without supervision at home?	
Very confident	2 (5.3%)
Somewhat confident	9 (23.7%)
Neither/nor	2 (5.3%)
Somewhat unconfident	5 (13.2%)
Not at all confident	20 (52.6%)
The intervention was appropriate for my needs	
Strongly agree	29 (76.3%)
Agree	9 (23.7%)
The topics covered in the questionnaire (i.e. pain, sleep, etc.) were relevant to me	
Strongly agree	18 (47.4%)

TABLE 4 (Continued)

Question and responses			
Agree			11 (28.9%)
Neutral			7 (18.4%)
Disagree			2 (5.3%)
Overall, I was satisfied with the program			
Strongly agree			36 (94.7%)
Agree			2 (5.3%)
I would recommend the EXOFFIT exercise programmes to others			
Strongly agree			35 (92.1%)
Agree			3 (7.9%)
I would do an EXOFFIT program again			
Strongly agree			35 (92.1%)
Agree			1 (2.6%)
Neutral			1 (2.6%)
Strongly Disagree			1 (2.6%)
Which of the following (if any) acted/could have acted as barriers to completing sessions			
Scheduled sessions did not suit	4 (10.5%)	Family commitments	18 (47.4%)
Lack of time	7 (18.4%)	Work commitments	22 (57.9%)
Inadequate knowledge about exercise	3 (7.9%)	Illness	19 (50.0%)
Feeling self-conscious	0	Pain (i.e. knee pain)	6 (15.8%)
Fear of being judged when exercising/being stigmatized due to weight		Muscle pain	1 (2.6%)
	1 (2.6%)	Fatigue/Lack of energy	4 (10.5%)
Holidays	4 (10.5%)	Accessibility of UCD	0
Parking	2 (5.3%)	Accessibility of the gym	4 (10.5%)
Transport issues	2 (5.3%)	Lack of motivation	0
All sessions were in person	0	Lack of interest or enjoyment	1 (2.6%)
Other	1 (2.6%)	Lack of social support	0
None	1 (2.6%)		
Do you identify any of the following as facilitators (factors which made it easy) to attend sessions			
Time of sessions (morning, lunchtime, evening)	33 (86.8%)	Online booking timetable	29 (76.3%)
Convenience of location	23 (60.5%)	Individualised programmes	30 (78.9%)
Private gym space	34 (89.5%)	Supervised sessions	32 (84.2%)
Gym set-up (i.e. space around equipment, access to equipment, etc.)	24 (63.2%)	Women only sessions	26 (68.4%)
		Other	6 (15.8%)

obesity.[17,19,22,23] Similarly, healthcare professionals with specialist exercise knowledge (i.e., physiotherapist) are aptly suited to the supervision of exercise in adults with obesity, not only to provide appropriate medical clearance and exercise prescription but also to share knowledge and provide psychosocial support, which lessens stigmatization related to exercise and reduces exercise avoidance.[24]

The privacy of the EXOFFIT gym was noted in both the interviews and exit questionnaire as being a key appealing factor, important for overcoming exercise apprehension and underpinning the ethicality of the programs as a good fit for participants. The provision of a dedicated gym space only for EXOFFIT participants negated the common fears (fear of being stared at or judged, self-consciousness) which promote self-exclusion from exercise.[16,17] Similarly, the design of the interventions with a gradual progression and with specific machines and/or low-impact exercises was deemed important, making the program easy for participants to commence

and suited to their values and needs. Exercises which might be perceived to require more skill, fitness, coordination, or flexibility (i.e., involve jumping, running, etc.) may have been viewed negatively if included due to participants being physically inactive and anticipating the inability to perform them or the risk of injury or pain 16. Due to the excess weight associated with obesity, higher impact exercises would have required the participants to do more work against gravity and would have not been viable for those with physical barriers such as impaired mobility.[25] Equally, the progressive design of the programs aligns with current exercise recommendations for adults with obesity.[26] The gradual progression and low-intensity or "easy-start" to the programs is advised particularly for adults who are physically inactive and/or have cardiac risk factors,[26,27] as is the case with the EXOFFIT participants.

Similar to previous exercise research,[28,29] completion of the program increased participants self-efficacy with regard to exercise performance and confidence in continuing with unsupervised exercise. This is a signal of more intrinsic motivation, which is positive for sustaining the habit of exercise independently. The improvements observed in self-efficacy in this study reflect the three components of exercise self-efficacy suggested in the literature (task, coping and scheduling).[29] The increased confidence participants reported in exercise performance (task self-efficacy) was underpinned by the knowledge and skills they felt they gained during the program.[30,31] Equally, witnessing an improved ability to execute the exercises (i.e., with good form, requiring less cueing) also contributed to the participants task self-efficacy.[32] The individualized exercise interventions, a key facilitator identified in this study, provided participants with realistic, achievable goals and targets as part of the exercise progression, which allowed the participants to experience small successes (i.e., could exercise for five minutes more) and feel confident in their improved ability.[28,33] Coping self-efficacy, as outlined here, which relates to the participants perception that they are overcoming barriers was further compounded by the benefits observed by participants. Indeed, observing improvements in certain aspects of their own physical and psychological health (i.e., improved mobility and mood), which previously had been barriers to exercise participation, likely reinforced the participants self-efficacy. In addition, though the supervision of the exercise interventions provided extrinsic motivation and required participants to fit in three exercise sessions per week, the flexibility of self-booking sessions promoted participants scheduling self-efficacy. Several participants who reported feeling confident in sustaining exercise post program commented that they would continue to schedule the sessions into their weeks to facilitate their adherence into the future, which suggests an improvement in this form of self-efficacy.

Less than half of the participants perceived a burden or opportunity costs associated with participation. Positively, all participants advised that any costs or burden were negated by participation benefits, with nearly 70% of participants reporting no cost with taking part. Unsurprisingly, with work and family commitments reported as the main barriers to exercise participation, the time burden of integrating the exercise into the week was the most reported barrier, aligning with previous literature.[34,35] With regard to needing additional social support as a burden, the dominance of support needed with childcare to participate is reflective of previous research wherein gender norms related to being a woman were seen to be one of the main barriers to PA in women with and without obesity.[19,22,35] While many participants positively reported on the fact that participation forced them to make time for themselves, there is an evident need for future interventions to consider how to best empower women to address the pressures and time constraints associated with cultural norms and to facilitate prioritisation of an active lifestyle.[36]

Though intervention coherence was good, with most participants understanding the purpose of EXOFFIT, areas for potential improvement included the provision of more advanced information regarding the exercise interventions (i.e., the exercises included). As participants were physically inactive upon commencing the study, it was unsurprising that several participants also desired to have some guidance provided regarding other areas related to exercise (i.e., suitable clothing, when to eat). Equally, discomforts associated with participation and how to avoid the same warrant consideration. For instance, a few participants expressed discomfort with the outcomes collected during the baseline and post-intervention assessments, specifically related to the fitness test and measurement of waist/hip circumference. While a future trial could utilize a different protocol for measuring VO_2max, a clearer explanation regarding the procedures for measuring body composition outcomes and their purpose may help reduce the feeling of self-consciousness associated with these measures where other techniques could not be employed.

This study had two main limitations. Due to the limited personnel involved in the EXOFFIT study, the program coordinator, who was involved in exercise delivery, performed the interviews with participants post program completion. Though several steps were taken to minimize the impact of potential bias, the client relationship with the coordinator still warrants consideration. However, it is positive to note that the results of the exit questionnaires, which were anonymous, complemented the findings of the interviews and thus, the coordinator's involvement in the interview process may not have heavily biased their responses. Second limitation of this research relates to the fact that only program completers were interviewed. Therefore, possible negatives or barriers associated with the program that impacted non-completers were potentially not explored by not also interviewing those that dropped out of EXOFFIT. However, it is positive to note that all of those who completed EXOFFIT were interviewed, which ensured a breadth of data and that all possible themes of acceptability were explored. This study had two other strengths. This is the first study to evaluate the acceptability of exercise interventions in women with obesity using a mixed methods approach. Thus, the acceptability of the program is clearly presented with contextual insights from the qualitative data and generalizable insights from the quantitative data so that the findings can be best applied to future interventions. Similarly, the consideration of the TFA in the design of the interview schedule ensured all aspects of the TFA, an issue that has faced other research applying this framework retrospectively.

5 | CONCLUSION

Findings of this mixed-methods paper indicate a high-level of acceptability of the EXOFFIT interventions, with the positive impact of the program being evident in the most reported TFA constructs (affective attitude, perceived effectiveness, and self-efficacy). Although initially apprehensive and some reporting the burden of family commitments, the perceived benefits outweighed any negative impact with participants finding the program suited their needs and values and most participants feeling encouraged toward longer-term sustained exercise practice. These results should be utilized to inform the development of future programs in women with obesity with consideration of all TFA constructs from the outset of study design. Indeed, given the importance of self-efficacy for long term exercise adherence, future researchers might also consider employing additional tools to quantify improvements in the three components of exercise self-efficacy to better address long-term adherence.

AUTHOR CONTRIBUTIONS

All coauthors have fulfilled each of the following criteria: have made a substantial contribution to research design or the acquisition, analysis, or interpretation of data; have drafted the paper or revised it critically; and have approved the submitted and final versions.

MED participated in the conception and design of the work, contributed to the data collection, analysis and interpretation of the data and drafting the work and critically revised it for important intellectual content. CC participated in the analysis of data and interpretation of the results and revising the work. CB participated in the interpretation of the results and revising the work. GO'D participated in the conception and design of the work, contributed to the data collection, analysis and interpretation of the data and drafting the work and revising it critically for important intellectual content. All authors have read and approved the final version of the manuscript and agree with the order of presentation of the authors.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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