Influence of Obesity Prevalence on Social Norms and Weight Control Motivation: a Cross-sectional Comparison of the Netherlands and the UK

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This cross-sectional survey study explored associations between perceived bodyweight norms, psychological need satisfaction and motivation for weight control among 500 adult residents of two countries with different overweight/obesity prevalence: the UK (63% prevalence) and the Netherlands (50%). A hypothesised model of the effects of descriptive norms (i.e. perceptions of what is typical for most people) and injunctive norms (i.e. perceptions of what is typically approved by others) on autonomous motivation, mediated through basic psychological need satisfaction, was analysed using structural equation modelling. Descriptive norms did not differ between countries, yet UK adults reported a lower-weight injunctive norm. Perceiving higher bodyweights to be normal negatively predicted motivation to manage one's bodyweight, mediated through an undermining effect on psychological need satisfaction. Perceiving higher bodyweights to be normal may have the potential to reduce individual motivation for weight control, but the sensitivity of people's perceptions to objective differences in overweight prevalence appears limited.

Keywords: obesity, social norms, cross-cultural comparison, self-determination theory, motivation

Background

Worldwide, obesity rates have doubled since 1980 and no country has yet managed to reverse the trend in rising obesity (Ng et al., 2014). Obesity increases the risk of developing chronic diseases (Renehan, Roberts, & Dive, 2008), reduces mobility (Vincent, Vincent, & Lamb, 2010) and, due to the stigma surrounding obesity, is associated with lower earning potential (Viner & Cole, 2005). This study examines public perceptions of the need for weight management and individuals' motivation to manage their weight, given the context of rising prevalence of overweight.

Social Norms for Obesity

Past work suggests that social norms for bodyweight reflect differences in obesity levels across countries (Johnson et al., 2015), and exploratory studies have observed small but significant increases in BMI when perceived norms for bodyweight increase (Wang, Xue, Chen, & Igusa, 2014). Obesity results directly from a range of diet- and physical activity-related behaviours that are subject to social influence, including norms (Rimal & Lapinski, 2015). The majority of evidence focuses on *descriptive* social norms (DNs), i.e., perceptions of what people in one's environment typically do or the prevalence of a certain trait (Lapinski & Rimal, 2005). In the dietary domain, providing information on what others are eating has been shown to have a moderate but meaningful impact on food choice (Robinson, Thomas, Aveyard, & Higgs, 2014). Similarly, DNs for physical activity are strongly associated with physical activity levels (Priebe & Spink, 2011).

Less research has focused on how *injunctive* norms (INs), i.e., a person's perceptions of what others think they *should* do, could influence weight-related behaviours. INs for body size do not appear to be closely linked to differences in prevalence; the societal slim ideal for body size remains pervasive across cultures where obesity prevalence is high (Motseki &

Oyedemi, 2017). Data show that INs and DNs have independent effects and one can comfortably hold different DNs and INs for body size simultaneously (e.g. believing it is normal for people to be overweight, but that we should still strive to be thin) (Rand & Resnick, 2000). Research has explored the potentially differential effects of INs and DNs in association with some health behaviours, such as alcohol use), where INs are seen to have a moderating impact on the relationship between perceived DNs and an individual's behaviour (Lee, Geisner, Lewis, Neighbors, & Larimer, 2007; Rimal & Real, 2005). However, most of this research has focused on substance use in university students (Dempsey, McAlaney, & Bewick, 2018) and there is little evidence to show how these two perceptions interact in different social conditions to influence obesity-related behaviours specifically. While commentators speculate on the likely negative effects of increasing norms for overweight and obesity alongside poor personal recognition of what constitutes being overweight (Burke & Heiland, 2018), empirical research into what measurable effects this has is limited.

The present study investigated the sensitivity of social norms to different levels of obesity prevalence by comparing two countries with different levels of prevalence: the UK and the Netherlands (NL). At the time of data collection (May 2016), 27% of UK adults were estimated to be obese and a further 36% were overweight (NHS Digital, 2016). Prevalence of overweight in the NL was 36% and obesity 14% (Rijksinstituut voor volksgezondheid en milieu, 2016). These countries were selected because of this contrast in obesity levels, given that a meaningful difference in prevalence is a necessary condition for there to be an effect. However, both are high-income, Westernised countries with a cultural preference for slim body sizes (Dijkstra, Barelds, & van Brummen-Girigori, 2015), which would inform individuals' INs. Thus our first hypothesis was:

Hypothesis 1: DNs of a 'normal' bodyweight would be higher in the UK than NL in line with differences in obesity prevalence, whereas there would be no difference in INs.

Social Norms and Motivation

Our study also aimed to investigate associations between perceived social norms for bodyweight and people's motivation for weight-management behaviours. Self-determination theory (Ryan & Deci, 2000) provides a useful theoretical framework for understanding how norms, and other socio-cultural factors, can influence motivation and behaviour through the process of internalisation. Partial internalisation takes place in contexts of pressure or coercion, leading to controlled forms of motivation, which commonly result in short-lived behaviour changes (Ryan & Deci, 2017). Full internalisation occurs in the absence of pressure, often with the endorsement of people one values, leading to autonomous forms of motivation that are associated with sustained behaviour change (Ryan & Deci, 2017). The process of internalisation is facilitated by socio-environmental factors that support three basic psychological needs: autonomy (feeling that one can determine one's own actions in line with one's values), competence (feeling capable to undertake a given behaviour and provided with opportunities to demonstrate capability) and relatedness (feeling valued by important others) (Ryan & Deci, 2017). In many health domains, including physical activity and diet (Teixeira et al., 2015), interventions that support autonomous motivation, by promoting psychological need satisfaction, have consistently been shown to promote behavioural persistence (Kwasnicka, Dombrowski, White, & Sniehotta, 2016).

Research suggests that INs are perceived as a form of social pressure, are stronger predictors of behaviour when other people are present (Rimal & Lapinski, 2015), and do not

contribute to autonomy supportive social environments (Chatzisarantis, Hagger, & Brickell, 2008). The effect of DNs is more ambiguous; DNs are suggested to indicate 'what is right', which people can draw on in making decisions, but whether this indicator is experienced as controlling or autonomy supportive may depend on one's identification with the social group exhibiting the norm (Deci & Ryan, 2000). Exploring how DNs are associated with motivation for weight-management behaviours could provide a better understanding of whether and how changes in visible population characteristics, such as bodyweight, influence obesity prevalence.

In line with the self-determination theory literature, we tested a model of the theoretical mechanisms that could help explain any identified differences, hypothesising that:

Hypothesis 2: (a) INs would be negatively associated with controlled motivation towards weight control (i.e., perceiving a lower bodyweight to be desirable would foster greater controlled motivation)

(b) DNs would be inversely associated with both controlled and autonomous motivation (i.e., the higher the normal bodyweight appears, the weaker the rationale to lose or manage one's weight).

Hypothesis 3: The association between norms and autonomous and controlled motivations would be mediated through psychological need satisfaction (Figure 1).

<Figure 1>

Methods

Participants and Procedure

We used a cross-sectional survey design, recruiting participants through online-panels: Flycatcher Internet Research B.V. in the NL and Marketest in the UK. A target minimum sample size of 200 from each country was set in order to test the hypothesised model in both populations (Kline, 2005). Inclusion criteria were being aged 18 years or older and living in either the UK or the NL for at least 10 years. Participants were selected with the aim of generating a sample representative of gender, age, educational level, occupation, geographical region, and living situation compared with national data. The final survey was piloted with six people in both countries, using cognitive debriefing (Collins, 2003) to check comprehension: directly after completing the questionnaire, pilot participants were interviewed by a researcher to ascertain what they understood each question to be asking. The departmental Research Ethics Committees at the authors' universities approved the study.

Materials and Measures

Demographic data were collected through self-report. Body mass and height were reported at the end of the questionnaire in order to avoid priming participants' responses to earlier questions. BMI was computed as: body mass (kg) ÷ height (m^2).

Social Norms

DNs and IN for bodyweight were both measured on scales with nine figures, ordered from thin to heavy, (Supplementary Figure S1). The scales are based on the Contour Drawing Rating Scale (Thompson & Gray, 1995), but updated for this study using the Sims 4 create-a-demo tool (Electronic Arts Inc.) to produce more realistic, detailed figures. Following pilot testing, the female scale was amended to better standardize the perceived increase in body size between figures. The response scale was extended from 9 to 17 response points to give participants the opportunity to choose a number between two figures, representing a greater

range of body sizes (Gardner, Jappe, & Gardner, 2009). A continuous response scale was not available on the online survey platform used in this study.

Participants responded according to the following instructions: (DNs) "*Using the figures as a guide, choose the number that best represents a normal bodyweight for people living in your area*", and (INs) "*Using the figures as a guide, choose the number that best represents the bodyweight you think people should be, to have the best health*". Participants responded to the questions for descriptive norms separately for both men and women, and for INs for their own gender. Higher scores on both norms indicated that participants considered a heavier bodyweight to be normal (DN) or socially required (IN).

Psychological Need Satisfaction

Psychological need satisfaction was measured using the satisfaction subscales of the Basic Psychological Need Satisfaction and Frustration Scale (BPNSFS; Chen et al., 2015), using the stem '*to control my weight*'. The scale has been successfully used in a range of populations of different nationalities, and has been validated in both English and Dutch (Chen et al., 2015). It comprises three subscales, each with four items measured on scales from 1 to 5: autonomy satisfaction (e.g. "*I feel that my decisions in relation to controlling my weight reflect what I really want*"; Cronbach's alpha = 0.85 in the current sample); competence satisfaction (e.g. "*I feel capable at what I do to control my weight*"; Cronbach's alpha = 0.89); and relatedness satisfaction (e.g. "*I feel that the people I care about, care about my attempts to control my weight* "; Cronbach's alpha = 0.92).

Motivation

Motivation for weight control behaviours was measured using the Treatment Self-Regulation Questionnaire (TSRQ) for diet (Williams, Ryan, & Deci, 2011) with an adapted stem '*I control my weight*'. The scale consists of 12 items: six assessing autonomous motivation

(e.g., "*Because I feel that I want to take responsibility for my own health*"), six assessing controlled motivation (e.g., "*Because I would feel guilty or ashamed of myself if I did not control my weight*"). All items were scored on a 7-point scale (1 = *not at all true*, 7 = *very true*). The scale score reliability coefficients were α = .87 for autonomous motivation and α = .84 for controlled motivation.

Analysis

Descriptive statistics were computed using SPSS v.22.0 (IBM Corp., 2013). Hypotheses 1 and 2 were explored using t-tests of between country differences and partial correlations (controlling for country) to assess predicted associations. Confirmatory factor analyses (CFAs) were conducted on the latent constructs to assess their performance with this sample and are presented in the supplementary materials (S2). To investigate the potential interaction between DNs and INs, separate regression models were run for the three basic need satisfaction variables, and autonomous and controlled motivations, including DNs, INs and their interaction term as independent variables. The relationships set out in Figure 1 were tested separately for the effect of each type of social norm using structural equation modelling with a maximum likelihood approach in AMOS v.23 (Arbuckle, 2014). The data were first checked for multivariate normality and bootstrapping was applied to calculate standard errors and confidence intervals, using 5000 bootstrapped samples (Hayes, 2013). Acceptable model fit was determined by a scale corrected comparative fit index (CFI) and Tucker Lewis Index (TLI) of >.90, a weighted root mean square residual (WRMR) <1, and close to or <0.08 for the root mean square error of approximation (RMSEA) (Brown, 2006; Kline, 2005).

In line with previous research in which mean values, but not the nature of interactions themselves are hypothesised to differ between groups (Standage, Gillison, Ntoumanis, & Treasure, 2012), we tested for invariance by comparing model fit indices when regression

weights between variables were constrained to equivalence across comparison groups, or unconstrained. A change in CFI of less than or equal to 0.01 was considered indicative of invariance (Cheung & Rensvold, 2002). Estimates of relevant direct and indirect effects within the model were calculated to test Hypothesis 3.

Results

The final sample comprised 500 participants (53% male, mean age = 46 years, mean BMI = 26.3 kg/m^2 SD = 5.40); 251 were from the NL and 249 from the UK. Details and comparisons across the two countries of participant characteristics are presented in Table 1. Contrary to Hypothesis 1, while there was a trend towards higher DNs for bodyweight in the UK sample, the effect was small and non-significant. There was a significant, small effect indicative of lower INs in the UK sample; adults in the UK, compared with adults in the Netherlands, were more likely to believe people should have a smaller body size for health.

<Table 1>

Hypothesis 2(a) was supported (Table 2): INs were negatively correlated with controlled motivation (i.e., perceiving the need to adhere to a smaller body size was associated with greater controlled motivation for weight management; $r = -0.10$, $p<0.05$). Interestingly, this association was also found with autonomous motivation ($r = -0.14$, $p<0.01$). Hypothesis 2(b) was not supported: DNs were not associated with either form of motivation, although perceiving larger body sizes to be normal was associated with lesser sense of competence to control one's own weight; $r = -0.10$, $p<0.05$. Regression models showed the interaction effect of DNs and INs did not significantly impact controlled or autonomous motivation, or autonomy, competence or relatedness needs satisfaction ($p>0.05$).

<Table 2>

The model for the effect of both INs and DNs on needs satisfaction and motivation showed good fit with the data (Table 3). For INs, Chi-square = 64.83 (33), CFI = 0.99, IFI = 0.99, RMSEA = 0.04, SRMR = 0.02. For DNs, Chi-square = 71.78 (33), CFI = 0.99, IFI = 0.99, RMSEA = 0.05, SRMR = 0.02. In line with Hypothesis 3, both DNs and INs negatively predicted autonomy and competence need satisfaction; these relationships mediated a negative indirect effect on both autonomous and controlled motivation. The pathways were stronger for INs than DNs, but in the same direction. Invariance testing of the causal structure between samples showed no difference in the relationships between countries.

<Table 3>

To explore whether these effects were equivalent for people of all bodyweights, we also ran an invariance test of the causal structure of the model across weight categories. People with overweight and obesity reported higher DNs and INs for bodyweight than did healthy weight participants, but there was no difference in the relationships between constructs (Table 4).

<Table 4>

Discussion

This study explored whether rising obesity levels and perceived normalisation of overweight is associated with shifts in people's motivation to actively manage their weight. Our findings suggest that the estimated 13% difference in prevalence of obesity between the UK and the Netherlands is not associated with a discernible difference in bodyweight DNs; however, despite more people being obese in the UK, INs were for a lower weight. For residents of both countries, perceiving a DN or IN for a higher bodyweight was associated with weaker autonomous and controlled motivation to manage one's weight, mediated through a negative effect on psychological need satisfaction for autonomy and competence.

Our findings in relation to motivation are consistent with the outcomes of a 10-year longitudinal cohort study in Australia that found an inverse relationship between local DNs

for overweight/obesity and healthy dietary behaviours, and a positive relationship with BMI (Carroll, Niyonsenga, Coffee, Taylor, & Daniel, 2018). Another longitudinal cohort study similarly found an undermining effect of DNs for physical activity, at the community and family level, on physical activity behaviour (Kite et al., 2018). Our findings could suggest that the effect of social norms on motivation to enact weight management behaviours may form part of the mechanism through which increasing social norms for bodyweight affect objectively measured increases in bodyweight

In our sample, social norms were perceived differently according to participants' own bodyweight; people with overweight believed both the norm for bodyweight in their community and the ideal bodyweight for health to be higher than did healthy weight participants. This has implications for the public health discussion around whether it is important to improve the accuracy of people's estimation of their own weight status: it has been suggested that this could push people to identify with a stigmatised identity that may harm self-esteem and compromise engagement with weight management services and activities (Robinson, 2017). Our findings suggest that people with overweight do not appear to experience greater social pressure to lose weight, as their perceptions of INs were for higher bodyweights than healthy weight participants' perceptions.

UK participants reporting lower INs than the NL participants, despite living in a country with higher prevalence of overweight and obesity, was unexpected. It is possible that INs are driven more by media images endorsing a slim ideal than by the people living around a person; both the UK and NL have a 'Western' culture but our findings suggest that people in the UK might be more strongly influenced by the media or exposed to different and lower-bodyweight images. The lack of difference between the DNs for participants in the two countries was also surprising given the objective difference of 13 percentage points in prevalence. It is possible that this difference in prevalence is too small to be perceptible to

individuals in society. Future research could compare countries with larger differences in prevalence to assess the impact on perceived norms.

With regard to practical implications for health promotion interventions, our findings suggest that highlighting healthy behavioural or weight norms, where they exist, might help to increase individuals' health motivations. However, among populations where there is high prevalence of overweight and unhealthy behaviours, health interventions might be undermined by making the unhealthy norms salient to the audience (e.g. a campaign that states that the majority of people in the population are overweight may only serve to raise the perceived DNs and INs of that population; (Staunton, Louis, Smith, Terry, & McDonald, 2014)). Instead, interventions could focus on directly influencing autonomy and competence needs, to have a positive impact on motivation (Ryan & Deci, 2017). Such interventions might, for example, focus on providing a range of equipment and spaces for physical activity, along with training and encouragement to use these resources.

Strengths and Limitations

Strengths of this study include the recruitment of UK and Dutch adults with a range of bodyweights and demographic backgrounds and the use of questionnaires validated independently in each language to facilitate direct comparison. However, the cross-sectional nature of the data limits the inferences that can be made. In addition, we did not account for local variation in overweight/obesity prevalence according to participants' geographical location within countries, so the results reflect only a comparison at a national level. While we attempted to mitigate this by stratifying sample selection within each country by geographical location to ensure diversity, we were not able to measure the success of this in relation to exposure to local weight norms, and this may have contributed to the lack of difference in perceived norms detected between samples. The scales used to assess social norms were created for this study in an attempt to use a tool with more realistic figures than

those in traditional contour drawing scales. The scales were developed iteratively with pilot testing, however further work is needed to validate them. In addition, the TSRQ showed poor factorial validity with this sample (see S2), suggesting it may have been a less accurate tool for detecting the hypothesised relationships with autonomous and controlled motivations. All measures were self-reported, so part of the associations found may stem from common-method variance and the weight status categories used for group comparisons are likely to under-estimate the number of people who would objectively be classified as overweight or obese (NHS Digital, 2018).

Conclusions

Perceived DNs for bodyweight did not differ as expected between people in the UK and the Netherlands according to national differences in obesity prevalence, suggesting that sensitivity to detecting changes in prevalence is low. Across both the UK and NL, social norms (particularly INs) were inversely related to motivation for weight control behaviours, mediated through a negative effect on autonomy and competence need satisfaction. This suggests that perceiving higher bodyweights to be normal can undermine autonomous motivation through reducing people's feeling that they are freely choosing to manage their weight in line with their own values, and their sense of capability to manage their bodyweight. Studies that test interventions to change perceived norms, using research designs that allow causal attributions to be made, would be valuable in exploring the further implications of the impact of social norms on behaviour.

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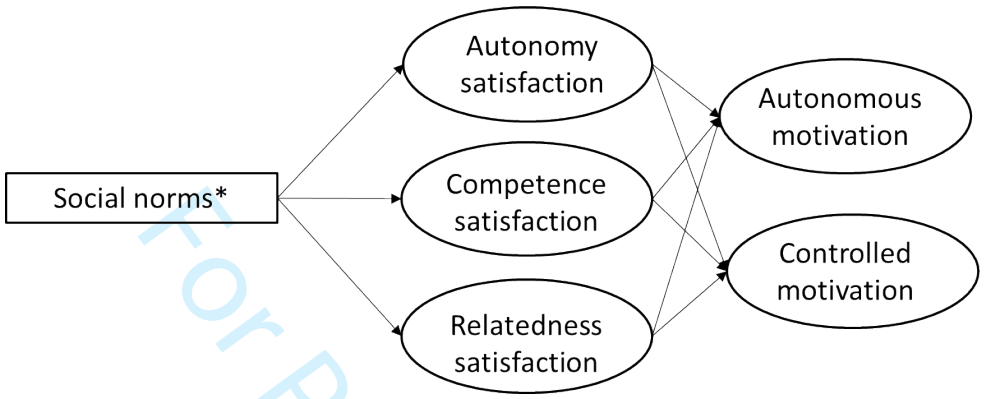
Figure 1. Model of theoretical effects of social norms on motivation for weight control



Notes: * separate models were tested for injunctive and descriptive norms

Table 1. Demographics, reported norms and motivation scores across samples

	NL N=249	UK N=251	Between country difference	
	M (SD)	M (SD)	Effect size (*d*)	Test statistic
Age	47.8 (16.8)	44.8 (13.7)	0.20 *	t = -2.45 *
Gender (% male)	55%	53%	0.03	Chi^2=0.09, NS
BMI	26.0 (5.0)	26.5 (5.8)	0.09	t = 0.84, NS
Proportion overweight	56%	51%		Chi^2=0.21, NS
Educational level[a] (% low, moderate and high)	34 / 44 / 23	6 / 44 / 50		Chi^2=73.56***
Occupation (% employed)	65%	59%		Chi^2=8.17*
Ethnic minority background	12%	7%		Chi^2=2.09, NS
Descriptive norms	9.63 (2.13)	9.98 (2.39)	0.15	t = 1.56 NS
Injunctive norms	9.33 (1.94)	8.75 (1.66)	0.31***	t = -3.6 ***
Autonomous motivation towards weight control	4.97 (1.00)	5.23 (1.09)	0.24**	t = 2.88 **
Controlled motivation towards weight control	3.33 (1.12)	3.91 (1.28)	0.48***	t = 5.48 ***

Notes: * p<0.05, **p<0.01, ***p<0.001; NS – non-significant; [a] Low education level – no qualifications on leaving school, Moderate education level – graduated from high

school, High education level – undergraduate degree or more.

Table 2. Correlations between social norms and motivational subscales

	Descriptive norms	Injunctive norms
Injunctive norms	0.40 ***	-
Autonomous motivation	-0.05	-.14**
Controlled motivation	-0.07	-.10*
Autonomy	-0.08	-.14**
Competence	-0.10*	-.11*
Relatedness	-0.04	-.07

Notes: * p<0.05, **p<0.01, ***p<0.001. All correlations are controlling for country; no significant between-country differences in size of association were found.

Table 3. Standardised direct and indirect effects for mediation model of effects

Parameter			β	Bootstrap bias-corrected 95% CIs
Direct effects				
Injunctive norms	→	Autonomy satisfaction	-.05**	-.06, -.01
Injunctive norms	→	Competence satisfaction	-.06*	-.09, -.02
Injunctive norms	→	Relatedness satisfaction	-.02	-.08, -.03
Descriptive norms	→	Autonomy satisfaction	-.03*	-.06, -.01
Descriptive norms	→	Competence satisfaction	-.04*	-.08, -.01
Descriptive norms	→	Relatedness satisfaction	-.02	-.05, .01
Indirect effects (mediated via need satisfaction):				
Injunctive norms	→	Controlled Motivation	-.13	
	→	Autonomous Motivation	-.18	
Descriptive norms	→	Controlled Motivation	-.04	
	→	Autonomous Motivation	-.08	

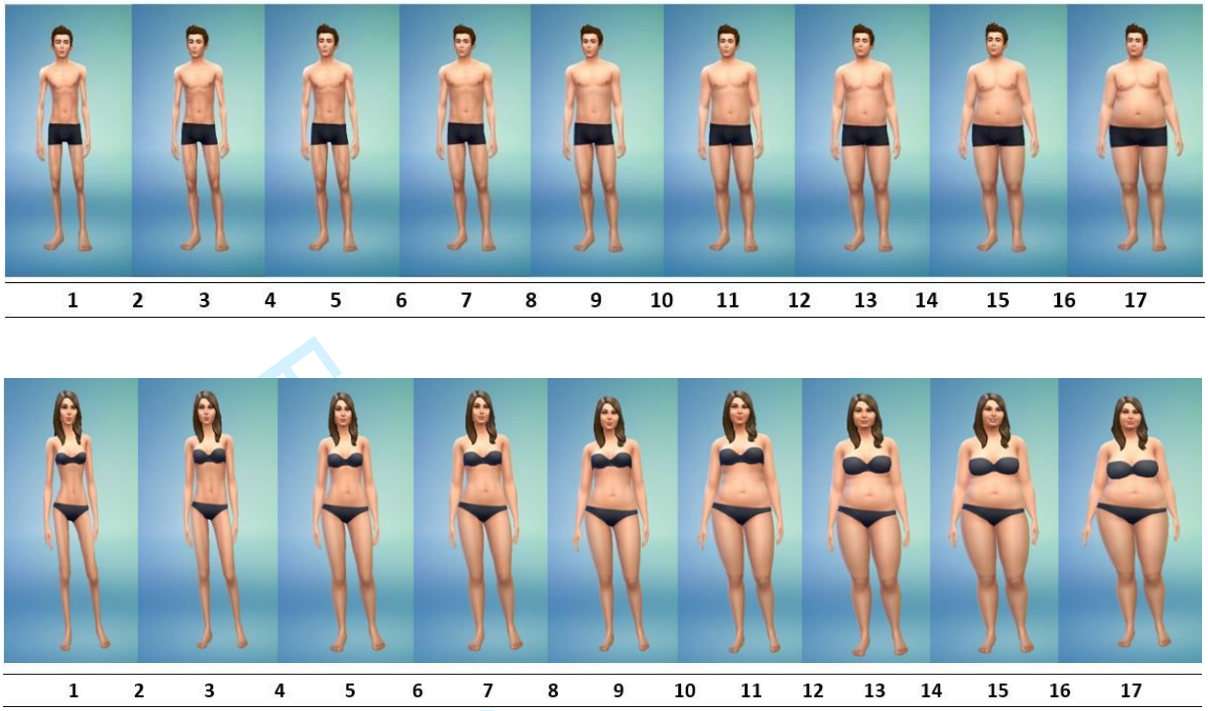
Notes: * p<.05, ** p=.01. CI – confidence interval

Table 4. Differences between overweight and non-overweight participants' perceptions of social norms regarding weight and motivation to manage their weight.

	Not overweight N=237 M (SD)	Overweight or obese N=267 M (SD)	Effect size *d*
Descriptive norms	9.57 (1.79)	10.23 (2.07)	0.19***
Injunctive norms	8.52 (1.64)	9.49 (1.86)	0.55***
Autonomous motivation	5.18 (1.02)	5.03 (1.08)	0.14
Controlled motivation	3.69 (1.27)	3.55 (1.21)	0.11

Notes: * p<0.05, **p<0.01, ***p<0.001, established through t-tests. Values for both countries are combined.

Figure S1. Social norm scales for men (upper row) and women (lower row).



S2. Confirmatory factor analyses (CFAs) were conducted on the latent constructs to assess their performance with this sample. Separate CFAs were run, using AMOS version 27, for the Basic Psychological Need Satisfaction and Frustration Scale (BPNSFS) and Treatment Self-Regulation Questionnaire (TSRQ). The BPNSFS model stipulated three latent factors (autonomy, competence and relatedness satisfactions) and the TSRQ model stipulated two latent factors (autonomous and controlled motivations). Criteria for adequate fit were established as: RMSEA Root Mean Square Error of Approximation (desired value < 0.10), GFI Goodness-of-Fit Index (desired value > 0.9), and CFI Comparative Fit Index (desired value > 0.95) (Byrne, 2010).

	Absolute fit indices		Relative fit indices
	RMSEA	GFI	CFI
BPNSFS	.086	.925	.959
TSRQ	.145	.797	.803

The data showed adequate to good fit for the BPNSFS, and poor fit for the TSRQ.