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Perceptions of body weight that vary by body mass index: Clear associations with perceptions based on personal control and responsibility

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Abstract

This project aimed to identify the perceptions of body weight that vary by body mass index. First, a qualitative study explored body weight perceptions in 17 individuals with overweight. Second, a questionnaire was developed and completed by a UK sample with body mass index from 16.6 to 59.7 kg/m^2 ($N = 328$). A higher body mass index was associated with perceptions of less personal control and responsibility. Body mass index in females was also associated with three other questionnaire factors and body mass index in males with illness/medication. Thus, body mass index was associated with different perceptions of body weight. Focussing on personal control and responsibility may be useful for treatment and prevention.

Keywords

body weight, cognitions, obesity, overweight, perceptions, personal control, personal responsibility, qualitative methods, questionnaires

Introduction

Overweight and obesity are currently major global risk factors for disease burden, disability and mortality (World Health Organization (WHO), 2018). Obesity is associated with and/or can result in cardiovascular disease, including stroke and high blood pressure, diabetes type II and insulin resistance, musculoskeletal disorders and some cancers (including endometrial, breast, ovarian, prostate, liver, gallbladder, kidney and colon) (WHO, 2018) and can result in reduced employment and productivity, increased health care costs and increased social support requirements (OECD, 2017). Obesity, furthermore, is estimated to currently affect 13 per cent of the global adult population, while overweight affects a further 26 per cent (WHO, 2018), and projections suggest

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further increases across developed and developing countries (OECD, 2017).

Recommendations for the treatment of overweight and obesity focus largely on the use of behavioural interventions (Curry et al., 2018; Jensen et al., 2104; National Institute for Health and Care Excellence (NICE), 2014a, 2014b; National Institutes for Health (NIH), 2013). Clinically significant reductions in body weight and risk factors for related health conditions are found (Atallah et al., 2014; Christian et al., 2010; Dombrowski et al., 2014; LeBlanc et al., 2018; McEvedy et al., 2017; Porter et al., 2019), but a considerable proportion of intervention participants also do not benefit substantially (Christian et al., 2010; LeBlanc et al., 2018; McEvedy et al., 2017; Porter et al., 2019), with reports of 26–57 per cent participants in interventions losing less than 5 per cent of initial body weight (Christian et al., 2010; McEvedy et al., 2017).

Success rates from weight loss interventions differ dependent on intervention intensity and features, including programme duration (Christian et al., 2010; Jiandani et al., 2016; Latner and Ciao, 2014; McEvedy et al., 2017; Porter et al., 2019). Attrition and poor adherence have been associated with various demographic variables (Burgess et al., 2017; Goode et al., 2016; Jiandani et al., 2016; Jung et al., 2017; Moroshko et al., 2011), initial weight or body mass index (BMI) (Burgess et al., 2017; Goode et al., 2016), early successes and satisfaction with the programme (Burgess et al., 2017; Goode et al., 2016; Grossi et al., 2006; Jung et al., 2017; Miller and Brennan, 2015; Moroshko et al., 2011), practical concerns (Grossi et al., 2006; Miller and Brennan, 2015; Moroshko et al., 2011), additional health concerns (Burgess et al., 2017; Grossi et al., 2006) and with poor motivation and self-confidence (Burgess et al., 2017; Grossi et al., 2006; Jung et al., 2017; Miller and Brennan, 2015; Moroshko et al., 2011). Similar barriers to weight change, in the absence of intervention use, are also found (Burgess et al., 2017; Halali et al., 2018), and limited studies find similar results when comparing individuals with overweight who have engaged and who have not engaged with weight-loss activities (Ciao et al., 2012; McVay et al., 2017, 2018; Tinker and Tucker, 1997).

These findings suggest that low engagement with weight-loss activities can be attributed, at least in part, to differences in the ways in which individuals perceive body weight and weight loss. Estimates suggest that 37 per cent of US adults with obesity fail to engage in weight-loss activities (Nicklas et al., 2012), and over 25 per cent of adults with obesity do not desire or plan to do so in the future (Ciao et al., 2012). Fundamental differences in how individuals perceive body weight may explain why some individuals engage with weight-related activities, while others do not. Many studies have investigated body weight and body weight perceptions in groups with overweight and obesity (Ellis et al., 2014; Johnson and Annesi, 2018), but these studies fail to ascertain whether these perceptions are different to those held by individuals without overweight. Understanding the different perceptions of body weight may explain why some individuals engage with weight-related activities and may provide novel strategies for encouraging weight loss and weight maintenance or engagement in weight loss and weight maintenance behaviours across the population.

This project aimed to investigate perceptions of body weight in a sample of the general UK population and how these perceptions vary with BMI. First, a qualitative study was undertaken to understand how individuals with overweight view their weight and the weight of others. Second, the themes from this work were used to develop a questionnaire, which was then administered to a numerous and varied sample of the UK population, to investigate relationships between body weight and perceptions of body weight across a wider BMI range. The project was undertaken specifically to identify the perceptions that distinguish between individuals based on BMI.

Study 1 – Qualitative study: Investigation of perceptions of body weight in a small sample of adults with overweight

Method

Participants. Volunteers with overweight and obesity were recruited from the local community in and around Bournemouth and Southampton. Participants were required to be aged above 18 years and have a BMI greater than 25 kg/m^2. The distribution of the samples was also intended to represent the UK population with overweight in terms of gender and age (Health and Social Care Information Centre (HSCIC), 2014), thus recruitment was purposive to some degree. The study was granted ethical approval by Bournemouth University Ethics Committee, prior to commencement. All participants provided written informed consent prior to participation.

Data collection. Both one-to-one interviews and a single focus group were used, to allow the collection of both detailed personal accounts (Braun and Clarke, 2013; Silverman, 2009) and a dynamically constructed and socially derived 'group' opinion (Wilkinson, 1998). Both methods were intended to maximize the number and variety of perceptions reported. Interviews were undertaken until data saturation was reached, using the methods suggested by Guest et al. (2006), where ten interviews followed by two more interviews were conducted, and if less than 3 per cent of new codes were found in the last two interviews, data collection ceased at 12 interviews. Both the interviews and the focus group used a semi-structured interview schedule where participants were encouraged to think both personally and about people in general. Interviews and the focus group were conducted by the primary researcher (K.R.), a female without overweight. All were audio recorded and field notes were written immediately after data collection.

Data analysis. Data were transcribed by the primary researcher (K.R.) as soon as possible after data collection and analysed using thematic analysis, through an inductive approach. Analyses were based on the six steps of analysis by Braun and Clarke (2013): (1) familiarizing yourself with the data; (2) generating initial codes; (3) searching for themes, including comparing and contrasting themes; (4) reviewing themes; (5) defining and naming themes; and (6) producing the report. Analyses were first conducted by the primary researcher (K.R.), with the aid of field notes and memos. Themes, subthemes, their definitions and quotes were recorded with the aid of NVivo (QSR International (UK) Ltd.), a qualitative analysis software package. Following coding, a random 10 per cent sample of quotes was verified by a second researcher (S.M.). Final themes were agreed by three researchers (K.R., S.M. and K.M.A.). Additional analysts were also females without overweight.

Results

Twelve participants took part in interviews (nine females and three males), and five participants took part in a focus group (four females and one male). There were eleven participants with overweight and six with obesity, and one participant was aged 18–24 years, one was aged 25–34 years, two were aged 35–44 years, three were aged 45–54 years, five were aged 55–64 years, three were aged 65–74 years and two were aged above 75 years. Seven participants were currently on a diet, and eight participants had dieted in the past 6 months – two of whom had successfully lost weight. Six participants were planning to diet or continue dieting in the coming months.

Interviews lasted between 35 and 62 minutes and the focus group lasted for 64 minutes. Analysis of the first 10 interviews resulted in the creation of 51 initial codes. In the following two interviews, only one new code was created.

Five themes were identified from the analysis: (1) 'Overweight is a (physical and psychological) health issue', (2) 'It's not me', (3) 'It's not my fault', (4) 'It is me and it's my responsibility' and (5) 'Change is difficult'. The themes

'it's not me' and 'it's not my fault' also included a number of sub-themes. Themes are presented below, but many overlapped, for example, consideration of the consequences of overweight (theme 1) was associated with recognition of oneself as overweight (theme 4) or denial of this (theme 2), and many of the causes of overweight were discussed both as causes of overweight (theme 3) and as barriers to change (theme 5).

Theme 1 – Overweight is a (physical and psychological) health issue. Participants recognized the major health consequences of being overweight such as increased risk of diabetes, heart disease and joint pain. Personal consequences of overweight also included not being able to do activities that they had previously enjoyed and negative impacts on psychological health:

> 'I don't, we don't let [daughter] eat happy meals. It's just because, as I said, I grew up on all that kind of thing and I'm here every week, and I don't want [daughter] to have to feel like that every week. It's not nice'.

Participants commented on how their weight affected how they felt about their looks, for example, '*You don't feel good looking in the mirror*', how they felt negative because of their weight, how they could not find clothes that they liked and they spoke positively when referring to themselves with less weight in the past.

Theme 2.1 – It's not me: I'm not a person with overweight. When discussing their own weight, participants denied being a person with overweight:

> 'I mean, to look at the figures, and I don't always agree with them, but to say you're clinically obese, well, I'm not, I still walk round a golf course 36 holes in a day carrying a golf bag, I'm still fairly fit, but you realise in the end, that actually that's not really the case, so a lot of people kid themselves probably, I certainly did'.

Participants reported having no faith in the BMI calculation and put weight down to build, for example,

> 'I have googled my BMI and I know that I'm overweight but I'm comfortable with that because, . . ., I feel that I'm a bit bigger built than most people of my height so I can't, I don't really see it, I don't really see the BMI index thing as an indication of what my actual weight should be, because I don't think its correct'.

Theme 2.2 – It's not me: People with overweight are different from me. Participants also distanced themselves from a group of 'people with overweight in general'. Members of this group were considered '*lazy*', '*filling their faces with crap food*' and '*don't exercise in any way, shape or form*' – '*I just think that carries on until they only live a short life, a short and unhappy and fat and sweaty life*'. The lazy connotation was also extended into the workplace and to the health care system such that participants felt that individuals with overweight are a strain on the National Health Service.

Theme 2.3 – It's not me: I won't suffer. As part of the dissociation from overweight, participants also suggested that, irrespective of their body weight, they felt that they were unlikely to suffer from the related health concerns, associations between overweight and poor health were not always made, or were downplayed:

> 'I have a friend who is over 20 stone, I mean she is tremendous, and fortunately there is nothing wrong with her except she's got a bad leg, she's got sciatica, but being so big, she, she hasn't got diabetes or she hasn't anything wrong with heart I mean, in that way, she's fortunate'.

Participants also discussed that they did not understand their weight as they only ate healthy foods and did not eat snack or 'junk' foods.

Theme 3.1 – It's not my fault: It's modern society. Participants agreed that generations are getting bigger; taller as well as heavier, and many suggested that this was disguising increases in body weight because people were still the same clothes size or were comparing themselves to others who were larger:

> 'I have found it quite shocking seeing how, how people have changed you know, just in my lifetime that the size of people how, we are just getting bigger and bigger'.

The abundance and easy access to fast food and convenience food was also considered important. Participants discussed how streets and social outlets, for example, cinemas, are '*awash'* with fast food and how supermarkets are stocked with '*rubbish*'. The abundance of food, increased portion sizes and processed foods were considered to be bad for the nation's weight, and many participants felt that many unhealthy foods are further brought into the consciousness of shoppers by advertising, such that the combination of advertising and easy availability was driving food choices towards fast, convenience or processed foods:

> 'There's an awful lot of rubbish you can buy in the supermarket and it's well advertised and in people's faces and does appear to look like it's quite nice, but it's actually rubbish, . . ., I was in the catering trade not so long ago and I think that, hmm, a well packaged advertised piece of dog poo would sell and I think people would eat it'.

Advertising and the media were also considered important in the portrayal of body weight. References to attractive females without overweight were largely blamed on the models depicted in the media and the irresponsible nature of these depictions:

> 'There is always a vision of, . . ., of a lovely young lady, slim and live on television isn't there, as a model to society. I wouldn't necessarily agree with the stick like 15-year-old'.

Theme 3.2 – It's not my fault: It's a modern day lifestyle. One of the reasons given for an increased consumption of more processed and convenience foods was financial. Fresh foods were considered to be more expensive than processed foods, but participants also felt that there was more money available for food and eating out. A second reason given was that of being too busy to cook, exercise or even diet. Participants felt that in order to maintain an acceptable financial position both adults in the household were forced to work long hours, resulting in less time to prepare food, while many participants suggested that 'scratch' cooking was the key to weight control:

> 'Working patterns were very different I think, the people, I mean, there was the gender thing of women were at home a lot of the time cooking, . . ., but it did mean that you know there was, you could boil potatoes or you could cook cabbage or whatever, you know, but now if you come in at 8 o'clock at night and your partner comes in at 8 o'clock at night, you know it's not too easy'.

An absence of family mealtimes and an increased consumption in front of the television were also considered to encourage weight gain as consumption was less obvious. Modern day life was not only considered busy but also '*hard at times'*. Food was discussed as an emotional aid to the stresses of life, an aid against loneliness and boredom and a reward for difficult deeds, for example, '*people like me reach[ing] for food, it tastes nice, we know it's going to make us fat, but we just do it, and we regret it after*'. Rewards for children and spoiling by parents were considered to contribute to overweight in children. The reduced need for physical activity in the modern-day lifestyle was also considered important in the nation's weight gain, with particular emphasis on less manual labour, modern transport and increased technology use.

Theme 3.3 – It's not my fault: Gender differences. Men were considered equally likely to be overweight and overweight was considered equally important for men as for women, but men were thought less likely to be concerned by their weight than women. Weight was considered a female issue and commercial weight loss programmes were considered female-orientated environments where men would likely feel uncomfortable. However, it was felt that men would find it easier to lose weight:

> 'I think men lose weight easier than women, whether that is because they diet better and, and, but it seems to fall off them. –I think men perhaps

have more willpower. – In this day and age men are more able to get out and exercise than women'.

Theme 3.4 – It's not my fault: Age. Participants also blamed their age for overweight, suggesting that as one gets older it is easier to gain weight and more difficult to lose weight, due to decreases in activity: *'As I get older, I don't know, it's just harder'.* To counterbalance negative references to today, participants compared themselves with a previous self and discussed how they had previously been slim, active and sporty.

Theme 3.5 – It's not my fault: I need more information. Participants expressed a desire for more information on food content and the consequences of being overweight. Participants felt that existing information was insufficient; greater focus was needed on the harms of over consumption; stronger and more graphic displays of these harms would be helpful (in a manner similar to those provided about smoking); messages needed to be consistent; and this information was needed early in life:

> 'I don't think people can be blamed too much because no-one's like telling you it's wrong. I mean, . . . the sort of things about drugs . . . and even . . . legal highs … they go on about how bad it is . . . and so you sort of feel that it is wrong, but when you can see a shelf full of Mars or whatever, and there is no sort of [information saying] its wrong, how is a 10-year-old supposed to know?'

Overweight in children was considered to result, at least in part, from a lack of education or understanding by parents.

Theme 4: It is me and it's my responsibility. Throughout the discussion on causes of overweight, conflicting views were also offered. There was some discussion that genetic factors may make some individuals more predisposed to weight gain than others, but weight gain was also not considered beyond individual control. Participants recognized that people do not always act on information or can dismiss harms as irrelevant to them. Reasons were given for not exercising, but other forms of exercise that could be undertaken were also recognized. Participants thus recognized that while blame for overweight could be attributed elsewhere, some responsibility for overweight also laid with the individual with overweight themselves: *'Yeah, I agree, but there is always something you can do!'.* Participants also expressed some sympathy for individuals with overweight, particularly if body weight was likely caused by medical reasons. The theme centred around an acceptance not only that an individual had overweight but also that they may struggle to do anything about it.

Theme 5: Change is difficult. Participants discussed difficulties with losing weight and believed that they were unable to exercise and not strong enough to lose weight on their own. Losing weight was described as a battle, requiring willpower, a need for constant thought and attention, and dedicated time/resources:

> 'I got to nearly 50 and I thought, I was 49, 50th birthday coming up, and I thought I'm fed up with this, I'm going to do it and I will stay regardless of whether I lose or I don't lose, I'm going to go every week and I'm going to stay for the talk'.

Fad diets were considered ineffective for weight loss, while commercial weight-loss programmes were promoted. Weight-loss programmes were considered helpful for maintaining the necessary thought and attention on body weight. The issue of weight regain following weight loss was also recognized requiring again a need for constant attention. The importance of exercise in weight management was recognized and many reasons were given for not exercising including a lack of motivation and enthusiasm.

Discussion

The themes identified here have all in a broad sense been identified elsewhere among populations with overweight and obesity. The well-reported psychological consequences of overweight largely stem from individuals with overweight themselves (Ciao et al., 2012;

Paulitsch et al., 2019; Piana et al., 2013), and repeated research suggests that individuals with overweight not only recognize the physical health consequences associated with excess body weight (Piana et al., 2013; Tinker and Tucker, 1997; Weaver et al., 2008; Winter and Wuppermann, 2014) but also have a tendency to minimize the importance of these (Piana et al., 2013; Weaver et al., 2008; Winter and Wuppermann, 2014).

Failure to recognize oneself as overweight or mistrust of the BMI calculation and preferences for more aesthetic definitions such as 'weight for build', more consideration for 'fitness as opposed to fatness' and more consideration for 'personal preferences' have also been previously reported (Ellis et al., 2014; Molinari and Riva, 1995; Sikorski et al., 2012). As in our study, men in the study by Weaver et al. (2008) also did not consider overweight a problem for men if they were also fit and active. In the study by Ellis et al. (2014), 'overweight' was considered a weight with which one was uncomfortable, and 'obese' was considered a weight that was debilitating, thus individuals did not perceive themselves to be overweight (regardless of their actual weight) until they felt uncomfortable within themselves. This concept of overweight may also tie in with tendencies in our participants to minimize the health issues associated with overweight, such that an individual's body weight may only be of concern (and hence overweight) when it is associated with health issues.

The dissociation of individuals with overweight and obesity from others who were overweight or from 'people with overweight in general' has also been reported previously. In relation to weight stigmatization and weight-based prejudices, individuals with overweight and obesity can report the same implicit and explicit weight-based biases that are found in individuals without overweight (Ellis et al., 2014; Essayli et al., 2016; Jung et al., 2017; Latner et al., 2009; Molinari and Riva, 1995; Piana et al., 2013; Sikorski et al., 2012) and can often fail to demonstrate an affiliation with their minority group (Crandall, 1994; Wang et al., 2004). This failure to identify positively with an in-group with overweight has been attributed to the potentially controllable and transitory nature of overweight (Crandall, 1994; Wang et al., 2004). Overweight is largely considered controllable, implying that have overweight do so through choice, and the transitory nature of overweight for those who successfully lose weight or regain weight can support these perceptions (Crandall, 1994; Wang et al., 2004). The dissociation in individuals with overweight from 'overweight in general' and from others with overweight and the consideration of negative attitudes towards overweight are thus very closely coupled with themes associated with a lack of control, assigning blame and a need to take personal responsibility.

Others also report a willingness by individuals with overweight and obesity to both blame themselves and blame others or aspects of their life for their excess weight (Johnson and Annesi, 2018; Metzgar et al., 2015; Weaver et al., 2008). The relative importance of these causes has been found to differ. Sikorski et al. (2012) found a greater emphasis from participants with overweight on internal causes, such as poor food choices, while others have found increased reliance on more external factors, such as the social environment (Piana et al., 2013; Weaver et al., 2008). Repeated previous research also finds reported difficulties with change (Ciao et al., 2012; Johnson and Annesi, 2018; McVay et al., 2018; Metzgar et al., 2015; Piana et al., 2013; Tinker and Tucker, 1997).

Study 2 – Quantitative study: Investigation of perceptions of body weight in relation to body weight across a wider population

Method

Questionnaire. The questionnaire was composed of three sections: (1) general weight-related perceptions; (2) specific weight-related perceptions; (3) demographic characteristics, including body weight. Sections were provided in this order, to allow respondents to admit to

weight-related behaviours and perceptions before admitting their own body weight.

The section on general weight-related perceptions asked questions on: current body-weight perception: *'Which of the following best describes you?' 'I am not overweight', 'I am slightly overweight', 'I am overweight' and 'I am very overweight'*; and current dieting: '*Are you currently on a diet to lose weight or help control my weight?' 'Yes', 'No'*.

The section on specific weight-related perceptions consisted of 64 statements about body weight, derived from the themes and sub-themes gained from analysis of the qualitative data. A number of statements were derived per sub-theme, where care was taken to ensure all statements considered only one idea. Statements were also written in the active voice, using the language of the participants, and related directly to the respondent, for example, '*I can never find clothes to suit me'*. Statements were both positively and negatively oriented and presented randomly across all themes and sub-themes. All statements were responded to on a five-point Likert-type scale, labelled *'strongly agree', 'mildly agree', 'neither agree nor disagree', 'mildly disagree'* and *'strongly disagree'*, and were scored +2 to −2, respectively.

The section on demographic characteristics requested: gender, age, height, body weight, highest educational qualification, illnesses and medications that may affect body weight, pregnancy, nationality and years residing in the United Kingdom. Height and weight were incorporated into this section to reduce their salience. All other characteristics have previously been related to body weight and BMI (Agrawal et al., 2014; Goode et al., 2016; Grossi et al., 2006; Jiandani et al., 2016; Jung et al., 2017; Moroshko et al., 2011; Peltzer and Pengpid, 2015; Wardle et al., 2006).

The questionnaire, once developed, was piloted, as is standard practice, among eight participants from Study 1. Participants were asked for comments on wording and understanding, and some changes were made.

Questionnaire administration. The finished questionnaire took 15 min to complete and was administered online. The study was advertised via posters, flyers and social media sites serving the Bournemouth and Southampton areas, which offered a direct web link to all study materials. To gain participants with a range of body weights and holding a range of weight-related perceptions, some recruitment was undertaken at commercial weight-loss meetings, at gyms and outside fast-food outlets, and the researchers approached some people directly based on observed body weight. Minimal exclusion criteria were used to allow greater inclusivity. Exclusion criteria were less than 18 years and above 65 years of age, currently pregnant and living in the United Kingdom for less than 5 years, to ensure against age-related, pregnancy-related and cultural influences on body weight, body-weight reporting and body-weight perceptions (Jung et al., 2017; Kuczmarski et al., 2001). The study was granted ethical approval by Bournemouth University Ethics Committee, prior to commencement, and all participants provided written informed consent.

One-hundred questionnaires were administered in person, to investigate the discrepancy between self-reported and actual height and weight in our sample and allow the calculation of a correction factor to self-reported heights and weights for the online questionnaire sample if necessary. Previous work suggests likely inaccuracies in self-reported height and weight data, and that these discrepancies can vary between populations, samples and with time (Bowring et al., 2012; Gorber et al., 2007; Kuczmarski et al., 2001). Participants completed the same questionnaire online and were then asked if a researcher could measure their height and weight. Measured height and weight were only requested once participants had completed the questionnaire, and participants were not aware of the request prior to self-reporting their height and weight. Measurements were undertaken in light clothing, using a portable stadiometer (Seca 213 Portable Stadiometer, Birmingham UK, accuracy: 1 mm) and body-weight balance (Wilko body-weight scale, Nottinghamshire UK, accuracy: 100 g) immediately after questionnaire completion (Gorber et al., 2007).

Analysis. First, measured height and weight data were compared to self-reported height and weight data, using correlations, means, standard deviations and minimum and maximum values. Conversion factors were then calculated for the self-reported data to result in means and standard deviations in this dataset that were comparable to the measured data. Analyses were undertaken separately for males and females. Quadratic as well as linear relationships were investigated. Conversion factors were tested prior to further use by comparing measured BMI with adjusted self-reported BMI.

Second, questionnaires where the section on the specific weight-related perceptions was incomplete were deleted, and remaining questionnaire responses were used for a principal component analysis (PCA). A PCA was undertaken due to the overlap of many of the themes from the qualitative work and was undertaken in an exploratory manner to elicit factors from the questionnaire. The PCA included all 64 specific weight-related statements in the questionnaire and was undertaken using a Varimax rotation. Number of factors was determined from the Scree Plot, and subsequent factors were derived based on factor loadings and semantic reasoning.

Third, analyses were undertaken to investigate associations between BMI and general and specific weight-related perceptions. Self-reported BMI was first adjusted using the calculated conversion factors, and all specific weight-related perceptions were converted into five factors as derived from the PCA by reverse scoring all relevant items and averaging over all items per factor, to result in a score per factor from +2 to −2. Cronbach's alphas were calculated to investigate coherence within each factor. Regression analyses were then undertaken where (1) adjusted self-reported BMI; (2) BMI perception as overweight; and (3) dieting behaviour were predicted using the 5 PCA factors, accounting for demographic variables. Similar analyses were also undertaken for distance from correct BMI classification. Distance was calculated by comparing BMI perception as overweight to adjusted self-reported BMI. Respondents who correctly classified their weight as not overweight ($<25.5\,kg/m^2$), slightly overweight ($25.0–27.5\,kg/m^2$), overweight ($27–30.5\,kg/m^2$) and very overweight ($>30\,kg/m^2$) were given a score of 0, while respondents who incorrectly classified their weight were given a score based on distance in kg/m^2 from the upper or lower boundary of the correct classification. Analyses for adjusted self-reported BMI, BMI perception as overweight and distance from correct BMI classification were run using linear regression; analyses for dieting behaviour were run using logistic regression. Regression results were also confirmed using analysis of variance (ANOVA). Analyses were undertaken separately for males and females, in IBM SPSS. Significance was considered at $p < 0.05$.

Results

Body-weight measurement. Correlations between measured weight and self-reported weight ($N = 100$) and measured height and self-reported height ($N = 100$) were high for both genders (smallest $r = 0.95$, $p < 0.01$). Scatterplots revealed no quadratic relationships. Means were found to differ, although standard deviations were comparable. Descriptive statistics are given in Table 1. For females, a correction factor of +0.8 kg for weight and −0.8 cm (−0.08 m) for height was suggested, and for males, no correction was suggested for weight, and a correction factor of −1.4 cm (−0.14 m) was suggested for height. These correction factors resulted in an adjusted BMI in both genders that was very close to measured BMI.

Questionnaire. A total of 372 questionnaires were used for the PCA. This analysis revealed five factors which explained 38.7 per cent of the variance, following seven iterations. The five factors were titled: (1) 'I can control my weight'; (2) 'Societal influences'; (3) 'Overweight has negative consequences'; (4) 'Hidden causes'; and (5) 'Guidelines are helpful'. All but four question items loaded onto these factors with a loading greater than 0.3. The remaining four items were added to existing factors based on

Table 1. Descriptive statistics for all reported, measured and converted height and weight variables.

	Mean	Standard deviation	Min.	Max.
Females ($N=51$)				
Weight reported (kg)	65.9	13.3	45.0	117.0
Weight measured (kg)	66.7	13.6	47.0	119.0
Adjusted weight (kg)	66.7	13.3	45.8	117.8
Height reported (m)	1.657	0.064	1.49	1.83
Height measured (m)	1.648	0.063	1.50	1.82
Adjusted height (m)	1.649	0.064	1.48	1.82
Measured BMI (kg/m^2)	24.5	4.5	18.6	42.7
Adjusted BMI (kg/m^2)	24.5	4.6	18.2	42.7
Males ($N=49$)				
Weight reported (kg)	89.9	15.3	62.0	124.0
Weight measured (kg)	90.0	15.9	61.0	124.0
Adjusted weight (kg)	89.9	15.3	62.0	124.0
Height reported (m)	1.812	0.058	1.72	1.96
Height measured (m)	1.798	0.06	1.66	1.95
Adjusted height (m)	1.798	0.058	1.706	1.946
Measured BMI (kg/m^2)	27.8	4.7	20.9	39.1
Adjusted BMI (kg/m^2)	27.8	4.5	20.8	38.0

BMI: body mass index.

semantic reasoning. Factor 1 (25 items) explained 18.9 per cent of the variance, factor 2 (nine items) explained 7 per cent of the additional variance, factor 3 (15 items) explained 4.9 per cent additional variance, factor 4 (eight items) explained 4.7 per cent additional variance, and factor 5 (seven items) explained 3.3 per cent of the additional variance. Cronbach's alphas ranged between 0.40 and 0.76 for all factors. These factors mapped roughly the qualitative themes: 'It is me and it's my responsibility' and 'Change is difficult'; 'It's not my fault: It's modern society' and It's not my fault: It's a modern day lifestyle'; 'Overweight is a (physical and psychological) health issue'; 'It's not me'; and 'It's not my fault: I need more education', respectively. Questions in each factor are given in the Supplementary material.

Associations between body weight and weight-related perceptions. A total of 356 individuals provided responses to the complete questionnaire. Four of these were pregnant, 13 individuals were aged above 65 years, and 11 individuals reported an adjusted BMI over 60 kg/m^2, leaving a final sample of 328 individuals. Descriptive statistics for the entire sample are given in Table 2.

Males. Descriptive statistics for body weight and weight-related perceptions for the sample of males ($N=92$) are given in Table 3.

Regression equations predicted adjusted self-reported BMI, BMI perception as overweight and distance from correct BMI classification (smallest: $R=0.44$, $R^2=0.20$, adjusted $R^2=0.11$, $F(9,91)=2.20$, $p=0.03$).

A higher adjusted self-reported BMI was related to less agreement that I can control my weight (Beta $=-.317$, $p=0.01$) and having an illness/medication that may affect body weight (Beta $=-.361$, $p<0.01$). Scores ($+2$ to -2) on the factor 'I can control my weight' were also different based on adjusted self-reported BMI classification ($F(2,88)=28.13$, $p<0.01$; individuals without overweight ($N=26$): mean $=0.7(0.6)$; individuals with overweight ($N=35$): mean $=-0.1(0.6)$; individuals with obesity ($N=28$): mean $=-0.5(0.6)$).

Table 2. Descriptive statistics for the entire sample ($N = 328$).

	Mean	Standard deviation	Range
Gender (*N* (%))	Male: 92 (28.0%); female: 236 (72.0%)		
Age (years)	34.7	13.8	18–64
Highest qualification (*N* (%))	No formal qualifications: 4 (1.2%); O-levels or equivalent: 31 (9.5%); A-levels or equivalent: 96 (29.3%); university degree or higher: 197 (60.1%)		
Illnesses/medications (*N* (%))	Yes: 53 (16.2%); no: 275 (83.8%)		
Nationality (*N* (%))	British: 306 (93.3%); Other: 22 (6.7%)		
Percentage of life lived in the United Kingdom (%)	92.4	19.4	19.2–100.0
Adjusted BMI (kg/m^2)	28.2	8.0	16.6–59.7
Current body-weight perception (*N* (%))	Not overweight: 142 (42%); slightly overweight: 101 (30.8%); overweight: 60 (18.3%); very overweight: 25 (7.6%)		
Dieting (*N* (%))	Yes: 132 (40.2%); no: 196 (59.8%)		
PCA: I can control my weight (–2 to +2)[a]	−0.2	0.8	−1.7–1.7
PCA: Societal influences (–2 to +2)[a]	0.0	0.8	−2.0–2.0
PCA: Overweight has negative consequences (–2 to +2)[a]	0.2	0.5	−1.3–1.6
PCA: Hidden causes (–2 to +2)[a]	0.8	0.6	−0.9–1.9
PCA: Guidelines are helpful (–2 to +2)[a]	0.7	0.6	−0.9–2.0

BMI: body mass index; PCA: principal component analysis.
[a]PCA scales ranging from −2 (strongly disagree) to +2 (strongly agree).

Perception of oneself as being more overweight was related to less agreement that I can control my weight (Beta = −.689, $p < 0.01$) and less agreement that societal influences are important (Beta = −.276, $p < 0.01$).

Underestimating one's BMI classification to a greater degree was related to having an illness/medication that may affect body weight (Beta = −.418, $p < 0.01$). In total, 48 males correctly estimated their BMI classification, 42 males considered themselves in a lower BMI classification than based on their adjusted self-reported BMI and two males overestimated their BMI classification.

Females. Descriptive statistics for body weight and weight-related perceptions in the sample of females ($N = 236$) are given in Table 4.

Regression equations predicted adjusted self-reported BMI, BMI perception as overweight, distance from correct BMI classification and current dieting (smallest: $R = 0.32$, $R^2 = 0.11$, adjusted $R^2 = 0.07$, $F(9,235) = 2.93$, $p < 0.01$).

A higher adjusted self-reported BMI was related to less agreement that I can control my weight (Beta = −.518, $p < 0.01$), less agreement that overweight has negative consequences (Beta = −.147, $p = 0.01$) and less agreement that guidelines are helpful (Beta = −.167, $p < 0.01$). Scores (+2 to −2) on the factors 'I can control my weight', 'Overweight has negative consequences' and 'Guidelines are helpful' were also different by adjusted self-reported BMI classification (smallest $F(2,227) = 8.63$, $p < 0.01$; individuals without overweight ($N = 106$): I can control my weight – mean = 0.2(0.6), Overweight has negative consequences: mean = 0.2(0.5) and Guidelines are helpful: mean = 0.8(0.5); individuals with overweight ($N = 51$): I can control my weight – mean = −0.3(0.6), Overweight has negative consequences: mean = 0.2(0.5) and Guidelines are helpful: mean = 0.8(0.5); and individuals with obesity ($N = 71$): I can control my weight – mean = −0.8(0.6), Overweight has negative consequences: mean = −0.1(0.5) and Guidelines are helpful: mean = 0.5(0.6)).

Table 3. Descriptive statistics for males ($N = 92$) by perception of self as being overweight.

	Not overweight	Slightly overweight	Overweight	Very overweight
Number	37	32	21	2
BMI (kg/m^2)	25.5 (8.2)	29.2 (5.6)	33.4 (4.3)	34.8 (2.3)
Dieting (number dieting (%))	10 (27%)	16 (50%)	6 (29%)	1 (50%)
PCA: I can control my weight (–2 to +2)[a]	0.6 (0.6)	−0.2 (0.6)	−0.5 (0.6)	−1.2 (0.1)
PCA: Societal influences (–2 to +2)[a]	−0.1 (0.8)	−0.1 (0.8)	−0.1 (0.9)	0.4 (1.0)
PCA: Overweight has negative consequences (–2 to +2)	0.4 (0.5)	0.4 (0.5)	−0.0 (0.5)	−0.1 (0.1)
PCA: Hidden causes (–2 to +2)[a]	0.7 (0.6)	0.9 (0.5)	0.4 (0.6)	0.4 (0.1)
PCA: Guidelines are helpful (–2 to +2)[a]	0.7 (0.5)	0.7 (0.7)	0.6 (0.6)	0.1 (0.4)

BMI: body mass index; PCA: principal component analysis.
[a]PCA scales ranging from −2 (strongly disagree) to +2 (strongly agree).

Table 4. Descriptive statistics for females ($N = 236$) by perception of self as being overweight.

	Not overweight	Slightly overweight	Overweight	Very overweight
Number	105	69	39	23
BMI (kg/m^2)	23.0 (3.9)	28.1 (8.0)	34.7 (7.0)	39.7 (7.0)
Dieting (number dieting)	27	33	24	15
PCA: I can control my weight (–2 to +2)[a]	0.2 (0.7)	−0.4 (0.6)	−0.8 (0.6)	−1.0 (0.4)
PCA: Societal influences (–2 to +2)[a]	0.0 (0.9)	0.1 (0.8)	0.1 (0.8)	0.1 (0.8)
PCA: Overweight has negative consequences (–2 to +2)[a]	0.3 (0.5)	0.2 (0.5)	−0.0 (0.4)	−0.2 (0.4)
PCA: Hidden causes (–2 to +2)[a]	0.9 (0.6)	0.8 (0.6)	0.9 (0.6)	0.9 (0.4)
PCA: Guidelines are helpful (−2 to +2)[a]	0.8 (0.5)	0.7 (0.5)	0.6 (0.6)	0.5 (0.7)

BMI: body mass index; PCA: principal component analysis.
[a]PCA scales ranging from −2 (strongly disagree) to +2 (strongly agree).

Perception of oneself as being more overweight was related to less agreement that I can control my weight (Beta = −.660, $p < 0.01$), less agreement that societal influences are important to me (Beta = −.292, $p < 0.01$), less agreement that overweight has negative consequences (Beta = −.210, $p < 0.01$), greater agreement that overweight has hidden causes (Beta = .168, $p < 0.01$) and a higher age (Beta = .129, $p = 0.02$).

Underestimating one's BMI classification to a greater degree was related to less agreement that I can control my weight (Beta = −.191, $p = 0.02$) and less agreement that guidelines are helpful (Beta = −.026, $p = 0.04$). In total, 139 females correctly estimated their BMI classification, 67 females underestimated their BMI classification, and 30 females overestimated their BMI classification.

Current dieting was related to less agreement that I can control my weight (Wald = 7.00, $p = 0.01$), greater agreement that overweight has hidden causes (Wald = 12.25, $p < 0.01$) and more time spent living in the United Kingdom (Wald = 7.15, $p = 0.01$).

Discussion

Our findings demonstrate different body-weight perceptions in males and females and in individuals of different BMI and with different

perceptions of their own BMI. Both males and females were found, in general, to misperceive themselves as less overweight than when calculated, and both BMI and perceptions of one's BMI were found to be predominantly associated with perceptions related to an individual's ability to control and take responsibility for their body weight, such that a higher BMI was associated with lower perceptions of personal control and a lower willingness to take personal responsibility. For males, a higher BMI and greater underestimation of BMI was also associated with having an illness or taking medication that may affect body weight. For females, weight-related perceptions on the negative consequences of overweight, the value of guidelines and hidden causes of overweight were also important in distinguishing between individuals based on BMI and perceptions of one's BMI.

Others also report a tendency among the population to misreport one's weight as lower, and one's BMI as less overweight and more healthy than the reality (Agrawal et al., 2014; Duncan et al., 2011; Grover et al., 2003; Kuchler and Variyam, 2003; Kuczmarski et al., 2001; Muttarak, 2018; Peltzer and Pengpid, 2015; Wardle et al., 2006), resulting in the possibility that individuals may be less aware of health risks and less inclined to want or try to lose weight than may benefit their health (Agrawal et al., 2014; Duncan et al., 2011; Ellis et al., 2014; Kuchler and Variyam, 2003; Muttarak, 2018; Naghshizadian et al., 2014; Peltzer and Pengpid, 2015; Wardle et al., 2006). These errors have also been found to be particularly pronounced in men (Grover et al., 2003; Kuchler and Variyam, 2003; Muttarak, 2018; Peltzer and Pengpid, 2015; Wardle et al., 2006; Weaver et al., 2008). Others have thus suggested that the first or an important step to overweight treatment and prevention may be to correct these misperceptions (Agrawal et al., 2014; Duncan et al., 2011; Ellis et al., 2014; Kuchler and Variyam, 2003; Peltzer and Pengpid, 2015; Wardle et al., 2006).

Associations between overweight and perceptions of poor control over one's body weight and intake have also previously been reported (Ellis et al., 2014; Halali et al., 2018; Lindvall et al., 2010; Sikorski et al., 2012; Welsh et al., 2012). Sikorski et al. (2012) and Halali et al. (2018) report recognition of a need for control over eating and body weight among individuals with overweight compared to individuals without, and Welsh et al. (2012) report high levels of lack of self-control in obese participants. Increases in self-control have also been found in association with weight-loss success (Latner and Ciao, 2014; Welsh et al., 2012) and have been suggested as important for weight maintenance (Lindvall et al., 2010; Welsh et al., 2012). Low motivation to change, low confidence and low self-efficacy towards weight change may also be associated with perceptions of poor control. Others report low self-efficacy in individuals with obesity compared to those without (Piana et al., 2013) and associations between self-efficacy and successful weight loss and weight maintenance are again reported (Grossi et al., 2006; Jung et al., 2017).

For males, having an illness or being on medication that affects weight may also partly explain perceptions of a lack of control (Jiandani et al., 2016), but perceptions of responsibility have also previously been linked with poor disease management (DePalma et al., 2011), and some illnesses (and medications) associated with body weight and weight gain may have originated from overeating and poor self-control (DePalma et al., 2011; Jiandani et al., 2016). Issues related to causality clearly need to be considered, and further study of perceptions of body weight, including causality, would likely be of interest in males.

For females, a higher BMI was also associated with disagreement that 'Overweight has negative consequences' and that 'Guidelines are helpful', and perceptions on these two factors clearly distinguished between individuals with/without overweight and individuals with obesity. An unwillingness among individuals with obesity to acknowledge the issues associated with overweight has been reported previously as already discussed (Ellis et al., 2014), as have requests for more information or low weight loss attempts and success due to a lack

of knowledge (Metzgar et al., 2015; Piana et al., 2013; Welsh et al., 2012). It is interesting, however, that these factors distinguish individuals with/without overweight from those with obesity. These findings may again suggest a minimization of concerns in those who have more overweight, and this minimization may occur for a variety of reasons including fear and self-protection (Essayli et al., 2016; Jung et al., 2017; Wardle et al., 2006). Alternatively, these findings may again suggest an unwillingness or failure to take control or accept responsibility.

For females, perceptions of oneself as being more overweight and currently dieting were also associated with perceptions that overweight has hidden causes. The factor labelled 'Hidden causes' most likely reflects a lack of understanding of the causes of obesity or a feeling of powerlessness.

Social influences were only important in males. Higher perceptions of oneself as being overweight were associated with less agreement that societal influences were important. This may relate to the idea that overweight is under personal control or may suggest that males with overweight feel more isolated or exempt from the surrounding society. Ellis et al. (2014) also suggests a likely external locus of control in those with obesity, suggesting greater reliance on external factors. As identified in our qualitative study, however, the literature is divided on the importance of internal versus external causes in obesity.

All factors derived from our questionnaire have previously been suggested to be important (Ellis et al., 2014; Kuchler and Variyam, 2003; Peltzer and Pengpid, 2015; Wardle et al., 2006), as was found also in our qualitative work. An absence of effects in our regression analyses simply demonstrate an absence of associations with BMI, and that males and females of all BMI likely hold these same perceptions. A lack of impact from other demographic variables can also be similarly explained (Ellis et al., 2014; Goode et al., 2016; Jiandani et al., 2016; Miller and Brennan, 2015; Paulitsch et al., 2019).

Implications for treatment and prevention

Our analyses suggest that perceptions related to control and personal responsibility are particularly important for distinguishing between individuals based on their BMI, so strategies to target these perceptions may be particularly valuable for encouraging changes to body weight. Our data are cross-sectional, so we cannot suggest that these perceptions cause BMI or even come first, but our findings suggest that strategies based on increasing control over body weight or highlighting the role of control may be valuable for aiding and encouraging individuals to address overweight. Ellis et al. (2014) also recommend focusing on control and personal responsibility for encouraging weight loss, but recognize potential difficulties, where increasing a focus on personal responsibility also implies blame and related negative connotations. However, Welsh et al. (2012) demonstrate associations between self-control and weight loss success and Lindvall et al. (2010) in their discussion of successful weight maintenance report benefits from gaining control for some individuals, but also suggest that some recognition of a balance between more and too much control is also needed. Focussing on factors that may aid taking control and accepting responsibility, such as improving motivation, self-efficacy and autonomy may be beneficial (Ciao et al., 2012; Grossi et al., 2006; McVay et al., 2017, 2018; Miller and Brennan, 2015; Moroshko et al., 2011; Tinker and Tucker, 1997; Welsh et al., 2012).

Focussing on control and responsibility may also be more valuable than focussing on misperceptions of body weight and overweight. The functioning behind these misperceptions, such that these perceptions may normalize or legitimize overweight (Wardle et al., 2006) and may reduce some of the distress associated with overweight and eating (Essayli et al., 2016; Jung et al., 2017) suggests that these may be difficult to target (Ellis et al., 2014). An alternative approach of targeting weight-related perceptions, particularly around the controllability

of body weight and the need for individuals to accept responsibility may be more valuable. Puhl and Brownell (2003), however, also provide good evidence that weight stigma may be largely attributed to perceptions of body weight as controllable and the responsibility of each individual. Considering that negative weight biases are also held by overweight individuals themselves, there may need to be careful communication to increase perceptions of control and responsibility sufficient to encourage weight loss, but at insufficient levels to also increase weight stigma and negative perceptions of those with overweight (Essayli et al., 2016; Jung et al., 2017). Recent evidence, for example, finds higher levels of depression in those who are obese and have a perception of themselves as obese, compared to those without obesity and without the perception (Paulitsch et al., 2019). Others have also suggested a need for obesity treatments that avoid increase in weight stigma and negative perceptions of those who are overweight (Latner et al., 2009; Simpson et al., 2019). Simpson et al. (2019), for example, report lower self-efficacy towards weight change in individuals perceiving weight-based public health messages that encouraged negative perceptions of obesity, although Latner et al. (2009) found improved weight-loss maintenance in those with more frequent previous stigmatizing experiences, possibly as a result of the removal of this discomfort. Latner et al. (2009) also recognize that these benefits may only occur in some. We accept, that different strategies and foci may be beneficial for different individuals. Lindvall et al. (2010) and Halali et al. (2018) categorize individuals as one of a number of different types of 'weight maintainer' and suggest alternative foci for each.

Strengths and limitations

Strengths of our project include the use of the qualitative component, the large sample for the quantitative part and our use of measured body weight and height in 100 participants to allow a correction for self-reported BMI. Self-reported BMI and discrepancies with measured BMI were comparable with those found in previous studies (Bowring et al., 2012; Gorber et al., 2007), and similar differences between males and females in perceptions of BMI have been previously reported (Jiandani et al., 2016; Kuchler and Variyam, 2003; Lindvall et al., 2010; Peltzer and Pengpid, 2015; Wardle et al., 2006). Number of respondents dieting in our survey (approx. 40%) was also comparable to those reported in other surveys or may be explained by the focus of other surveys specifically on weight loss and body satisfaction (Anderson et al., 2002; Halali et al., 2018).

Our study was limited by the lack of consideration of a number of aspects of body weight and overweight. We did not measure emotional factors, such as body dissatisfaction, anxiety and body image (Anderson et al., 2002; Ciao et al., 2012; Essayli et al., 2016; Goode et al., 2016; Grossi et al., 2006; Grover et al., 2003; Johnson and Annesi, 2018; Jung et al., 2017; Latner et al., 2009; McVay et al., 2017, 2018; Simpson et al., 2019), we did not assess culture or ethnicity (Agrawal et al., 2014), and we did not assess all aspects of body weight or overweight that may impact on individual perceptions, such as current desires for weight loss, number of previous weight loss attempts or experience of previous weight-loss attempts (Anderson et al., 2002; Ciao et al., 2012; Essayli et al., 2016; Goode et al., 2016; Grossi et al., 2006; Jung et al., 2017; Latner and Ciao, 2014; Miller and Brennan, 2015; Moroshko et al., 2011; Piana et al., 2013). More practical concerns that have also previously been reported for low weight loss or weight maintenance (Burgess et al., 2017; Ciao et al., 2012; Grossi et al., 2006; Johnson and Annesi, 2018; McVay et al., 2018; Miller and Brennan, 2015; Moroshko et al., 2011) were also not assessed. Limited perceptions were assessed to limit the work and maximize questionnaire completion. A reduced body-weight perceptions questionnaire, however, may allow further assessment of these related characteristics. Finally, interviews and analyses were undertaken by females without overweight and thus may include inherent biases. Use of researchers of both genders with overweight or obesity may have been of benefit.

Conclusion

In conclusion, in our qualitative work, we found five themes that have previously been identified in individuals with overweight and obesity in their consideration of body weight. In our questionnaire based on these themes, five factors also emerged: (1) 'I can control my weight', (2) 'Societal influences', (3) 'Overweight has negative consequences', (4) 'Hidden causes' and (5) 'Guidelines are helpful'. Of these, BMI in males and females was associated with the factor 'I can control my weight', where a higher BMI was associated with perceptions of less personal control and responsibility. BMI in males was also positively associated with having an illness or taking medication that may affect body weight, and a higher BMI in females was associated with perceptions that overweight has less negative consequences, more hidden causes and will benefit less from guidelines. These findings suggest that focussing on perceptions of personal control and responsibility may be useful in treatment and prevention.

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Author contributions

Karen Robinson contributed to conceptualization, investigation, methodology, formal analysis and writing – original draft, review and editing. Sarah Muir contributed to supervision, methodology, formal analysis and writing – review and editing. Annie Newbury contributed to writing – original draft, review and editing. Lourdes Santos-Merx contributed to methodology and writing – review and editing. Katherine M Appleton contributed to supervision, methodology, formal analysis and writing – original draft, review and editing.

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Data accessibility statement

Questionnaire data have been uploaded and are freely available from SAGE. A copy of the online questionnaire as used is also provided.

Supplemental material

Details of the questionnaire items per factor are given in Table S1.

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