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RESEARCH ARTICLE

A cognitive behavioural model of the bidirectional relationship between disordered eating and diabetes self care in adult men with Type 1 diabetes mellitus

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Abstract

Aims: This qualitative study aimed to develop the first cognitive behavioural (CBT) model outlining the development and maintenance of disordered eating in adult men living with Type 1 diabetes to improve on previous theoretical models of Type 1 diabetes and disordered eating and to draw comparisons to women with Type 1 diabetes and disordered eating.

Methods: Twenty-seven men ($n = 16$ with Type 1 diabetes and disordered eating, $n = 11$ with Type 1 diabetes without disordered eating) participated in semi-structured interviews. Data were analysed using thematic analysis and individual CBT formulations were developed for each participant to inform the model.

Results: Men with Type 1 diabetes and disordered eating experience negative thoughts about food, insulin, weight/shape and diabetes itself, which cause negative emotions such as fear and vulnerability and difficulties with diabetes self care such as problems with hyper and hypoglycaemia and problems accessing structured education and technology result in men feeling more dissatisfied about their body weight/shape.

Conclusions: This CBT model of disordered eating in men with Type 1 diabetes can guide new interventions.

KEYWORDS

cognitive behavioural therapy, disordered eating, eating disorders, theory testing, Type 1 diabetes

1 | INTRODUCTION

Psychiatric disorders are commonly observed in those with Type 1 diabetes,[1,2] in particular, depression, anxiety and eating disorders.[3–6] Disordered eating affects up to 40% of people with Type 1 diabetes and is associated with high levels of distress and increased rates of acute and chronic diabetes complications, driving morbidity and mortality.[7] In a population-based survey in emerging adults with Type 1 diabetes, 30% of women and 10% of men met diagnostic criteria for eating disorders.[8] This lower detection rate in men mirrors findings in the wider eating disorder literature, where eating disorders are more frequent among women and girls. For example, a simulated nationally representative cohort found 1 in 7 men (14.3%) and 1 in 5 women (19.7%) experience an eating disorder by the age of 40.[9] A recent review highlights that while a desire for leanness is present in men with eating disorders, they are more likely to present with a higher drive for muscularity, leading to muscularity-oriented disordered eating. Mens who are athletes and/or from racial/ethnic, sexual and gender minorities are more vulnerable to eating disorders.[10] There is some indication that men with eating disorders may have better treatment outcomes than women. For example, with remission defined as body weight restoration to at least 85% of 'ideal' body weight, and the absence of behaviours like bingeing and purging in the last 6 months, the median time to remission from anorexia nervosa was 3 years for men, yet 7 years for women.[11]

It has been suggested that people living with Type 1 diabetes are more vulnerable to developing a challenging relationship with food and their body because of the necessary focus on eating and the content of food, which is needed to inform the key diabetes self care behaviour of insulin administration.[12,13] Two theoretical models informed by research evidence and clinical experience have begun to map out the factors involved in the development and maintenance of disordered eating in Type 1 diabetes.[14,15]

Our recent cognitive behavioural model of disordered eating and Type 1 diabetes[13] built on this work and was the first to be informed by the lived experience of 26 adult women with Type 1 diabetes and either current or past disordered eating. This model elucidates the predisposing factors (a history of mental health difficulties, including eating disorders; personality factors like perfectionism and life events like migration and trauma) and precipitating factors (negative experiences of diabetes onset and diagnosis and the impact of diabetic ketoacidosis, re-insulinisation, physical symptoms and changes to weight and the daily relentless self care tasks involved in diabetes, including a focus on the details of food) involved in the development of disordered eating. These predisposing and precipitating factors sensitised the women to disordered eating, because, for example, weight changes and a necessary focus on the components of food made them more dissatisfied and distressed about their body and resulted in a negative experience of, and relationship with Type 1 diabetes and insulin. Variants of disordered eating in Type 1 diabetes were present in these narratives, including a variant involving perfectionism around diabetes self care and a fear of hyper or hypoglycaemia; a fear of insulin and/or weight gain and insulin omission as a means of preventing weight gain or provoking weight loss; and hypoglycaemia as permission to consume otherwise prohibited sweet treats, with ensuing binge eating. This work is limited by its focus on the experience of women need further development to include men's experiences.

Currently, there is no evidence-based treatment for disordered eating in Type 1 diabetes which improves diabetes self care, glycaemic control and disordered eating symptoms.[16] To ensure that any treatment intervention developed meets the needs of a diverse population of people with diabetes who are experiencing disordered eating and is as accessible and inclusive as possible, a comprehensive model which underpins the intervention and directs clinicians towards modifiable perpetuating factors across genders is vital.

Therefore, the research questions for this study were 'How do men with Type 1 diabetes experience disordered

What's new?

What is already known?

Disordered eating is common in Type 1 diabetes; current conceptualisations have focused largely on the experiences of women.

What this study has found?

This qualitative study interviewed men with Type 1 diabetes and disordered eating and these data from lived experience tell us that men can develop disordered eating when difficulties with diabetes self care make them dissatisfied about their body, weight and shape.

What are the clinical implications of the study?

Enabling self care through education, technology and supportive clinic visits could protect men with Type 1 diabetes from disordered eating.

eating?' and 'What similarities and differences are there between the experiences of men and women?'

2 | PARTICIPANTS AND METHODS

2.1 | Design

This semi-structured interview study used a cross-sectional design involving men with Type 1 diabetes with experience of disordered eating (T1DE-group) and men with Type 1 diabetes without experience of disordered eating (Type 1 diabetes group).

2.2 | Participants

Purposive, opportunity sampling was used to obtain this volunteer sample. Participants were recruited via adverts placed within King's Health Partners Diabetes Services, and on social media (X, formally known as Twitter; Diabetics with Eating Disorders website). Participants were invited to contact the researcher by email if they were interested in taking part.

All participants who opted to take part and met the inclusion criteria were offered a research interview, which took place online, until we had a well-matched group of men (matched as closely as possible for age and duration of Type 1 diabetes to reduce confounding) with Type 1 diabetes with and without disordered eating data saturation was reached. No participants withdrew from the study at any point.

Inclusion criteria were adult men with Type 1 diabetes for ≥1 year, glycated Haemoglobin A1c (HbA1c) <15.0% (140 mmol/mol), with and without self-reported current disordered eating, who could respond in English and provide informed consent. Exclusion criteria were severe mental illness requiring intensive psychiatric treatment, intellectual disability or cognitive impairment, current or planned pregnancy, body mass index <15 or >40 kg/m^2, advanced diabetes complications or physical or mental health conditions requiring inpatient admission.

Participants with disordered eating were required to score ≥20, the clinical cut-off for disordered eating, on the Diabetes Eating Problem Survey-Revised (DEPS-R) and/or self report the presence of disordered eating behaviours such as restriction, bingeing and purging, through a clinical discussion with a consultant physician (MS) and a health psychologist (EK) and these eligibility data were reviewed by a clinical psychologist (AH) with specialist expertise in eating disorders. Participants without disordered eating needed to score below the DEPS-R clinical cut-off and were excluded if they cited examples of disordered eating behaviour.

2.3 | Measures

A semi-structured interview (Appendix S1) was developed and piloted through discussions with an expert advisory board with personal and professional experience (our public patient involvement group members, psychiatrists, clinical psychologists, clinical researchers, physicians and diabetes specialists including a diabetes nurse specialist).

The DEPS-R[17] is a 16-item self report screening tool for disordered eating in Type 1 diabetes to corroborate the clinical interview. Higher scores indicate greater symptoms.

2.4 | Procedure

Ethical approval was obtained from the East of England Cambridge Central Research Ethics Committee, ref: 17/EE/0490. After providing informed consent, participants attended an interview held on the online Zoom platform lasting around 60 min with a woman health psychologist who was a PhD candidate with specialist training in conducting semi-structured interviews and qualitative approaches acquired through Masters level study (EK) who was not known to participants/involved in their clinical care. The interviewer was interested in pursuing this research because of their background in health psychology and the interaction between physical and mental health. The Participants were not informed about the interviewer's personal goals or reasons for doing the research, but they were informed that the work would form part of their PhD thesis.

Self-reported height and weight were recorded and used to calculate body mass indices. Glycated haemoglobin Hba1c was obtained from participants' last clinic letter. The study had to be conducted online as it took place during the Covid-19 pandemic.

The interview took place with only the interviewer and participant present. Participants were asked the questions within the interview and did not have access to the full list of questions beforehand, although they were given some sample items in the information sheet. No repeat interviews were held. Participants were encouraged to keep their camera on but had the option to turn it off if they preferred. The interviews were audio recorded through the Zoom record to cloud option. Field notes were recorded during and after the interviews. We need not return the transcribed interviews to participants for

comment or correction because we did not want to further burden these individuals with more work.

2.5 | Data analysis

Our previous study[13] used grounded theory[18] to develop categorical themes from the data as the first stage in data analysis. This iterative method was appropriate in our original work because we sought to develop an initial model and inform a qualitative theory of Type 1 diabetes and disordered eating and was the first study to use these participants' narratives. In the present study, we were more interested in analysing the data from the men's lived experiences, as by now, several models and a qualitative theory of Type 1 diabetes and disordered eating were available. Therefore, thematic analysis[19] was used to derive themes from the data which we then planned to compare with our existing theory.[13]

After transcription, interviews were analysed into the NVivo® software for data management, with initial codes created. Separate analyses were conducted for men with and without disordered eating. We applied Braun and Clarke's[19] six-phase framework of thematic analysis. First, the study authors and coders (AH, EK and MS) familiarised themselves with the data by listening to interviews and reviewing transcripts (primary analysis). Initial codes were generated before being collated into potential themes. Themes were not identified in advance; they were derived from the data. An interview could be un-coded, coded once or coded multiple times. We discussed emerging themes in regular meetings. All three analysts agreed that data saturation had been reached (i.e. no new codes could be created). Themes and subthemes were agreed through a collaborative process between the authors (health psychologist, clinical psychologist and diabetologist) conducting the analysis, and discussed within the larger multidisciplinary group of co-authors (psychiatrists, psychologists and people living with diabetes) who all provided feedback on the findings. Themes were reviewed and refined, subthemes consolidated or merged into existing themes and descriptive labels altered to best reflect the subject matter or deleted if deemed irrelevant. Thematic maps were developed to explain the super and subordinate themes and the different experiences of participants with and without disordered eating of the themes.

As in our previous study[13] which required us to develop a novel analytic approach involving combining qualitative research methodology with a clinical tool (the development of individual cognitive behavioural formulations to conceptualise the experiences of the women with Type 1 diabetes and disordered eating), we developed our final model of Type 1 diabetes and disordered eating in men through a combination of analytic techniques: themes obtained through thematic analysis and the production of individual cognitive behavioural formulations which we brought together in a final overarching model representing men's experiences.

3 | RESULTS

3.1 | Demographic and clinical background data

Those with and without disordered eating had a similar age and diabetes duration. White British participants were the most common ethnicity in both groups. The groups had similar Hba1c values. Those without disordered eating reported fewer episodes of diabetic ketoacidosis and severe hypoglycaemia in the last year than those with disordered eating. Those with disordered eating had a significantly higher DEPS-R score (Table 1).

3.2 | Thematic analysis

Two superordinate themes emerged from the data. The first, 'my relationship with food and my body' reflects subordinate themes of disordered eating thoughts and thinking styles, disordered eating emotions and disordered eating behaviours. The second, 'my diabetes self care' reflects two subordinate themes: the first, challenges, describes the barriers that men encountered around caring for diabetes; the second, adaptive ways of coping, reflects ways of working out how to live well with and alongside diabetes. These themes are discussed below highlighting the experiences of men with Type 1 diabetes, with and without disordered eating. Figure 1 is a thematic map outlining the superordinate and subordinate themes.

3.2.1 | Superordinate theme 1: *My relationship with food and my body*

The first superordinate theme was *my relationship with food and my body* and within this theme, the first subordinate theme was disordered eating thoughts and thinking styles.

Subordinate theme 1: Disordered eating thoughts and thinking styles

This subordinate theme is characterised by negative thoughts and problematic thinking styles. Men who had experienced disordered eating alongside Type 1 diabetes discussed negative thoughts about insulin and weight:

TABLE 1 Demographic and clinical background data for the sample.

	Type 1 diabetes and current disordered eating ($n=16$)	Type 1 diabetes without disordered eating ($n=11$)	
Age	37 (8.4), 21–52	38 (9.9), 20–51	t (26) −1.2, $p=0.241$
Ethnicity (%)	White British $n=12$ (79%), White Irish $n=1$ (7%), White Other $n=1$ (7%), Asian $n=1$ (7%)	White British $n=8$ (73%), White Other $n=2$ (18%), British Indian $n=1$ (9%)	
Diabetes duration	22 (8.39), 5–36	22 (11.62), 1–35	t (26) 0.91, $p=0.06$
Current Hba1c (mmol/mol and %)	55 (13.2), 33–85 7 (1.2), 5.2–9.9	53 (11.3), 36–79 7 (1.1), 5.4–8.6	t (25) 0.85, $p=0.4$ t (25) 0.83, $p=0.2$
Episodes of severe hypoglycaemia or diabetic ketoacidosis in the last 12 months (n)	1 severe hypoglycaemia 1 diabetic ketoacidosis	0 severe hypoglycaemia 0 diabetic ketoacidosis	
Diabetes eating problem survey-revised	24.3 (9.45), 6–39	12.7 (7.4), 2–27	t (25) 3.56, $p=0.002$

Note: Data are presented as mean (standard deviation) and minimum-maximum. t represents the t-test statistic and p represents the level of marginal significance, such that $p<0.5$ indicates the data differ significantly between groups. One participant with disordered eating did not provide their Hba1c data.

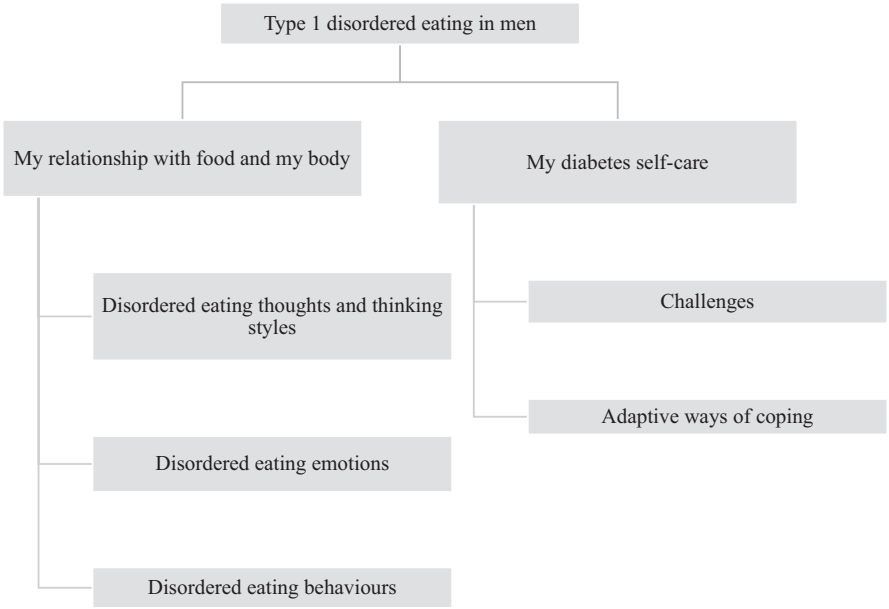

FIGURE 1 Thematic map representing the super and subordinate themes derived from interview data from participants with Type 1 diabetes with and without disordered eating ($n=26$).

'insulin makes me gain weight', 'my body doesn't look right'. They held positive beliefs about insulin restriction or omission: 'I can lose weight and eat whatever I want by restricting insulin. I can regain control this was....I know what I'm doing...it's my way of compensating for overeating'. There was also a belief expressed that 'eating disorders don't look like me', which reflected the idea that a person with an eating disorder must look a certain way (underweight and ill) to warrant this description.

The negative content of their thinking was further compounded by particular thinking styles. One example was a focused thinking style involving intrusive or obsessive thoughts about food and their body which they perseverated on and found it difficult to shift their attention onto other topics. Another example was biases in their perceptions of their body: 'everyone said I was too skinny but I couldn't see it... I don't look like someone with an eating disorder'. A third example was mindreading, where they discussed others liking them more and thinking more highly of them when their body was leaner and more muscular.

For men without disordered eating, their thoughts reflected a stance of acceptance of their body: 'I accept my body with diabetes, my body can be fit and healthy despite diabetes' and reflected a neutral stance towards their body: 'it does its job, it's OK as it is'. These men had a bigger picture perspective, which was focused on general health and caring for themselves: 'it's more important to be generally fit and healthy than to be a certain size'.

Subordinate theme 2: Disordered eating emotions

The second subordinate theme was disordered eating emotions.

Men with disordered eating expressed positive feelings about the function of their disordered eating behaviours: 'it (being lean and building muscle) helps me deal with difficult emotions... it makes me feel more in control and it gives me confidence because it makes me feel I'm successful at something when I'm failing at everything else, especially diabetes. Physiologically, insulin restriction or omission provided a desired experience of being able to avoid difficult emotions because "the fogginess blocks that right out"'. They explored how difficulties with diabetes self care made them feel about their body: 'when I can't get it right, which is often, and I've been high all day, can't seem to get it down, I absolutely hate my body'. They also discussed their feelings towards their body, expressing negative emotions and a body dissatisfaction and discomfort: 'I hate it—it causes me so much grief, it just doesn't do what it should and it doesn't look like it should, it is not fit or muscular'.

For men without disordered eating, their feelings towards their body were more neutral in valance: 'I'm not too bothered about it, I doesn't really bother me, how I look, that much'.

Subordinate theme 3: Disordered eating behaviours

The third subordinate theme was disordered eating behaviours.

Men with disordered eating discussed a range of avoidant behaviours. The first example was avoidance of blood glucose: 'I avoid checking my sugars, I'm not sure why I stopped but I rarely check them.... Sometimes I just want to rebel against everything I'm told to do'. The second example involved avoiding telling others about diabetes: 'I hide my diabetes at all costs... I never, ever, ever inject in front of them'. The third example involved avoidance of food as a means of managing diabetes: 'I like to restrict because then I don't have to give insulin, I just don't have to think about it all the time'. Another example involved excessive avoidance of hypoglycaemia: 'I always always keep my levels high to avoid going low in front of others – that's so awful and embarrassing.... To feel I have control over my diabetes because when I'm high, I can eat what I want and remain skinny'. A final example involved actions to avoid weight gain, or diabetes complications and this involved diabetes perfectionism: 'if I do it all perfectly and have that perfect time in range, I won't get too overweight, I won't get scary complications'. This latter idea was discussed by men with and without disordered eating. One difficulty with this approach was that it increased the cognitive burden of self care, because achieving such high standards meant that they had to be focused on diabetes and their body all the time. Technology was discussed as a way of helping reduce the cognitive burden, and as a means of aiding self care more broadly.

Men without disordered eating were more relaxed in their approach to eating. They described a more flexible approach to eating, eating more freely and giving insulin afterwards: 'if I eat something, I just give some insulin, I don't avoid any foods'; 'I can pretty much eat what I want, I just need to work out how much to insulin to give'. This more relaxed approach was also present in the context of exercise: 'I don't exercise to look a certain way, I do it because I enjoy it'.

3.2.2 | Superordinate theme 2: *My diabetes self care*

The second superordinate theme was *my diabetes self care* and within this theme, the first subordinate theme was challenges.

Subordinate theme 1: Challenges

This subordinate theme reflects the challenges experienced by men around diabetes self care and was discussed predominantly by men experiencing disordered eating. A variety of challenges were discussed around managing episodes of hypo and hyperglycaemia: 'I spend too much time sorting out hypos and then I have to eat sugary things to sort it out which isn't good for my weight'; 'it's a hassle to give insulin'; 'some days I just walk around so high and nothing I do seems to improve things'; difficulties knowing how much insulin to give which for some stemmed from problems accessing diabetes education around the time of diagnosis or at any point afterwards: 'I'm in the dark a lot of the time not knowing what to do' and practical difficulties managing blood glucose levels when exercising: 'every time I exercise, I find myself going hypo... I just can't get it right...on the other hand, exercise and being fit are important to me, vital...and I don't want to pile on more weight'. This latter example was discussed in the context of challenges around losing weight safely when living with Type 1 diabetes: 'I know I shouldn't be doing what I'm doing with my insulin, but I don't know of any other ways of losing weight that works with diabetes'.

Cognitive burden was previously discussed in the context of perfectionism, but it was also discussed as a self care challenge by participants both with and without disordered eating: 'there is so much to think about and so much to do, it's overwhelming, I can't cope with it all sometimes'.

Subordinate theme 2: Adaptive ways of coping

The second subordinate theme was adaptive ways of coping. This subordinate theme largely reflects the experience of men without disordered eating. Adaptive coping took four forms. The first was strategies that helped with feeling more in control of diabetes and these included the use of technology such as continuous glucose monitors, pumps and closed loop systems which the men explained reduced the cognitive burden of self care: 'I immediately got access to the sensor and pump and they have been so helpful, taking so much of the hassle out of it all'. The second was building resilience. Through dealing with difficult situations such as episodes of hypoglycaemia, men discussed how they had built expertise and experience, which was further supported by accessing structured education programmes that provided a flexible approach to food, insulin and exercise. They were then able to draw on these options to support their self care further over time: 'I know what to do now and that makes it all feel a bit safer for me'. This enabled those men in the group who wanted to make changes to their weight to feel that this was a possibility, which helped in feeling less dissatisfied about their body. The third was utilising practical and emotional support from others. Men discussed how their partners offered to carry their diabetes equipment in their bag, or how their manager at work gave them breaks to check their glucose levels and give insulin. Another example was being able to talk about diabetes with loved ones in supportive way and this was facilitated by loved ones' higher-level knowledge of diabetes: 'it helps so much when they take the time to read up about it and then they don't say the wrong thing all the time, or when they ask me questions and show interest'. The fourth form reflected the idea that 'diabetes prompted me to take care of my body'. Men discussed how their diagnosis had motivated them to look after their body and general health in their 20s, for example, they felt this would have been a task they would have taken on in their 40s: 'I've made so many positive changes due to diabetes, it was a definite call to action'.

3.3 | Cognitive behavioural formulations

A cognitive behavioural model of disordered eating in men with Type 1 diabetes is presented in Figure 2.

1. *Predisposing factors* that result in men being more vulnerable to disordered eating were personality factors (e.g. perfectionism) and a personal or familial history of physical or mental health difficulties (Box 1) interact with their experience of diabetes diagnosis (Box 2).
2. *Experience of diabetes* diagnosis was described as problematic by those who were old enough to remember their diagnosis, with two key components. The first was the physical impact of diabetes and this includes thirst, polyuria, weight loss (dehydration) and subsequent

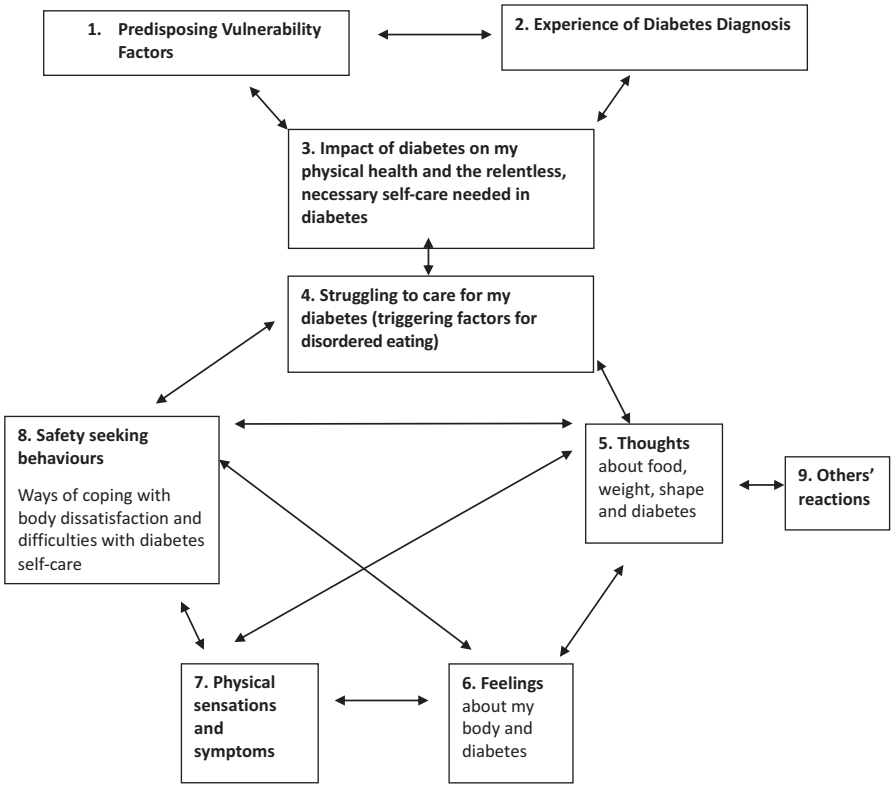

FIGURE 2 A cognitive behavioural model of Type 1 disordered eating in men.

weight gain (due to re-insulinisation), as well as needing intensive care treatment for diabetic ketoacidosis. The second, we have termed healthcare system-related factors, and this includes iatrogenic healthcare involving a lack of social support, difficulties accessing diabetes education and technology and being introduced to an inflexible regime around insulin, food and exercise. It is important to point out here that some men in the sample without disordered eating reported receiving more social support after their diagnosis than before, and they provided examples of partners helping by carrying around their diabetes equipment for them in their bags. This could be a factor that protects men from difficulties with diabetes self care and subsequent disordered eating.

3. *Impact of diabetes on physical health and relentless self care need*: In the men who participated in our interviews, these predisposing factors, interacting with, in particular, negative experiences around diabetes diagnosis led to greater difficulties with diabetes self care and more physical health challenges, such as repeated difficulties with hypo and hyperglycaemia, body weight changes (typically, weight gain) and significant fatigue, diabetic ketoacidosis and the onset of diabetes complications (e.g. changes to eyesight) (Box 3).
4. *Struggles around diabetes* self care were the sensitising or triggering factors for disordered eating in men, because they caused men to become more dissatisfied about their bodies; their experiences of diabetes burnout led to the idea that 'nothing works' and a sense of being 'out of control in my body' (Box 4).

This longitudinal part of the model explains how the disordered eating got started, and the vicious cycles of thoughts, feelings, physical sensations and behaviours discussed below go on to explain how disordered eating is perpetuated.

5. *Thoughts and beliefs about food*, *weight*, *shape and diabetes* shared by the men included, for example, 'I am too overweight and others will judge me negatively' 'insulin will make me gain weight', 'diabetes makes me weak', 'time in range is vital', 'I must look strong, sculpted and muscular', 'I can't manage my weight when diabetes means I have to eat constantly and treat hypos with sugary treats'.
6. *Feeling about diabetes and their body* (Box 6) included feeling out of control, afraid, angry, frustrated, a sense of loss of the body I should be able to achieve and a sense of vulnerability.

NaN. *Physical sensations and symptoms* that accompanied these feelings (Box 7) were fatigue, symptoms resulting from hyper and hypoglycaemia which only sought to emphasise feelings of being out of control and vulnerable. These thoughts, feelings and physical sensations led to men wanting to find ways of coping with difficulties with diabetes self care and their increasing body dissatisfaction.

NaN. *Safety-seeking behaviours* (Box 8), which in the short-term, act as a means of temporarily alleviating the distress experienced around food, eating, weight and shape and diabetes self care, include excessive monitoring or avoidance of blood glucose and insulin, insulin omission, food restriction, bingeing, purging and excessive exercise. Some men also using excessive amounts of sports supplements like protein powders, trying to create a body they were more satisfied with. In the longer term, these safety-seeking behaviours were continually cued when diabetes self care became challenging, and body dissatisfaction was again evoked, further strengthening and emphasising the negative thoughts held about food, weight, shape and diabetes, and the negative affect and challenging physical sensations men experienced. This made the safety-seeking behaviours more necessary as a perceived means of coping or avoiding negative evaluation and men became trapped in this recursive cycle.

This vicious cycle was further reinforced by difficult social interactions around diabetes, where others' misunderstandings ('you better not exercise with diabetes'), perceived negative beliefs ('they think it's my fault and that it's down to my bad lifestyle') or avoidance of needs ('they just let me get on with it and thought I was fine'). Those who had managed to avoid developing disordered eating were protected from body dissatisfaction developing through early access to diabetes education and technology which allowed them to develop a more flexible and individualised approach to self care. This protected them, to a degree, from large and distressing fluctuations in their weight, and difficult experiences with hypo and hyperglycaemia and aided the development of a more accepting stance towards diabetes which in turn empowered them to engage in self care behaviours (rather than disordered eating behaviours).

4 | DISCUSSION

This qualitative study aimed to answer the research question 'how do men with Type 1 diabetes experience disordered eating and what similarities and differences are there with the experiences of women?' by developing a cognitive behavioural model of Type 1 diabetes and disordered eating in men, derived from their lived experiences. The data suggest that men with Type 1 diabetes

and disordered eating experience negative thoughts about food, insulin, weight/shape and diabetes itself, which cause negative emotions such as fear and vulnerability and difficulties with diabetes self care such as problems with hyper and hypoglycaemia and problems accessing structured education and technology result in men feeling more dissatisfied about their body weight/shape. Men without disordered eating with Type 1 diabetes have found other ways to cope, such as seeking social support, drawing on learning from past experiences and using technology to reduce the cognitive burden of self care, whereas men with disordered eating use behaviours like insulin omission, food restriction, excessive exercise and sports supplements to try to feel better about their body, or to make it look more like they think it ought to look (lean and/or muscular). Unfortunately, these safety-seeking behaviours which are intended to increase the perception of control over diabetes and body weight/shape only serve to strengthen negative thoughts about diabetes, their body weight/shape, insulin and food and increase the associated negative emotions. One implication of this work is that helping men with self care might reduce body dissatisfaction and then eating disorder behaviours may become less necessary. Further, men could harness the social support that they report being readily offered by partners and colleagues when they disclose their diabetes diagnosis to help with both emotional and practical coping.

The key disordered eating symptom of the use of insulin omission to influence shape and weight was discussed both by the women we interviewed previously[13] and men who participated in this study. This corroborates findings from a scoping review which showed that across 56 articles, up to three quarters of both men and women have used insulin omission to influence their shape and weight.[20] It was interesting to note that while several men discussed the use of insulin omission as a behaviour designed to influence their weight and shape, we did not find that there was a higher mean Hba1c in those reporting disordered eating than those who did not engage in disordered eating. As we have found in women with Type 1 diabetes and disordered eating, there are many ways in which the disordered eating can manifest[13] and this was a heterogeneous group with men reporting a range of behaviours, not limited to but including insulin restriction or omission, which may explain why we did not identify hyperglycaemia.

For many men in our study, like those in the wider eating disorder literature,[21] muscularity was important in the dissatisfaction their experienced around their body. It was interesting to learn that men were sensitised to disordered eating behaviours after significant practical struggles with their self care made them unhappy with their body. This is different to what we learnt from the women we previously interviewed.[13] For them, the triggering factor was the significant focus on the details of food as a part of self care, and changes to their weight and shape that they experienced around their diagnosis and starting insulin therapy. Further, the women we interviewed previously who had recovered from disordered eating or had never developed disordered eating discussed achieving this through developing a different relationship with diabetes, insulin and their body. This took the form of a caring, accepting or neutral stance which created more flexible thinking and behaviours and fewer diet and exercise rules. This was rather similar to the men in this study who had not experienced disordered eating. Those who has resilience to disordered eating discussed taking a neutral or accepting stance to their body where they were more tolerant of it and were focused on overall health goals, rather than forcing their body to look a certain way.

4.1 | Comparisons with our existing cognitive behavioural model of Type 1 disordered eating in women

Our existing model[13] shares features with this one informed by the lived experience of men. For both men and women, predisposing factors like perfectionism and existing experiences of mental health difficulties like depression and anxiety were important vulnerability factors, as were difficult experiences of diabetes diagnosis. Both men and women discussed experiencing difficult reactions from others, particularly misinformed comments about food, and others nagging them about their food, drink and exercise choices. As previously mentioned, men, however reported more experiences of receiving social support from others around some of the practical elements of diabetes self care, such as carrying hypo treatment or glucose monitors for them.

There was one very significant difference in the experiences of the men and women that we have interviewed. The key sensitising factor for men was practical difficulties with diabetes self care which made them feel more dissatisfied about their body, making the disordered eating behaviours more necessary as a means of coping or avoiding feared outcomes such as their body not looking the way they felt it ought to. For women, it was weight change around their diabetes diagnosis and the necessary focus on the details of food as a component of self care that sensitised them to disordered eating.

A further important difference was that while leanness was important to both men and women, for men, achieving a muscular body was also important. Men discussed how practical difficulties caring for diabetes during exercise (either because it is fundamentally

challenging, or because 'I just don't know how to work out without going hypo') made it more difficult for them to live in the body that they felt they ought to, or wanted to have. This is an example of how practical difficulties with diabetes self care evoked body dissatisfaction that sensitised the men in our study to disordered eating. Wanting a strong, fit body or indeed a body with a particular shape was discussed by men in the study in the context of sexuality. Examples included 'I need to look strong to be considered masculine' or 'in the gay community that I'm part of, it's not acceptable to be really overweight and I feel powerless to change my body to feel more comfortable'.

4.2 | Clinical implications

This new knowledge will assist us in adapting the Safe management of people with Type 1 diabetes and EAting Disorders studY (STEADY) cognitive behavioural therapy intervention to be more relevant for men with Type 1 diabetes and disordered eating. For example, within this work, we can be more aware of the self care challenges that the men in this study discussed, and the role these challenges can play in precipitating body image distress and perpetuating disordered eating. We can make good use of psychoeducation, diabetes education and technology and social support as a means of intervening and increasing self care, with the aim of reducing or protecting against body dissatisfaction. More broadly, as a field, we can use this new knowledge to protect against disordered eating through providing good support and information around self care and diabetes technology at and after diagnosis. It is also important for clinicians to recognise that disordered eating may be present in the men they care for with Type 1 diabetes, and while it can present as a desire for leanness, it can also present as a drive for a muscular body. We need to be showing curiosity about this in our clinics, so that we raise awareness and support men to discuss concerns they have about their bodies. This will help us to better identify disordered eating cognitions and behaviours and offer extra care.

4.3 | Limitations

The nature of qualitative research means that there is a focus of the rich experiences of a small number of individuals. Therefore, while data saturation was reached and sufficient data were collected to allow the research question to be addressed, it is not possible to represent the views and experiences of all men with Type 1 diabetes and disordered eating. While we have now looked at women and men's experiences of Type 1 diabetes and disordered eating, it would be useful to extend this work even further to include more gender identities and transgender individuals to ensure our treatment model and approach meets the needs of the diverse individuals who might stand to benefit from this work. It would also be useful to explore the validity of this cognitive behavioural model in children and adolescents with Type 1 diabetes, particularly considering the age of diabetes diagnosis and the role of supporting others in their self care which might be different at this age of the lifespan in comparison to the adults that were interviewed in this study. This study involved a volunteer sample obtained through opportunity sampling and therefore may represent the experiences of men who are motivated to discuss their health and well-being which could affect the generalisability to the findings. We were interested in the presence of disordered eating in the context of Type 1 diabetes and therefore we allowed participants to self-define their experience of disordered eating, and we used a self report measure (DEPS-R) to corroborate this. In future work, it may be useful to consider conducting a standardised clinical assessment interview which would conform the presence of a formal eating disorder diagnosis.

5 | CONCLUSIONS

This work extends existing models of Type 1 diabetes and disordered eating to men and provides ideas around how to make treatment for disordered eating more accessible and useful for men, such as asking about a desire for muscularity and understanding more about how difficulties with self care affect men's experience of their body weight and shape.

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CONFLICT OF INTEREST STATEMENT

The authors have no conflict of interest to declare.

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REFERENCES

1. Ducat L, Philipson LH, Anderson BJ. The mental health comorbidities of diabetes. *JAMA*. 2014;312(7):691-692.
2. Benton M, Cleal B, Prina M, et al. Prevalence of mental disorders in people living with type 1 diabetes: a systematic literature review and meta-analysis. *Gen Hosp Psychiatry*. 2022;80:1-16.
3. Bächle C, Lange K, Stahl-Pehe A, et al. Symptoms of eating disorders and depression in emerging adults with early-onset, long-duration type 1 diabetes and their association with metabolic control. *PLoS One*. 2015;10(6):e0131027.
4. Colton PA, Olmsted MP, Daneman D, Rydall AC, Rodin GM. Five-year prevalence and persistence of disturbed eating behavior and eating disorders in girls with type 1 diabetes. *Diabetes Care*. 2007;30(11):2861-2862.
5. Peveler RC, Bryden KS, Neil HAW, et al. The relationship of disordered eating habits and attitudes to clinical outcomes in young adult females with type 1 diabetes. *Diabetes Care*. 2005;28(1):84-88.
6. Jones JM, Lawson ML, Daneman D, Olmsted MP, Rodin G. Eating disorders in adolescent females with and without type 1 diabetes: cross sectional study. *BMJ*. 2000;320(7249):1563-1566.
7. Goebel-Fabbri AE, Fikkan J, Franko DL, Pearson K, Anderson BJ, Weinger K. Insulin restriction and associated morbidity and mortality in women with type 1 diabetes. *Diabetes Care*. 2008;31(3):415-419.
8. Colton P, Olmsted M, Daneman D, Rydall A, Rodin G. Disturbed eating behavior and eating disorders in preteen and early teenage girls with type 1 diabetes: a case-controlled study. *Diabetes Care*. 2004;27(7):1654-1659.
9. Ward ZJ, Rodriguez P, Wright DR, Austin SB, Long MW. Estimation of eating disorders prevalence by age and associations with mortality in a simulated nationally representative US cohort. *JAMA Netw Open*. 2019;2(10):e1912925.
10. Nagata JM, Ganson KT, Murray SB. Eating disorders in adolescent boys and young men: an update. *Curr Opin Pediatr*. 2020;32(4):476-481.
11. Støving RK, Andries A, Brixen K, Bilenberg N, Hørder K. Gender differences in outcome of eating disorders: a retrospective cohort study. *Psychiatry Res*. 2011;186(2–3):362-366.
12. Staite E, Zaremba N, Macdonald P, et al. Diabulima'through the lens of social media: a qualitative review and analysis of online blogs by people with type 1 diabetes mellitus and eating disorders. *Diabet Med*. 2018;35(10):1329-1336.
13. Harrison A, Zaremba N, Brown J, et al. A cognitive behavioural model of the bidirectional relationship between disordered eating and diabetes self care in people with type 1 diabetes mellitus. *Diabet Med*. 2021;38(7):e14578.
14. Treasure J, Kan C, Stephenson L, et al. Developing a theoretical maintenance model for disordered eating in type 1 diabetes. *Diabet Med*. 2015;32(12):1541-1545.
15. De Paoli T, Rogers PJ. Disordered eating and insulin restriction in type 1 diabetes: a systematic review and testable model. *Eat Disord*. 2018;26(4):343-360.
16. Clery P, Stahl D, Ismail K, Treasure J, Kan C. Systematic review and meta-analysis of the efficacy of interventions for people with type 1 diabetes mellitus and disordered eating. *Diabet Med*. 2017;34(12):1667-1675.
17. Markowitz JT, Butler DA, Volkening LK, Antisdel JE, Anderson BJ, Laffel LM. Brief screening tool for disordered eating in diabetes: internal consistency and external validity in a contemporary sample of pediatric patients with type 1 diabetes. *Diabetes Care*. 2010;33(3):495-500.
18. Charmaz K. Constructionism and the Grounded Theory Method. In: Holstein JA, Gubrium JF, eds. *Handbook of Constructionist Research*. The Guildford Press; 2008:397-412.
19. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006;3(2):77-101.
20. Goddard G, Oxlad M, Turnbull D. The misuse of insulin by males with type 1 diabetes mellitus for weight and/or shape control: a systematic scoping review. *J Diabetes Metab Disord*. 2023;22(1):13-34.
21. Lavender JM, Brown TA, Murray SB. Men, muscles, and eating disorders: an overview of traditional and muscularity-oriented disordered eating. *Curr Psychiatry Rep*. 2017;19:1-7.

SUPPORTING INFORMATION

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

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