



Case Report

Changes in body image during a 6-month lifestyle behaviour intervention in a sample of overweight and obese individuals

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ABSTRACT

Background: Individuals with long-term chronic body image dissatisfaction may experience excessive stress and negative cognitions and feelings. Changes in negative cognition about body image are often reported as outcomes of obesity treatment. In turn, body image dissatisfaction also influences behavioural adherence and success in weight loss.

Objectives: The purpose of the present study was to elucidate psychological changes during 6 months of lifestyle behaviour intervention and the association of these changes with actual weight loss.

Methods: The study examined associations between body image dissatisfaction and obesity treatment-related variables among 33 overweight and obese adults (age = 38.9 ± 6.5 years) participating in a 6-month diet and exercise weight loss intervention. Measurements of body image dissatisfaction and anthropometric variables were taken at baseline and after 6-months.

Discussion: Significant improvements were observed in all physical variables (e.g. weight, percentage of body fat mass, waist and hip circumference) after intervention. Body image dissatisfaction improved significantly over the treatment, and these changes were associated with changes in obesity indicators. **Conclusions:** Changes in weight and body image probably influence each other dynamically. Results from this study support the inclusion of cognitive intervention aimed at improving body image in weight management programs.

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1. Introduction

Cognitive constructs related to dissatisfaction with body shape, weight, or a discrepancy with the ideal weight are closely linked to a broad range of negative outcomes and risk factors. In particular, body image dissatisfaction, defined as an individual's thoughts (cognitions) and feelings (affect) about one's body weight and shape (Thompson et al., 1999) is classified as an influential factor associated with higher negative affect (Manjrekar and Berenbaum, 2012), distress (Schwartz and Brownell, 2004; Banfield and McCabe, 2002; Ruggiero et al., 2008), and many unhealthy weight-related outcomes (Mond et al., 2011; Wade et al., 2011). It can result in adverse psychosocial consequences for both sexes, including poorer social self-esteem (Cash and Pruzinsky, 2002), less satisfaction with life (Annis et al., 2004) and can be implicated in a number of unhealthy behaviours (Grogan, 2006) such as physical inactivity. According to some authors (e.g., Maier et al., 2003), body

dissatisfaction is a mental process and a critical psychological mechanism linking stress and biological factors, which seems to be even more important than emotions. Moreover, research (e.g. Banfield and McCabe, 2002; Johnson and Wardle, 2005) provides evidence that body dissatisfaction is a psychologically stressful state, which may predict stress and depression and may have a clinical implication. Some studies (Putterman and Linden, 2006) argue that cognition that affects one's health behaviour responses to general stress are similar or even more closely linked to body dissatisfaction stress. Regardless of the documented association between body dissatisfaction, emotional stress and negative affect, individuals with long-term chronic weight dissatisfaction may experience excessive stress and negative cognitions and feelings. Recently, it has been shown that aspects of dissatisfaction with the body and weight plays some role in the pathophysiology of chronic disease, such as Type 2 diabetes, metabolic syndrome and inflammation-based illnesses, (Černelič-Bizjak and Jenko-Pražnikar, 2014, 2018; Wirth et al., 2014, 2015) and hence potentially increases the risk of developing disease and negative impact on human health.

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In addition, body image dissatisfaction is a common feature in overweight or obese subjects (Sarwer et al., 2005) and body dissatisfaction measurements have been found to be closely associated with body mass index (Allen et al., 2008). Thus, for many, being overweight has profound effects on body image (Sarwer et al., 2005) and body image thoughts and feelings. Therefore, individuals' negative cognitions about body image must be taken into account when drawing up strategies for health promotion and in intervention strategies for the treatment of obesity.

It is often assumed that the key to improving body image dissatisfaction is to lose weight. The benefits of weight loss are well documented but with greater emphasis on physiological benefits, such as reduced risk of developing disease and other health-related improvements (Franz et al., 2007), while there is less emphasis on psychological benefits. Consequently, many weight loss strategies and intervention programs focus on strategies to reduce weight and improve health (Lasikiewicz et al., 2014). However, weight loss and obesity have physical and psychological consequences, and conversely, psychological problems may lead to weight gain. Indeed, weight loss may serve to improve these psychological outcomes and, in turn, these improvements may increase the chances of maintaining successful weight loss (Teixeira et al., 2010). Although findings are not entirely consistent, intervention studies performed in the past 30 years tend to agree and report improvements in everyday cognitive and personality functioning besides weight loss, such as quality of life, self-esteem, depression and body image satisfaction (Blaine et al., 2007; Palmeira et al., 2010). On the other hand, these improvements in negative cognitions and affects related to body image could be interpreted as influencing or facilitating behaviours in the direction of weight loss. Some cognitive and affective changes, such as cognitive evaluation of the body measured by body image satisfaction and dissatisfaction and subjective well-being variables (e.g. self-esteem) are often reported as outcomes of weight loss programmes or therapeutic techniques for obesity treatment.

The purpose of the present study was to elucidate psychological changes during a 6-month lifestyle behaviour intervention. The focus was on the cognitive evaluation of the body, measured by body image satisfaction and dissatisfaction. However, there are indirect relationships between body cognition and satisfaction, elements observed as improved cognitive aspects related to body, weight and shape. Specifically, the aim of this study was to analyse the changes in body image dissatisfaction during a 6-month lifestyle behaviour intervention in a sample of overweight and obese individuals, and the association of these changes with actual weight loss.

2. Material and methods

2.1. Study overview and participants

Participants were recruited from the community through media advertisements. They were eligible if they were over 25 years of age, had a body mass index (BMI) between 25 and 35 kg/m², were healthy with no metabolic, cardiovascular, endocrine, acute or chronic inflammatory diseases, were not taking medication for lipid metabolism, and had had a stable weight over the previous 3 months (loss or gain <3% of the subject's weight was tolerated). Subject selection included also some psychological criteria such as emotional stability and the absence of depression or any other mental illness. After a baseline physical and psychological screening, the subjects were invited to participate in a 6-month lifestyle behaviour change programme, primarily aimed at increasing physical activity and energy expenditure, and making some changes in their diet. Among 48 subjects participating in the

6-month lifestyle behaviour change intervention, 15 dropped out during the study. One participant dropped out before Week 2 because she became pregnant, two participants due to their inability to follow the intervention programme, and two due to conflicting time schedules, while ten participants dropped out for unspecified reasons or reasons unrelated to the study.

A total of 33 subjects (13 males and 20 female), aged 38.9 ± 6.5 years completed the whole intervention programme. Twenty were overweight and thirteen obese. Hence, 33 subjects that entered the 6-month lifestyle behaviour intervention programme were divided into small groups for in-person training, individual diet planning, and establishing an exercise regime. All participants attended educational sessions about various topics (i.e., nutrition, learning about healthy diet, nutritional composition, and education on water intake and proper hydration, correct timing of eating, beneficial effects of daily consumption of fruit and vegetables, the role of breakfast and meal frequency in weight control and reducing portion size). In addition, all participants attended two individual sessions about their prescribed individual diet plan including proper hydration (each subject was given a personalised diet plan). They were asked to eat at least 3 meals a day at around the same time each day (breakfast, lunch and dinner) but depending on their own eating regime and habits. Daily energy requirements were calculated from the individual's resting metabolic rate (RMR) and physical activity level factor, with a moderate energy restriction of 2100 kJ (500 kcal). The planned macronutrients were 15–17% of energy from proteins, 25–30% from fat and more than 50% from carbohydrates. The participants were instructed against drug, antioxidant use or any supplement use. All participants had three weight checking and RMR measurements during intervention when the diet plan was adjusted. Dieticians checked the dietary composition and nutrient intake of subjects during the study. Records of food intake were also checked at all weight checking point of the study.

Within the intervention, subjects were invited to participate in a guided exercise programme, organised at the local sport centre by a physiotherapist and a sport physiologist. The programme included exercises to improve muscle function and strength, and a Nordic walking course. They received a brochure with pictures of individual exercises (for extremities, back, and trunk muscles) and instructions on how to perform them. The brochures also included recommendations for a daily work-out based on many studies documenting the benefits of exercise programmes consisting of 30–60 min of continuous exercise performed 3 days per week, and moderate intensity activity, preferably performed every day. These activities also included other dynamic and sufficiently intense forms of occupational and recreational exercises. This way, the subjects were encouraged to increase aerobic and anaerobic capabilities.

The programme principles and the style of intervention were based on multidisciplinary interventions, including lifestyle behaviour changes, which are significantly more effective than weight loss group programmes. The same team conducted educational and practical sessions for all treatment groups (i.e. exercise physiologists and dieticians).

2.2. Assessments

2.2.1. Body image evaluation

The cognitive and subjective dimension of body image dissatisfaction was measured at baseline and at the end of the 6-month period of intervention. Body dissatisfaction represents one of the symptoms of eating disorders but it is also a symptom of obesity. Participants completed the Body Dissatisfaction subscale of the Eating Disorders Inventory-2 (EDI-2; Garner, 1991). While the EDI-2

is used to assess eating disorders in order to facilitate understanding and treatment, it consists of nine general psychological scales that are general integrative psychological constructs (Garner, 1991) and is designed for both research and clinical applications. The Body Dissatisfaction subscale consists of 9 items assessing how satisfied or dissatisfied an individual is with both the overall body shape and the size/shape of specific body parts (e.g., “I think that my stomach is too big”, “I think that my thighs are too large”, “I think that my hips are too big”). In addition, 2 items were used that focused on the most relevant particular appearance concerns of obese individuals (i.e., body weight and shape) (Sarwer et al., 2005) which had already been used in previous studies. Participants were asked to evaluate their current weight, body shape and specific body parts by answering the two questions on the satisfaction and the EDI-2, which needed to be answered according to 5-point Likert scale from 0 to 4. Total score was calculated as average value, where higher value represents greater dissatisfaction. The author of EDI-2 (Garner, 1991) reported internal consistency reliabilities (alphas) of 0.74–0.97, and test-retest reliabilities of 0.86–0.98. Alpha in the current study was 0.88.

2.2.2. Measurements of body composition

Data were collected and evaluated at baseline and at the end of the 6 months of intervention. All examination methods and procedures followed standard manual operations; therefore, body composition including height, weight, waist and hip circumference, was measured using a standardised protocol. The examination included measuring height (to the nearest 0.1 cm in a standing position, without shoes, using Leicester Height Measure (Invicta Plastics Limited, Oadby, England)); weight (measured to the nearest 0.1 kg); waist circumference (WC, measured with a soft tape to the nearest 0.1 cm at a middle point between the lowest rib and the iliac crest); and hip circumference (HC, to the nearest 0.1 cm measured at the widest part of the glutei region). BMI was calculated using the standard formula ($BMI = \text{weight [kg]} / \text{height [m]}^2$). Body composition, e.g., total percentage body fat (% BF) was assessed by using bioelectrical impedance analysis (BIA) Tanita BC 418 MA (Tanita Corporation, Arlington Heights, IL) and data were analysed using software provided by the same producer.

2.3. Procedure

The study was approved by the National Medical Ethics Committee (No. 56/08/11 bis) and was conducted according to the principles and guidelines of the Helsinki Declaration. The participants were evaluated at baseline and at the end of the 6-month

period of lifestyle behaviour intervention and were fully informed of the procedures before written consent was obtained. All measurements were performed in the morning in standardised conditions by the same examiner after fasting overnight. A clinical psychologist performed the psychological evaluation.

2.4. Statistical analyses

All analyses were carried out using the SPSS statistics version 19.0 (IBM, Chicago, IL). Means and standard deviation of the mean were determined at both baseline and after 6 months of intervention for all parameters. Analysis of the effect of intervention on the variables was conducted using Student's paired *t*-test. Associations among the variables were examined using Pearson correlations. Statistical significance was defined as $p < .05$.

3. Results

Results for physical measurements revealed significant decreases in BMI, percentage of total fat mass, and waist and hip circumference over the studied period of the intervention programme ($p < .01$). More specifically, body weight change from baseline to the end of 6 months was $-4 \pm 3.4\%$ ($p < .001$, ranging from -17.1% to $+9.2\%$). In addition, results for body image measurements showed that body image dissatisfaction improved during the intervention program; the change from baseline to the end of 6 months of intervention was $-15 \pm 20.8\%$ ($p < .01$), ranging from -44.8% to $+14.9\%$. Moreover, the change in body image dissatisfaction was higher for the female group and was $-17 \pm 40\%$ ($p < .005$, ranging from -51% to 17%) and for men the change was $-11 \pm 11\%$ ($p > .05$, ranging from -25% to $+25\%$) (see Table 1).

For a more detailed analysis of these changes we tested the effect of the amount of weight loss on the change in body image dissatisfaction. The participants' data were divided into two groups according to the loss of weight, e.g. weight stable and weight loss group. The first group consisted of overweight or obese adults ($n = 13$) who lost less than 3.5% of fat mass and the second group consisted of those who lost more than 3.5% of fat mass ($n = 20$). As shown in Table 2 (see Table 2), the group who lost more than 3.5% of fat mass showed significant improvement in body image dissatisfaction compared with the group whose weight remained stable.

In addition, analyses revealed significant associations between changes in obesity indicators and changes in body image dissatisfaction. As shown in Table 3 (see Table 3), improvement in body image dissatisfaction was directly correlated to changes in physical measures (for BMI: $r = 0.262$, $p < .05$; for WC: $r = 0.441$, $p < .01$).

Table 1
Body image dissatisfaction and physical measurements at baseline and after 6 months.^a

Measure	Baseline ($n = 33$)		After intervention ($n = 33$)		P value
	M	SD	M	SD	
Psychological measure					
Body image dissatisfaction	3.88	0.96	3.30	1.16	0.005
Men	3.6	0.9	3.2	0.8	>0.05
Female	4.1	1.0	3.4	1.4	0.005
Physical measure					
Weight (kg)	86.5	11.8	83.1	11.4	<0.001
BMI (kg/m^2)	29.4	2.7	28.2	2.6	<0.001
Waist circumference (cm)	95.2	8.3	90.9	8.4	<0.001
Hip circumference (cm)	106.7	7.9	103.2	6.9	0.006
Body fat mass (%)	32.7	7.6	31.4	8.1	0.009

Note. BMI = body mass index (kg/m^2).

^a Comparisons of anthropometric and body dissatisfaction at baseline and after 6 months of intervention were conducted with Student's paired *t*-test. The mean difference is significant at the .05 level.

Table 2
Changes in body image dissatisfaction in relation to changes in weight.

	Weight stable (n = 13)			Weight loss (n = 20)		
	Baseline		%	Baseline		%
	M(SD)	After intervention M (SD)		M (SD)	After intervention M (SD)	
Body image dissatisfaction	3.67 (1.09)	3.58 (1.00)	–5	4.00 (0.82)	3.04 (1.27*)	–24

Note: Analysis for the effect of intervention on the variables was conducted using Student's paired *t*-test.

**p* < .05.

Table 3
Correlations between body image dissatisfaction and physical measurements at baseline and correlations between relative changes after 6 months of intervention.

	Body image dissatisfaction	
	Baseline	6 months
Physical measures		
BMI	0.72***	0.26*
WC	0.52***	0.44**
BF	0.61***	0.13

Note. *n* = 33; BMI = body mass index; WC = waist circumference; BF = body fat.

All associations are presented as Pearson's correlation coefficients (*r*).

p* < .05. *p* < .01. ****p* < .001.

Finally, no significant associations were observed between changes in physical activity or dietary intakes and changes in body dissatisfaction (*data not shown*).

4. Discussion

The purpose of the present study was to explore psychological changes during a 6-month lifestyle behaviour intervention, observed as cognitive aspect related to dysfunctional thoughts about body, weight and shape. Specifically, the aim of the study was to analyse the association between changes in these dysfunctional thoughts and physical changes during 6 months of weight loss intervention that included dietary and behavioural components in a sample of overweight and obese individuals.

The results of the present study indicated that body image dissatisfaction was related to physical characteristics at baseline. In accordance with previous reports (Sarwer et al., 2005), the measurements revealed a strong relationship between BMI, body fat mass and waist circumference and body image dissatisfaction, assessed as the cognitive aspect of person's thoughts about his/her body weight, shape and physical appearance. Moreover, participants showed significant improvements in physical measurements and also in body image satisfaction after the 6-month lifestyle behaviour intervention. Some research (e.g. Ross and Bradshaw, 2009) suggests that a minimum threshold of 5% of weight change/loss is required and associated with greater improvements. Therefore, the participants were divided into two groups depending on the amount of weight loss after intervention. The weight loss group displayed statistically significant reduced body weight, BMI, WC and body dissatisfaction, seen as decreased negative thoughts and feelings about body, weight and shape. Indeed, the subjects that lost more body weight reported significantly higher improvements in body image satisfaction in comparison with the subjects whose body weight remained relatively stable. It seems that improvements in body image dissatisfaction were moderated by the absolute amount of weight loss, whereby greater weight loss was associated with greater improvements in body image. Importantly, causality between these changes is difficult to assert during treatment, as changes coexist temporally. In addition, it is difficult to discern whether these effects are due to the weight loss *per se*,

the nature of the diet used to induce weight loss, energy restriction itself, or in part to physical activity or maybe even body image satisfaction.

Similar findings were reported by another fourteen studies (Lasikiewicz et al., 2014) that assessed changes in body image following the completion of the intervention. Despite different interventions and measurements of body image, all of the studies consistently demonstrated that measurements of body image can improve during the intervention. In addition, there has been great interest in recent years in trying to identify the most effective treatment for overweight and obese adults. As obesity is a multifactorial disease, a multidisciplinary team, including a physician, a dietician, an exercise physiologist and a behaviour therapist, is required for effective weight loss intervention (Seagle et al., 2009). Moreover, individual interventions are significantly more effective than weight loss group programmes (Gagnon et al., 2011). However, the first step in weight loss intervention is to achieve negative energy balance. Very low energy diets (800 kcal or less) are not successful because they are frequently followed by weight regain (Franz et al., 2007). Key factors of this problem are an adaptation of energy metabolism, especially RMR, non-exercise thermogenesis and diet induced thermogenesis. Therefore, a measurement of individual's RMR is crucial to determine the energy needs of the individual before and during weight loss programme (Sénéchal et al., 2012; Dulloo et al., 2012). In addition, the negative energy balance can also be achieved by increasing regular physical activity. Most studies reported significant reduction in body mass, body fat, and abdominal adiposity and blood lipids after physical exercises (Schmidt et al., 2001). Moreover, regular physical activity also improves glucose homeostasis and insulin sensitivity, coronary blood flow and cardiac function, enhances endothelial function, and reduces blood pressure (Murphy et al., 2009).

However, detailed correlational analyses revealed that changes in body image showed weaker associations with BMI and waist circumference after treatment and even no significant association with changes in body composition (e.g. body fat mass). This observation is in line with some other reports (Bas and Donmez, 2009; Latner and Wilson, 2011) indicating that improvements in body image are concurrent with the amount of weight loss but not directly correlated to weight loss. One possible explanation is that other therapeutic or/and psychosocial aspects, and the context of the intervention and/or personal life, in addition to weight loss, may have elicited body image improvements. Another possible explanation for the weak association between weight loss and body image change is that *actual* changes to the body are less important than *perceived* changes. For instance, a systematic review of literature revealed that perceived changes to one's body (i.e. perceived changes in physical fitness) and perceived improvements in one's physical abilities were more consistently correlated to body image change than were actual physique-related changes (Ginis et al., 2012). In fact, only half of studies yielded a significant correlation between body image change and changes in body composition (e.g. fat mass) or anthropometric variables. Furthermore, there is evidence that improvements in psychological outcomes may not

always depend on actual weight loss (Lasikiewicz et al., 2014).

The results of this study have important theoretical and clinical implications. From a clinical perspective, results underscore previous observations, that changes in body fat mass or obesity indicators are not necessary to produce significant improvements in body image, as observed previously (Ginis et al., 2012). Overall, results provide important information that among overweight and obese participants the changes in body composition are not necessary to produce significant improvements in satisfaction with one's body weight and shape. Changing dysfunctional cognitions towards body size and shape may be effective in raising a person's psychological profile in the absence of weight loss. This observation also underscores the importance of including efforts in interventions towards the development of realistic weight/fat loss goals that will make participants feel good about even relatively small weight losses.

Some limitations of this study warrant consideration. Firstly, the small sample size provided limited power in analyses. The number of subjects was small and the study did not include a control group. Secondly, as body dissatisfaction is a multidimensional construct consisting of cognitive and affective components, it is worth exploring body-related cognitive stress with different assessments. We used one measurement of body image dissatisfaction, as a number of different methods are used to measure body image dissatisfaction or distress among adults (Thompson, 2004). However, replication of these results with larger, more representative samples, should be recommended. The more complex and/or global satisfaction with one's appearance and contextual factors, such as negative affect and stress levels, could be assessed in future studies.

5. Conclusions

In conclusion, this study demonstrated consistent significant improvements in psychological outcomes following a 6-month lifestyle behavioural intervention. Specifically, improvements in negative body image thoughts and feelings about the body, weight and shape were observed. Consequently, results highlight the need to explore cognitive constructs related to the body, weight and shape in future. It is important to consider the study of Simonsen et al. (2008) that summarises the results from studies on intentional weight loss among healthy individuals and indicates that body image had a much bigger impact on health than body size. In other words, two equally overweight individuals may have very different psychological and physical health outcomes, depending on how they felt about their bodies. Body dissatisfaction and related constructs must be considered as important among generally accepted relevant health-related factors and lifestyle behaviours, and may have significant impact on physical and psychological health.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Informed consent was obtained from all individual participants included in the study.

Conflicts of interest

There are no conflicts of interest to disclose.

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