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Fear as a barrier to physical activity in young adults with obesity: a qualitative study

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ABSTRACT

Obesity continues to be a growing public health problem worldwide. In adults with obesity, physical activity has health benefits beyond those directly attributable to weight loss. However, adults with obesity encounter various barriers to physical activity. Some barriers including fear, have received little academic attention, particularly in adults under 45 years. The aim of this qualitative study was to explore how fears about physical activity are experienced by, and impact on, adults with obesity aged 18 to 45 years. Semi-structured interviews were undertaken in a sample of 10 participants with a body mass index greater than 30 kg/m². Analysis was conducted using the six phases of thematic analysis from the guidelines of Braun and Clarke. Participants gave detailed accounts of their experiences of fear and how it impacted on physical activity. Three themes were extracted: (1) fear as a barrier to physical activity; (2) threats, concerns and worries about weight underpinning fear(s) of activity; and (3) the consequences of fear(s). The findings suggest that the emotion of fear, particularly pain-related fear(s), were a frequent and important barrier to physical activity among younger adults with obesity. This is an important finding because of the risk it poses to health behaviour change. The findings provide some evidence that younger adults experience fear avoidance beliefs aligned to the conceptual principles of the Fear Avoidance Model. Further research is needed to further explore this relationship in a larger sample of younger adults with obesity, and explore its implications for promoting behaviour change in this group.

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Emotions; obesity; physical activity; barriers; health behaviour

Introduction

It is estimated that the global economic impact from obesity is roughly \$2 trillion (Dobbs et al. 2014). Obesity continues to be a growing public health problem worldwide because of the increased risk of weight-related non-communicable diseases that lead to early mortality (Agha and Agha 2017). Management strategies for obesity have largely centred on the promotion of dietary interventions (energy intake reduction) in combination with a secondary focus on physical activity (energy expenditure). With there still being an upward trend in obesity levels in many countries, it is clear these strategies have not been wholly effective (Foster-Schubert et al. 2012). Because of this, an increased emphasis on physical activity could be beneficial since it has advantages in health benefits beyond weight loss (e.g. improving self-esteem and, independently, reducing the risk of non-communicable disease) (Gatineau and Dent 2011; Dobbs et al. 2014). However, research has highlighted that adults with obesity encounter various barriers to physical

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activity that result in a failure to meet recommended guidelines (Aibar-Almazán et al. 2018). These barriers are multifactorial and can include physical, psychological, and environmental components (Hamer et al. 2021). Central to physical barriers is pain and injury, making basic movement difficult and uncomfortable (Cooper et al. 2016). External barriers include, for example, lack of time and lack of transportation (Coe et al. 2017). Psychological barriers which impact on activity participation include low mood, lack of motivation and fearful cognitions (Hamer et al. 2021; Aibar-Almazán et al. 2018; Rosic et al. 2019). Based on the existing body of qualitative evidence around being active with obesity, psychological barriers appear to be the primary concerns because of increased perceptions of disability, weight stigmatisation, depressive cognitions (negative views of self, the world, and the future), lack of motivation and fear (Napolitano et al. 2011; Hamer et al. 2021). Several studies have highlighted the importance of psychological barriers and its impact on physical activity participation (Toft et al. 2020; Danielsen, Sundgot-Borgen, and Rugseth 2016; Myre, Glenn, and Berry 2021; Cooper et al. 2016). Key findings from these studies show that activity avoidance by adults with obesity is often a consequence of negative emotions (e.g. fear, shame, guilt and embarrassment), more so than barriers related to time, access to equipment or ill health (Myre, Glenn, and Berry 2021; Toft et al. 2020). Psychological barriers, in these contexts, have been conceptualised as an attitude, belief, thought pattern or perception that prevents an individual from participating in physical activity (Rankin 2012).

Intervention studies that fail to acknowledge psychological barriers or include psychological components have been shown to be less effective at increasing activity in adults with obesity (Wiklund, Olsén, and Willén 2010). According to Cooper et al. (2016), motivation and depressive symptoms are likely to be the primary targeted psychological barriers that limit activity in populations with obesity. However, even though there is a much greater understanding of the role played by these psychological barriers, there are still high levels of inactivity among adults with obesity (Napolitano et al. 2011). This would indicate that some of the other psychological factors may contribute to the problem of inactivity in individuals with obesity (Foster-Schubert et al. 2012). In order to further understand the issue, it is necessary to re-examine the barriers that an obese population may face that could prevent an increase in their levels of activity.

An area of research that has received little attention within this field is that of fear. The emotion of fear has been shown to be a powerful motivator; for example, the Government has used fear to help motivate individuals to stop smoking, using images of diseased lungs on packets of cigarettes (Nichols 2017). However, the conventional perspective is that fear is a poor motivator for behavioural change (Zelle et al. 2016). Experiences of fear can be debilitating and traumatising, creating numerous concerns both mental and physical (Andreasen 2016). Fear-related concerns have been shown to restrict health-promoting behaviour. For example, Zelle et al. (2016) found that physical activity levels are lower following renal transplantation with few transplant recipients meeting physical activity guidelines, and fear of movement being an important barrier (mediated by low physical self-efficacy). Other research has also shown that adults with obesity perceive fear as a significant psychological barrier to physical activity (Vincent et al. 2011, 2014; Wingo et al. 2013). These studies suggest that fear is likely to manifest from the heightened physical response to activity and catastrophizing of joint pain (often experienced by adults with obesity).

According to the psychological theory of 'Basic Emotion', fear is one of a small set of 'basic' or fundamental emotions (including but not limited to sadness, anger, surprise and happiness) (Ekman and Cordaro 2011). The term 'basic', when used to define an emotion, represents two key characteristics: The first is a view that emotions have evolved through adaptation to our environment, and the second is that they are discrete, fundamentally distinguishable from one another (Buckley, 2016; Ekman and Cordaro 2011). Historically, 'basic' emotions share at least 12 key characteristics (e.g. distinctive universal signals, automatic appraisal, presence in other primates, capable of quick onset,

etc.) and are said to be preprogrammed from birth (Ekman and Cordaro 2011). More recently though, emerging frameworks suggest that a person's affective experience may play a part in shaping these emotions (Williams 2017).

In psychology, fear is thought to arise consequence to a 'threat' of harm, either psychologically, physically, or emotionally (LeDoux 2014). The psychological construct of fear suggests that its purpose is to protect an individual against an immediate, real, and subjective threat (Asmundson et al. 2004). For example, a fear of reptiles (herpetophobia) may serve (in evolutionary contexts) to provoke an increase in awareness that helped humans to survive the species (LeDoux 2014). In this sense, fear is typically directed towards a distinguishable stimulus, situation, or activity (rather than an unknown) (Asmundson et al. 2004). However, the intensity of fear is thought to be multifaceted and largely dependent on the stimulus (ranging from being afraid to extremely terrified) (Ekman 1992).

The emotion of fear can exist prior to, and following three key dimensions along which fear is expressed: cognitive, behavioural and physiological (Asmundson et al. 2004). The cognitive emotional dimension is characterised by cognitions relating to threatening stimulus or danger (Asmundson et al. 2004). This dimension increases negative cognitions, which directs attention away from motivating action. The physiological dimension is characterised by a stimulation of the sympathetic nervous to prepare the body to respond to a 'threat' (Asmundson et al. 2004). This dimension provokes an increase in heart rate and muscle tension to better facilitate action (Vlaeyen and Linton 2000). The behavioural dimension can be characterised by the defensive behaviour that occurs as a direct response to a perceived threat, typically those that include fight or flight responses (Asmundson et al. 2004). A flight response may include a partial or complete avoidance, whilst a fight response may include actions to combat a perceived 'threat' (such as ill health or mortality) (Cannon 1915).

Studies in some groups of older adults and adults with obesity have confirmed that threats, such as pain or injury, can trigger fears that may elicit a flight response from physical activity (fear avoidance) (Vincent et al. 2014; Bennett et al.'s 2017). In this area of research, flight responses to fear have been theoretically conceptualised using factors of the Fear Avoidance Model (FAM) (Vlaeyen and Linton 2012; Vincent et al. 2014). The FAM proposes that individuals enter a detrimental psychological cycle by first experiencing pain or catastrophizing about threatening illness information. These experiences result in a series of maladaptive psychological responses (fear), and activity avoidance (Vlaeyen, Crombez, and Linton 2016). Fear has been hypothesised as the most important factor in understanding why pain and other factors (depression and perceptions of disability) persist once the initial discomfort from physical activity has subsided (Vlaeyen and Linton 2012). Obese individuals experiencing fear may be in danger of more serious health detriments because fear-related inactivity may entail more negative consequences (e.g. catastrophizing, depression, low mood and heightened perceptions of disability) than when prompted by other barriers (e.g. lack of time or lack of motivation) (Cooper et al. 2016; National Heart, Lung, & Blood Institute, 2013).

A recent scoping review of fear-related barriers by this author found that while there were 34 studies suggesting nine different fear-related barriers to activity in adults (of all ages) with obesity, only five studies explicitly explored fears in younger adults (Hamer et al. 2021). The review specifically highlighted a research gap around activity related fear of pain and movement. There was also limited literature about fears in adults under 45 years of age (Hamer et al. 2021), despite the increased prevalence of obesity in this age group (Hamer et al. 2021; NHS Digital 2019). Fears found in older groups cannot be assumed to be mediators of physical inactivity in younger age groups (Ramírez-Vélez et al. 2015). Given the importance of the health implications of obesity in younger adults, there is a need to identify barriers to inform approaches to increase physical activity levels in younger populations. This study explores how fears impact on physical activity among younger adults (aged 18 to 45 years) with obesity, and how this is experienced day-to-day.

Materials and methods

A qualitative interpretative description study design was employed as the methodological approach (Thorne 2016). This approach remains pragmatic in that it fits with a wide range of epistemological views, firmly focused on answering practical research questions that arise from real world problems (Thorne 2016). This aligns with the researcher's pragmatism paradigm in that it is the principles of what may best resolve any given problem, and a drive towards practical outcomes that direct the inquiry. The approach was guided by the work of Peirce (1886) and James (1907) who considered the significance of human beings as experiential individualists. The approach could, at points in time, tilt the researcher towards an interpretivist philosophy. The design was deemed appropriate given the exploratory nature of the study (Sullivan-Bolyai, Bova, and Harper 2005).

Thematic analysis was chosen as the method of analysis because of the similarities relating to key principles of the interpretative description design (Braun and Clarke 2013; Vaismoradi, Turunen, and Bondas 2013). Both the approach and method of analysis seek to provide a rich description of participant experiences whilst remaining firmly focused on answering research questions through pragmatic approaches (Thorne 2016). This study generated codes and themes inductively to capture meaning and content whilst staying close to the surface of the data (Sandelowski 2000; Bradshaw, Atkinson, and Doody 2017).

Participants

Ten participants aged 18 to 45 years with a body mass index over 30 kg/m² were recruited. The age range of 18 to 45 years was employed because existing literature has largely explored fears in populations over 45 years of age (Hamer et al. 2021). Participants included four females, six males, eight class one obese adults (BMI, 30.0 to 34.9 kg/m²), and two class two obese adults (BMI, 35.0 to 39.9 kg/m²). Seven participants declared themselves as inactive, whilst three participants stated that they participated in moderate levels of low intensity physical activity. None of the participants suffered from any physical condition unrelated to weight that affected movement or restricted physical activity (e.g. degenerative muscle conditions, artificial joints, amputations, neurological conditions and fatal diseases).

Participants were recruited from one University and one leisure facility within North West England. A purposive sampling strategy was used to ensure that the participant group included representation across different genders and ages (Sharma 2017). Participants were recruited through flyers, newsletters and social media. In addition, snowball sampling was employed to build a network of participants with the relevant characteristics for the purposes of the study (Braun and Clarke 2013).

Ethics

This study was approved by Edge Hill University Research Ethics Committee (FOHS 202). Following each interview, the audio voice recordings were transcribed, anonymised and a unique study pseudonym assigned to protect the identity of each participant.

Data collection

Semi-structured interviews were conducted in a private space face-to-face, or via telephone if the participant could not meet in person. An interview schedule (seen in Table 1) was constructed based on available literature and included questions relating to physical activity and barriers to participation. As the data collection progressed, new topics were probed based upon the concepts, insights and patterns of themes that were constructed in earlier interviews. Informed written consent was obtained from all participants prior to the interviews. Interviews

Table 1. Schedule used to guide interviews.

Topic area	Questions
Physical activity participation	Thinking back to the last few days, weeks, and months ...
Concerns/ barriers (including fear-related barriers)	• Could you please tell me if any, what activities you engage in such as grocery shopping, taking the stairs, gardening, walking, or group exercise classes? <i>Prompt: how often and the duration of activity you take part in an average week.</i> • Could you please tell me if you enjoy these activities and what helps you to take part in them? • Could you tell me if you have had any concerns/ barriers that may have stopped you or restricted you taking part in these activities or any activities? • Could you please tell me under what circumstances activity is most concerning for you? • Could you please tell me where you perceive your concerns originate from and what it means for your experiences of activity? <i>Prompts:</i> • <i>In your response you talked about(led by participants response) could you expand on that point please?</i> • <i>You talked about (participant response/ emotion), how does that influence your decision to partake in activity?</i> • Finally, is there anything else you would like to add on the topics that we have discussed?

were digitally audio recorded and ranged from 30 to 80 minutes in length, typically lasting 40 minutes. Brief field notes were made during the interview to support the contextualisation of data during analysis.

Data analysis

Analysis was conducted using the six phases of thematic analysis from the guidelines set out by Braun and Clarke (Braun and Clarke 2013). In phases one to three, transcripts were transcribed verbatim and initial thoughts were noted in a reflexive journal. The transcriptions were re-read several times to obtain a sense of the whole, noting emotions and themes, whilst taking into account the overall picture. Once the researcher was immersed with the data, an inductive approach guided the coding of interesting topics within the transcriptions. Coding was conducted line-by-line in a systematic fashion, identifying as many potential patterns as possible. Full and equal attention was given to each transcript to identify interesting, evocative, and powerful data items that formed the basis of the candidate themes. The codes and their corresponding data extracts were then collated and organised to form a set of candidate themes. Phases four to five generated a thematic map, identifying the candidate themes and several sub-themes. During these phases, several candidate themes were collapsed together because of the distinct similarities they shared. Other candidate themes were divided into sub-themes because they contained data important for the objectives of the study. Sub themes were formed because they provided a hierarchal structure for some of the more complex themes within the dataset. As the data collection progressed, the themes were refined by revisiting the transcripts, re-reading data extracts and an updating of the thematic map until each had a corresponding analytic narrative. Three refined themes were formed from these phases of analysis. Phase six combined appropriate data extracts with an analytical narrative that addressed the objectives of the current study (Braun and Clarke 2006). Steps one and two were conducted by two authors whilst steps three to six were conducted collaboratively by three authors. The final set of themes were presented to the each of the authors for approval. Collaboration between the researchers aided in strengthening the robustness and rigour of the findings.

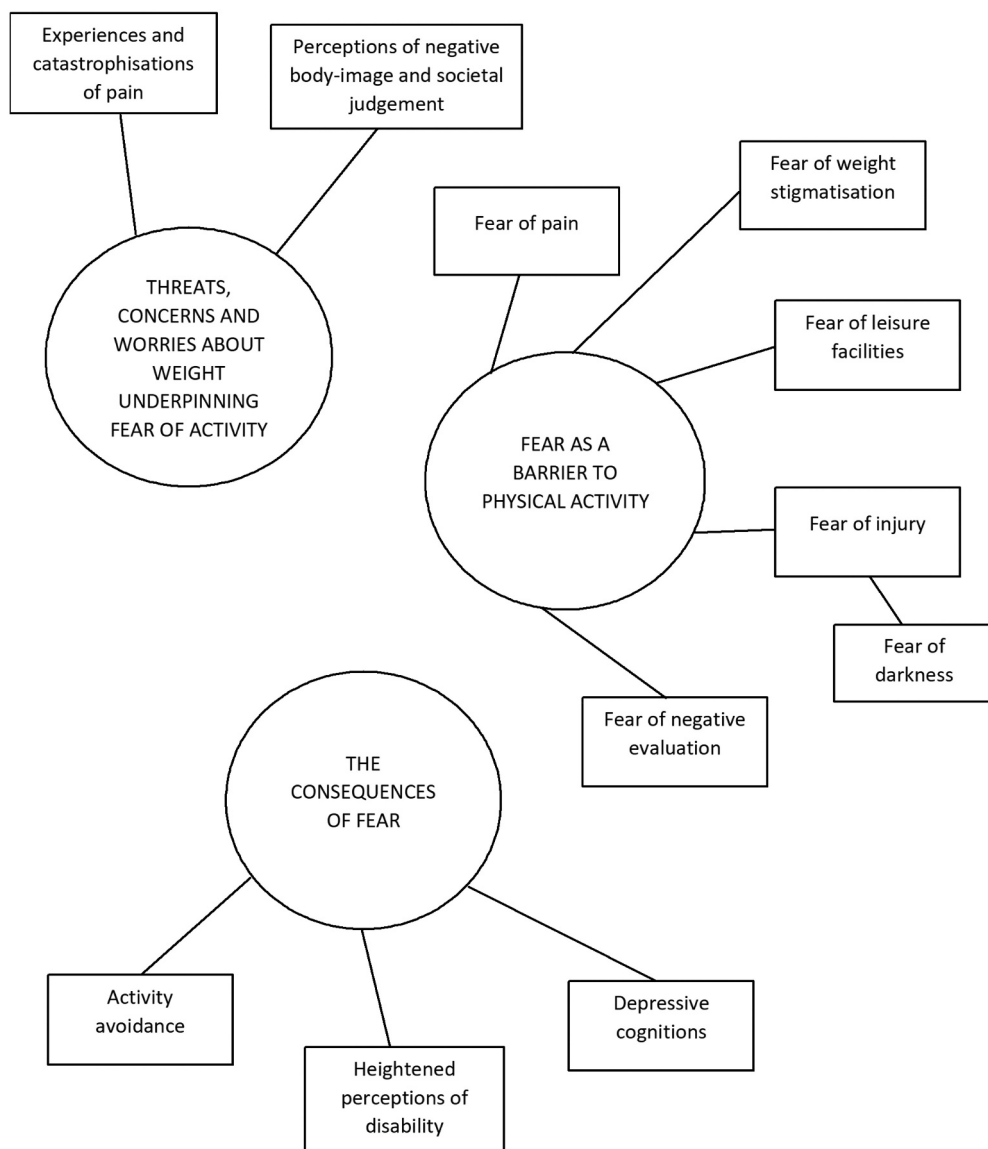


Figure 1. Thematic map, showing final themes and sub themes.

Findings

A thematic 'map' (seen in Figure 1) was generated to show the three candidate themes and the sub themes within them (Braun and Clarke 2006). The first theme described how fears were perceived as a barrier to physical activity. The second outlined some of the important factors that may have been influential in participants' development of fear. The third theme highlighted the consequences of fear and how the experience of fear may lead to inactivity.

Theme 1 – fear as a barrier to physical activity

The theme demonstrated that fear is an important barrier to activity for younger adults with obesity. All ten participants described fear as a barrier to physical activity. Participants frequently adopted a flight response (avoidance) when experiencing activity-related fears. These behavioural responses typically meant that participants would seek to stop or avoid physical activity. An example of this was described by participants who were ‘scared’ of leisure facilities.

Sub theme – fear(s) of leisure facilities

Fearful experiences exacerbated perceptions that leisure facilities were intimidating, and this led to activity avoidance:

It's so scary, it really is, I can't even describe how daunting it is, just putting your PIN code in the (leisure centre) entrance door ... I got really scared, especially when you walk in, the first thing you see is all the machinery (Participant 6).

Participant's experiences of activity-related fears shaped a consensus that leisure facilities or gyms may not be ideal locations to exercise. Several participants indicated that these fears had manifested through a combination of unfriendly leisure atmospheres, negative evaluation and staff members who fail to recognise the sensitivity of weight concerns.

Sub theme – fear(s) of weight stigmatisation

Alike concerns about leisure facilities, participants feared enacted weight stigma which was exacerbated by thoughts that peers may judge them:

There's the fear of looking foolish like how you'd look or how you kind of appear to other people (Participant 1).

I always thought that people around me were looking at me, judging me and then that would play on my mind and then I would question myself and then wonder ... (Participant 5).

These fears were intensified in settings with large crowds and whereby they could be easily observed whilst participating in activity (e.g. a university campus and swimming pools).

Fears related to weight stigmatisation were closely interlinked with other fears related to negative evaluation.

Sub theme – fear(s) of negative evaluation

Fear(s) of negative evaluation were a powerful barrier to physical activity that often led to activity avoidance. They were particularly pertinent in contexts of physical activity which included ‘gyms’, ‘swimming pools’, ‘one to one PT sessions’ and ‘the weights area’. The following quotations illustrate fear(s) related to negative evaluation:

Well going to the gym on my own is a big no for me, I just couldn't do it ... If I walked into a gym on my own, I always thought oh, everyone's looking at me (Participant 5).

They're discriminating you because of weight and the way you look ... even if you're trying to make yourself better people still look at you like ‘what are you doing here’, like go over there you fat [obscenity]. Honestly, it just makes me want to go away, if I want to do exercise I do it where there's no people, I don't need people like them judging me, putting me down (Participant 9).

Notably, these concerns were a consequence of negative self-body image perceptions that had been formed because of the way society ‘blamed’ them for their obesity. As participants navigated fear-related experiences they discussed the mental anguish it had caused them, and these intensified other fears related to embarrassment.

Sub theme – fear(s) of injury and fear(s) of darkness

Another important fear related to the contemplation of sustaining an injury. In navigating these fears, participants emphasised a need to ‘protect’ their long-term health. Several participants described a strong desire to avoid injury that would immobilise them:

I don't want to be that person ... in a wheelchair just sort of unable to move any of the time (participant 9).

Because of this, participants nearly always avoided activity:

I'm always scared of getting hurt, I always avoid it (physical activity) (Participant 3).

I think about it (injury) as soon as I'm approaching it (exercise machine) and I'm thinking right, do I, what do I do. I just end up ignoring it all and don't do it (Participant 2).

These fears were described during contexts where participants engaged with moderate intensity activity, such as, jogging, lifting weights and climbing stairs, both in leisure facilities and outdoor environments.

Several participants acknowledged that their obesity contributed to fearful cognitions because of the increased risk of a severe injury, and that the possibility of weight gain from injury related inactivity intensified fears. Many of the female participants described a fear of darkness as a feature of injury related fear avoidance. Participating in activity in darkness was described as ‘dangerous’ and it was perceived to increase the risk of injury through falling (Participant 2, 4 and 6). Fearful perceptions meant that participants would not engage with activity such as walking or jogging in their usual outdoor settings during hours of darkness, and this led to an increase in inactivity.

Sub theme – fear(s) of pain

Although many explicit fears were described, more than half the participants emphasised pain-related fears as the most important activity related fear. This was because the experience of pain-related fear did not just impact upon activity but had a far-reaching impact on quality-of-life. Most participants cited pain-related fear as the primary reason for their inactivity and sedentary lifestyles. Experiences of pain-related fear had severe consequences for social wellbeing because participants would not engage in community events (e.g. charity walks, sports days etc.), expecting that any involvement in activity would trigger chronic pain:

I fear it, I don't want to go back to that pain ... and (because of the pain) I'm secluded I can't do nothing (activity), I feel like a right idiot just sat doing nothing (Participant 9).

If I had that fear and I was going to go to the gym or someone asked me to go or asked me if I want to go for a run and my legs were in pain there's no chance I would do that, I would just stay inside (Participant 3).

Pain-related fear had consequences for the intensity and context of activity in that it caused participants to avoid jumping, running, twisting or descending stairs. Participants viewed these modes of activity as ‘problematic’, and this intensified psychological and behavioural avoidance. Patterns within the theme also indicated that pain-related fears frequently threatened low intensity activities of daily living, preventing them from carrying out ‘the simplest of tasks’ such as carrying grocery bags, lifting children into a high chair, and caring for dependants. Participants suggested that pain-related fears contributed to a cycle of fear avoidance that resulted in low levels of physical activity and heightened perceptions of disability. The behavioural and psychological interaction between pain-related fears created a complex web of barriers to activity that were ‘difficult’ to overcome, even when participants were sufficiently motivated to become active.

This theme shows that experiences of activity-related fear (if perceived as a barrier) can modify behaviour, resulting in the avoidance of physical activity. This highlights that fear is an important concern for younger adults when they contemplate and attempt to participate in physical activity or enact health promoting behaviour. Fear could be an important risk factor for inactivity in younger adults with obesity.

Theme 2 – threats, concerns and worries about weight underpinning fear of activity

This theme captured the threats, concerns, and worries that participants appeared to have about their weight which were contributing factors in how fearful cognitions began to manifest. Participants described factors of weight stigmatisation and pain as the key concerns and worries that provoked catastrophizing which likely led to fear(s). This theme provides some conceptual underpinning for the factors that may be important for the construct of fear(s) described by younger adults with obesity in this study.

Sub theme – perceptions of negative body-image and societal judgment

Participants described feeling overweight and this made them feel ‘horrible’ about their aesthetic appearance. More than half the participants experienced heightened self-consciousness, low self-esteem and low self-confidence because of their weight status:

It is really horrible to deal with this weight, it kicks in a lot of negative feelings about yourself (Participant 6).

I am overweight and I feel self-conscious (Participant 8).

These appeared to relate to concerns about how society and others in the community judged and evaluated their obesity. These thoughts were accompanied by worries that they would embarrass themselves or be humiliated by others, when engaging in physical activity. Participants described previous instances of embarrassment and weight stigmatisation that exacerbated their present concerns:

I had a personal trainer when I was younger, he made me jump on a box and I fell straight forward ... It was the most embarrassing thing in my life, it still plays on my mind, so it obviously had an effect on me, my sister always tries to get me to go to the trampoline classes and it is not happening, no jumping ever (Participant 6).

I think it definitely exists in males as well, I don't think that's highlighted as much as females but it definitely exists that stigma yeah ... I have had negative comments come my way (Participant 8).

As participant's worries, concerns and negative cognitions (relating to prior experiences) worsened, fears related to weight stigma and leisure facilities began to manifest.

Sub theme – experiences and catastrophisations of pain

Alongside weight concerns, participants lived with, and suffered frequent pain that acted as an important barrier to physical activity. Participants often catastrophized about the threat of pain, specifically in parts of their back:

My back gives me that much pain that even when I'm on my tablets and stuff like that, I still can't pick up my daughter, I still find it hard doing the simplest of tasks (Participant 9).

I've ended up with constant sciatic nerve pain ... there was one point I had to walk with something against my hip and the pain for some reason would kind of ease off (Participant 2).

Experiences of pain ranged from acute soreness to chronic discomfort, and this had an impact on the participation with physical activity. Most participants described how they would actively avoid activities (such as, jogging or sports games), that was challenging on the joints or that may intensify pain. All activity that included 'jumping', 'twisting' or 'running' was mostly avoided because of concerns about pain and sustaining an injury:

No jumping ever, no star jumps, no jumping on boxes anything like that (Participant 6).

If you asked me to go and play football, that's an absolute no no, I couldn't, the twisting and the turning, the other thing I have real difficulty with is ermm jumping is really problematic ... I need to see were I'm going, I can sort of plan were I'm going to put my feet (Participant 8).

On occasions, activity avoidance extended to include basic household tasks such as carrying groceries and climbing stairs. This was partly because participants experienced joint pain in the knees, hips and ankles. When prompted about the experience of pain in contexts of activity, participants stated that pain had caused them to terminate exercise early:

I had to stop because it was hurting, and I couldn't physically walk because of the pain (Participant 3).

When I did running my hips started to hurt, that was quite a barrier to exercise (Participant 2).

Previous instances and experience with pain and injury worsened participant worries and concerns, increasing perceptions of disability. The consequence of these concerns was severe in that it provoked guarded movements and exacerbated physical limitations (diminishing exercise intensity):

My legs would seize up, but they could bend and stuff but if I'd put pressure on them they'd hurt like I don't know how to describe the feeling but it's sort of like just like shocks on my legs ... (Participant 3).

Experiencing activity related pain often led participants to catastrophize and magnify the threat of pain. Most felt cautious and concerned about future physical activity because of concerns that pain would reoccur. The negative cognitions surrounding pain often dictated activity levels, particularly moderate to high intensity exercises (e.g. participation in sport or group exercise classes):

Yeah, its pain, the pain tells me if I'm able to go and do it or not ... You just sort of get used to not doing a lot, the pain, it just becomes constant (Participant 9).

I'll have to put bits in place to combat the pain, I'm just aware all the time that it could happen (Participant 4).

The majority of participants described that prior experiences of pain had exacerbated concerns and manifested into pain-related fears. These worries intensified perceptions that participants were 'disabled' by weight related pain, one describing himself as a 'fat lump in a load of pain' (Participant 9).

This theme highlights that pain, perceptions of negative body-image and weight stigmatisation are important factors in how younger adults conceptualise fear-related barriers to activity. These concerns, threats and worries may be key to understanding the construct of activity related fears, and how they manifest. The findings suggest that pain was the most frequent and harmful of concerns, worsening inactivity and limiting musculoskeletal function. The experience and catastrophizing of pain appears to be a factor in the manifestation of pain-related fears, decreasing physical activity participation.

Theme 3 – the consequences of fear

For many of the participants, experiencing and living with the emotion of fear had severe consequences. The subsequent quotes represent how participants felt following their experiences with fear(s).

Sub theme – activity avoidance

The most common consequence related to a behavioural flight response in that participants avoided all physical activity. This response to fear typically meant that participants would live day-to-day without any intention to engage in physical activity:

I get around after my little girl, but nothing that I get up with a view to doing activity for ... like I don't go out of my way to do any exercise (Participant 7).

More than half of the participants in the sample avoided physical activity such as jogging, sports, and weight lifting as a consequence of activity-related fear(s). In some instances, activity related fears led to a reduction in participation of low intensity activities of daily living (e.g. carrying groceries and climbing stairs).

Sub theme – heightened perceptions of disability

Another important consequence of fear was that participants described heightened self-perceptions of physical and psychological disability. This worsened exercise efficacy as participants believed they were not capable of partaking in physical activity. Fear(s) acted to psychologically disable participants as they contemplated physical activity:

I still find it hard doing the simplest of tasks, the only thing I'm literally able to do now is to work and walk, I can't run at all (Participant 9).

I just felt like really anxious about it, said why am I even doing this, think that's when I started dropping out, it's not for me anymore (Participant 6).

Sub theme – depressive cognitions

Fearful experiences also triggered depressive cognitions that impacted upon participant's mental health and wellbeing. This was particularly evident in experiences of stigma-related fears, because it provoked feelings of self-consciousness and negative affectivity:

I think they don't understand how emotional it actually is, it's not such a physical thing ... it's a massive head game constantly, a constant battle with yourself, first thing you do in a day is wake up and look in a mirror, you feel horrible about yourself (Participant 6).

The findings of this theme suggest that participants struggled with depressive cognitions and perceptions of disability as a consequence of activity related fear. These consequences independently had a negative impact on engagement with physical activity because younger adults with obesity did not feel physically capable or mentally equipped to participate. Fearful experiences often left younger adults with obesity feeling distressed, disabled and wanting to avoid physical activity. The consequences of fear appear to reduce activity participation and increase depressive cognitions in this population.

Discussion

This is the first known study to qualitatively explore fears in relation to physical activity among younger adults with obesity. Through thematic analysis, fears were identified as important barriers to physical activity (Braun and Clarke 2013). The accounts of younger adults with obesity provide valuable insight into how fears initially developed, how fear impacted on physical activity and the consequences of fearful experiences for health behaviour.

A key finding of this study is that participant's experiences of fear often led to an avoidance of physical activity. Alongside avoidance, the emotion of fear provoked negative cognitions (e.g. negative feelings), defensive behaviours (e.g. guarded movements), and/or physiological responses

(e.g. muscle tightening). These findings support the view that fear can be a powerful psychological barrier for individuals with obesity, restricting health promoting behaviour change (Perriard-Abdoh et al. 2019).

In the current study, participant's experiences of fear triggered activity avoidance, emotional distress, and exacerbated perceptions of disability. These experiences are consistent with activity related fear beliefs of middle to older aged adults with obesity ($\text{BMI} \geq 40 \text{ kg/m}^2$) (Vincent et al. 2014, 2010; McPhail, Schippers, and Marshall 2014). These behaviours and perceptions align with the sequential and dynamic relationships of the theoretical Fear Avoidance Model (FAM) and the psychological construct of fear (Asmundson et al. 2004; Vlaeyen and Linton 2000).

The FAM model conceptualises that individuals avoid activity because of fear, and that these fears manifest from experiences of pain, catastrophizing of pain and/or negative affectivity (Vlaeyen and Linton 2000). It is proposed that experiences of fear-related activity avoidance provoke depression, disability, and a decline in physiological function (through musculoskeletal disuse) (Vlaeyen and Linton 2012; Vincent et al. 2014). The FAM has a basis within psychological research as it portrays a cycle of undesirable behaviour change towards increasing levels of inactivity (Vlaeyen, Crombez, and Linton 2016). This is because psychological components such as fear, threaten individual perceptions of capability (exercise efficacy) and motivation. Notably, both capability and motivation are key components of well-known behaviour modification frameworks (such as The Behaviour Change Wheel) and are known to be important factors in why adults with obesity do not adopt active lifestyles (Michie, Atkins, and West 2014; McCormack and Shiell 2011). For practitioners, the current findings in relation to fear avoidance and behaviour change models, means that younger adults with obesity may require psychological intervention to overcome fears and improve perceptions about their capability to enact health promoting behaviour change (Vlaeyen, Crombez, and Linton 2016). Without intervention that addresses these factors (and how they interact with other psychological components of behaviour change), it is unlikely that younger adults with obesity will autonomously participate in sustained levels of activity.

The study identified several explicit fears that may have contributed to activity avoidance behaviours in younger people. These included fears relating to weight stigma, negative evaluation, injury, leisure facilities and pain. While fears relating to weight stigma and negative evaluation have been explored by previous research in this age group, as identified in our recent scoping review (Hamer et al. 2021; Vartanian and Novak 2011), this study provides novel insights into fears relating to pain, in younger adults with obesity. This is important because such fears have been found to exacerbate perceptions of disability (which intensify activity avoidance behaviours) in other groups (Vincent et al. 2014, 2011; Hamer et al. 2021). The study findings are consistent with previous research that adults with obesity report greater fears, lower quality of life and reduced physical function compared to their non-obese counterparts (Vincent et al. 2010). For practitioners, pain-related fears may be a determinant of sedentary behaviour and are likely to interact with other psychological factors (such as depression, low mood and low self-esteem) that are associated with inactivity (Perriard-Abdoh et al. 2019). It may be the case that interventions need to evaluate pain-related fears against popular behaviour modification models (such as The Behaviour Change Wheel), in order to target psychological components (e.g. self-efficacy and motivation) that may be restricting health behaviour change (Michie, Atkins, and West 2014).

This study identified that health promoting behaviour change may have also been restricted by experiences of pain. Younger adults with obesity highlighted that experiences of pain resulted in the manifestation of pain-related fears, and greater incidence of activity avoidance. This evidence supports the sequential concepts of the FAM and highlights a logical entry point for younger adults with obesity into a cycle of fear related activity avoidance (Vlaeyen, Crombez, and Linton 2016). This finding is consistent with other research that has found that chronic musculoskeletal pain is a factor in the manifestation of activity related fear avoidance for older adults with obesity (Turk and Wilson 2010; Cooper et al. 2016). With more than half the sample in this study suffering frequent pain, it strengthens evidence that chronic pain and obesity co-exist among younger adults (Okifuji and Hare

2015). This finding is particularly important in that chronic pain reduces exercise efficacy, functional ability, increases sedentary behaviours and can be a catalyst for further weight gain (Janke and Kozak 2012; Egan et al. 2013; Peacock, Sloan, and Cripps 2013; McCarthy et al. 2009). For practitioners, chronic pain (and its associated factors) could be an indicator for declining levels of exercise efficacy in adults with obesity. Efficacy, or an individual's perception of capability is often cited as a key component in conceptual models that detail how successful behaviour change can be achieved (Michie, Atkins, and West 2014). The findings of this study suggest that younger adults with obesity and experience pain, will likely avoid activity because of a cycle of fear avoidance, restricting the success of interventions that aim to promote physical activity (Okifuji and Hare 2015; Napolitano et al. 2011; Matter et al. 2007).

The findings show that both pain and fear triggered activity avoidance, but this was arguably not the most damaging consequence for younger adults with obesity. The participants in this study experienced distress, predominately because of their experience with fear. This relationship was bi-directional in that younger adults with obesity also experienced psychological distress (regarding their body image) that manifested into fears, exacerbating avoidance behaviour. This is not surprising given that adults who are obese often suffer with depression, stress and other mental health concerns (Luppino et al. 2010; Vincent et al. 2011). These findings are important given that these factors can independently impact on the ability to enact health promoting behaviours (Gatineau and Dent 2011). It is also notable because of the increased risk that younger adults with obesity may gain further weight through inactivity (Gatineau and Dent 2011). Collectively, these findings strengthen literature that suggests obesity related mental health concerns escalate fears and exacerbate other barriers to activity (Egan et al. 2013). Practitioners may need to consider the impact of stress and depressive cognitions (caused by fear), because it may be that younger adults with obesity do not feel psychologically capable or motivated to engage with physical activity (Luppino et al. 2010). This is likely to impact upon the success of interventions because desired behaviour change is unlikely to occur without adequate motivation or perceived capability (key components of popular behaviour change models such as the COM-B) (Michie, Atkins, and West 2014). The study findings reinforce the importance of psychologically addressing mental health concerns as a means to increase physical activity in younger adults with obesity (Sallinen et al. 2009; Flannery et al. 2018).

The key findings from this study have demonstrated that younger adults with obesity perceive fears, pain, perceived disability, and depressive cognitions as factors both independently, and collectively, as barriers to physical activity. These barriers present an obstacle for health promoting behaviour change, because they place restrictions on perceptions of physical and psychological capability (exacerbating perceptions of disability and decreasing exercise efficacy).

A key strength of this study was that a substantial proportion of the sample were male, which is uncommon in qualitative and obesity research. Studies often only include females with obesity, because they largely rely upon weight management groups for recruitment, which females are more likely to attend (Alvarado, Murphy, and Guell 2015). In total ten participants were recruited, while some may feel this is limited, the sample size met the recommendations for a qualitative exploratory study (Braun and Clarke 2013). The study relied upon self-reported data to estimate body mass index. However, research has suggested that adults with obesity tend to underestimate their weight and so this limitation may not be substantially detrimental given its inclusion criteria and exploratory nature (Elgar and Stewart 2008). Participants self-reporting of weight could also be viewed as a strength of this study, as it minimised weight related embarrassment and harm to participants that may have been caused by measuring participants at the point of data collection (Cooper et al. 2016).

Fear may be a detrimental factor to younger adults with obesity, because of a perceived lack of capability to enact behaviour change towards a more active lifestyle. The findings may begin to explain why many younger adults with obesity fail to adhere to physical activity recommendations. This study's findings suggest that activity related fears exacerbate mental health concerns and perceptions of disability that may be determinants of poor behavioural choices (such as inactivity). Collectively, these factors are likely to restrict efforts by practitioners because they weaken

perceptions of exercise capability and motivation. Practitioners need to address fear through intervention to decrease perceptions of disability and increase the likelihood that younger adults with obesity feel capable (physically and psychologically) of engaging in sustained physical activity. With specific reference to some of the novel activity related fears highlighted by this study (such as pain-related fear), practitioners could utilise the fear avoidance model as a reference of inquiry to determine the impact fear has on the different components of behaviour change theory (Vlaeyen and Linton 2000).

There is a need to determine how other barriers influence fear beliefs and in turn, impact on levels of physical activity. The inter-relatedness of other barriers may be important in understanding a holistic approach to improving physical activity levels of younger adults with obesity, and for the measurement of fear-related barriers. More research is needed to explore these inter-relations. There is also need for further research to confirm and quantify fear, specifically pain-related fear, as a risk factor for inactivity in younger adults with obesity.

Conclusions

This study strengthens the limited research that has focused on younger adults with obesity. It suggests that fears, pain, pain catastrophizing, disability and depressive cognitions were all perceived as barriers to, and provoked the avoidance of, physical activity. The emotion of fear, particularly pain-related fear, was a frequent and important barrier to physical activity. This may be an important finding because of the risk it poses to the restriction of health promoting behaviour change. Notably, this study found that experiences of activity related fears align with the conceptual principles of the FAM in that younger adults with obesity highlighted sequential and dynamic relationships between pains, pain catastrophizing, fears, activity avoidance, perceived disability, and depressive cognitions (Vlaeyen, Crombez, and Linton 2016). Collectively, these findings suggest an important role of fear as a risk factor for inactivity in younger adults with obesity which warrants further research.

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