

THE UNIVERSITY OF HULL

NEGATIVE BODY IMAGE AND COGNITIVE BIASES TO BODY SIZE

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ABSTRACT

This thesis explored the relationship between cognitive biases to body size and one's developed levels of body image concerns and weight status. Women with higher body image concerns were hypothesised to process body-related information in a biased fashion, specifically, to choose thin body ideals and rate thinner bodies higher on attractiveness, display an attentional bias towards thin bodies, and to estimate their own body size inaccurately. In study 1 ($N = 84$), although an attentional bias to thin bodies was not found, a positive thinness bias in young females was identified and related to one's level of body image concerns. In study 2 ($N = 61$), an even more pronounced positive thinness bias was identified in a female sample with average to high levels of body image concerns. The study provided evidence that this bias can be successfully modified and that shifting the interpretation of body size can result in less extreme attitudes towards body size and improve one's negative body image. Study 3 showed that a positive attitude towards thin female bodies exists in both young men ($N = 67$) and women ($N = 67$), but the choice of attractiveness ideals is related to one's body image only when judging the bodies of one's own gender. Study 4 ($N = 87$) indicated that regardless of one's weight status, women higher in body image concerns present a greater discrepancy between their estimated and ideal size. However, the magnitude of one's body size underestimation and inaccuracy in judging the amount of weight one would need to lose to achieve their body ideal was related to body image concerns for overweight and obese, but not normal weight women. Overall, the results show that cognitive body biases exist in young women and are related to one's body image concerns and weight status.

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TABLE OF CONTENTS

LIST OF TABLES	viii
LIST OF FIGURES	x
<u>CHAPTER 1 – Introduction</u>	1-43
General Introduction	1
Sociocultural theories	7
Dual pathway model	11
Tripartite influence model	15
Elaborated tripartite influence mode	18
Objectification theory	20
Critique of sociocultural theories	23
Cognitive-behavioural theories	25
Information-processing model	27
Cognitive biases to body-related information	31
Cognitive-behavioural therapy (CBT)	38
Cognitive bias modification	39
Critique of cognitive-behavioural theories	40
Thesis rationale	41
Summary of empirical studies	42
Study 1: Attentional biases to thin and heavy bodies	42
Study 2: Cognitive bias modification of body size interpretation	42
Study 3: Body size biases towards own and opposite gender	43
Study 4: Self-referential body size biases	43
<u>CHAPTER 2 – Study 1</u>	44-75
Introduction	44
Attentional bias in eating disorders	46
Attentional bias in non-eating disordered samples	47
Methods	52
Participants	52

Measures	52
<i>Eating Disorder Inventory (EDI-3)</i>	52
<i>Body Shape Questionnaire (BSQ-34)</i>	52
<i>Dutch Eating Behaviour Questionnaire (DEBQ)</i>	53
<i>Beck Depression Inventory (BDI-II)</i>	54
Stimuli and apparatus	54
3D body analysis: BMI estimates	54
Procedure	57
<i>Dot-probe task</i>	57
<i>Ratings</i>	59
<i>Questionnaires</i>	59
Results	60
Demographic variables and questionnaires	60
Principal component analysis	61
Dot-probe task	62
<i>Reaction times</i>	62
<i>Attentional Bias Index</i>	64
Ratings of normality, attractiveness and closeness to ideal	66
<i>Regression analysis</i>	69
Discussion	71
<u>CHAPTER 3 – Study 2</u>	76-97
Introduction	76
Methods	79
Participants	79
Measures	80
<i>Eating Disorder Inventory (EDI-3)</i>	80
<i>Body Image States Scale (BISS)</i>	80
Stimuli and apparatus	80
3D body analysis: BMI estimates	81
Design and procedure	81
<i>Body size categorization task</i>	82
<i>Rating task: attractiveness and closeness to ideal</i>	84

Results	85
Body size categorization task: thresholds	85
The effect of training on body image measures	88
Ratings of closeness to ideal	90
Ratings of attractiveness	91
Discussion	92
<u>CHAPTER 4 – Study 3</u>	98-126
Introduction	98
Methods	103
Participants	103
Measures	104
<i>Drive for Muscularity Scale</i>	104
<i>Body Image States Scale</i>	104
<i>The Appearance Schemas Inventory</i>	104
<i>Adapted version of the Self-Objectification Questionnaire</i>	105
Stimuli and apparatus	105
Design and procedure	106
Results	108
Comparison between the sexes (males vs. females)	108
Demographic variables and questionnaires	108
Thresholds	110
Ratings – female and male bodies	112
<i>Normality ratings</i>	112
<i>Attractiveness peaks (female stimuli)</i>	114
<i>Averaged ratings of attractiveness (male stimuli)</i>	115
Regressions	116
Female bodies	117
<i>Threshold</i>	117
<i>Attractiveness peak</i>	118
<i>Ideal peak</i>	119
Male bodies	119
<i>Threshold</i>	119

<i>Attractiveness averaged</i>	120
<i>Ideal averaged</i>	120
Discussion	121
<u>CHAPTER 5 – Study 4</u>	127-156
Introduction	121
Methods	134
Participants	134
Measures	135
<i>Eating Disorder Inventory (EDI-3)</i>	135
<i>Dutch Eating Behaviour Questionnaire (DEBQ)</i>	135
<i>Body Image States Scale (BISS)</i>	135
<i>Sociocultural Attitudes Towards Appearance (SATAQ-4)</i>	135
Stimuli and apparatus	135
3D body analysis: BMI estimates	136
Design and procedure	138
Results	138
Demographic variables and questionnaires	138
Principal component analysis	139
Regressions	140
<i>Estimated-actual BMI discrepancy</i>	141
<i>Estimated-ideal BMI discrepancy</i>	145
<i>Visual ideal-weight ideal discrepancy</i>	148
Discussion	151
<u>CHAPTER 6 – Discussion</u>	157-167
Main aim and hypothesis	157
Main findings	158
Positive thinness bias exists in young females and is related to higher body image concerns	158
Positive thinness bias can be cognitively modified, with a positive effect on body image	162
Attitudinal bias in the judgements of one's own body size	164

Limitations	164
Implications	165
REFERENCES	168-208
APPENDICES	209-215
Appendix A: Study 3: A modified version of the objectification questionnaire	209
Appendix B: Study 4: Screening form	213

LIST OF TABLES

CHAPTER 1 – Introduction

Table 1.	The main differences between the sociocultural, objectification, and cognitive-behavioural theories of body image disturbance.	32
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CHAPTER 2 – Study 1

Table 2.	Norms for the dietary restraint scale of the DEBQ for healthy women.	53
Table 3.	Estimated body mass indices (BMIs) for all female stimuli.	56
Table 4.	Mean scores and standard deviations on demographic variables and self-report questionnaires for all participants (N = 80), the two groups separately: low (N = 40) and high (N = 40) in dietary restraint, and independent samples t-tests of group comparison	61
Table 5.	Correlations between the participants' BMI and various self-report questionnaires for all participants (N = 80).	61
Table 6.	Component coefficients and communalities for N = 79.	62
Table 7.	Hierarchical Multiple Regressions predicting thin and heavy ABIs from the DEBQ restraint score, the latent variable PSYCH, the interaction between DEBQ and PSYCH, and the participants' actual BMI.	65
Table 8.	Hierarchical Multiple Regressions predicting attractiveness and ideal peaks from the DEBQ-R restraint score, the latent variable PSYCH, the interaction between the DEBQ-R and PSYCH, and the participants' actual BMI	70

CHAPTER 3 – Study 2

Table 9.	Mean scores (standard deviation) on demographic variables and self-report questionnaires taken during the 1st session for: all participants (N = 61), control group (N = 30) and intervention group (N = 31).	89
Table 10.	Mean scores and standard deviations on self-report questionnaires for both groups: control group (N = 30) and intervention group (N = 31) given for the 1st and 5th session.	89

CHAPTER 4 – Study 3

Table 11.	Mean scores (standard deviation) on demographic variables and self-report questionnaires for all participants: males (N = 67) and females (N = 63).	109
Table 12.	Correlations between the participants' BMI and various self-report questionnaires for males (N = 67).	109

Table 13.	Correlations between the participants' BMI and various self-report questionnaires for females (N = 63).	109
Table 14.	Independent samples t-tests of scores on demographic variables and self-report questionnaires between males and females.	110
Table 15.	Correlations between the thresholds, the peaks for female bodies and averaged ratings for male bodies and various self-report questionnaires as well as BMI.	117

CHAPTER 5 – Study 4

Table 16.	Estimated body mass indices (BMIs) for all stimuli.	136
Table 17.	Component coefficients and communalities for N =80.	139
Table 18.	Mean scores (standard deviation) for the BMI and self-report questionnaires for all participants (N = 81).	140
Table 19.	Correlations between the participants' BMI and various self-report questionnaires for all participants (N = 81).	141
Table 20.	Mean scores and standard deviations on various BMI estimates for all participants (N = 81).	141
Table 21.	Multiple Regression predicting the estimated-actual discrepancy from the participants' actual BMI, the latent variable PSYCH, and the interaction between the BMI and the PSYCH variable.	144
Table 22.	Multiple Regression predicting the estimated-ideal discrepancy from the participants' actual BMI, the latent variable PSYCH, and the interaction between the BMI and the PSYCH variable.	147
Table 23.	Multiple Regression predicting the visual ideal-weight ideal discrepancy from the participants' actual BMI, the latent variable PSYCH, and the interaction between the BMI and the PSYCH variable.	150

LIST OF FIGURES

CHAPTER 1 – Introduction

Figure 1.	The theoretical components of the dual-pathway model of bulimic symptomatology.	13
Figure 2.	Stice's (2002) dual-pathway model with risk factors for eating pathology.	13
Figure 3.	Tripartite influence model of eating pathology.	17
Figure 4.	An elaborated sociocultural model – a revision and extension of the Tripartite Influence Model.	19
Figure 5.	Antecedents and consequences of self-objectification.	23
Figure 6.	Dimensions, determinants, and processes influencing a person's body image.	27
Figure 7.	Cognitive model of body image as it applies to eating disorders.	29

CHAPTER 2 – Study 1

Figure 8.	Neutral sized female and male body.	55
Figure 9.	Both types (heavy and thin) and all levels (5 for each body type) of female body stimuli.	55
Figure 10.	Both types (heavy and thin) and all levels (5 for each body type) of male body stimuli.	56
Figure 11.	Trial timecourse for congruent and incongruent trials.	58
Figure 12.	Mean reaction times (ms) for congruent and incongruent thin and heavy body trials, for both restraint groups, with standard error bars.	63
Figure 13.	Mean attentional bias indices for thin and heavy body types and both restraint groups with standard error bars.	65
Figure 14.	An illustrative graph showing how the second-order polynomial was fitted to the attractiveness ratings for one participant.	67
Figure 15.	Mean ratings of attractiveness for all female body stimuli and both restraint groups, with standard error bars.	68
Figure 16.	Mean ratings of closeness to ideal for all levels of female body stimuli and both restraint groups, with standard error bars.	68
Figure 17.	Mean ratings of normality for all levels of female body stimuli and both restraint groups, with standard error bars.	69

CHAPTER 3 – Study 2

Figure 18.	All levels of body stimuli (15) used in the study.	83
Figure 19.	Mean thresholds for thin-heavy categorisations for both groups (control, intervention) for all 5 sessions, with standard errors (SE).	86

Figure 20.	Mean proportion of “thin” responses to for each body on a thin-heavy continuum for the control group.	87
Figure 21.	Mean proportion of “thin” responses to for each body on a thin-heavy continuum for the intervention group.	87
Figure 22.	Mean body mass index estimations at peak ideal ratings (peak ideal BMIs) and standard error bars for control and intervention group, with 1st and 5th session contrasted.	90
Figure 23.	Mean body mass index estimations at peak attractiveness ratings (peak attractiveness BMIs) and standard error bars for control and intervention group, with 1st and 5th session contrasted.	91

CHAPTER 4 – Study 3

Figure 24.	All levels of male body stimuli (15) used in the study.	107
Figure 25.	Male and female ‘thin’ and ‘heavy’ category judgements of female body stimuli (calculated thresholds).	111
Figure 26.	Male and female ‘thin’ and ‘heavy’ category judgements of male body stimuli (calculated thresholds).	112
Figure 27.	Mean normality ratings of the female stimuli, with standard error bars and the average rating (5) marked, for both males and females.	113
Figure 28.	Mean normality ratings of the male stimuli, with standard error bars and the average rating (5) marked, for both males and females.	114
Figure 29.	Mean attractiveness ratings of the female stimuli, with standard error bars and the average rating (5) marked, for both males and females.	115
Figure 30.	Mean attractiveness ratings of the male stimuli, with standard error bars and the average rating (5) marked, for both males and females.	116
Figure 31.	Mean closeness to ideal ratings of the female stimuli, with standard error bars and the average rating (5) marked.	119
Figure 32.	Mean closeness to ideal ratings of the male stimuli, with standard error bars and the average rating (5) marked.	120

CHAPTER 5 – Study 4

Figure 33.	Four template body stimuli with their estimated BMI values in the brackets.	136
Figure 34.	All 16 body stimuli used in the study.	137
Figure 35.	Scatterplot of the relationship between the participants’ BMI and their over-/underestimation of own body size.	142
Figure 36.	Simple slopes equations of the estimated-actual BMI discrepancy regression on the psychological body image variables (PSYCH) at three levels of the participants’ BMI.	144
Figure 37	Scatterplot of the relationship between the participants’ BMI and the discrepancy between estimated own and ideal BMI.	145

Figure 38.	Simple slopes equations of the estimated-ideal discrepancy regression on the psychological body image variables (PSYCH) at three levels of the participants' BMI.	147
Figure 39.	Scatterplot of the relationship between the participants' BMI and the discrepancy between the visual and weight ideals.	148
Figure 40.	Simple slopes equations of the visual ideal-weight ideal discrepancy regression on the psychological body image variables (PSYCH) at three levels of the participants' BMI.	150

CHAPTER 1 – Introduction

General Introduction

The contemporary interest in body image has developed into a vibrant research area, with a specialist journal emerging in 2004 and the number of publications relating to body image growing from year to year. In the UK, an All Party Parliamentary Group (APPG) on Body Image was formed in 2011 (APPG, 2012) and the UK Government launched the body confidence campaign (Burrowes, 2013), after recognising the need for a conversation about body image issues and acknowledging a link between positive body image and mental well-being. The specialists in the area agree that improving the negative body image is crucial for eating disorder prevention, treatment, and recovery (Cash, 2008). However, body image problems were suggested to be at least partially grounded in normal functioning (Williamson, Muller, Reas, & Thaw, 1999); therefore, investigating a non-clinical population with high body image concerns may provide useful information about the unfortunate normative state of female body dissatisfaction.

Body image is central to one's self-concept (Cash & Pruzinsky, 2002; Cash & Smolak, 2011; Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999) and influences behaviour and psychological processing. It consists of a system of perceptions, attitudes, feelings and beliefs related to one's own body. Attitudinal body image, of relevance to this thesis, has been specified to consist of at least two dimensions (Cash, 1994): body image evaluation, which refers to a person's level of satisfaction or dissatisfaction with the body and the evaluative beliefs about it, and body image investment, which relates to the importance of appearance to one's self-concept – cognitive, behavioural and emotional importance of body for self-evaluation. Body image is developed and maintained through complex interactions between psychological and sociocultural factors. Some people, however, may end up developing a negative body image and become dissatisfied with their bodies.

The theories of body image disturbance aim to explain the causal and maintenance factors of negative body image. While varied causes and vulnerabilities have been documented for eating disorders, with genetic, biological, psychological and social causes contributing to their development (Baker & Munn-Chernoff, 2014; Polivy & Herman, 2002; Rikani et al., 2013; Thornton, Welch, Munn-Chernoff, Lichtenstein, & Bulik, 2016; Treasure &

Schmidt, 2013), the causes of body image problems in the general population have been attributed largely to sociocultural factors and individual differences in psychological functioning. A person who develops a negative body image may be also described as having a 'disturbed body image', which has been specified as a symptom of eating disorders (American Psychiatric Association, 2013) but it can also be present in the non-clinical population. Body image disturbance (BID) is defined as a gap between the reality of a person's appearance and their self-perception (Cash & Pruzinsky, 1990). It was suggested that body image disturbance combines two main elements: perceptual distortion of one's own body size and cognitive-evaluative dysfunction, which would include negative and irrational thoughts and feelings pertaining to one's body, resulting in increased body shape and size concerns and body dissatisfaction (Cash & Brown, 1987, Cash & Deagle, 1997). Body image disturbance is not binary – either having a distorted view of the body or not – but it is rather a continuum where body image distress and body dissatisfaction can vary from relatively harmless to life-affecting distress and intense preoccupation with one's body, which may result in body dysmorphic disorder, anorexia nervosa, bulimia nervosa, or gender identity disorder (Cash, 2002).

This thesis focuses on the cognitive-evaluative dysfunction, as defined above, with a specific focus on body dissatisfaction, which is defined as a negative bias in the evaluation of the physical characteristics of one's own body (Stice & Shaw, 2002). Body dissatisfaction has been linked to chronic dieting (Ackard, Croll, & Kearney-Cooke, 2002), eating disorders (Leon, Fulkerson, Perry, & Cudeck, 1993; Stice & Shaw, 2002; Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999), obesity (Darby, Hay, Mond, Rodgers, & Owen, 2007; Mond, van den Berg, Boutelle, Hannan, & Neumark-Sztainer, 2011), social anxiety (Cash & Fleming, 2002), depressive mood (Paxton, Neumark-Sztainer, Hannan, & Eisenberg, 2006), and low self-esteem (Mond et al., 2011; Paxton et al., 2006). In countries with high socio-economic status and those influenced by Western culture, the thin female body ideal and body dissatisfaction with one's size, shape and specific body parts are prevalent, which makes it a widespread problem of international nature (Swami, Frederick, et al., 2010).

The main aim of the thesis was to investigate the link between young women's negative body image and cognitive biases towards body size (e.g. attentional bias to thin/heavy bodies, positive thinness/ negative heaviness bias, over-/underestimation of body size, estimated-ideal body discrepancy), which were suggested to play a role in

maintaining the negative body image (Rodgers & DuBois, 2016). The project investigated the specific connections between the body mass index (BMI), psychological body image-related variables and cognitive body biases, providing empirical evidence for the claim that personal negative body image can affect the processing of body-related information and fitting the results into the existing theories of body image. These theories – sociocultural, objectification, and cognitive-behavioural – illustrate that body size and shape concerns may contribute to one's feelings of inadequacy and influence the relationship between the beliefs about how others see us and how we see ourselves.

The main assertion of the sociocultural theories of body image is that attractiveness and body ideals are socially constructed and transmitted through various sociocultural channels. Sociocultural as well as objectification theories offer sociocultural explanations of body image disturbance in women, where the media, family, peers and partners take part in transmitting the notion that appearance is a more crucial part of identity for women than men. Thinness and attractiveness function as a major determinant of a women's value in the Western culture and there is more focus on the way women look than act, which leads to a systemic objectification and sexualisation of a female body (Fredrickson & Roberts, 1997). If a woman perceives or is exposed to more pressure for looking attractive and thin, she may start to internalise the sociocultural messages and develop an inner drive to achieve the unrealistic standard set by others. For some women, this may result in negative body image, which is then further socially reinforced by the same messages that lead to its development.

The latest sociocultural model (Fitzsimmons-Craft et al., 2014) underlines the fact that to develop body dissatisfaction, which in extreme cases may result in eating-disordered and risky behaviour, such as purging, laxative use, extreme exercise and dieting, one must be aware of the sociocultural pressures for thinness, accept them, and incorporate the set attractiveness standard into one's self-concept. The model underlines the importance of engaging in behaviours aimed at achieving the ideal as well as upward social comparisons with attractive targets to monitor one's progress. When a woman does not match the chosen attractiveness target, she may start to feel body dissatisfied and be filled with negative emotions towards her own body.

People have a tendency to internalise the attitudes of the significant others and the social groups they belong to. Own attitudes are therefore socially reinforced and might

become a part of the self-concept (Stice & Shaw, 2002). People use social comparison to place their appearance in a larger social context, and sociocultural theories stress the role of more frequent upward comparisons in developing larger body dissatisfaction. However, the sociocultural theories do not fully address the reason why it is women that tend to engage in those upward body comparisons and develop greater levels of body dissatisfaction in comparison with men. The main difference between the sociocultural and objectification theory of body image is that the objectification theory offers a direct explanation for the disproportion of body dissatisfaction between genders.

In brief, the objectification theory (Fredrickson & Roberts, 1997) assumes that body dissatisfaction is a social construct developed through a tendency to objectify the female body on a much larger scale than the male body. Being objectified by others may lead to self-objectification where women may internalise the observer's perspective and start to evaluate themselves mainly from an appearance perspective. When appearance becomes central to one's self concept, other qualities, successes and accomplishments, such as academic and professional performance, relationship success, or good-natured personality, may be disregarded. Body surveillance, which refers to frequent body checking and monitoring behaviours, is a concept introduced by the objectification theory and proposed as a mechanism through which the acquired standards of attractiveness become internalised and lead to body dissatisfaction. The theory proposes that the social norms of appearance and greater objectification of the female body can disproportionately affect the evaluation of own bodies in women more so than in men.

Sociocultural theories of body image disturbance received strong empirical support (e.g. Keery, van den Berg, & Thompson, 2004; Shroff & Thompson, 2006; Stice, 2002; Thompson & Stice, 2001; van den Berg, Thompson, Obremski-Brandon, & Covert, 2002) and suggest that cultural values and normative standards affect how the individuals see themselves and others. The objectification theory is also supported by empirical evidence (Slater & Tiggeman, 2002; Tiggeman & Lynch, 2001) and provides explanation of why it is the women and not men who are more easily judged against those developed standards of appearance and why there is a disparity between genders with regards to body satisfaction.

These theories, however, do not offer much discussion of the interaction between the attitudes we hold for ourselves and others and propose little explanation of the

psychological mechanisms behind the maintenance of negative body image. In addition, the sociocultural and objectification theories stress the role of external influences on the development of one's negative body image, whereas the cognitive-behavioural theories, discussed below, include people's developed psychological mechanisms – learned patterns of thoughts, emotions, and behaviour – as constantly influencing and maintaining one's own body image thoughts.

In line with the cognitive-behavioural theories of body image, individual differences are thought to influence performance on cognitive tasks, which may reveal the presence of cognitive biases. Cognitive bias is a tendency to process the information from the environment in favour of disorder-relevancy over neutrality (Williamson, 1996) and cognitive biases were shown to be crucial in the development and maintenance of a number of psychological disorders (MacLeod, 2012), including eating disorders. The existence of cognitive biases towards body-related stimuli points towards a presence of a disordered body schema, which can be also seen in non-clinical samples (Williamson, Muller, Reas, & Thaw, 1999). According to the information-processing model of body image disturbance (Williamson et al., 1999; Williamson, Stewart, White, & York-Crowe, 2002; Williamson, White, York-Crowe, & Stewart, 2004), concerns about weight and shape result in the development of a negative body self-schema, which can be activated by both internal and external stimuli relating to those concerns. The disturbed body image is therefore a form of a cognitive bias, where schema-activation directs a person's attention and memory towards a certain class of stimuli and selective interpretations. The main hypothesis that can be derived from this model is that normal weight and underweight people with body size and shape concerns can develop a variety of cognitive biases, which severity might approach that seen in eating disorders (Williamson et al., 2002). The cognitive biases, including attentional bias, selective memory bias, selective interpretation bias, body size overestimation, and extreme drive for thinness, are thought to occur without conscious awareness.

This thesis explored the impact of the levels of developed body image concerns (negative body self-schema) on cognitive processes associated with perception, attention, interpretation and evaluation of social stimuli (bodies). Although the disordered body schema does not have to lead to disordered eating behaviours, it has been specified as one of the most important risk factors for the development of eating disorders (Stice, 2002; Thompson & Stice, 2001). The people who are most susceptible to develop a cognitive bias

are those with a fear of fatness, overconcern with body size/shape, internalisation of a thin ideal size/shape as well as perfectionism and obsessionality (Williamson, Stewart, White, & York-Crowe, 2002).

Individuals higher in body image concerns were shown to express positive attitudes towards thinness and negative attitudes towards heaviness (Cho & Lee, 2013), engage in more body comparisons with superior targets (Schaefer & Thompson, 2014) and be more negatively affected by exposure to thin bodies (Groesz, Levine, & Murnen, 2002; Hausenblas, Campbell, Menzel, Doughty, Levine, & Thompson, 2013). In line with the theoretical models of body dissatisfaction, if the stimuli were interpreted as reflecting the environment (other-referential), the body dissatisfied individuals would attend to the 'thin' and 'attractive' stimuli, as these are used for upward body comparisons. For example, the studies which investigated the visual attention biases illustrated that individuals with more body size and shape concerns were more inclined than individuals with less appearance concerns to allocate more attention to their own unattractive body areas (Janelle, Hausenblas, Ellis, Coombes, & Duley, 2009; Jansen, Nederkoorn, & Mulken, 2005) and others' attractive body areas (Roefs, Jansen, Moresi, Willems, van Grootel, & van der Borgh, 2008). These results are consistent with the framework which proposes that individuals with a negative body image preferentially process negative self-relevant information, which confirms their negative self-beliefs in return, and that these individuals tend to emphasise positive characteristics in others, such as thinness or attractiveness, hence sustaining the view that one is inferior to others.

In individuals with high body image concerns, a negative schema for the self and a positive schema for others are constructed. These are theorised to interact and maintain one's maladaptive cognitions, emotions, and behaviour, which was shown to be reliant on the type of the stimuli used (thin or fat/heavy) and the relevance of the stimuli to the self (self-relevant or other-relevant). In the past, the researchers studying cognitive biases frequently paired the appearance-related stimuli with neutral stimuli to observe an increased attention, recall or more negative interpretations of these appearance-related stimuli. More recent research indicates that body dissatisfied individuals express differential patterns of cognitive bias towards 'thin' vs. 'fat' stimuli (Chen & Jackson, 2013; Gao et al., 2013, 2014; Glauert, Rhodes, Fink, & Grammer, 2010), which shows the importance of separating the appearance-related and bodily stimuli into these two separate categories and

investigating the cognitive biases relating to thinness and fatness separately. In addition, there are few studies that investigate body image in relation to difference between self-referential vs. other-referential interpretations and the distinct patterns of cognitive biases towards thin vs. fat/heavy stimuli. This thesis will address these important distinctions. Separating the influences of the above conditions was especially difficult in the studies which used word stimuli, thus in this thesis only body stimuli were used to increase the ecological validity of the investigations. The empirical studies designed for the thesis set out to explain the relationship between the development of the negative body schema for one's own body and the positive body schema for the bodies of others, as well as the differences in attitudes and biases towards thin and heavy bodies, and to discuss the results within the well-established sociocultural, objectification, and cognitive-behavioural frameworks of body image disturbance.

Sociocultural theories

Sociocultural theories of body image offer an explanation of the relationship between the internalised appearance standards and the development of body dissatisfaction. Objectification theory (Fredrickson & Roberts, 1997) postulates centrality of appearance to women's self-worth as one of the causes of the widespread body dissatisfaction among women. When social comparison theory (Festinger, 1954) is applied to body image, it specifies the tendency of comparisons with more attractive targets (upward comparison) as a contributing factor. These theories will be discussed in more detail in this section. They all propose and explain the cognitive processes affecting women's perceptions of their own bodies and they all draw to some extent on the assumptions of the social learning theory, which is described in the next paragraphs.

According to the social learning theory (Bandura, 1977), a person's psychological functioning depends on reciprocal interaction between one's behaviour and what's influencing and controlling it, with the focus placed on self-regulatory processes and vicarious learning. Thus, a person can learn from direct experience but also by observing others. A person could learn, for example, that attractive and thin people are being rewarded for their appearance (positive vicarious reinforcement) and that unattractive and bigger people are punished and teased for the way they look (negative vicarious

reinforcement). The people will then incorporate these messages, which will be constantly reinforced by one's environment (e.g. family, peers, media), into their own body image.

Social learning theory also assumes that, in part, people learn how to evaluate their behaviour based on others' reactions to their behaviour (Bandura, 1977). For instance, if a mother is rewarding her daughter for dieting, looking attractive and thin and criticises her when she puts on weight, the daughter will eventually judge her dieting and appearance-related behaviours in a self-approving or a self-critical way. The daughter's evaluation of her own behaviour and appearance will depend on how much it deviates from the norm, which in this instance is set by her mom, but it could also be set by a peer group, a partner, or any other person or social group relevant or important to the daughter. In addition, it needs to be remembered that not only the people specify and impose the standards of behaviour on others (like the mom above) but they also use these standards to guide their own behaviour.

Social groups contain large numbers of varied individuals and the individuals belonging to these groups may select some particular members against which they can compare themselves. The level of satisfaction or dissatisfaction with the self would depend on this chosen comparison model. When a person chooses to adhere to very high standards, it frequently ends with self-dissatisfaction when one fails to meet those self-imposed standards. With regards to body image, a person might choose unrealistic appearance standards and start to habitually compare one's looks with these ideals. The constant focus on the discrepancy between the chosen ideal and one's own appearance may result in body dissatisfaction (Anton, Perri, & Riley, 2000; Jacobi & Cash, 1994).

The sociocultural models assume that: 1) there exists a culturally-dependent societal ideal of attractiveness, 2) the ideal is transmitted via various sociocultural channels (e.g. internet, TV, family, friends), 3) the ideal might be internalised by individuals. The result of these three influences can be satisfaction or dissatisfaction with one's own appearance, depending on the extent to which the individual meets the "ideal" requirements (e.g. thinness for women, and muscularity for men) (Tiggemann, 2011). The above assumptions will be discussed in this section along with the empirical evidence supporting them and an in-depth description of the theoretical models.

Sociocultural theories of body image stress the role of cultural values in constructing the perception of our own and other people's bodies (Tiggeman, 2011). Thus, if the culture

values thinness and attractiveness, the individuals will place more stress on attaining a thin body, which is considered attractive (Jackson, 2002). Sociocultural theory offers a cultural explanation of body image and eating disturbance and posits the existence of a culturally-dependent body ideal.

Exposure to mass media images depicting thin women might be a cause of a greater discrepancy between a body ideal unattainable for most women and a person's actual body size and shape (Spitzer, Henderson, & Zivian, 1999). Research evidence supports the existence of the socioculturally constructed ideals (Tiggemann, 2011): firstly, the female body ideal got progressively smaller from the 1950's to this day, as evidenced, for example, by the decreasing size and weight of Miss America pageant winners and Playboy centrefolds' models (Sypeck, Gray, & Ahrens, 2004); secondly, the same trend exists regarding the size of children's toys, for instance Barbie dolls, which may have an effect on the young girls' body esteem (Dittmar, Halliwell, & Ive, 2006). Thirdly, women and men who work in professions where there's focus on athleticism, thinness and beauty (e.g. dancers, models, athletes) were shown to be at more risk or had higher rates of body image disturbance (Blouin & Goldfield, 1995; Swami, Steadman, & Tovée, 2009). Lastly, the investigations into the cultural differences regarding the choice of body ideals indicated that more exposure to the Western media results in the choice of thinner female body ideals (Boothroyd et al., 2016; Swami, Fredrick, et al., 2010).

For instance, Boothroyd and colleagues (2016) collected their data in Nicaragua, where they asked the participants to rate the photographs of 50 women with known BMIs on attractiveness (range 1-5). The participants were split into three groups based on their access to television: an urban sample, a sample from a village with established television access, and a sample from a nearby village with limited television access. The results showed that the heavier bodies were preferred in the village with least media access, while thinner bodies were being preferred in an urban sample, thus implicating television consumption in the choices of thinner body ideals. In another study, Swami and colleagues (2010) investigated a large sample of 7434 individuals, and asked them to rate 9 line-drawings of female bodies arranged from very thin to heavy. All drawings were rated on how physically attractive the participants thought they were to men (1-9 scale). The differences in the choice of body weight ideals were small between the socioeconomically developed countries, pointing to a tendency of rating the thinner female bodies as more attractive in

countries with such socioeconomic status. Exposure to the Western media emerged as a significant predictor of the attitudes towards thin female bodies, with both men and women who were more exposed to Western media rating thinner female bodies as more attractive.

The above evidence suggests that the construct of attractiveness is heavily socially influenced, with more empirical evidence showing that body size found attractive relies on the culture (Swami, Neto, Tovée, & Furnham, 2007; Swami & Tovée, 2005; Swami & Tovée, 2007; Tovée, Swami, Furnham, & Mangalparsad, 2006) and a moment in history (Sypeck, Gray, & Ahrens, 2004). In contrast with the Western culture, the individuals in some non-Western countries associated greater female body weight with fertility and attractiveness (Swami & Tovée, 2007), which was also shown to be dependent on the socio-economic status of the individuals (Swami, Frederick, et al., 2010). In the Western culture, thinness is a determinant of women's value in the society, with their bodies not being treated in functional terms (fertility, nursing) but serving mostly an aesthetic purpose (Fredrickson & Roberts, 1997). This conviction that a female body should be, above all, beautiful, leads to greater sexualisation and objectification of the female body – an issue that would be discussed in more detail later in this chapter.

The sociocultural explanation of body image disturbance is the most discussed and perhaps the most empirically validated of all body image theories. There are different versions of the model, which set out to explain how the socioculturally transmitted predominant appearance ideal leads to body image and eating disturbance (Tiggemann, 2011). An earlier sociocultural model – the dual pathway model (Stice, Schupak-Neuberg, Shaw, & Stein, 1994; Thompson & Stice, 2001; Stice, 2001, 2002) – suggested the internalisation of the prescribed body ideals as the major mediating mechanism between the sociocultural pressures to be thin and the development of eating pathology and disturbed body image. A later model – the tripartite influence model (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999; Shroff & Thompson, 2006) – added social comparison processes as another important mediator. Body image experiences are diverse and organised on a continuum, with disturbances developing only in some women, despite similar exposure to sociocultural messages regarding female appearance. Early sociocultural models were criticised for not providing an explanation for this diversity of body image experiences and varied levels of body discontent (Thompson et al., 1999). The conceptual

development of the above-mentioned models, evidence supporting them and their critique will be discussed in the following paragraphs.

Dual pathway model

The dual-pathway model drew on the assumption that women would be unlikely to become very dissatisfied with their bodies unless they started to internalise the cultural messages about female beauty and build their self-esteem primarily on their body appearance, size, and shape. The media exposure was hypothesised to be crucial in the development of female body dissatisfaction. There is a promise of a number of benefits attached to losing weight and achieving the thin ideal, such as happiness, health, self-esteem, and romantic success (Bordo, 1993). However, an awareness of the thin ideal and the knowledge of the social benefits which come with trying to approximate the ideal is not the same as thin ideal internalisation. It needs to be specified that thin ideal internalisation refers to acceptance of the set attractiveness standard and incorporation of this standard into one's self concept paired with engaging in behaviours aimed at reducing the gap between one's actual appearance and the set ideal (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999; Thompson & Stice, 2001).

Before the dual pathway model was formally introduced, Stice, Schupak-Neuberg, Shaw and Stein (1994) designed a correlational study which first reported a connection between media exposure to the female thin ideal, as measured by self-reported media consumption (number of magazines looked at and hours of TV shows watched), and eating disorder symptoms, as measured by the 26-item Eating Attitudes Test (Garner, Olmsted, Bohr, & Garfinkel, 1982). It was also one of the first to investigate the mediating mechanisms of this connection as well, such as gender-role endorsement, internalisation of the thin ideal, and body satisfaction, as measured by various questionnaires. The internalisation of the thin ideal was hypothesised to occur when repeated exposure to the sociocultural messages about the importance of appearance and thinness produced an inner drive to achieve the unrealistic standard. Inability to achieve this standard would produce greater levels of body dissatisfaction, which, in turn, would lead to eating pathology, such as restrictive dieting and purging. Their findings suggested for the first time that the internalisation of the thin ideal mediates the negative effects of media exposure on body satisfaction and eating behaviour.

Thin-ideal internalisation was later found to predict the onset of bulimic symptoms (Stice & Agras, 1998) and increased dieting (Stice, Mazotti, Krebs, & Martin, 1998). Stice (2001) set out to integrate the previous models of eating pathology, including the sociocultural (Striegel-Moore, Silberstein, & Rodin, 1986), dietary (Polivy & Herman, 1985), and affect regulation (McCarthy, 1990) models and test the assumptions of a newer model – the dual-pathway model of eating pathology. In his prospective study with adolescent girls ($N = 231$), Stice (2001) found that initial pressure to be thin and thin-ideal internalisation predicted increases in body dissatisfaction, also, that initial body dissatisfaction predicted increases in dieting behaviour and negative affect, and finally that initial dieting and negative affect predicted increases in bulimic symptoms (please refer to figure 1 for an illustration of these relationships). The above evidence and the correlational and experimental research that followed (Stice, 2002; Stice & Shaw, 2002; Thompson & Stice, 2001) provides support for establishing the thin-ideal internalisation as a risk factor for eating and body-image disturbance, along with other well-established risk-factors, such as body dissatisfaction, dieting and negative affect.

Stice (2002) later elaborated on the dual-pathway model and provided a summary of risk and maintenance factors for eating pathology. The below graph (figure 2) does not include risk or maintenance factors specific to the bulimic symptomatology, but the more general risk factors of body image and eating disturbance. A number of additional risk factors were specified, including body mass as a risk factor for pressure to be thin, body dissatisfaction, and dieting; body dissatisfaction as a risk factor for dieting, negative affect, and eating pathology; and negative affect, perfectionism, impulsivity, and substance use as a risk factors for eating pathology. Perceived pressure to be thin and thin-ideal internalization were considered causal risk factors for body dissatisfaction, dieting, negative affect, and eating pathology, in line with the findings from experimental studies which specified that the former preceded the occurrence of the latter (Cattarin, Thompson, Thomas, & Williams, 2000; Groesz, Levine, & Murnen, 2002; Stice & Shaw, 1994; Stice, Spangler, & Agras, 2001). However, the prospective and experimental findings for dieting were not as clear leading to conclusion that dieting is not a risk factor for eating pathology but rather constricts overeating tendencies (Stice, 2002).

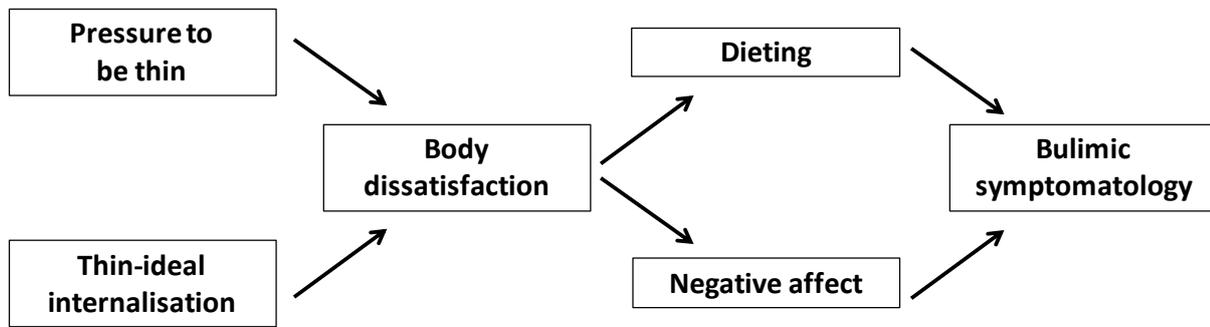


Figure 1. The theoretical components of the dual-pathway model of bulimic symptomatology, adopted from Stice (2001).

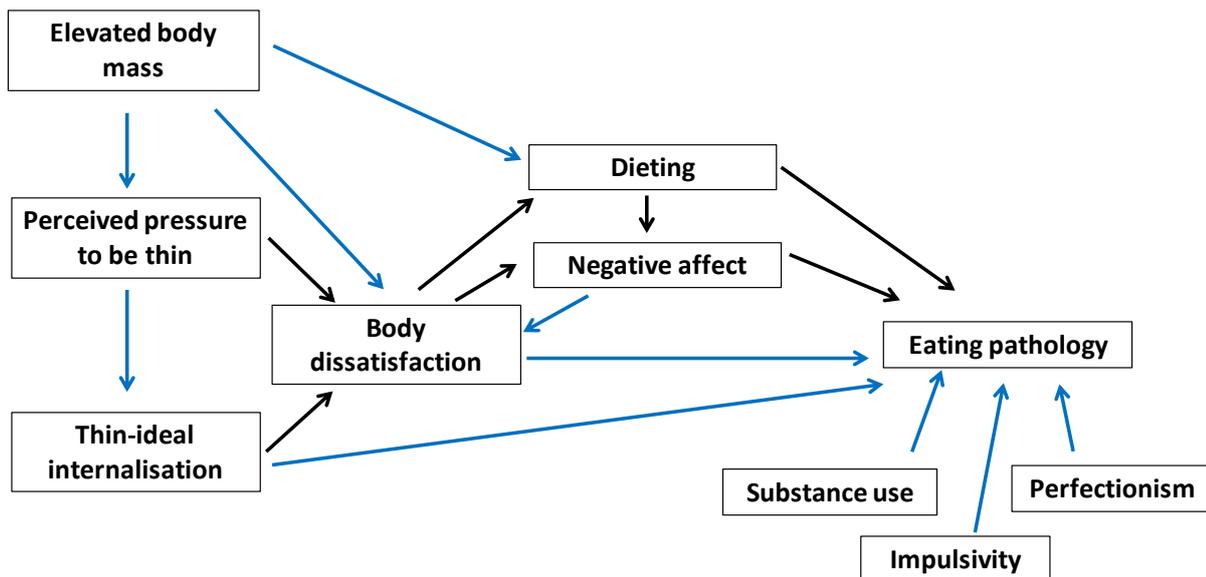


Figure 2. Stice's (2002) dual-pathway model with risk factors for eating pathology. In black there is an original theoretical model (Stice, 2001) and in blue there are new risk factors added (Stice, 2002).

The most recent support for the dual-pathway model comes from Urvelyte and Perminas' (2015) study, where a sample of 348 teenage girls completed various questionnaires, including the Eating Attitude Test, Negative Affect Schedule, and Body shape Questionnaire. The structural equation analyses confirmed that initial pressure to be thin and thin-ideal internalization predicted subsequent growth in body dissatisfaction, initial body dissatisfaction predicted growth in dieting and negative affect, and initial dieting and negative affect predicted growth in eating disordered symptoms. Urvelyte and Perminas (2015) provided a more recent support for the dual pathway model for predicting not only bulimia but also anorexia symptoms.

The early sociocultural model explored various mediating mechanisms which offer an explanation of how the media and cultural attitudes towards thinness and attractiveness give rise to eating and body image disturbances. However, most of the research was correlational in nature and the information about the direction of the relationships and interrelationships between the variables and risk-factors was lacking. Stice and Shaw (2002) specified the conceptual and methodological limitations of this early model and noticed that body dissatisfaction was far more often investigated as a risk factor but not the maintenance factor of eating disorder symptoms.

In addition, the possibility of third-variable influences on the interrelation between the variables (body dissatisfaction, body mass, pressure to be thin, thin-ideal internalization, dieting, negative affect, and eating pathology) was not investigated and ruled out. Moreover, some possible reciprocal and bi-directional relationships were not tested, for example, according to the dual-pathway model body dissatisfaction precedes negative affect, so that a failure to meet the ideal causes negative feelings about oneself as a person (shame, guilt etc.). However, the possibility that negative affect may be related to negative processing of body-related information and biased interpretation of one's own body attributes, was not taken into account. In addition, the effect of self-esteem and social comparison tendencies on susceptibility to sociocultural messages did not receive enough focus. It is very possible that people with high self-esteem will be more resistant to the sociocultural pressures and will engage in healthier social comparisons. Moreover, the research has focused largely on the maintenance factors for certain eating disorders, such as bulimia and binge eating but without taking the genetic and biological risk factors into account. The main criticism of the early theory, however, is a lack of focus on how the risk and maintenance factors work together to perpetuate eating pathology (Stice, 2002).

This early sociocultural theory underlines that people may absorb sociocultural messages about the importance of thinness and develop body image disturbance if certain predisposing factors occur. In the dual-pathway model, these factors include perception of one's own weight, family and peer pressures and weight-related teasing, low self-esteem, and unstable self-concept. Another sociocultural model builds on the earlier theoretical work and adds the tendency for social comparisons as an important mediator between the sociocultural messages on the importance of thinness and the development of body image concerns.

Tripartite influence model

The main concept of the tripartite influence model (TIM) is that the body ideal is transferred through three powerful sociocultural channels, such as family, peers and the media hence its name - the "tripartite" model (Tiggemann, 2011). There has been support for the direct link between thin-ideal internalization, body image disturbance and eating pathology (Stice, 2002; Thompson & Stice, 2001) as well as media influences and interpersonal pressures to be thin and body dissatisfaction (Keery, van den Berg, & Thompson, 2004; Stice, Nemeroff, & Shaw, 1996; Stice & Shaw, 1994). The above-mentioned research indicated that there is a connection between the exposure to the media ideals and the negative effect it has on body image. The tripartite influence model (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999; Shroff & Thompson, 2006; van den Berg, Thompson, Obremski-Brandon, Covert, 2002) built on those early findings and proposed social comparison as an important mechanism by which media images and other pressures to be thin lead to body dissatisfaction.

Before the tripartite influence model of body image disturbance is explained and the evidence supporting the theory is reviewed, the general mechanism of social comparison will be now discussed as this mechanism is used as an explanation for how the exposure to the sociocultural thinness and attractiveness ideals leads to increased levels of body dissatisfaction.

The social comparison theory assumes that people are driven to evaluate their opinions and abilities (Festinger, 1954) so that they can gain guidance for their future behavioural choices. For the most part, people learn about themselves through social comparison by contrasting their subjective thoughts and judgements with others to gain perspective. According to the social comparison theory, people who are unsure if their judgements are correct tend to be more influenced by the opinions of others and change their judgements more frequently (Festinger, 1954). This theory suggests that even when an objective standard is provided and available, for instance: body mass index charts, daily calorie intake recommendations, national statistics about average weight and height, people might still seek social comparisons to put their attributes in context, define themselves and clarify their self-concept.

People need to compare themselves against the social norms so that they can accurately assess the existence and magnitude of the discrepancy between their actual attributes and the attributes they would like to possess. Without a mechanism enabling people to compare themselves with others, people would not be able to monitor their progress. Therefore, people use social comparison to place their appearance in a larger social context. Social comparisons can be upward – comparing oneself with superior targets, or downward – comparing oneself with inferior targets. Upward social comparisons can serve a positive purpose. By engaging in an upward social comparison, a person might be focusing on the similarities between themselves and the inspirational person or group, which can lead to higher motivation for change. However, comparing oneself with superior targets may also remind people of their own inferiority and negatively affect one's self-esteem (Bailey & Ricciardelli, 2010; Major, Testa, & Bylsma, 1991). In contrast, the purpose of engaging in a downward comparison is usually to dissociate oneself from the comparison group and the comparison with inferior targets may result in self-enhancement and increase one's self-esteem (Major, Testa, & Bylsma, 1991; Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999).

Bailey and Ricciardelli (2010) measured a frequency of negative and positive comments via the Verbal Commentary on Physical Appearance Scale (Herbozo & Thompson, 2006), the frequency of upward and downward comparisons via the Social Comparisons on Physical Appearance Scale, and self-esteem via the Contingent Self-Esteem Scale (Paradise & Kernis, 1999). These variables, alongside the participants' BMI, were used as predictors in regression models with body dissatisfaction, drive for thinness, and bulimia scores of the Eating Disorder Inventory (Garner, 2004) used as dependent variables. The results indicated that more upward comparisons and less downward comparisons predicted higher body dissatisfaction, more drive for thinness, and more bulimic symptoms.

Social comparison theory assumes that there are individual differences in propensity for social comparisons, the choice of comparison targets, and a tendency for upward comparisons. For instance, early correlational studies showed that a greater tendency for social comparisons was positively correlated with higher levels of body dissatisfaction (Heinberg & Thompson, 1992a, 1992b). In addition, whether people respond positively or negatively to upward social comparison depends, in part, on self-esteem. People with higher

self-esteem were shown to respond more positively to upward social comparisons than people lower in self-esteem (Aspinwall & Taylor, 1993).

Van den Berg, Thompson, Obremski-Brandon and Covert (2002) tested the tripartite influence model's assumptions and the mediating role of appearance comparison on body image. The assumptions were that, firstly, there are three primary sources of influence contributing to the development of eating and body image disturbances: parents, peers, and media. Secondly, that there are two main factors mediating the relationship between the sociocultural influences and body image disturbance: appearance-related social comparisons and internalisation of the thin ideal (please refer to figure 3). Covariance structure modelling showed that appearance-related social comparisons mediated the effects of family and media influences on body dissatisfaction, which in turn influenced restrictive and bulimic behaviours, whereas peer influences affected restrictive behaviour directly. A recent meta-analysis showed that the relationship between social comparison tendencies and body dissatisfaction is evident especially in young females (Myers & Crowther, 2009).

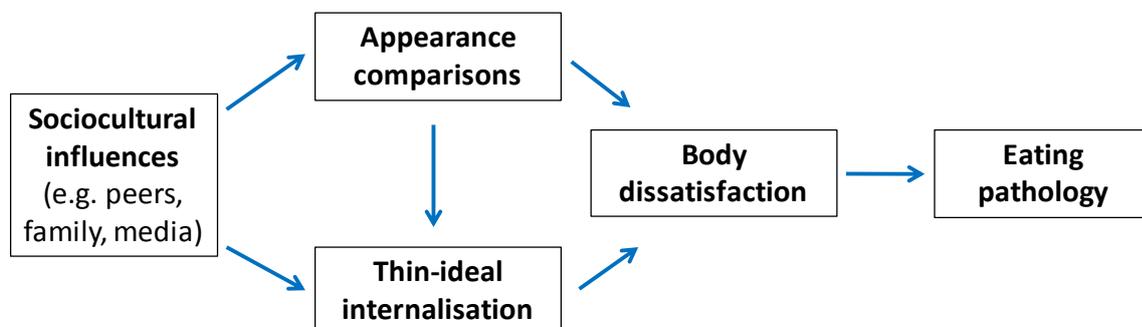


Figure 3. The tripartite influence model of eating pathology. Of note is the fact that the tripartite influence model (Thompson et al., 1999) examines social appearance comparison and thin-ideal internalisation as mediators of the relationship between sociocultural influences (similar to pressure for thinness) and body dissatisfaction.

More recent evidence also showed that the sociocultural influences may impact negatively on one's body image and that social comparison links these sociocultural pressures for thinness with negative body image outcomes. For instance, frequent upward social comparisons with peers were found to mediate the relationship between thin ideal internalization and body dissatisfaction (Dittmar, 2005; Dittmar & Howard, 2004; Leahey, Crowther, & Mickelson, 2007). Peer influence on one's body image can be exerted through weight-teasing (Thompson, Covert, & Stormer, 1999) and bullying or so-called "fat talk"

where a peer group engages in conversations about own and others' appearance and weight. These kinds of conversations were found to intensify social comparison (Shroff & Thompson, 2006). Family may be another source for social comparison and an association between the mothers' body image attitudes and their daughters' own body image was also documented (Hillard, Gondoli, Corning, & Morrissey, 2016; Rieves & Cash, 1996), which shows the importance of indirect parental influence on their children's body image.

Among the sociocultural influences, the mass media have been identified as the most influential, with the link between media exposure and body dissatisfaction supported by extensive correlational, experimental, and meta-analytic evidence (Clark & Tiggemann, 2007; Dohnt & Tiggemann, 2006; Grabe, Ward, & Hyde, 2008; Groesz, Levine, & Murnen, 2002; Holmstrom, 2004; Levine & Murnen, 2009; Want, 2009). The most recent and comprehensive meta-analysis revealed that the influence of the thin-ideal media messages on body image is minimal for most women, but the influence of those messages is greater for women with already developed body image concerns (Ferguson, 2013). The negative effects of media exposure to the thin ideal have generally been attributed to social comparison (Levine & Murnen, 2009; Want, 2009). Women evaluate their own appearance by comparing themselves with the cultural ideals of beauty and thinness presented in the media. As the culture of thinness is widespread in Western countries (Stice & Shaw, 2002; Sypeck, Gray, & Ahrens, 2004), almost invariably this will be an upward comparison by which women fall short, resulting in dissatisfaction with their own appearance and body (Bailey & Ricciadelli, 2010; Strahan, Wilson, Cressman, & Buote, 2006; Want, 2009).

Elaborated tripartite influence model

The dual pathway model suggested thin-ideal internalisation to play an important role between the acquisition of the positive sociocultural messages regarding thinness and the development of body dissatisfaction. This explained why only some women develop body dissatisfaction even though most women in the Western cultural are exposed to the same sociocultural messages. The tripartite influence model introduced social comparison as an important mediator between the sociocultural influences from peers, family and media and the development of body dissatisfaction. More recent results (Fitzsimmons-Craft et al., 2014), however, suggest that an association between thin-ideal internalisation and body dissatisfaction is not automatic, with social comparison (body, eating, dieting) emerging as

an important mediator of this relationship. Such comparisons are used by women to compare themselves with the chosen ideal, which can lead to discontent with one's body. A longitudinal study by Rodgers, McLean and Paxton (2015) investigated 277 school girls (M age = 12.77) who were measured on internalisation of the medial ideal, social appearance comparison, and body dissatisfaction at a baseline, 8 months, and 14 months later. The study suggested that the internalisation of the media ideal precedes social appearance comparison, which in turn predicts body dissatisfaction. The above studies provide support for the elaborated tripartite influence model and the directionality of the relationship between thin-ideal internalisation, appearance-based comparisons, and body dissatisfaction. Please see the latest model in figure 4.

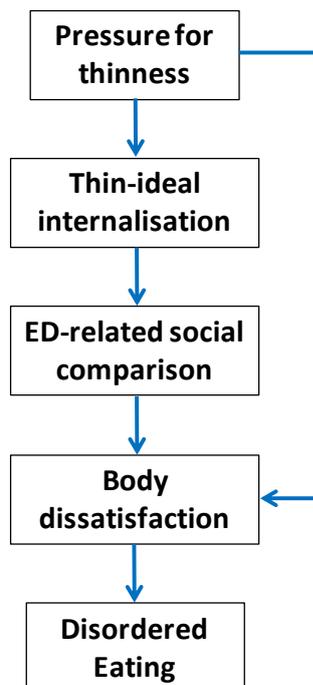


Figure 4. The elaborated sociocultural model (Fitzsimmons-Craft et al., 2014) – a revision and extension of the tripartite influence model. The relationship between thin-ideal internalisation and body dissatisfaction was shown not to be automatic, with eating disorder-related social comparison (body, diet, exercise) emerging as an important mediator of this relationship.

The elaborated sociocultural model of disordered eating (Fitzsimmons-Craft, 2011; Fitzsimmons-Craft et al., 2014; Fitzsimmons-Craft et al., 2015; Fitzsimmons-Craft, Ciao, & Accurso, 2016) aims to integrate social comparison and objectification theories, with both theoretical constructs – body surveillance and social body comparison – thought to mediate the relationship between the thin-ideal internalisation and body dissatisfaction. To evaluate their bodies, women need to first assess the discrepancy between their actual and ideal

appearance. If they feel the pressures from the environment regarding their appearance, e.g. they are being criticised for their weight, they might choose to comply with the norm for female attractiveness. However, for the woman to start to evaluate her body in a negative way and feel badly if the actual-ideal discrepancy is pronounced, she would first need to evaluate her proximity to the ideal. According to the elaborated sociocultural model, social comparison is used for direct comparison of one's body with the bodies of others' whereas body surveillance – persistent body checking and monitoring behaviours – may be a process which starts off the evaluation process. Body surveillance is conceptually linked to self-objectification, which is the core concept of the objectification theory of body image. The theory's assumptions and the empirical evidence supporting them will be described in the next paragraphs.

Objectification theory

The objectification theory (Fredrickson & Roberts, 1997) sets out to explain how women's socialisation experiences of sexual objectification affect the development of related mental health problems. Objectification theory received a lot of attention, with cross-sectional research providing support for the theory in adolescents and adults (Slater & Tiggeman, 2002; Tiggeman & Lynch, 2001). First of all, objectification theory points to a fundamental gender difference in conceptualisation of the body (Striegel-Moore & Franko 2002). Women are more frequently sexually objectified than men (Swim, Hyers, Cohen, & Ferguson, 2001) and research suggests that boys and men feel less objectified and feel less body shame than do girls and women (Hebl, King, & Lin, 2004; Lindberg, Hyde, & McKinley, 2006; Lowery et al., 2005; McKinley, 1998). For example, Lowery and colleagues (2005) tested 267 female and 156 male participants and conducted a multivariate analysis of variance (MANOVA) with the five body image scales: the Objectified Body Consciousness Scale (McKinley & Hyde, 1996), the Weight and Appearance Visual Analogue Scales, the Contour Drawing Rating Scale (Thompson & Gray, 1995), the Rosenberg Self Esteem Scale (Rosenberg, 1965), and measures of health-related behaviours. The results showed that women, compared to men, reported more body dissatisfaction and more body surveillance as well as greater body shame and greater discrepancy between their ideal and actual bodies.

There is a cultural focus on how women's bodies look as opposed to how men's bodies act (Murnen, 2011) and every day, women and girls are exposed to the messages from the media, peers and family reinforcing the idea that women are to be evaluated on the basis of their appearance and, going a step further, be treated as mere objects to be looked at. It was suggested that the marked differences between males and females with regards to body image cannot be explained by social learning and social comparison theories alone, as those theories ignore the gendered nature of body dissatisfaction (Smolak, 2006, p.71).

Fredrickson and Roberts' theory (1997) aims to explain how the sociocultural pressures and experiences of sexual objectification may give rise to psychological disorders in girls and women, as self-objectification has been associated with depression (Miner-Rubino, Twenge, & Fredrickson, 2002; Tiggemann & Kuring, 2004), appearance anxiety (Calogero, 2004; Tiggemann & Slater, 2001), and eating disorders (Noll & Fredrickson, 1998; Tiggemann & Slater, 2001). Studies indicate that weight criticisms and the pressures to be thin are positively associated with body shame in girls and women (Befort et al., 2001; Lindberg, Hyde, & McKinley, 2006; Lindberg, Grabe, & Hyde, 2007; Tylka & Hill, 2004), as most girls and women are not able to meet the internalised or culturally-accepted standards of beauty. Tylka and Hill (2004) examined 460 college women and used structural equation modelling analyses to test the main assumptions of the objectification theory. The participants completed questionnaires measuring pressure for thinness, body surveillance, body shame, interoceptive awareness, and eating disorder symptomatology. The analyses indicated that pressure for thinness predicted unique variance in body shame, and that pressure for thinness along with body surveillance, which will be described in more detail in the next paragraphs, predicted 72% of the variance in body shame.

Acquired through various sociocultural channels, sexual objectification can develop into self-objectification as a girl or a woman may internalise the observer's perspective of her own body. The more women self-objectify and the more importance they place on appearance, the more body shame they feel, as was confirmed by experimental studies (Moradi & Huang, 2008; Noll & Fredrickson, 1998; Tiggemann & Lynch, 2001; Tiggemann & Slater, 2001). Male romantic partners can create pressure for their female partner to comply with the female attractiveness ideal, and studies have shown that this pressure can result in

increased body dissatisfaction and thin-ideal internalisation (Halliwell & Dittmar, 2006; Huxley, Clarke, & Halliwell, 2015).

Women are more biased than men when it comes to evaluating their own appearance as they feel greater pressure to comply with the social norm of an attractive female body. The objectification theory illustrates how this negative bias may develop. Some women are more vulnerable to follow and internalise the norm, e.g. due to low self-esteem or more perceived pressure for thinness, which may lead to a habitual negative bias in evaluation of one's own appearance. Women were shown to experience more body dissatisfaction (Paap & Gardner, 2011) and engage in disordered eating more frequently (Johnson et al., 2004; Milligan & Pritchard, 2006; Muth & Cash, 1997) than men. The objectification theory suggests that larger objectification of the female body (e.g. in advertisements) makes vulnerable women internalise the unrealistic standard and place more focus on own appearance, above competence or personality. Research indicates that being exposed to objectified images of women's bodies is associated with self-objectification and body dissatisfaction (Fredrickson & Roberts, 1997; Harper & Tiggemann, 2008). Women are exposed to thin media images on a daily basis and may experience self-objectification several times a day. While being exposed to the verbal and visual cues regarding female appearance, the women start to think about their own appearance, taking a third-person perspective (Harper & Tiggemann, 2008). In everyday life, one does not always have a mirror or an adequate comparison target to appraise one's looks. Therefore, women who engage in self-objectification may rely on the mental image of their own body, which may be distorted, and engage various cognitive resources to evaluate their appearance, including attention and memory. Objectification theory (Fredrickson & Roberts, 1997) posits that self-objectification consumes attentional resources, which may compromise one's mental performance. A study by Fredrickson, Roberts, Noll, Quinn and Twenge (1998) showed that inducing state self-objectification, by making the participants try on a swimsuit, caused a decline in math performance for women but not for men. In addition to impairing cognitive performance, self-objectification was found to heighten negative affect, cause restrictive eating, and lessen sexual enjoyment (Moradi & Huang, 2008).

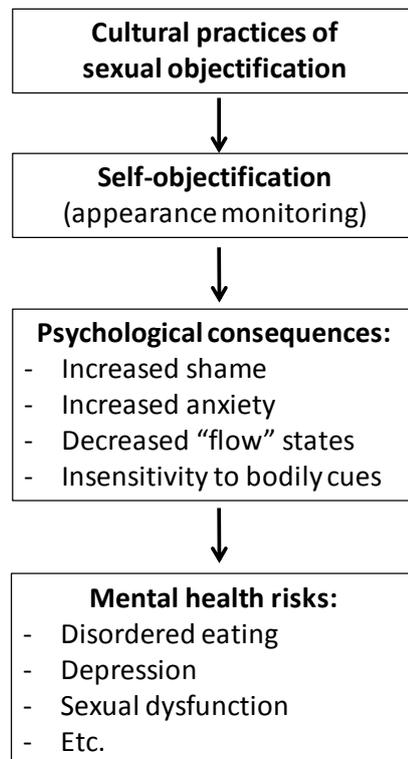


Figure 5. Antecedents and consequences of self-objectification (Fredrickson, Roberts, Noll, Quinn, & Twenge, 1998).

Self-objectification can result in heightened body surveillance, i.e. frequent body checking and monitoring behaviours (please refer to figure 5 for an illustration of the antecedents and consequences of self-objectification). People have a tendency to internalise the attitudes of the significant others and the social groups they belong to. Own attitudes are therefore socially reinforced and might become a part of the self-concept (Stice & Shaw, 2002). Body surveillance has been proposed as a mechanism through which the acquired standards of appearance become internalised and lead to body dissatisfaction (Fitzsimmons-Craft, 2011; Fitzsimmons-Craft et al., 2014; Fitzsimmons-Craft et al., 2015; Fitzsimmons-Craft, Ciao, & Accurso, 2016).

Critique of sociocultural theories

Most women are exposed to the female attractiveness ideal in some way or the other, but not all suffer the negative psychological consequences and develop body dissatisfaction because of the discrepancy between the thin ideal and their actual size and shape. Identifying moderating variables – biological, psychological, or social – which make people more resilient or vulnerable to the sociocultural pressures to be thin and attractive is a crucial task to be undertaken by body image researchers (Tiggemann, 2011). Identifying

the variables responsible for resilience to omnipresent sociocultural pressures is as important as identifying the risk factors of body image disturbance.

The main criticism of the tripartite influence model is its linearity. Body image is complex and actively influenced by internal and external stimuli and attitudes. Rodgers, McLean and Paxton (2015) suggested there might be a reciprocal relationship between thin ideal internalisation and body dissatisfaction. Thin-ideal internalisation was found to precede body dissatisfaction in their longitudinal study, where the pressures from others to attain the thin ideal are integrated into one's self-concept and lead to body dissatisfaction if one fails to achieve the set ideal. However, the sociocultural model does not account for the influence of those already developed negative feelings towards one's own body on the attitudes towards the thin ideal and a drive to achieve it. As described previously in this chapter, social comparison may be the main mechanism through which body dissatisfaction is maintained, as a result of the internalisation of the thin ideal. Most recently, researchers provided evidence for body surveillance as a potential mediating variable of this relationship as well (Fitzsimmons-Craft, Ciao, & Accurso, 2016). The sociocultural models, however, do not take into account the visual processes and perceptual biases that may occur during appearance-based social comparisons. Women higher in body dissatisfaction were shown to be paying more attention to the idealised body images (Cho & Lee, 2013; Gao et al., 2014; Glauert, Rhodes, Fink, & Grammer, 2010), which may foster further appearance comparisons and maintain body dissatisfaction.

Sociocultural theories offer a robust theoretical framework for explaining the causes of body dissatisfaction, suggesting three main sociocultural channels – peers, family and media – through which an individual learns about the female thin ideal (Groesz, Levine, & Murnen, 2002; Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999; Tiggemann, 2011). Earlier in the chapter, thin ideal internalisation, which was implicated in the development of negative body image, was described as an acceptance of the normative attractiveness standard and incorporation of this standard into one's self-concept (Thompson et al., 1999; Thompson & Stice, 2001). In cognitive terms, this suggests that internalisation would involve an acquisition of a social schema – awareness of the set norms – which would then become a part of the self-schema – being accepted as a guide for self-evaluation (Cash, 2005). The line between the awareness of the thin ideal and its internalisation is not clear though (Cafri, Yammamiya, Brannick, & Thompson, 2005; Cash, 2005) and the sociocultural theories do not

offer an in-depth explanation of how the developed social schema influences the self-schema, which calls for better definitions and operationalisations of the constructs.

The sociocultural theories do not thoroughly explore the fact that the internalisation of cultural values is an active and not a passive process and that our body image does not only develop through sociocultural and developmental pathways but is also constantly adjusted and modified by a person's cognitive processing, day to day events and situations, as well as self-regulatory and coping strategies. Therefore, the theoretical models of body image development should focus on the reciprocity of these relationships. The cognitive behavioural theories of body image provide more rigorous investigation of how the sociocultural values become psychological and guide an individual's behaviour and propose cognitive biases as one of the mechanisms which cause and/or maintain negative body image. These theories will be explored in depth in the next section.

Cognitive-behavioural theories

The cognitive-behavioural theories relate to the sociocultural theories through historical influences on body image, i.e. past events and prior cognitive social learning. In the cognitive-behavioural model, a distinction is made between these historical factors and proximal factors which relate to current life events and actions; both types of factors interact to influence body image experiences and attitudes (Cash, 2011). With regards to cognitive theories, there is a greater emphasis on the active side of socialisation and its effect on affective and cognitive development – an interplay between a person's cognitions, emotions, environment and behaviour. Contemporary research into body image is constructed, analysed and explained within the frames of cognitive and behavioural tradition, emphasising social learning processes and cognitive mediation of behaviours and emotions (Cash, 2002, 2011). One of the biggest proponents of the cognitive-behavioural perspective on body image is Thomas F. Cash (2002, 2008, 2011). His integrative cognitive-social learning model of body image disturbance draws on various viewpoints and contemporary empirical evidence. In its essence, it proposes the existence of a reciprocally interactive causal loop between the external influences and events, internal personal factors (physical, cognitive, affective), and the individual's own behaviours relating to one's body image (Cash, 2002). The main aspects of the model are described below.

The above-mentioned historical influences on body image include cultural socialisation, interpersonal experiences, physical characteristics, and personality factors. Cultural socialisation, with the help of vastly available mass media, can spread the information about normative attractiveness ideals and thus influence a person's body image attitudes, which will then influence and guide emotions and cognitions towards own and others' appearance. Interpersonal experiences relate to the messages received for example from parents, siblings, friends, or co-workers, which can be positive (e.g. compliments), or negative (e.g. appearance teasing or bullying). Others' opinions and attitudes about appearance, just like the messages conveyed through mass media, can be internalised and used for self-evaluative and social comparison purposes. Physical characteristics are also an important factor in the development of body image attitudes towards one's own body as heavier and less attractive people will have different interpersonal experiences than thinner and more attractive people. People tend to ascribe more positive characteristics and qualities to attractive people (Dion, Berscheid, & Walster, 1972; Eagly, Ashmore, Makhijani, & Longo, 1991) who also tend to be less criticised for their looks and dietary choices. Lastly, personality factors can have either a protective or detrimental effect on one's body image. Protective personality traits would include having a positive and clear self-concept (Cash, 2011; McFarland & Kaminski, 2009; Parent & Bradstreet, 2017; Vartanian & Dey, 2013) and high self-esteem (Aspinwall & Taylor, 1993; Brechan & Kvaem, 2015; Parent & Bradstreet, 2017), whereas the traits contributing to the development of disturbed body image would include poor self-esteem, perfectionism, public self-consciousness, need for social approval, insecure attachment system, or endorsing traditional gender attitudes (Cash, 2002).

The described historical factors instil central body image attitudes, which can be categorised into body image evaluation, which refers to satisfaction or dissatisfaction with one's body and positive or negative thoughts and emotions associated with one's appearance, and body image investment, which refers to the degree of importance that an individual places in their appearance (Cash, 2011). Body image attitudes towards one's body develop as the interplay between the abovementioned historical factors, such as cultural socialisation or personality attributes, and proximal processes, including information processing, self-regulatory strategies and emotions relating to one's body. Please see figure 6 above for an illustration of the effect of historical and proximal influences on body image.

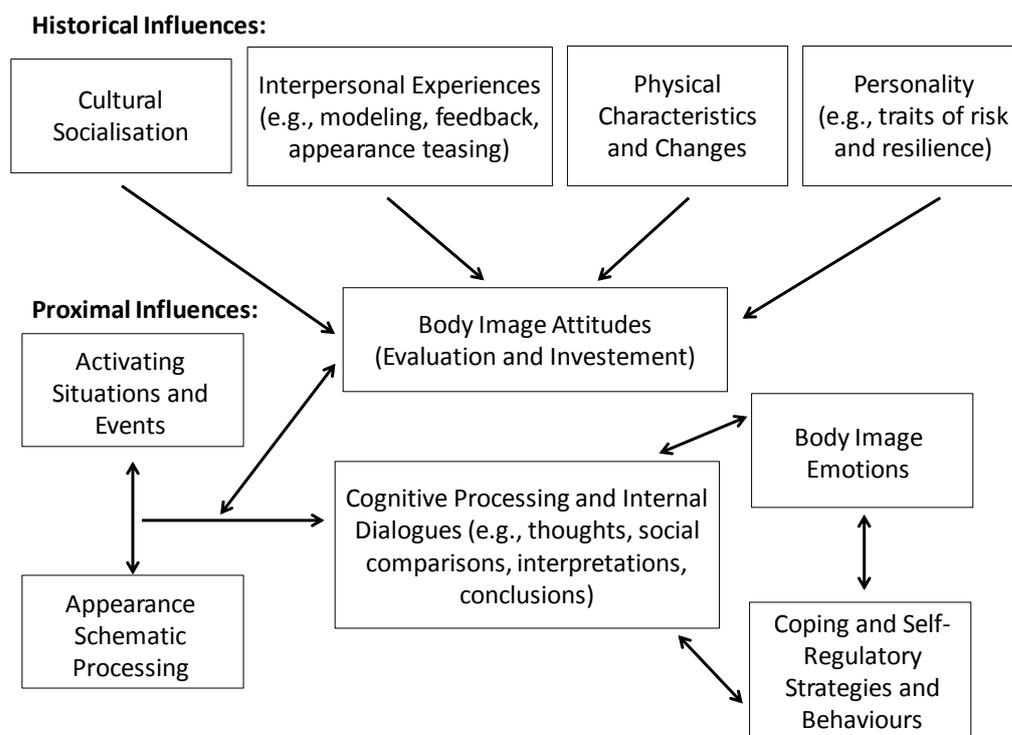


Figure 6. Dimensions, determinants, and processes influencing a person's body image (adopted from Cash, 2011, p. 41).

Information-processing model

As the historical influences from Cash's model refer back to the sociocultural theories of body image, the influence of the proximal factors on one's body image draws on the earlier information processing models of body image disturbance. Proximal factors in Cash's model relate to activating events and cognitive processing of body-related information, therefore it is important to first describe and explain one of the core concepts in the cognitive theories of mental disorders – a schema.

Schema is an organised knowledge structure, which influences most cognitive processes such as attention, perception, learning, and memory (Beck, 1976). Schemas have been defined as "organised packets of information about the world, events, or people stored in long-term memory" (Eysenck & Keane, 2010, p. 401). They are scripts and frames through which the information about the world is organised and they allow people to form expectations and facilitate the understanding of the situations they find themselves in.

Schema is derived from past experience and guides the processing of self-relevant information (Markus, 1977) in a consistent manner. According to cognitive-behavioural theories, certain external and internal cues can activate schema-driven processing of body-

related information. These cues can include: body exposure, mirror exposure, social scrutiny, social feedback, wearing certain clothing, weighing, exercising, mood states, or changes in appearance (Cash, 2011). In addition, certain people are more schematic than others in processing specific types of information. For example, a person who has developed a schema for one's body appearance will pay more attention to and preferentially processes appearance-relevant information, thus expressing a different behaviour from a person not relying on such developed body schema (Cash, 2002). People with extreme levels of body dissatisfaction, those who restrict their eating and persons with eating disorders tend to develop maladaptive and dysfunctional body image schemas, which sustain pathological actions, cognitions and emotions. An information processing model of body image disturbance (Williamson, Muller, Reas, & Thaw, 1999; Williamson, Stewart, White, & York-Crowe, 2002; Williamson, White, York-Crowe, & Stewart, 2004) provides a theoretical explanation of how the self-schema develops and how cognitive biases operate.

Vitousek and Hollon (1990) were one of the first to stress the relevance of cognitive research to eating disorders and suggested that eating-disordered individuals develop organised cognitive structures (schemata) around the weight-related issues, which has implications for the self by influencing one's perceptions, thoughts, feelings, and behaviour. This theoretical model links a person's self-schemata, which refer to one's negative or positive self-image, weight-related schemata, which relate to information and evaluative judgements about thinness and fatness in general, and weight-related self-schemata, which combine the self-view with the information about weight, size and shape in general, where weight and shape become a major determinant of the person's self-value. It was hypothesised that the above types of organised cognitive structures influence information processing in an automatic fashion and take part in maintaining the eating-disordered symptoms (Vitousek & Hollon, 1990).

Williamson and colleagues combined preceding perspectives on the origin of body image disturbance (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999; Vitousek & Hollon, 1990) and developed the cognitive information-processing model of body image (Williamson, Muller, Reas, & Thaw, 1999; Williamson, Stewart, White, & York-Crowe, 2002; Williamson, White, York-Crowe, & Stewart, 2004). Williamson theorised that disturbed body image is a type of cognitive bias which emerges from a self-schema containing stored memories related to body size, shape and eating, which can be easily and automatically

activated by external stressors/stimuli and be accessible for fast retrieval from memory (Williamson et al., 2002). The model assumes that that this cognitive bias is most similar to selective interpretation biases where the individuals engage in biased interpretations of the stimuli and situations and arrive at conclusions at which people with positive body image would not arrive. Please find an illustration of the model in figure 7.

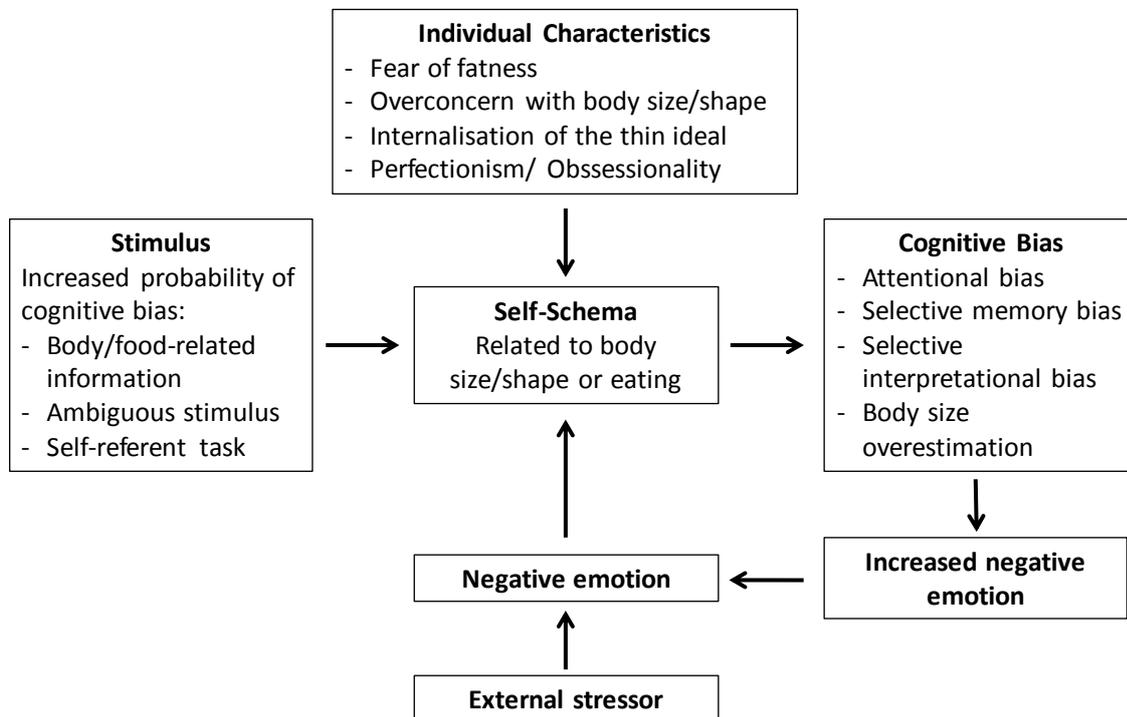


Figure 7. Cognitive model of body image as it applies to eating disorders, adopted from Williamson, Stewart, White, and York-Crowe (2002).

The information-processing model presumes that a cognitive bias is a function of a disordered body schema – not disordered eating behaviour. Thus, this theoretical model predicts that cognitive biases may develop not only in eating disordered individuals but also in individuals highly preoccupied with body size and shape (Williamson, Muller, Reas, & Thaw, 1999). The model hypothesises that specific stimuli, including body and eating-related stimuli, can activate self-schema related to body size, shape or eating in susceptible people. Individual characteristics such as fear of fatness, perfectionism and obsessionality are more specific to eating disorders, whereas the internalisation of the thin ideal and overconcern with body size, shape or eating can be found in the general female population. When the schema is activated by external stressors or the aforementioned specific stimuli, various cognitive biases may guide a person's cognitive processing, resulting in interpretations which can be at odds with reality but consistent with one's negative body image and thus result in

negative emotions. These negative emotions would then be fed back to the self-schema. If the above pattern of behaviour is repeated consistently for a long period of time, the developed memory networks for body-related information would become stronger and contain increasingly more negative information about one's own body, which would be processed and retrieved automatically and habitually, thus becoming more resistant to change. Body schema can be therefore treated as a mental shortcut for analysing and processing body-related information.

Information about bodies needs to be organised like any other socially acquired information. Schema development is affected by both external and internal experiences; with regards to body image, those external sources may include socialisation experiences, normative societal pressures to be thin for women or weight bullying and teasing, whereas one's internal experiences may relate to one's personality characteristics such as self-esteem and negative emotions regarding one's body. According to the sociocultural model of body image disturbance, the sociocultural pressures on attaining the thin ideal may lead to preoccupation with one's body size and shape, if one first internalises the ideal and equals one's self-worth with attractiveness and appearance. Therefore, linking the two models, sociocultural pressures may lead to one's preoccupation with size and shape, with the information about body size/shape, appearance and eating becoming self-relevant to the individual and being stored and organised in a form of a cognitive self-schema, which guides future information processing of such information. Although everybody will have a developed schema for their own body, for the individuals who have not internalised the thin ideal and did not develop body size and shape concerns, this schema will be more balanced and realistic, and would not bias one's cognitive processing of body-related information. For such persons, negative comments about their appearance would not have a negative impact on their self-concept. For a person with a negative body schema, on the other hand, a negative comment about one's looks, e.g. "this dress does not really fit you" would increase negative emotion and it would have a greater chance of being stored in memory and becoming integrated with one's negative self-concept.

In short, the information processing model posits that cognitive biases are content-dependent, i.e. people with eating disorders and high body image concerns would develop biases specifically towards body and eating related stimuli. In addition, the model proposes that normal-weight and underweight people without a clinical diagnosis can develop

cognitive biases which may approach the severity seen in eating disorders but which can be more easily modified.

Cognitive biases to body-related information

The historical influences on body image were sometimes conceptualised as the early developmental-causal factors (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999), which were already extensively reviewed while discussing the sociocultural theories. The proximal influences, on the other hand, are sometimes treated as maintaining factors (Thompson et al., 1999) and how the negative body image is maintained is a core issue for the cognitive-behavioural theorists of body image. The main assumption of the cognitive-behavioural models is that the processing of body-related information may be guided by the schemas related to appearance, size and shape (Cash & Labarge, 1996; Williamson, White, York-Crowe, & Stewart, 2004). The researchers, with the use of various cognitive tasks and methods, provided evidence for the existence and role of cognitive biases in maintaining the eating-disordered pathology (Faunce, 2002; Lee & Shafran, 2004; Siep, Jansen, Havermans, & Roefs, 2010; Williamson, Muller, Reas, & Thaw, 1999; Williamson, White, York-Crowe, & Stewart, 2004). The existence of cognitive biases of attention, memory, and judgement when faced with body-related stimuli in women with higher body image concerns has been documented and the empirical evidence for their existence and link to negative body image will be reviewed below.

Empirical studies provided support for the existence of cognitive biases and their role in the maintenance of various psychopathologies. Some of the most well-researched cognitive biases include attentional biases to threat in anxiety disorders (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van IJzendoorn, 2007) and memory biases for negative events in depression (Gotlib & Joormann, 2010). Early cognitive-behavioural theory of body image disturbance predicted that: eating-disordered individuals would present an automatic biased interpretation of body and eating-related information, the attention of such individuals would be drawn to body and food stimuli, and memory for body and eating-related events would be easily activated and recalled (Williamson, Muller, Reas, & Thaw, 1999). In short, the early theory predicted that in eating disordered individuals their attention, memory, and interpretation of ambiguous stimuli would be biased in favour of schema-congruent information.

Table 1. The main differences between the sociocultural, objectification, and cognitive-behavioural theories of body image disturbance, with comparisons between specific models for each theory added.

	Sociocultural theory	Objectification theory	Cognitive-behavioural theory
	Focus on sociocultural factors related to body image disturbance	Focus on objectification of the female body in relation to the prevalent body image disturbance in women	Focus on individual differences in psychological functioning in relation to body image disturbance
	Attractiveness and body ideals are sociocultural constructs	Attractiveness and body ideals are sociocultural constructs, with the female ideal being more pervasive in the sociocultural space	A person constructs their attractiveness and body ideals through own experience (historical and proximal factors)
	Internalisation of the sociocultural body ideals through upward social comparisons may lead to body image disturbance	Internalisation of the sociocultural body ideals through body surveillance may lead to body image disturbance	Biased cognitive processing of body-related information may lead to body image disturbance
	Criticised for its linearity and not enough focus on reciprocal relationships influencing a person's body image	Primarily concerned with women's body image	Explores the active side of socialisation and focuses on cognitive processes influencing a person's body image
<i>Dual pathway model</i>	Internalisation of the thin body ideal as the major mediating mechanism between the sociocultural pressures to be thin and the disturbed body image		
<i>Tripartite influence model</i>	Social comparison added as another important mediator of the above-mentioned relationship		
<i>Elaborated tripartite influence model</i>	Directionality of the relationship between thin-ideal internalisation, appearance-based comparisons, and body dissatisfaction	Acknowledges body surveillance as the mediator between thin-ideal internalisation and body dissatisfaction	
<i>Williamson's information processing model</i>			Body image concerns can lead to biased information processing of body-related information
<i>Cash's body image model</i>			Reciprocal relationships between external events, internal personal factors, and individual's behaviours relating to one's body image

In the past, the cognitive biases were thought to occur only in eating disordered individuals, however, more recently the researchers showed evidence that women high in body image concerns may also develop cognitive biases, which might be maintaining their negative body image (Rodgers & DuBois, 2016). A review of cognitive biases to appearance-related stimuli in body dissatisfaction (Rodgers & DuBois, 2016), which is the only such review published so far, confirmed the ample support for the connection between attention biases and body dissatisfaction and indicated a moderate support for memory and judgement biases in relation to body dissatisfaction. The review also shed some light on the nature of these cognitive biases and discussed the emerging distinct patterns of biases for “fat” versus “thin” stimuli. Attentional biases were the most researched, however the importance of memory and judgement biases, i.e. the encoding, recalling, perceiving and processing of the appearance-related stimuli, may also impact one’s negative body image (Williamson, White, York-Crowe, & Stewart, 2004).

An attentional bias occurs when a person is selectively attending to a specific class of stimuli (Mathews & MacLeod, 2005), for example body stimuli. Studies indicated that eating disordered women and those higher in body image concerns display attentional biases to body-related stimuli, with evidence for both increased attention to various body-related stimuli and their avoidance (Cooper, Anastasiades, & Fairburn, 1992; Cooper & Fairburn, 1992; Rieger et al., 1998; Shafran, Lee, Cooper, Palmer, & Fairburn, 2007; Smeets, Roefs, van Furth, & Jansen, 2008). These studies provided a link between negative body image and attentional biases, but the causality between cognitive biases, negative body image, and eating disordered symptoms could not be pinpointed.

Specific attentional biases to thin and fat stimuli were identified in women with higher body image concerns. Cho and Lee (2013) showed their participants thin, fat, normal, and muscular bodies simultaneously: male bodies for men and female bodies for women. An eye-tracker was used to measure an attentional bias, with a greater attentional bias being displayed by higher gaze duration and frequency towards one of the bodies, relative to the other bodies. The results showed that women higher in body dissatisfaction, in comparison with women low in body dissatisfaction, displayed an attentional bias to the thin bodies of their own gender.

Glauert, Rhodes, Fink, and Grammer (2010) used a dot-probe task to investigate selective spatial attention to thin and fat female bodies. The pairs of stimuli consisted of one thin and one fat female body, which were presented one above the other, for a short time. The participant's task was to respond as quickly as possible to a probe, which appeared in a space previously occupied by one of the bodies. The reasoning behind the dot-probe task is that a person displaying attention to one of the bodies (thin or fat) would be quicker to respond to the probe appearing later in the location of the body that was being attended to (faster reaction time). Attentional bias was measured as the difference in reaction times (only correct responses) to two possible probe locations – in the space of a thin or a fat body. The results indicated that the attentional bias was significantly negatively correlated with body dissatisfaction, indicating decreased attention to thin female bodies, as BMI and body dissatisfaction increased.

The patterns of attention for women higher in body image concerns were thus showed to be inconsistent, with such women showing increased attention towards thin female bodies (Cho & Lee, 2013), decreased attention to thin bodies as body dissatisfaction increased (Glauert, Rhodes, Fink, & Grammer, 2010), and sometimes the attentional patterns would not emerge at all (Jiang & Vartanian, 2012).

As attentional biases were suggested to play a causal role in the development of body image issues and eating-disordered symptoms (Williamson, White, York-Crowe, & Stewart, 2004) it is essential to investigate their nature, role and specificity. The more detailed discussion of the attentional bias research in eating disorders and body image will be included in the thesis' first empirical study (study 1), which was designed to investigate the specificity of attentional biases to thin and heavy bodies in individuals higher in body image concerns.

A memory bias is thought to occur when the individuals more easily encode and retrieve from memory information related to bodies and appearance, as compared with other types of information (Williamson, White, York-Crowe, & Stewart, 2004). In their study, Jiang and Vartanian (2012) investigated both attentional as well as memory bias towards body-related stimuli. They used a visual search task to investigate attention, and a recognition task to investigate memory biases in restrained eaters. Attentional allocation to the images of thin and overweight bodies was measured by tracking the eyegaze of the

participants. The participants were asked to press a spacebar whenever a blue triangle appeared onscreen, and their response and reaction time were recorded. Averaged fixation durations for each image type (thin, overweight, and control) were used as a measure of an attentional bias. The results showed no difference between the group of restrained and unrestrained eaters in their fixation durations to the images of thin and overweight bodies.

Memory for the images was tested in a recognition task. The participants were presented with 20 images of “old” images per category, and 20 images of “new” pictures for each of the three categories (120 trials in total). The memory performance was measured with a combination of both hits and false alarms in a signal detection analysis – measure of sensitivity (d'). A higher sensitivity score indicated more accurate and selective recognition. Restrained eaters had significantly higher sensitivity scores than unrestrained eaters for the images of thin as well as overweight bodies, thus indicating a memory bias towards body-related images in a group of restrained eaters.

Evidence for the existence of memory biases is more modest than for attentional biases and the recent review (Rodgers & DuBois, 2016) illustrated that the results from the studies investigating memory biases were mixed but, in general, indicated that memory biases for appearance-related words are present in individuals higher in body image concerns, as compared with individuals lower in these concerns (Altabe, Wood, Herbozo, & Thompson, 2004; Baker, Williamson, & Sylve, 1995; Chen & Jackson, 2005; Labarge, Cash, & Brown, 1998).

More specifically, in comparison with individuals lower in body image concerns, the individuals higher in these concerns exhibited greater memory performance for “fat” words and weaker memory performance for “thin” words (Rodgers & DuBois, 2016), which is consistent with the idea that negative self-relevant information is preferentially processed compared to positive information. However, it can only be assumed that the words were interpreted as self-referential and not as related to the outside world. More studies with the use of visual body stimuli, as in Jiang and Vartanian’s study (2012), instead of words could explain the nature of self-referential and other-referential biases in more detail.

Selective interpretation (judgement) bias is thought to occur when an individual interprets incoming information in a way that is consistent with his or her body self-schema, without considering alternative interpretations (Williamson, White, York-Crowe, & Stewart,

2004). For a person with high levels of body image concern, an ambiguous or uncertain situation might be interpreted in a negative way. It has been suggested that body size estimation might be a type of judgement bias, where a person interprets and evaluates their body in a biased, negative manner, usually overestimating their body size. For a person with negative body image, even the most mundane activities, such as putting on clothes, can cause the retrieval of negative emotions and memories regarding one's body, which may result in biased evaluations – thinking and feeling that one is larger and more unattractive than in reality (Williamson et al., 2004). A judgement bias is also expressed when, for instance, an individual automatically ascribes positive traits and attributes to others (thin, attractive) but negative traits to themselves (fat, ugly).

Heightened tendency to interpret ambiguous situations as appearance-related and negative was found in overweight children (Jansen, Smeets, Boon, Nederkoorn, Roefs, & Mulkens, 2007) and individuals with eating disorders (Cooper, 1997). Only a few studies investigating the relationship between judgement (interpretation) biases towards appearance-related stimuli and body dissatisfaction exist (Rodgers & DuBois, 2016). A study by Jackman, Williamson, Netemeyer and Anderson (1995) demonstrated that non-clinical weight-preoccupied participants presented with ambiguous scenarios interpreted the scenarios in a way that was congruent with their heightened body size and shape concerns, i.e. in favour of negative and fatness interpretations. In line with the above study, men and women with high levels of appearance concerns were found to interpret ambiguous words (Rosser, Moss, & Rumsey, 2010) and sentences (Martinelli, Holzinger, & Chasson, 2014) as appearance-related and of negative valence.

A study by Rosser, Moss and Rumsey (2010) investigated attentional and interpretation biases and measured the participants' appearance concerns. Attentional bias was investigated with a use of the dot-probe task, where pairs of two words, appearance- and nonappearance-related, were presented for 500ms, and the reaction times for the response to the probe were measured. The interpretation bias was investigated with a word categorisation task, where the participants were supposed to categorise the words into "appearance-related" and "nonappearance-related" category, and later into the "negative", "positive", or "neutral" category. The results suggested that people with higher appearance concerns are more inclined to interpret ambiguous stimuli as both negative and appearance-

related (interpretation bias), while also preferentially attending to the negative and appearance-related information (attentional bias).

A more recent study by Martinelli, Holzinger, and Chasson (2014) used the Word Sentence Association Paradigm (WSAP) to investigate the link between body dissatisfaction and interpretation biases. In the task, the female participants were presented with a phrase/word for 750ms, which represented either a negative (e.g. "fat") or benign (e.g. "thankful") interpretation. After the phrase disappeared, the participants were shown an ambiguous scenario on the screen (e.g. "Your doctor tells you that you are at a healthy weight"). The participants were asked to press 1 if they thought the phrase/word and the ambiguous scenario were related or 3 if they thought the two were unrelated. An interpretation bias was measured by an interpretation bias score, which was the number of the participant's neutral interpretations subtracted from the number of the participant's negative interpretations – the higher the score, the higher the endorsement of negative associations between word/phrase and ambiguous sentences. The results indicated that higher IB-score was associated with higher levels of body dissatisfaction.

Taken together, the experimental studies show that individuals with higher levels of appearance concerns are more likely to interpret some aspects of their environment as appearance-related and select negative/maladaptive interpretations of ambiguous stimuli and situations, disregarding other, more adaptive alternatives (Altabe, Wood, Herbozo, & Thompson, 2004; Cooper, 1997; Jackman et al., 1995; Martinelli, Holzinger, & Chasson, 2014; Rosser et al., 2010).

The theoretical accounts and the previously reviewed studies indicate that individual differences in body image concerns can influence the performance on cognitive tasks and the individuals higher in body image concerns can exhibit cognitive biases of attention, memory, and judgement, which, in turn, may be maintaining their negative body image (Rodgers & DuBois, 2016). Thus, the elimination of these cognitive biases might be crucial to improvement of negative body-related thoughts and feelings. The cognitive biases can be modified through either a more traditional cognitive-behavioural therapy or more experimental cognitive bias modification (CBM) techniques, which will be described in the following paragraphs. The evidence for another important assumption of the cognitive-

behavioural theories of body image will be reviewed – that cognitive biases can be modified, which can result in improvement of one's negative body image.

Cognitive-behavioural therapy (CBT)

One of the most popular and validated cognitive-behavioural treatment strategies is described in detail in a self-help manual designed to aid people in improving their thoughts and emotions about their body image (Cash, 2008). A crucial aspect of this self-help programme focuses on successful identification of and challenging the cognitive errors and negative thoughts related to evaluation of one's own appearance. Cognitive processes of the individuals with negative body self-schemas may reflect various errors or distortions, including dichotomous thinking, emotional reasoning, biased social comparisons, arbitrary inferences, overgeneralisations, over-personalisation, magnification of perceived defects, and minimisation of assets (Cash, 2002). Cash (2008), for example, used the term "unfair to compare" to describe a cognitive error similar to upward appearance comparisons, which involves the individuals selectively noticing and comparing with people possessing superior attributes to their own (e.g. thinness, attractiveness). The choice of an unrealistic appearance ideal is also a type of cognitive error where the superior, unrealistic ideal is regarded as a standard of acceptable appearance for the self. The above-mentioned cognitive errors may result in exacerbation of one's negative body image.

One of the main goals of the cognitive-behavioural therapy (CBT) is to modify these cognitive errors, maladaptive thoughts, and schemas. The patients are taught to detect, specify and challenge their automatic negative thoughts by engaging in effortful "for" and "against" review of the evidence for the patients' negative interpretations which lead to negative thoughts. The patients take on various cognitive and behavioural tasks aimed at challenging the dysfunctional assumptions and interpretations (Fairburn, Marcus, & Wilson, 1993). However, even though the cognitive-behavioural therapy has been shown to be successful in alleviating the symptoms of eating disorders and disturbed body image problems (Jarry & Cash, 2011; Murphy, Straebl, Cooper, & Fairburn, 2010), the precise mechanisms behind the symptom improvement and their relation to cognitive biases are not fully clear. For instance, it has been shown that the attentional biases reduced after 20 weeks of standardised cognitive-behavioural treatment for eating disordered patients (Shafran, Lee, Cooper, Palmer, & Fairburn, 2008). However, the change in the bias was not

closely associated with the change in the symptoms. It was suggested that the treatment may affect the way people process the information regarding size, shape and eating, independently of the change in behaviour.

Cognitive bias modification

In the past, although the evidence for the existence of cognitive biases existed, their exact nature and role in the maintenance of negative body image were not fully understood. With the increase in popularity of using cognitive biases modification (CBM) techniques to investigate body image, the causal role of cognitive biases in the development of negative body image started to gain more evidence. CBM is based on the assumptions of the cognitive-behavioural models which emphasise social learning processes and cognitive mediation of behaviours and emotions (Cash, 2011). As explained by MacLeod and Mathews (2012), the CBM research has three main targets: to investigate the causal nature of cognitive biases in various psychopathologies, to manipulate cognitive biases with the aim of examining their fundamental mechanisms, and to be potentially used as a therapeutic or preventive tool. Cognitive bias modification is a technique which sets out to modify the maladaptive processing biases through computerised training, showing potential for effective use in clinical practice. CBM techniques usually involve repetitive presentation of trials with an aim of adopting a well-rehearsed processing style, which is no longer maladaptive (Koster & Hoorelbeke, 2015).

In the recent years, the investigations focused on manipulating the cognitive biases associated with a specific psychopathology (mainly interpretation or attentional biases in emotional disorders) and investigating the effect of the manipulation on the symptoms (e.g. negative mood, anxiety) (Woud & Becker, 2014). There exists robust evidence that cognitive biases can be modified (Woud & Becker, 2014) and the novel experimental techniques were shown to have effects on directly manipulating the cognitive bias (Grey & Mathews, 2000; MacLeod, Rutherford, Campbell, Ebsworthy, & Holker, 2002; Mathews & MacLeod, 2002). There is growing literature on cognitive bias modification with regards to various psychopathologies, including depression (Hallion & Ruscio, 2011; Penton-Voak, Bate, Lewis, & Munafò, 2012; Williams et al., 2015; Yiend, Lee et al., 2014), anxiety (Hakamata et al., 2010; MacLeod, Fox, & Koster, 2009) as well as eating disorders (Cardi et al., 2015; Yiend, Parnes, Shapherd, Roche, & Copper, 2014). Research using CBM techniques to alter a

specific bias in body processing is a new but developing field. Based on the successful use of CBM techniques in different psychopathologies, it was expected that CBM techniques used with the aim of improving negative body image symptoms will also be successful. Empirical evidence indicated that alleviating the eating-disordered symptoms can be possible with the use of cognitive training (Yiend, Parnes et al., 2014). Study 2 designed for this thesis investigated the effectiveness of a CBM technique on improving body satisfaction in women higher in body image concerns.

Critique of cognitive-behavioural theories

Although there exists ample support for the presence and successful modification of cognitive biases, there is a causality issue surrounding cognitive bias research. Cognitive-behavioural theories of body image consider directional or reciprocal relationships among specific dimensions of body image, such as appearance-related concerns, a person's level of schematicity, and negative emotions (Cash, 2002, 2011; Williamson, Stewart, White, & York-Crowe, 2002). Most of the existing research which aims to specify the individual factors of eating disorder pathology has either correlational or cross-sectional design. With these types of design, the direction and causal influences of the cognitive biases on eating disorder symptoms cannot be inferred.

The studies which investigate causality, such as these utilising CBM techniques, should be interpreted with caution though. It is difficult to pinpoint whether a cognitive bias causes a particular behaviour or disorder, or whether it is a by-product of the existing disorder. When discussing schemas, cognitive biases and their relation, an argument relies on the assumption of the feedback loop between the two, without giving much direct evidence for the existence of schemas. Specifically, behavioural evidence (e.g. disordered eating, body checking, avoiding social situations) of a cognitive bias implies that a particular schema exists, with this schema being then used to account for the observed cognitive bias (Fiske & Taylor, 2013). Cognitive biases could be forming a feedback loop with the disordered emotions, thoughts and behaviours and be taking part in maintaining those cognitive, emotional and behavioural distortions. If cognitive biases were found to be just an effect of the developed disorders they would have much less utility in clinical therapy, therefore their exact nature and influence on the symptoms requires thorough investigation.

Thesis rationale

The previous sections provided a description of the theoretical models of body image, outlined the theories' important assumptions, and provided a summary of the empirical support for these theories. In the following sections, the main aim and hypothesis of the thesis along with a short summary of the empirical studies is provided.

As was described in the general introduction, body image disturbance (BID) consists of a perceptual distortion of body size as well as a cognitive-evaluative dysfunction, which concerns one's negative and irrational thoughts and feelings related to the body and can result in higher body image concerns. This thesis focused on exploring the relationship between the cognitive-evaluative dysfunction and specific cognitive body biases. The main aim of the thesis was to identify the specific cognitive body biases in young females, explore their relationship with one's level of body image concerns and weight status, and refer the findings to the well-established theories of body image, including cognitive-behavioural, sociocultural, and objectification theories.

In the past investigations of cognitive biases to body-related stimuli, the distinction between thinner and heavier bodies was not always taken into account, with the focus falling on investigating the general biases to appearance or non-appearance related stimuli. More recently, however, the distinct patterns of cognitive biases towards "fat" (heavy) and "thin" stimuli emerged (Chen & Jackson, 2013; Gao et al., 2013, 2014; Glauert, Rhodes, Fink, & Grammer, 2010). In this thesis, the distinction between thin and heavy bodies will be taken into account, with the specific patterns of processing biases towards bodies varied in size being investigated. In all empirical studies, only visual computer-generated body stimuli will be used, instead of word stimuli or silhouettes, to allow for the maximum control over the stimuli. In line with the theoretical accounts of body image development, women higher in body image concerns are thought to construct a negative self-schema for their own body and a positive schema for the bodies of others, which organise the processing of body-related information. Thus, the distinction between the stimuli as being either self- or other-referential is crucial to body image investigations. In this thesis, apart from including the differentiation between the thin and heavy stimuli, the relation of the stimuli to the self will also be taken into account.

This thesis examines whether high levels of body image concerns affect cognitive processes associated with perception, attention, interpretation, and evaluation of specific social stimuli – thin and heavy bodies. When writing about a negative body image or a high level of body image concerns, the author of this thesis refers to any above-average scores in a pathological direction on the questionnaires measuring body image and eating-disordered symptoms, such as dietary restraint, thin-ideal internalisation, drive for thinness, or body dissatisfaction. Thus, the main hypothesis for the thesis is that women with higher body image concerns will display cognitive biases to body size in general (attentional bias to thin bodies, positive thinness and negative heaviness bias) and towards their own bodies (the choice of unrealistic ideals, inaccurate body size estimation).

Summary of empirical studies

The summaries of findings for each empirical study are outlined below. The theoretical and practical implications of the below findings are discussed in the thesis, in relation to the sociocultural, objectification, and cognitive-behavioural theories of body image, to provide more information on the nature of a biased body processing in the young female population.

Study 1: Attentional biases to thin and heavy bodies

In study 1, the spatial distribution of attentional resources when faced with social stimuli (bodies) and the overt attitudes to thin and heavy female bodies were investigated in young women with varying levels of body image concerns. The aim was to identify distinct patterns of attentional biases to thin and heavy bodies. Although specific attentional biases to bodies varied in size were not identified, a positive thinness bias in women with higher levels of body image concerns was found, which I argue plays a role in the maintenance of these body image concerns.

Study 2: Cognitive bias modification of body size interpretation

In study 2, the relationship between the general body biases and personal body image was investigated further. In this study, the participant's interpretation of body size was manipulated through a cognitive bias modification task. The study supports the ideas of malleability of body size norms and body ideals and suggests that manipulating the

interpretation of body size can affect the attitudes towards bodies and improve personal body image.

Study 3: Body size biases towards own and opposite gender

In study 3, the appraisal of bodies of own and opposite gender was investigated to provide more information on the link between personal body image and other-relevant cognitive biases to thin vs. heavy (females) and thin vs. muscular (males) bodies. In line with the objectification theory, both men and women were found to objectify the female body more than the male body, and the young men were found to express a positive thinness bias towards female bodies of the same magnitude as women but it was not greater for men with higher body image concerns. The study showed that the link between personal body image and the attitudes towards bodies of own gender does not transfer to the attitudes towards the bodies of the opposite gender, providing more information on the nature of connection between self-relevant and other-relevant cognitive biases.

Study 4: Self-referential body size biases

Study 4 investigated the attitudinal evaluation of own body size in reference to the chosen body ideals. Specifically, it investigated the connection between the individual's body image concerns and BMI and the evaluative bias towards one's own body (over-/underestimation of body size) as well as the choice of body ideals. The results showed that one's weight status (BMI) is an important factor influencing the accuracy of own body size estimation, the discrepancy between the estimated body size and the ideal size, and the discrepancy between the weight and visual body ideals. A more pronounced estimated-ideal discrepancy was related to higher body image concerns at all levels of the participants' BMI: normal, overweight, and obese. However, the magnitude of the estimated-actual BMI (over-/underestimation) and the visual ideal-weight ideal discrepancies were related to the level of body image concerns only for the women of heavier weight.

CHAPTER 2 - Study 1

Introduction

According to cognitive-behavioural theories, when people become very concerned with their looks, weight or shape, they might process body-related information differently from people without these concerns. Therefore, if a person thinks that bodies should be thin and one should aspire to obtain a thin body, this may result in paying more attention to thin bodies and to information confirming that bodies should be thin. In accordance with these cognitive theories, restrained eaters are thought to have more organised strategies for processing body-related information than unrestrained eaters (Jiang & Vartanian, 2012). The restrained eaters' self-schemas were also shown to relate more to weight and food-related concepts than the schemas of controls (Morris, Goldsmith, Roll, & Smith, 2001). It has been suggested that selective attention might play a causal role in worsening the symptoms of eating disorders, such as body dissatisfaction and dieting. However, there is also a possibility that the symptoms might intensify the attentional biases (Smith & Rieger, 2009). Thus establishing more specific attentional biases and investigating the relationship between them and the symptoms might prove very useful for the treatment of eating disorders as well as alleviating the symptoms of negative body image and disordered eating in at-risk populations. Although the existence of attentional biases to food in restrained eaters is well-documented (e.g. Hollitt, Kemps, Tiggemann, Smeets, & Mills, 2010; Neimeijer, de Jong, & Roefs, 2013), a few studies so far have investigated an attentional bias to body size and shape in people high in dietary restraint.

The study will investigate:

- 1) The relationship between the level of dietary restraint and negative body image, including body dissatisfaction, drive for thinness, body size/shape concerns, as measured by various questionnaires (DEBQ, EDI-3 & BSQ-34)
- 2) The differences between women high and low in dietary restraint with regards to attention and attitudes to bodies varied in size (attentional dot-probe task and ratings of attractiveness, normality, and closeness to body ideal)

Our own body image is constructed through self-observation, appearance comparisons and it can also be influenced by others' perspectives and opinions on

appearance ideals, which is consistent with the previously-described sociocultural and objectification theories of body image. Social comparison is one of the proposed mechanisms through which thin-ideal internalisation leads to increased levels of body dissatisfaction; selective attention has also been implicated to play a causal role in increased feelings of body dissatisfaction (Smeets, Jansen, & Roefs, 2011; Smith & Rieger, 2006). Individuals higher in body image concerns were shown to express positive attitudes towards thinness and negative attitudes towards heaviness (Cho & Lee, 2013), engage in more upward body comparisons (Schaefer & Thompson, 2014) and be more negatively affected by exposure to thin bodies (Groesz, Levine, & Murnen, 2002; Hausenblas et al., 2013). Prioritising socially relevant objects is one of the functions of visual attention (Fox, 2005) and for women who have higher levels of body image concerns such socially relevant objects would be bodies, especially thin ones (Glauert, Rhodes, Fink, & Grammer, 2010). The thin and attractive bodies would be the stimuli that these people would seek out in the environment and pay more attention to for the purpose of social comparison. Visual attention would be crucial for allowing direct comparisons of one's body with the bodies of others thus it is hypothesised to play an important role in the relationship between social comparison tendencies and body dissatisfaction. Attentional bias to thin and heavy bodies is the focus of this empirical study. The evidence for the existence of attentional biases to bodies in both eating disordered population and individuals higher in body image concerns, to which a group of restrained eaters belongs, will be reviewed below.

Out of all cognitive biases, the attentional bias was most widely researched. An attentional bias is a tendency to selectively attend to a certain class of stimuli, for example disorder relevant stimuli (Mathews & MacLeod, 2005), such as threatening animals or angry faces in anxiety disorders. A variety of methods have been used over the years to investigate the attentional biases to food and bodies in normal eaters, restrained eaters, dieters and eating disordered populations. Most notable paradigms include the emotional Stroop tasks, visual search, dot-probe tasks, or eye-tracking. Recently, also EEG has been used to investigate motivated attention to underweight bodies in girls with anorexia nervosa (Horndasch, Heinrich, Kratz, & Moll, 2012). Most of the results from the modified Stroop task indicated that eating disordered individuals presented an increased Stroop interference for eating and shape-related words and pictures (Dobson & Dozois, 2004). However, the modified (emotional) Stroop task have been criticised as a measure of selective attention

(Faunce, 2002; Lee & Shafran, 2004). First of all, not a lot of attention was given to investigate and explain the exact mechanism behind the Stroop interference. It is unclear whether the interference effect can be used as an evidence of a mood-congruent attentional bias, or cognitive avoidance (De Ruiter & Brosschot, 1994). Faunce (2002) suggested that, at best, the Stroop task is an indirect measure of a cognitive bias, and it presents a difficulty in interpreting whether attention is directed towards or away from the target stimuli. Given the methodological limitations of the Stroop task, the focus will fall on studies which applied different methods (e.g. dot-probe task, visual search) in the following paragraphs.

Attentional bias in eating disorders

Several reviews showed the existence of cognitive biases in eating disorders (Brooks, Prince, Stahl, Campbell, & Treasure, 2011; Dobson & Dozois, 2004; Faunce, 2002) but these have largely focused on eating-disordered behavioural outcomes, such as restrictive diet or purging, and reviewed the use of food-related stimuli. Below, only the cognitive biases to appearance-related stimuli will be reviewed.

Rieger and colleagues (1998) were the first to use a dot-probe task to investigate attentional biases in eating disorders. They showed that attention in anorexics might be biased towards words implicating fat physique and away from words related to thin physique, as well as towards negative word stimuli and away from positive word stimuli. They concluded that people with eating disorders are “more likely to attend to information consistent with fatness and to ignore information consistent with thinness” (Rieger et al., 1998). However, they used only words, which are considered to provide a more fragile index of attentional bias; pictures are suggested as a better choice of stimuli (Mogg et al., 2000).

At the beginning of research into attentional biases in eating disorders, most studies relied on word stimuli, which limited the external validity of those studies. However, more and more studies nowadays tend to use pictorial stimuli, including photographs and computer-generated bodies. In another dot probe task, Shafran, Lee, Cooper, Palmer and Fairburn (2007) used coloured photographs from the internet and showed that patients with bulimia nervosa and anorexia nervosa responded faster to the probe when it appeared in the same location as the negative eating stimuli and neutral weight stimuli, as well as the negative and neutral shape stimuli. On the other hand, the patients responded slower to a probe when it appeared in the same location as positive eating stimuli. They found no

attentional bias towards positive weight-related stimuli (e.g. thin bodies). These findings showed an attentional bias towards negative eating and shape stimuli and away from positive food stimuli, which seems to be consistent with the findings of Rieger and colleagues (1998).

In a visual search and detection task, Smeets, Roefs, van Furth and Jansen (2008) compared eating disordered patients and healthy controls. They used word stimuli and found speeded detection for body-related information, but lack of distraction by the same body-related information. It was suggested that the body-related stimuli might be in fact threatening to the eating disorder patients, who showed initial vigilance to the bodily stimuli (speeded detection) but not distraction, which marks a possible avoidance response. This avoidance response seems to be consistent with the previous findings from emotional Stroop tasks, where both people with eating disorders (Cooper, Anastasiades, & Fairburn, 1992) and restrained eaters (Cooper & Fairburn, 1992) needed more time to name the colour of the words relating to their body concerns in comparison to the neutral words.

Attentional bias in non-eating disordered samples

As mentioned before, the existence of attentional biases was also showed in individuals without an eating disorder diagnosis. One of the more recent studies have used 3D images of various types of bodies (normal, fat, thin, and muscular) and both sexes (Cho & Lee, 2013). The results showed more frequent attention (measured by gaze durations and fixation frequencies) to muscular bodies in men higher in body dissatisfaction, and increased attention to thin bodies in more dissatisfied women. Also, both sexes rated thinner and more muscular bodies as more attractive. Therefore, both sexes showed an attentional bias towards the body types that they rated as more attractive. Although only healthy people, with different levels of body satisfaction, were used in the study, it provided evidence for the relationship between body satisfaction, attentional bias to bodies, and sociocultural influence on body perception.

The results of Smith and Rieger's study (2009) showed that inducing an attentional bias towards negative shape and weight related information in normal population exacerbated state body dissatisfaction. In another study, Smith and Rieger (2010) attempted to test the opposite relationship and induced body dissatisfaction to observe its effect on attention towards negative shape and weight information. A normal sample and a dot-probe

task were used. Contrary to expectations, the induced body dissatisfaction did not trigger selective attention to negative shape and weight stimuli. Therefore, Smith and Rieger suggested that although inducing attentional bias has an effect on body satisfaction (Smith & Rieger, 2006, 2009) the reverse might not be the case. In an experiment by Smeets, Jansen and Roefs (2011), normal participants were trained to attend to their attractive and unattractive body parts and their body satisfaction was measured. The results showed that the body satisfaction of women trained to attend to their unattractive body parts significantly decreased, which provided further support for the causal role of selective attention in body dissatisfaction.

Another recent study investigated the attentional biases to body size in women with body dissatisfaction (Glauert, Rhodes, Fink, & Grammer, 2010). The researchers used a modified dot-probe task and displayed fat and thin bodies together to see which type of body will capture a woman's attention when faced with both types of stimuli. The study showed that all women, regardless of their BMI, level of body dissatisfaction and internalisation of the thin ideal, were faster to respond to the probe located in the position of the thin body, which might suggest that attentional bias towards thin bodies might be a universal characteristic of a contemporary woman's behaviour. Surprisingly, more dissatisfied women showed a reduced bias to thin bodies compared to less dissatisfied women, which could be a possible avoidance response, but it is contrary to the idea that body dissatisfied women would attend to thin bodies in the environment for the purpose of upwards social comparison. Contrary to predictions, the study did not support the view about the causal role of selective attention in body dissatisfaction.

The most recent studies investigated the attentional biases towards different body sizes and shapes by using simultaneous presentation of computer-generated 3D images and measured eye-gaze durations and fixation frequencies (Cho & Lee, 2013) or used the dot-probe task (Glauert, Rhodes, Fink, & Grammer, 2010). Another recent study by Jiang and Vartanian (2012) used a visual search task to compare the visual attention towards thin and overweight bodies between restrained and unrestrained eaters. By measuring the eye gaze of participants, it was concluded that restrained eaters allocated more attention to body-shape stimuli in comparison to neutral stimuli (here, plants were used), but contrary to predictions unrestrained eaters showed a similar pattern of attention.

The above studies and multiple reviews presented an extensive support for the existence of attentional biases towards appearance and body image-related stimuli in eating disorder individuals (for reviews see: Faunce, 2002; Lee & Shafran, 2004) and individuals with higher body image concerns (for a review see: Rodgers & DuBois, 2016). However, the patterns of attention were shown to vary depending on the type of stimuli used (thin vs. heavy) and the relevance of the stimuli to the self (self-referential vs. other-referential), which shows the importance of separating these conditions in future studies of cognitive bias to body-related stimuli.

The findings investigating the relationship between attentional bias and body dissatisfaction are mixed and inconclusive. In addition, the variety of methods (emotional Stroop, dot-probe task, visual search, eye-tracking) and stimuli (words, pictures, 3D images) used in the studies of eating disordered patients, normal samples and restrained eaters make it hard to compare the findings. This study will investigate the characteristics of and differences between individuals higher and lower in dietary restraint, with regards to selective attention and attitudes towards bodies varied in size.

The focus on women high and low in dietary restraint is based on previous findings, which showed that the group has higher levels of body image concerns than unrestrained eaters (van Strien, Herman, Engels, Larsen, & van Leeuwe, 2007; Vartanian & Hopkinson, 2010) and an increased drive for thinness (Hoffmeister, Teige-Mocigemba, Blechert, Klauer, & Tuschen-Caffier, 2012; Polivy & Herman, 1987), as measured, for example, by the EDI-3 drive for thinness scale. Restrained eaters are thought to internalise the societal standards of thinness more than unrestrained eaters, express more negative attitudes and beliefs towards fatness, and engage in social comparison more frequently than unrestrained eaters (Griffiths et al., 2000; Vartanian, Herman, & Polivy, 2005). Restrained eaters are characterised by a higher tolerance towards hunger and satiety (Herman & Polivy, 1983) and display higher cognitive control over eating (Fedoroff, Polivy, & Herman, 1997). Therefore, restrained eaters are expected to score in a more pathological direction than non-restrained eaters on various measures of body image and disordered eating. Due to restrictive food intake and high body image concerns, women high in dietary restraint can thus be regarded as a non-clinical group most closely resembling an eating-disordered (clinical) sample.

According to the social comparison theory, people with disturbed body image and low body satisfaction are likely to compare themselves with thinner people (upward comparison), which results in negative self-evaluation (Cattarin, Thompson, Thomas, & Williams, 2000; Heinberg & Thompson, 1992a); this idea agrees with the cognitive-behavioural model where people with the maladaptive body schema will regard themselves as inferior when faced with attractive bodies of other people. According to cognitive-behavioural theories, certain external and internal cues can activate schema-driven processing (Cash, 2002). Therefore, when the negative self-schema is activated and a person is faced with the idealised body types, the processing of such information will be guided by the schema and an attentional bias towards thinner bodies is likely to develop. Thus, women high in dietary restraint are hypothesised to display an attentional bias towards thinner female bodies, as it is likely to be consistent with their body schema (bodies should be thin, thin bodies are more attractive).

In this study, a dot-probe task was used to investigate the attentional biases to bodies in women high and low in dietary restraint. A dot probe task is used to measure selective attention to stimuli, and it was shown to be more reliable than an emotional Stroop task (Fauce, 2002). This paradigm was developed and introduced by MacLeod, Mathews & Tata (1986) to investigate attentional biases in emotional disorders, such as mood and anxiety disorders. Since then, the dot probe task became a popular paradigm to investigate selective attention to threat (e.g. Koster, Crombez, Verschuere, & De Houwer, 2004). In the task, the participants are told to respond to a probe, for example with a key press, which will appear either on the top or the bottom of the fixation cross (later, left and right presentations have been used). However, before the presentation of the probe, two cues appear on the screen simultaneously, one emotionally significant, and one neutral. The main assumption behind the task is that a person with an emotional disorder will respond faster to the probe if it was presented in a place of an emotional stimulus. Therefore, it shows whether a certain group of people (e.g. patients with eating disorders) have an attentional bias, i.e. selective attention to a certain class of stimuli (usually threatening or emotional), when presented at the same time as neutral stimuli. Unlike an emotional Stroop, a dot probe task allows for making inferences about the direction of an attentional bias. For example, when the response to the probe presented in the same location as the emotional stimuli is faster, it implies having an attentional bias towards this class of emotional stimuli. If, on the

other hand, the response to the probe presented in the same location as the emotional stimuli was slower, then it would imply an attentional bias directed away from this class of emotional stimuli. Thus three conclusions can be made: selective attention towards the location of the target, avoidance of the stimulus, or no significant attentional bias.

This study will be the first to examine the specificity of attentional biases to thin and heavy bodies varying in thinness/heaviness levels in individuals high in restraint, using a dot-probe task. The methodology of the current study will combine various features of the above-mentioned experiments and will aim to extend their findings. First of all, as the study will investigate attention to specific body sizes, only bodily stimuli will be used, and a normal sized body (with a BMI of 18.5) will be used as a 'neutral' picture. Secondly, computer-generated pictures of bodies will be used to reflect the maximum experimental control over the stimuli and direct the participants' attention only to size variations. Thirdly, the ratings of attractiveness, body normality (level of thinness/heaviness), and closeness to the participants' body ideal will be added after the dot-probe task is administered. This will allow for making conclusions about the nature of the attentional bias and whether the ratings (e.g. thinner bodies rated as more attractive) will match the attentional bias – attention directed towards the stimuli that the participants found attractive, as seen in Cho and Lee's (2013) study. The ratings will provide valuable information about the attitudes towards thin and heavy bodies of women high and low in dietary restraint. They will enable to either contradict or provide support for the findings that women higher in body image concerns express more positive attitudes towards thinness and more negative attitudes towards heaviness (fatness).

The following hypotheses were formed:

- 1) Dietary restraint will positively correlate with body dissatisfaction, higher drive for thinness, and more weight and shape concerns
- 2) Women high in dietary restraint are expected to rate the thinner female bodies as more attractive and closer to their ideal than the heavier bodies
- 3) Women high in dietary restraint are expected to display an attentional bias towards thinner bodies of other women

Methods

Participants

Eighty four female postgraduate and undergraduate students from the University of Hull, UK participated in the study. Two participants were removed as they were aged above 40. One participant was removed as the data collection was incomplete. One further participant was removed as she had a high number of inaccurate responses on the dot-probe task. The participants were between 18-33 years old. Forty eight participants were of healthy weight, 18 were overweight, 11 were underweight and 3 were obese. Three participants had a history of an eating disorder. The final sample consisted of 80 participants. All participants had normal or corrected to normal vision. The study has been approved by the Department of Psychology ethics committee, University of Hull.

Measures

Eating Disorder Inventory (EDI-3)

The latest version of the Eating Disorder Inventory was used in this study. Eating Disorder Inventory is a standardised and widely used self-report measure of psychological traits and constructs relating to eating disorders (EDI-3; Garner, 2004), where higher scores indicate a more severe eating disorder psychopathology. Participants were asked to indicate whether the items applied to them on a 6-point scale including always, usually, often, sometimes, rarely or never. Three scales of EDI-3 were of interest in this study: drive for thinness, bulimia, and body dissatisfaction. Drive for thinness scale (EDI-3 DT) assesses a preoccupation with dieting and fears about gaining weight; bulimia scale (EDI-3 B) assesses the tendency to overeat uncontrollably; body dissatisfaction scale (EDI-3 BD) assesses an overall satisfaction with one's shape and weight (Garner, 2004). The three scales are combined into the eating disorder risk composite, which provides a global measure of eating and weight concerns.

Body Shape Questionnaire (BSQ-34)

The Body Shape Questionnaire is a 34-item inventory designed to assess shape and weight concerns (BSQ; Cooper, Taylor, Cooper, & Fairburn, 1987). Respondents are asked to rate their experiences over the past four weeks on a 6-point Likert scale: 1 (never) to 6

(always). Each item is scored 1 to 6 and the overall score is the total across the 34 items (range: 34-204). The questionnaire includes general questions, such as “Have you felt ashamed of your body?” as well as more specific ones, for instance “Have you worried about your thighs spreading out when sitting down?”. The following norms have been used to distinguish between various levels of body shape concern: 34-80 – no concern with shape, 80-110 – mild concern with shape, 111-140 – moderate concern with shape, 140-204 – marked concern with shape. The Body Shape Questionnaire is a psychometrically sound measure, which includes high internal consistency among females, the ability to discriminate between women with bulimia nervosa and female controls, and significant correlations with other measures of body dissatisfaction.

Dutch Eating Behaviour Questionnaire (DEBQ)

The Dutch Eating Behaviour Questionnaire (DEBQ; van Strien, Frijters, Bergers, & Defares, 1986) assesses the patterns of an individual’s eating behaviour. The DEBQ contains separate scales for emotional, external, and restrained eating. In the current study, the restraint scale was used to determine the level of dietary restraint (eating less than desired) among the participants (please refer to table 2). DEBQ scale for restraint (DEBQ-R) has good predictive validity for the restriction of food intake, which was confirmed in a number of studies (e.g. Green, Rogers, Elliman, & Gatenby, 1994; Wardle, 1987). The scale contains 10 items, for instance “If you have put on weight, do you eat less than you usually do?” and “Do you try to eat less at mealtimes than you would like to eat?”, with response categories ranging from 1 (never) to 5 (very often).

Table 2. Norms for the dietary restraint scale of the DEBQ for healthy women.

Age group	21-40
Very high	≥ 4.01
High	3.51-4.00
Above average	3.23-3.50
Average	2.78-3.22
Below average	2.31-2.77
Low	1.30-2.3
Very Low	≤ 1.29

Beck Depression Inventory (BDI-II)

Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996) is a widely used, reliable and valid 21-item self-report instrument for measuring depression. The total score can range from 0 to 63 with higher scores indicating a higher symptom severity.

Stimuli and apparatus

The 3D program Poser Pro 2012 (Smith Micro Software, Inc.) was used to create all body stimuli: male and female bodies with varying degrees of thinness and heaviness. The bodies were only partially dressed to emphasise the body shape: male bodies wore briefs and female bodies wore a bra and briefs (see figure 8, 9 and 10). All body stimuli have front view, hands spread and held at the same height as the hips. Firstly, two neutral bodies (male and female) were created which served as a reference and a neutral stimulus in the dot-probe task. Two body types (thin and heavy) with 5 different levels of thinness and heaviness were created, for both genders. Therefore, the bodies can be arranged on a continuum starting with body number 1, which would be the thinnest body, body number 6 would be the reference, neutral body, and body number 11 would be the heaviest body type. There were 22 pictures created in total: 5 levels of thin bodies (1-5), 5 levels of heavy bodies (7-11) and one neutral body (6), with a total of 11 bodies, for both genders. Please refer to figures 8, 9 and 10 for examples of all body sizes used in the tasks. The images were 12.5 cm in height and 7.5 cm wide (from hand to hand) on the screen. The computer monitor was positioned at a distance of approximately 57 cm away from the participant. The vertical visual angle was 12.52° and the horizontal visual angle was 7.53°. The stimuli were presented on a 22-inch NEC FP2141SB monitor using E-Prime 1.2 (Psychology Software Tools, Inc.). The resolution was 1600 x 1200 and the refresh rate was 85Hz.

3D body analysis: BMI estimates

All female bodies were exported as an .obj file from Poser Pro 2012 in a so-called zero-pose (arms spread out and perpendicular to the body) and opened in 3ds max (autodesk.com). The body's height was set to 1.68 m (as this was the original height imported from Poser Pro 2012). To estimate the weight of the models a similar procedure was used as described in Crossley, Cornelissen, and Tovée (2012). The volumes of the 3D models were calculated by the software and then multiplied by the density of the average

young adult female body: 1.04 g/cm^3 (Pollock, Laughridge, Coleman, Linnerud, & Jackson, 1975). Finally, the BMI was calculated as the weight (in kilograms) divided by the square of the model's height (in metres). The estimated BMIs (kg/m^2) of the 11 stimuli can be found in table 3. The differences between the bodies were slightly smaller for the thin bodies (average = 0.82, range = 0.7-0.9) than for the heavy bodies (average = 1.18, range = 1.1-1.2). The BMIs of the male stimuli were not estimated as they were used just as filler items in the dot-probe task.

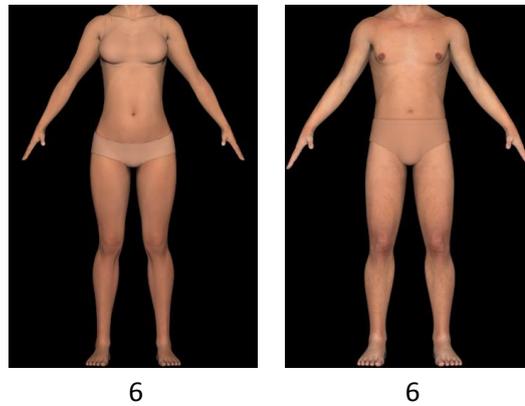


Figure 8. Neutral sized female and male body.

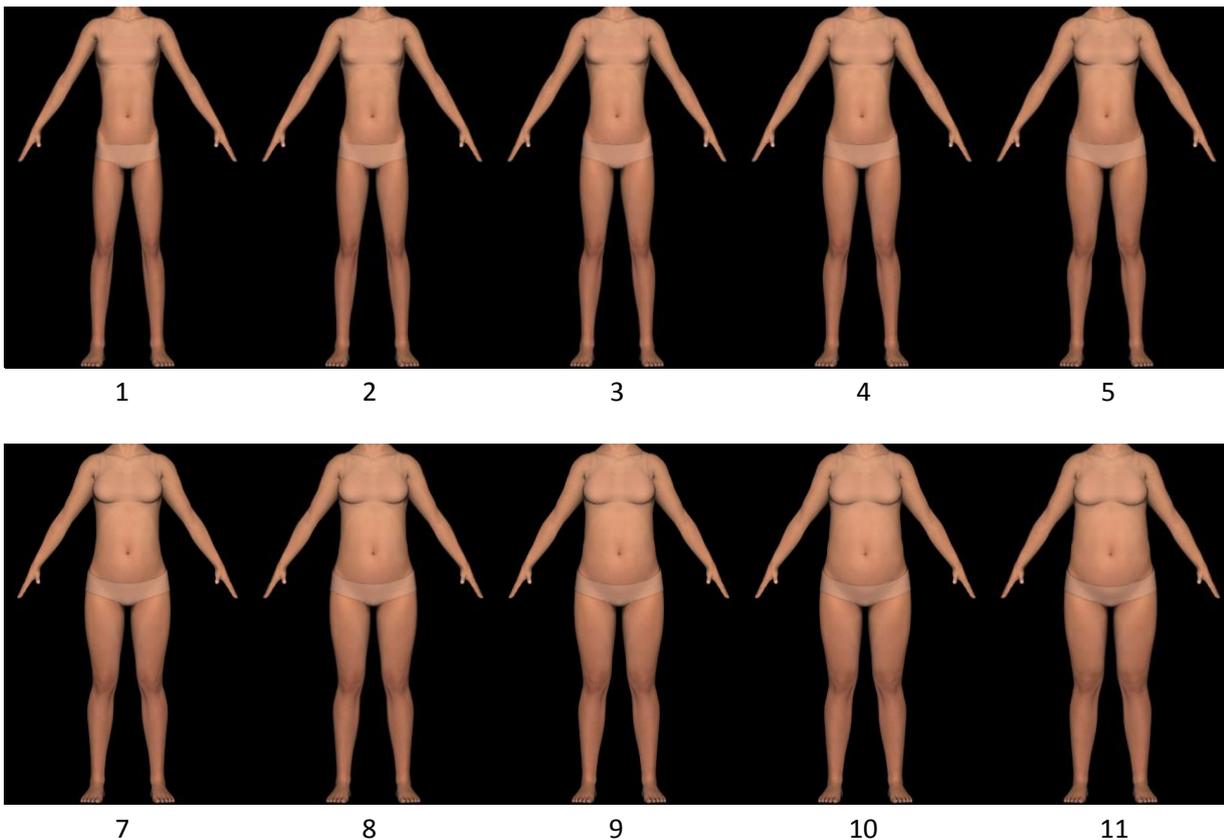


Figure 9. Both types (heavy and thin) and all levels (5 for each body type) of female body stimuli.

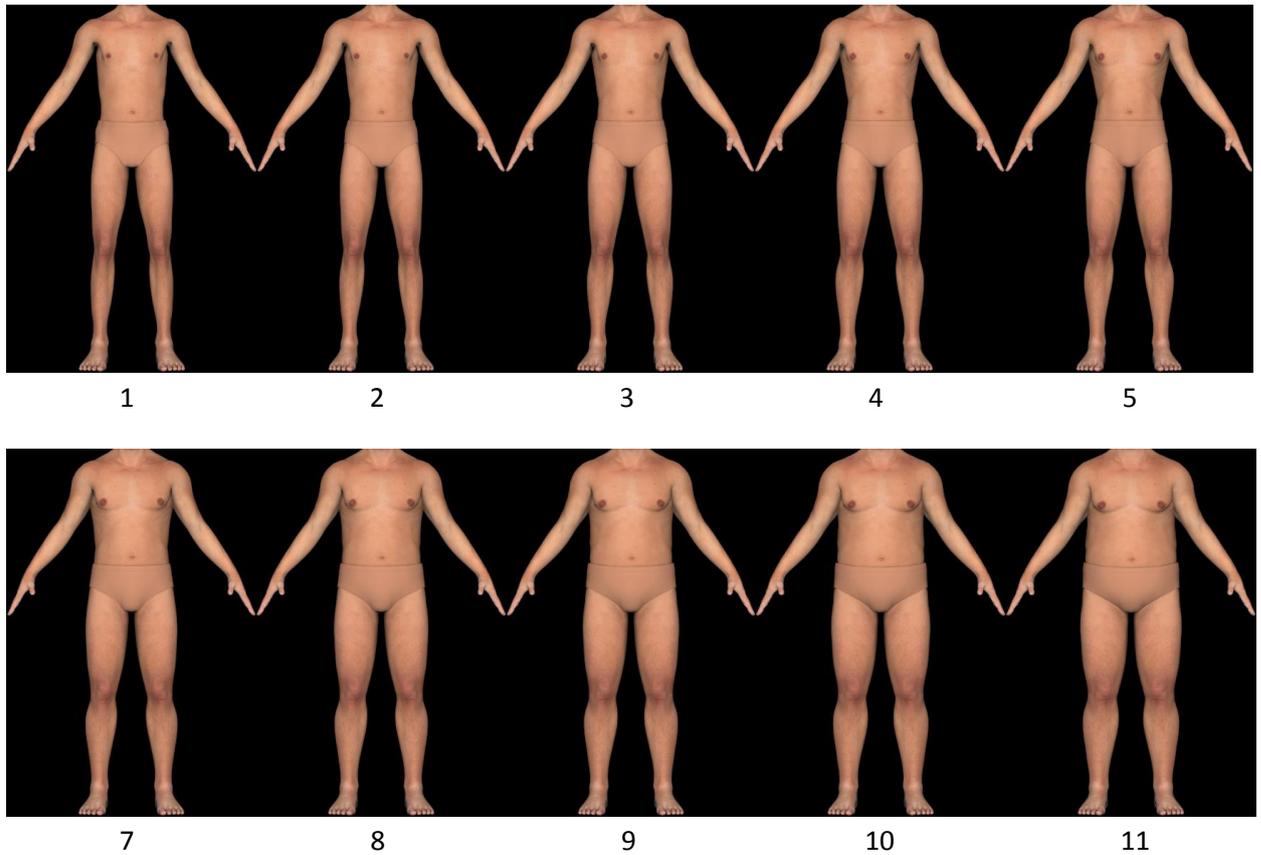


Figure 10. Both types (heavy and thin) and all levels (5 for each body type) of male body stimuli.

Table 3. Estimated body mass indices (BMIs) for all female stimuli.

Body number	Body type	Estimated BMI	BMI category
1	Thin	14.4	Severely underweight
2	Thin	15.2	Severely underweight
3	Thin	15.9	Severely underweight
4	Thin	16.8	Underweight
5	Thin	17.6	Underweight
6	Neutral	18.5	Underweight/Normal
7	Heavy	19.7	Normal
8	Heavy	20.8	Normal
9	Heavy	22	Normal
10	Heavy	23.2	Normal
11	Heavy	24.4	Normal/Overweight

Procedure

Dot-probe task

The participants were seated approximately 57 cm away from the monitor and were instructed to keep their eyes on a fixation cross and only use their peripheral vision to locate the dot in the task. Before the experiment started, the participants completed 10 practice trials. Each trial began with a central fixation cross shown for 1000 ms. Afterwards, two bodies appeared simultaneously on the left and right to the fixation cross for 500 ms. The distance between the centres of the two bodies was 11 cm. Next, a white dot, 0.5 cm in diameter, replaced one of the bodies. The participants had to identify its location (left or right) by pressing one of two response keys ('z' for left and 'm' for right) as quickly and as accurately as possible. Each probe appeared until a response was made (2000 ms max). After the response had been made, an interval of 500 ms followed and the next trial started.

In the dot-probe task the neutral bodies (6) were always paired up with one of the bodies varied in size, or with another neutral body (6), which served as a control trial. A heavy body (7-11) was never paired up with a thin body (1-5), and female bodies were never paired up with the male bodies. There were two experimental blocks – thin and heavy. The order of their presentation was counterbalanced. In the first block, only varying levels of thin bodies paired up with a neutral body were presented; in the second block only varying levels of heavy bodies paired up with the neutral body were presented. There were six pairs of female bodies in each block, body no. 6 - body no. 6, body no. 6 - body no. 1, body no. 6 - body no. 2, etc. (for the thin block), and, body no. 6 - body no. 6, body no. 6 - body no. 7, body no. 6 - body no. 8, etc. (for the heavy block). There were four different types of trials (configurations): congruent and incongruent, for both right and left side (please refer to figure 11).

The male bodies were presented in the same way as the female bodies, however, as they served as filler items and responses to the male bodies were not analysed, the pairs of male bodies were presented just twice, instead of four times, within each block. Therefore, there were 288 trials in total per participant: 192 female body trials (6 pairs of stimuli x 4 configurations x 4 presentations x 2 blocks) and 96 male body trials (6 pairs of stimuli x 4 configurations x 2 presentations x 2 blocks). The entire task took 15 minutes to complete.

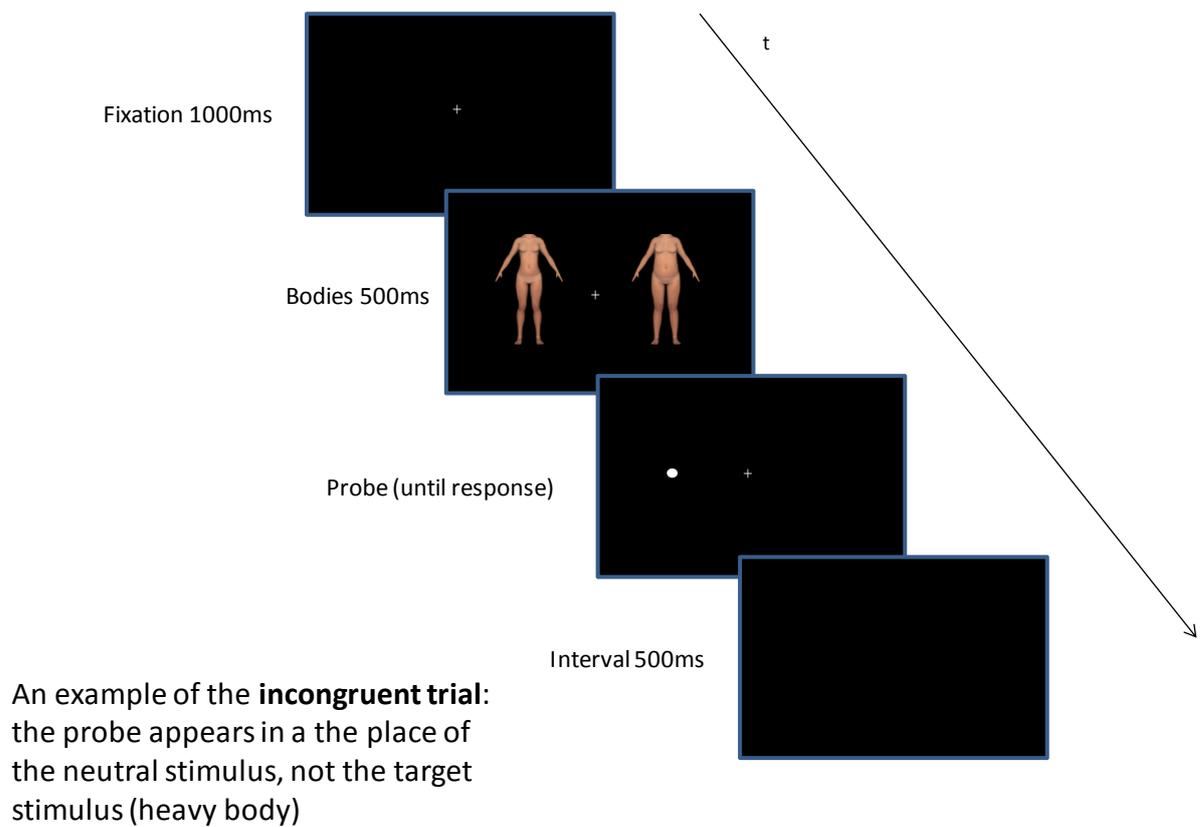
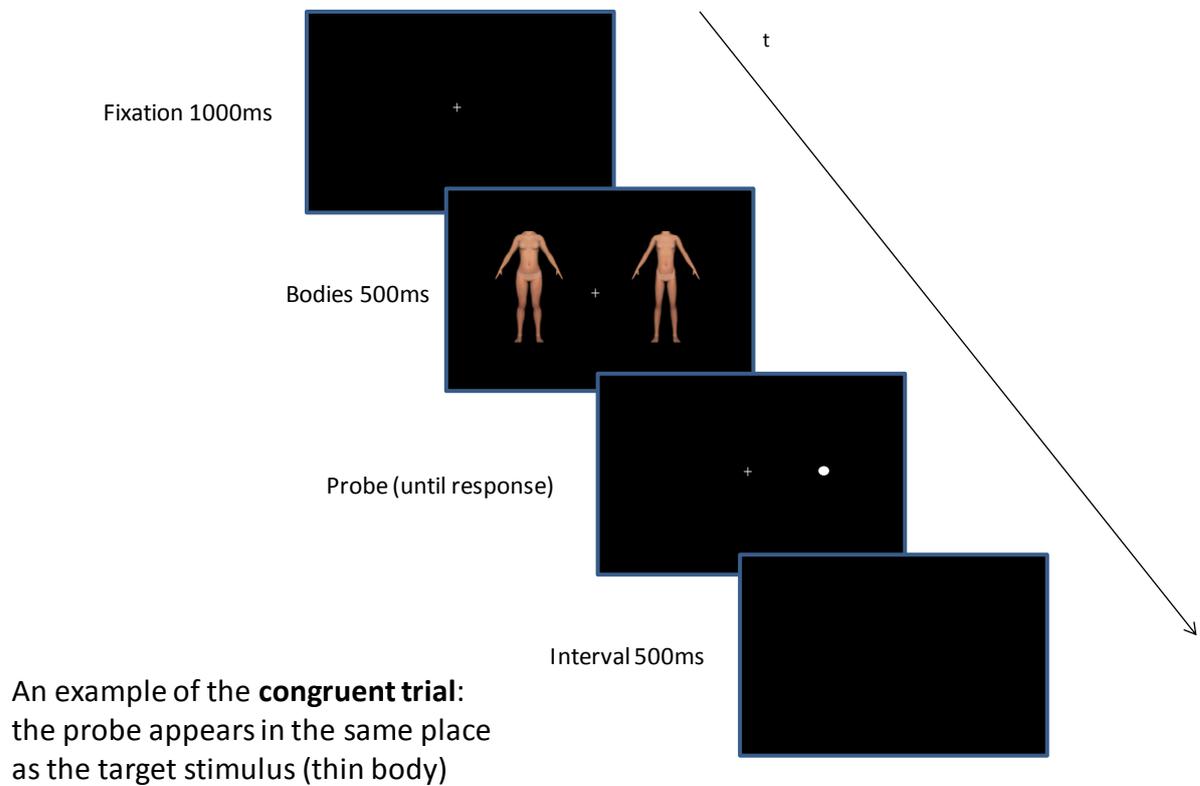


Figure 11. Trial timecourse for congruent and incongruent trials: a fixation cross, a neutral body and a target body, a probe, and a post-stimulus screen.

Ratings

After the dot-probe task was completed, the participants were instructed to remain in their seat and a rating task, which took 10 minutes, was administered. The participants rated the same images they had seen in the dot-probe task on three qualities: size normality (22 pictures, male and female bodies presented randomly), attractiveness (22 pictures, male and female bodies presented randomly), and closeness to the body ideal (11 pictures, just female). The pictures were presented one by one on the screen until the participant made a response. The participants responded with the keyboard keys (1-9). The participants could choose between the following responses:

Ratings of size normality: 1-too thin, 2-very thin, 3-thin, 4-a bit thin, 5-normal (average), 6-a bit heavy, 7-heavy, 8-very heavy, 9-too heavy

Ratings of attractiveness: 1-extremely unattractive, 2-very unattractive, 3-unattractive, 4- quite unattractive, 5-average, 6-quite attractive, 7-attractive, 8-very attractive, 9-extremely attractive

Ratings of closeness to body ideal: 1-not my ideal at all, 2-very far from my ideal, 3-far from my ideal, 4-quite far from my ideal, 5-not far nor close to my ideal, 6-quite close to my ideal, 7-close to my ideal, 8-very close to my ideal, 9-my ideal

Questionnaires

At the end of the experiment, 45 minutes were allowed for participants to fill in the second part of the screening form and the questionnaires. The screening form included questions about height, current weight, having any history of eating disorders, being currently on a diet and the number of past diets. Afterwards, the participants completed four different questionnaires: Eating Disorder Inventory (EDI-3), Dutch Eating Behaviour Questionnaire (DEBQ), Body Shape Questionnaire (BSQ-34), and Beck Depression Inventory (BDI). They were informed beforehand that the questionnaires included questions about personal and sensitive issues and were advised not to continue filling them in if they felt uncomfortable at any point. After the participants completed all self-reported measures, they were debriefed and asked how they felt. They were given a debriefing form which

included a contact to the Hull University Counselling Service in case any feelings of discomfort or distress persisted after the completion of the study.

Results

Demographic variables and questionnaires

The median split of all participants' DEBQ restraint scale scores ($N = 80$) was carried out: the participants with scores above 2.75 were allocated to the high restraint group and the participants with scores below 2.75 were allocated to the low restraint group ($N = 40$ per group). Please refer to table 2 for further information. The mean scores on the demographic variables and the questionnaires for all participants and for the low and high restraint groups separately can be found in table 4. The correlations between the scores and the BMI can be found in table 5.

A series of independent t-tests were conducted to see how the groups differed on a variety of demographic and body image concern measures, using Bonferroni adjusted alpha level of .006 per test (.05/8). Equal variances were not assumed for drive for thinness, bulimia, and depression scores therefore different degrees of freedom had to be reported. No significant differences between the groups were found for age, $t(78) = 0.13$, $p = .896$, $d = 0.03$, 95% CI [-1.42, 1.62], bulimia, $t(57.63) = -1.93$, $p = .059$, $d = 0.43$, 95% CI [-3.72, 0.07], and depression as measured by the BDI, $t(67.23) = -1.45$, $p = .151$, $d = 0.33$, 95% CI [-6.23, 0.98]. On average, the participants high in dietary restraint had also higher BMIs ($M = 24.05$, $SD = 4.28$) from the participants lower in restraint ($M = 21.64$, $SD = 4.41$), $t(78) = -2.49$, $p = .015$, $d = 0.55$, 95% CI [-4.35, -0.48], however when the Bonferroni correction is applied, the difference is not statistically significant. The high restraint ($M = 12.33$, $SD = 6.45$) group also differed significantly from the low restraint group ($M = 3.48$, $SD = 3.31$) with regards to drive for thinness, $t(58.23) = -7.72$, $p = .000$, $d = 1.73$, 95% CI [-11.15, -6.56]. In addition, the high restraint group was characterised by more body shape concerns ($M = 107.60$, $SD = 29.19$) and higher body dissatisfaction ($M = 20.95$, $SD = 7.77$) than the low restraint group ($M = 69.38$, $SD = 26.29$; $M = 11.68$, $SD = 8.62$); both differences were significant: $t(78) = -6.16$, $p = .000$, $d = 1.45$, 95% CI [-50.59, -25.86] and $t(78) = -5.06$, $p = .000$, $d = 1.08$, 95% CI [-12.93, -5.62], respectively. Finally, the two groups differed significantly on dietary restraint, $t(78) = -11.69$, $p = .000$, $d = 2.73$, 95% CI [-1.71, -1.21], with the high restraint group ($M = 3.46$, $SD = 0.58$) having higher scores than the low restraint group ($M = 2.00$, $SD = 0.54$).

From the above results it can be clearly seen that the group high in dietary restraint has different qualities than the group lower in dietary restraint, including higher BMI, body dissatisfaction, drive for thinness, and more body shape concerns. Please refer to table 4 for a summary of the differences.

Table 4. Mean scores and standard deviations on demographic variables and self-report questionnaires for all participants ($N = 80$), the two groups separately: low ($N = 40$) and high ($N = 40$) in dietary restraint, as well as the independent samples t-tests of group comparison (* sig. at .05 level, ** sig. at .006 level (Bonferroni adjusted alpha))

	N = 80		Low Restraint		High restraint		Group comparison
	M	SD	M	SD	M	SD	t
Age	20.72	3.39	20.78	3.53	20.68	3.29	0.131
BMI	22.84	4.49	21.64	4.41	24.05	4.28	-3.387*
EDI-3 DT	7.9	6.77	3.48	3.31	12.33	6.45	-7.719**
EDI-3 B	4.21	4.31	3.3	2.7	5.13	5.36	-1.925
EDI-3 BD	16.31	9.39	11.68	8.62	20.95	7.77	-5.057**
BSQ-34	88.49	33.64	69.38	26.29	107.6	29.19	-6.155**
DEBQ-R	2.73	0.92	2	0.54	3.46	0.58	-11.693**
BDI	10.41	8.13	9.1	6.25	11.73	9.56	-1.454

Note: BMI = Body Mass Index, EDI-3 DT = Drive for thinness, EDI-3 B = Bulimia, EDI-3 BD = Body dissatisfaction, BSQ-34 = Body Shape Questionnaire, DEBQ-R = Dutch Eating Behaviour Questionnaire-Restraint scale, BDI = Beck Depression Inventory

Table 5. Correlations between the participants' BMI and various self-report questionnaires for all participants ($N = 80$).

	BMI	DEBQ-R	BSQ-34	EDI-3 DT	EDI-3 B	EDI-3 BD	BDI
BMI	1						
DEBQ-R	.418**	1					
BSQ-34	.429**	.743**	1				
EDI-3 DT	.403**	.829**	.827**	1			
EDI-3 B	.156	.448**	.597**	.607**	1		
EDI-3 BD	.439**	.563**	.731**	.670**	.336**	1	
BDI	.029	.198	.440**	.324**	.443**	.297**	1

Principal Component Analysis

As most of the variables seen in table 5 are moderately to highly correlated, a decision was made to carry out a principal component analysis (PCA) to reduce some of these variables to components and use in the following multiple regression analyses.

Before the analysis was run, the data for all 80 participants were inspected to determine the outliers. Boxplots, normality tests, and Q-Q plots were inspected for the questionnaire variables and the participants' BMI. One outlier was removed for the EDI-3 bulimia score from further analyses.

A principal components analysis (PCA) with oblique rotation (direct oblimin) was conducted on five questionnaire scores measuring various psychological traits: Body Shape Questionnaire (BSQ-34), three scales of the Eating Disorder Inventory (EDI-3): drive for thinness (DT), bulimia (B), and body dissatisfaction (BD), as well as Beck's Depression Inventory (BDI). The suitability of PCA was assessed prior to analysis. Inspection of the correlation matrix showed that all variables had at least one correlation coefficient greater than 0.3. The overall Kaiser-Meyer-Olkin (KMO) measure was 0.78 with individual KMO measures all greater than 0.7, classification of 'middling' according to Kaiser (1974). Bartlett's test of sphericity was statistically significant ($p = .000$), indicating that the data was likely factorisable. PCA revealed one component which had an eigenvalue greater than one and which explained 62.56 % of the total variance. Visual inspection of the scree plot confirmed that only one component should be retained. As only one component was extracted, the oblique rotation was not carried out. Component loadings and communalities for the new latent variable 'PSYCH' are presented in table 6.

Table 6. Component coefficients and communalities for $N = 79$ (one outlier for the EDI-3 bulimia score excluded listwise).

	Component 1	Communalities
BSQ-34	.926	.857
EDI-3 DT	.884	.781
EDI-3 B	.800	.537
EDI-3 BD	.732	.639
BDI	.561	.315

Note: BSQ-34 = Body Shape Questionnaire, EDI-3 DT = Drive for thinness, EDI-3 B = Bulimia, EDI-3 BD = Body dissatisfaction, BDI = Beck Depression Inventory

Dot-probe task

Reaction times

Accuracy was calculated for all participants' reaction times to all female body types and levels. The accuracy was very high – 99.01%. In total, 152 inaccurate trials were excluded from further analyses. The mean for all reaction times (without the inaccurate

trials) was 381.82 and the standard deviation was 108.27. Any RTs 3 standard deviations from the mean (above 706.62ms and below 57.01ms) were excluded. In total, further 231 (1.5%) outlier trials were excluded.

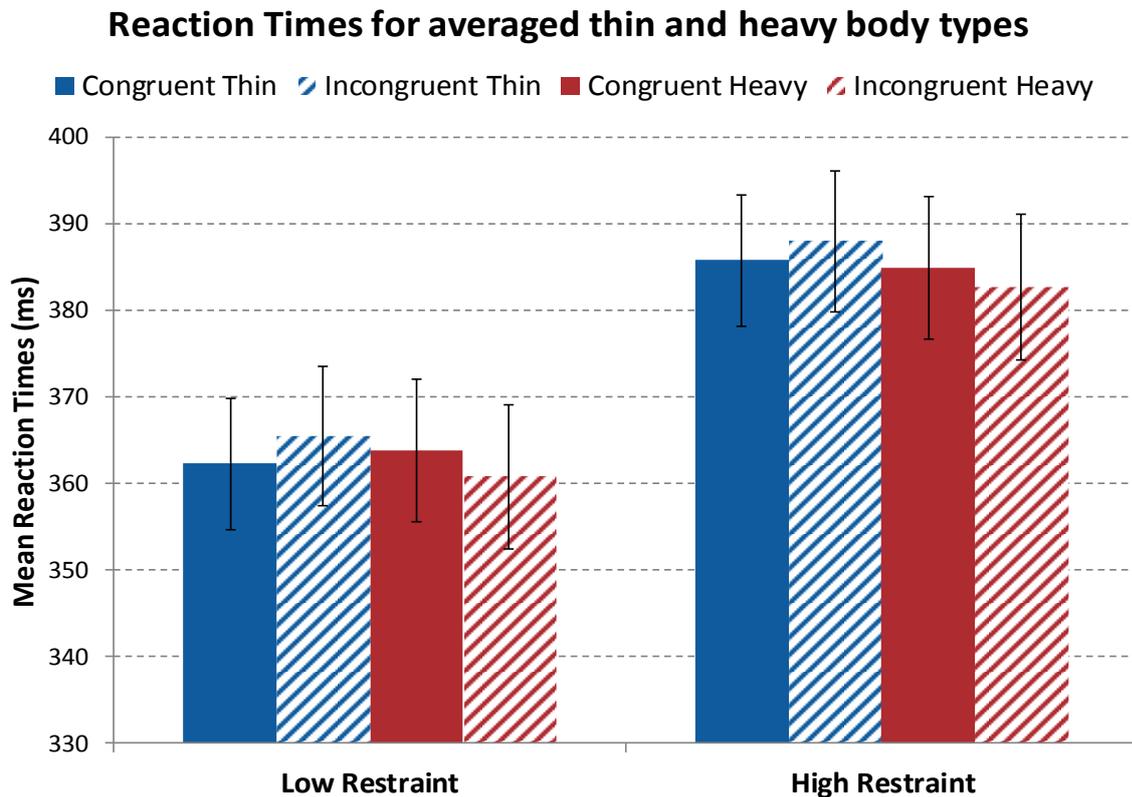


Figure 12. Mean reaction times (ms) for congruent and incongruent thin and heavy body trials, for both restraint groups, with standard error bars. The participants in the low restraint group responded faster than the participants in the high restraint group.

Reaction times were analysed using a 4-way mixed ANOVA (2x2x2x5). There was a 1 between subject variable of restraint group (high vs. low restraint) and 3 within subject variables: congruency (congruent vs. incongruent trials), body type (thin vs. heavy bodies), and level (5 levels of thinness vs. 5 levels of heaviness). There was a main effect of group, $F(1,78) = 4.25$, $p = .043$, $\eta_p^2 = .05$, with the low restraint group's reaction times being significantly faster ($M = 363.07$) than those of the high restraint group ($M = 385.30$), indicating that the task was harder for the participants high in dietary restraint. No other main effects were significant. There was only one significant interaction effect between congruency of trials and body type of stimuli, $F(1,78) = 4.99$, $p = .028$, $\eta_p^2 = .06$. On average, the participants responded slightly slower to congruent heavy bodies trials ($M = 374.35$) than to incongruent heavy bodies trials ($M = 371.73$), indicating that the participants' attention was drawn away from the heavier bodies in comparison to the neutral, thinner

(control) body. Also, the participants responded slightly faster to congruent thin bodies trials ($M = 373.98$) than to incongruent thin bodies trials ($M = 376.68$), indicating that the participants' attention was drawn towards the thinner bodies in comparison with the neutral, heavier (control) body.

Attentional Bias Index

Attentional bias index scores were calculated for each level of thinness and heaviness, for each participant. Following Smith & Rieger (2009), the below formula has been used (up and down locations were substituted for left and right):

$$\text{Attentional Bias Index} = [(TRPL - TLPL) + (TLPR - TRPR)] / 2$$

(T - target; R - right; P - probe; L - left)

For further analyses of the attentional bias indices, the ABIs for thin bodies (1-5) and ABIs for heavy bodies (7-11) were averaged to produce one score. A positive attentional bias score indicates selective attention towards the location of the target body, while a negative attentional bias score indicates avoidance of the target stimulus. Boxplots were used to detect outliers for the ABIs, but no outliers were found therefore all participants' data was used in the analyses ($N = 80$).

A 2x2 ANOVA was run on the ABIs with a between subjects variable of restraint group (high vs. low restraint) and a within subjects variable of body type (ABI for thin vs. heavy bodies). There was a significant main effect of body type, $F(1,78) = 4.99$, $p = .028$, $\eta_p^2 = .06$, with the ABI for the thin bodies ($M = 2.69$, $SE = 1.82$) being significantly higher than the ABI for the heavy bodies ($M = -2.62$, $SE = 1.51$). This indicates that all participants responded faster to the thin bodies when they were targets, therefore directing their attention towards the thin bodies. Attention was directed away from the heavy bodies when they were targets. The main effect of group nor the interaction between the group and body type did not reach statistical significance.

Attentional Bias Indices for thin and heavy bodies

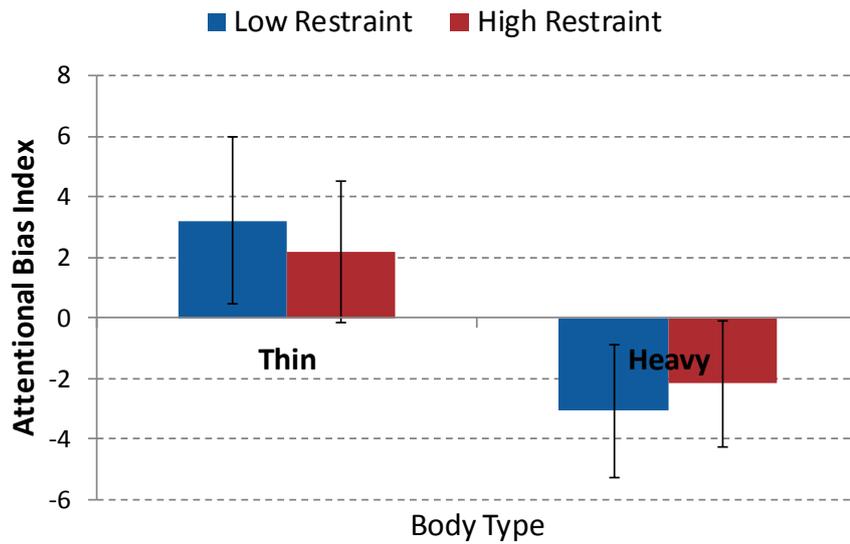


Figure 13. Mean attentional bias indices for thin and heavy body types and both restraint groups with standard error bars. The participants responded faster to thin targets, however the interaction between body type and restraint group was not significant.

The thin and heavy ABIs did not significantly correlate nor were they successfully predicted by dietary restraint, the latent variable PSYCH, the interaction between DEBQ-R and PSYCH, or the participants' BMI. Z-scores were used for the independent variables to avoid multicollinearity. Please see table 7.

Table 7. Hierarchical Multiple Regressions predicting thin and heavy ABIs from the DEBQ restraint score, the latent variable PSYCH, the interaction between DEBQ and PSYCH, and a covariate – the participants' actual BMI.

Variable	Thin ABI				Heavy ABI			
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Constant	2.83	2.23	2.81	2.27	-3.42	1.85	-3.74	1.86
DEBQ-R	-1.90	2.68	-1.94	2.78	1.57	2.21	0.88	2.28
PSYCH	1.89	2.82	1.87	2.87	-2.92	2.33	-3.33	2.35
DEBQ-R*PSYCH	-0.19	1.82	-0.17	1.89	1.15	1.50	1.63	1.54
Actual BMI			0.13	2.13			2.17	1.74
R^2	-.01		-.01		.02		.04	
F	0.189		0.141		0.58		0.83	
ΔR^2	-.01		.000		.02		.02	
ΔF	0.189		0.004		0.58		1.55	

Note: $N = 80$, for PSYCH $N = 79$

Ratings of normality, attractiveness and closeness to ideal

To determine whether the attractiveness preferences differed between the groups, second-order polynomials were fitted to attractiveness ratings for each observer in each group (Tovée, Maisey, Emery, & Cornelissen, 1999), allowing the peak attractiveness BMI to be calculated for each participant (see figure 14). Each fit was inspected for each participant separately to determine any atypical trends. In addition, boxplots, normality tests and Q-Q plots were inspected for each group as well. In total, 6 outliers were removed from further ANOVA and ANCOVA analyses, with 5 outliers being taken away from the high restraint group and 1 outlier taken away from the low restraint group, which resulted in 39 participants in the low restraint group and 35 participants in the high restraint group.

To compare the peak attractiveness ratings between the two restraint groups (see figure 15), a one-way ANOVA was run. There was a significant main effect of restraint group, $F(1,72) = 13.21, p = .001, \eta_p^2 = .16$, with the high restraint group rating the thinner bodies as more attractive ($M = 19.18, SD = 0.65$) than the low restraint group ($M = 19.76, SD = 0.72$). A covariate, the participants' own BMI, was added as perception of body size was shown to be related to the participants' own size (Cornelissen, Bester, Cairns, Tovée, & Cornelissen, 2015; Leonhard & Barry, 1998; Tovée, Emery, & Cohen-Tovée, 2000). Body mass index (BMI) was significantly related to the choice of the most attractive body type, $F(1,70) = 7.48, p = .008, \eta_p^2 = .10$. When controlling for the participants' BMI the main effect of restraint group remained significant and increased in magnitude, $F(1,70) = 19.29, p = .000, \eta_p^2 = .22$.

Same procedure as with the attractiveness ratings was applied to calculate the BMIs that the participants rated as closest to their personal body ideal. As before, each fit, boxplots, normality tests and Q-Q plots were inspected. In total, 8 outliers were removed from further ANOVA and ANCOVA analyses, with 7 outliers being taken away from the high restraint group and 1 outlier taken away from the low restraint group, which resulted in 39 participants in the low restraint group and 33 participants in the high restraint group.

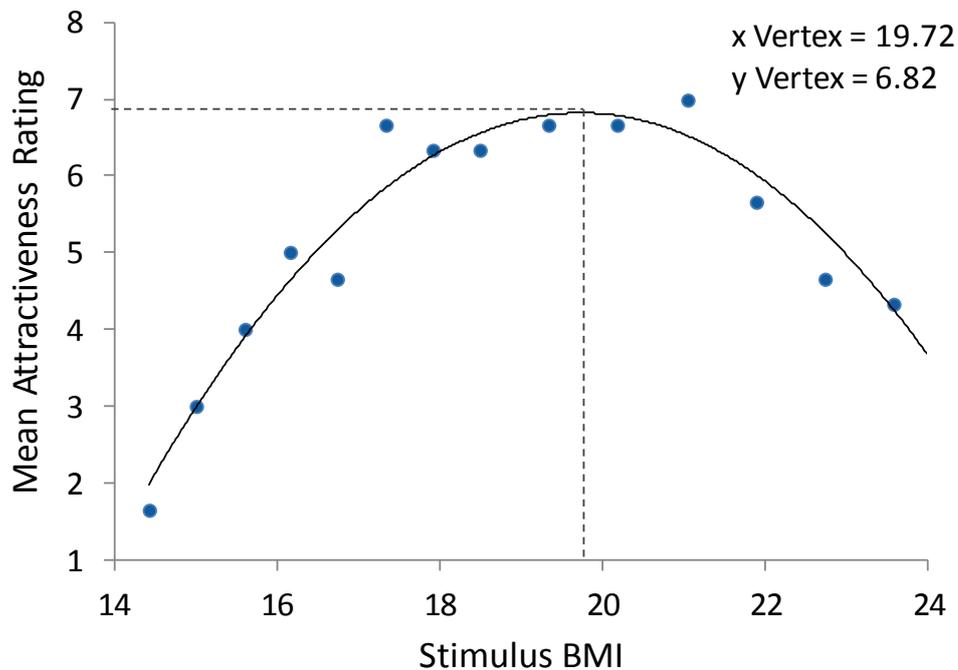


Figure 14. An illustrative graph showing how the second-order polynomial was fitted to the attractiveness (and closeness to ideal) ratings for one participant. A calculated x Vertex refers to the stimulus BMI rated the highest (y Vertex) for attractiveness (or closeness to ideal).

To compare the peak ideal ratings between the two restraint groups (see figure 16) a one-way ANOVA was run. The main effect of restraint group was significant, $F(1,70) = 6.48$, $p = .013$, $\eta_p^2 = .09$, with the high restraint group rating the thinner bodies as closer to their ideal ($M = 18.99$, $SD = 0.86$) than the low restraint group ($M = 19.45$, $SD = 0.68$). An ANCOVA with the participants' BMI as a covariate indicated that the BMI was not significantly related to the ideal peaks, $F(1,68) = 2.56$, $p = .114$, $\eta_p^2 = .04$. When controlling for the BMI the main effect of restraint group remained significant and increased slightly in magnitude, $F(1,68) = 8.30$, $p = .005$, $\eta_p^2 = .11$.

As the normality ratings followed a linear trend (see figure 17), the intercept and the slope of the ratings were compared between the two groups. No outliers were detected for the intercepts and the slopes, thus all cases were analysed. The main effect of group was not significant for neither the intercept of normality ratings, $F(1,78) = .002$, $p = .967$, $\eta_p^2 = .00$, nor the slope, $F(1,78) = .047$, $p = .829$, $\eta_p^2 = .00$, meaning that the two groups did not differ in their ratings of normality and had a similar idea of what is considered thin, average, and heavy.

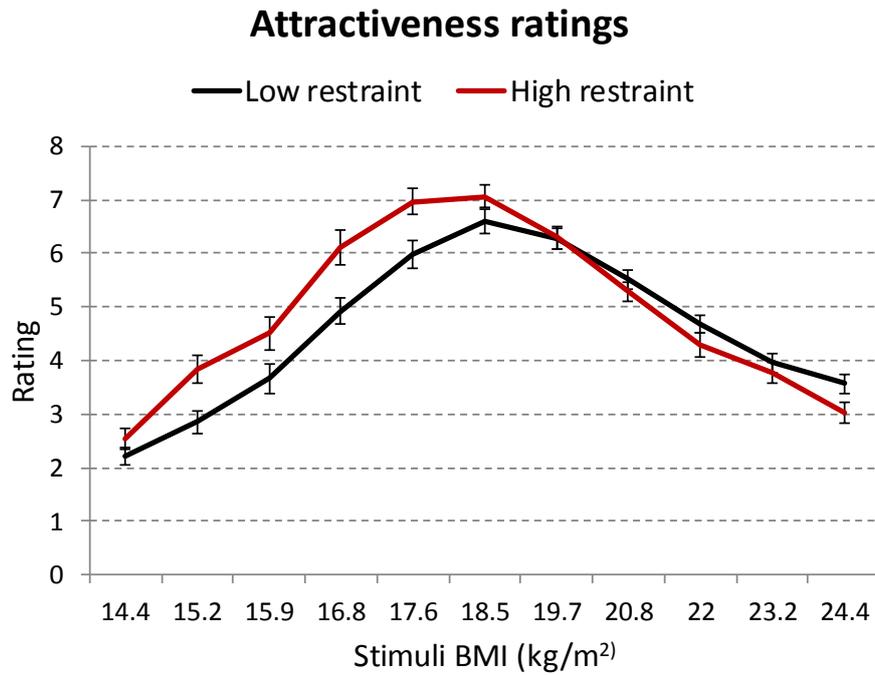


Figure 15. Mean ratings of attractiveness for all female body stimuli and both restraint groups, with standard error bars. The participants higher in restraint rated the thin bodies higher on attractiveness than the low restraint group.

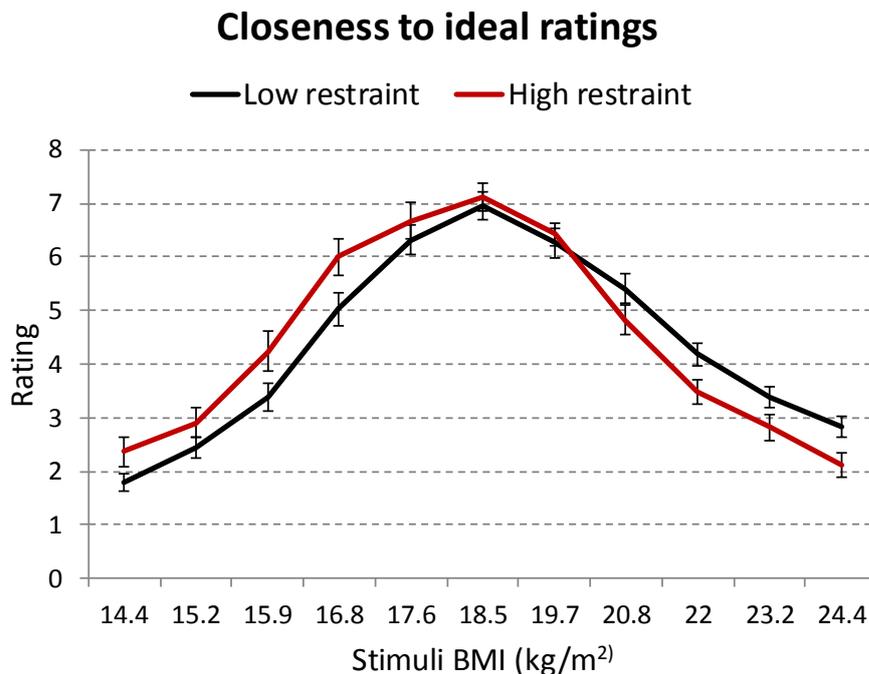


Figure 16. Mean ratings of closeness to ideal for all levels of female body stimuli and both restraint groups, with standard error bars. The participants higher in restraint rated the thin bodies higher and heavy bodies lower on closeness to ideal than the low restraint group.

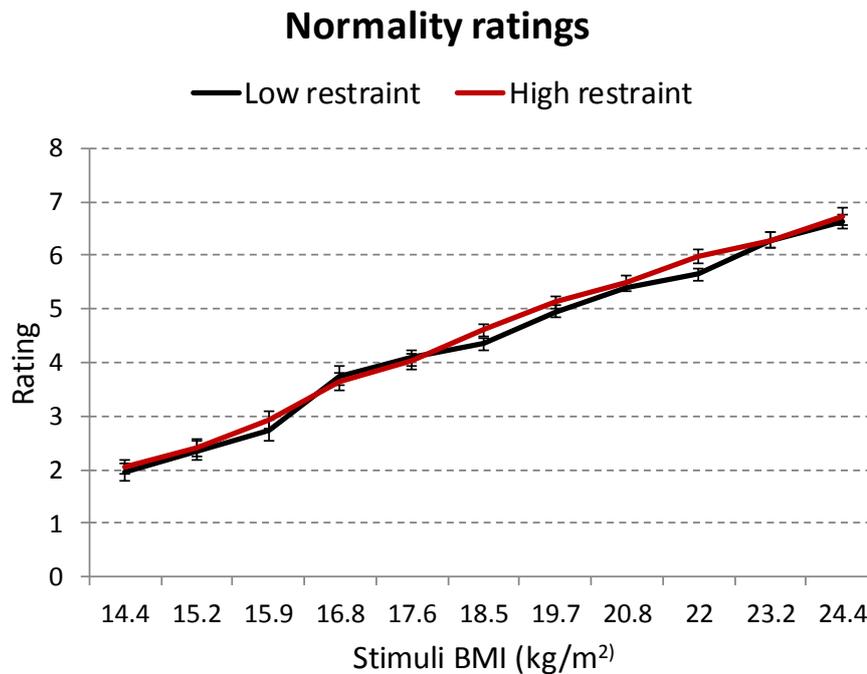


Figure 17. Mean ratings of normality for all levels of female body stimuli and both restraint groups, with standard error bars. The participants did not differ in their ratings of normality.

Regression analysis

Two hierarchical multiple regressions were run to determine whether the following variables can predict the choice of an attractive body type and the body ideal: dietary restraint and the latent variable PSYCH (higher values indicate higher body image concerns and more negative psychological functioning) as well as their interaction were entered first, and a covariate, the participants' BMI, was entered into the second model. The independent variables – DEBQ and BMI – were transformed into z-scores to avoid multicollinearity (variable PSYCH is already given in terms of SDs).

To determine the outliers, the boxplots, normality tests and Q-Q plots were inspected for all participants as a whole ($N = 80$); high residual values were also inspected and their impact on the model was evaluated. Six outliers were removed from peak attractiveness ratings, resulting in 74 participants used for the regression analysis (73 for the 'PSYCH' variable, excluded pairwise). With regards to peak ideal ratings, 8 outliers were removed, resulting in 72 participants used for the regression analysis (71 for the 'PSYCH' variable, excluded pairwise). The assumptions of linearity, independence of residuals, homoscedasticity, and multicollinearity were investigated for both hierarchical regressions. A decision was made to further exclude one participant from the peak attractiveness

analysis, as this participant's studentized deleted residuals approached ± 3 standard deviations, had a leverage value greater than 0.2, and unusually high Mahalanobis distance (> 26). After excluding this participant's full data set, the regression model for attractiveness improved.

For attractiveness, the first model (model 1) of the hierarchical multiple regression with DEBQ-R and PSYCH and their interaction as predictors did not significantly predict the attractiveness peaks, $F(3, 68) = 1.96, p = .128, R^2 = .08, \text{adj. } R^2 = .039$. The addition of the participants' actual BMI to the prediction of attractiveness peaks (model 2) led to a statistically significant increase in R^2 of .136, $F(1, 67) = 11.61, p = .001$, and explained 17% of variance ($R^2 = .216, \text{Adj. } R^2 = .169$). However, only the actual BMI contributed significantly to the model, $b = 0.31, 95\% \text{ CI } [0.13, 0.49], t = 3.41, p = .001$. The regression coefficients can be found in table 8.

For closeness to ideal, the first model (model 1) of the hierarchical multiple regression with DEBQ-R and PSYCH and their interaction as predictors did not significantly predict closeness to ideal peaks, $F(3, 67) = 1.13, p = .345, R^2 = .048, \text{adj. } R^2 = .005$. The addition of the participants' actual BMI to the prediction of closeness to ideal peaks (model 2) led to a statistically significant increase in R^2 of .07, however, the full model with all four predictors did not reach statistical significance, $F(4, 66) = 2.20, p = .079, R^2 = .118, \text{adj. } R^2 = .064$. The regression coefficients can be found in table 8.

Table 8. Hierarchical Multiple Regressions predicting attractiveness and ideal peaks from the DEBQ-R restraint score, the latent variable PSYCH, the interaction between the DEBQ-R and PSYCH, and the participants' actual BMI; * $p < .05$, ** $p < .01$

Variable	Attractiveness peaks				Ideal peaks			
	Model 1		Model 2		Model 1		Model 2	
	B	SE _B	B	SE _B	B	SE _B	B	SE _B
Constant	19.46**	.11	19.42**	0.10	19.17**		19.13**	
DEBQ-R	-0.14	0.13	-0.24	0.13	-0.01	0.14	-0.08	0.14
PSYCH	-0.10	0.13	-0.17	0.13	-0.17	0.14	-0.24	0.14
DEBQ-R*PSYCH	-0.02	0.11	0.03	0.10	0.08	0.10	0.13	0.10
Actual BMI			0.31**	0.09			0.24*	0.11
R^2	.08		.216		.048		.118	
F	1.96		4.60**		1.13		2.20	
ΔR^2	.08		.136		.048		.07	
ΔF	1.96		11.61**		1.13		5.21*	

Discussion

This study was designed to investigate selective attention and attitudes towards thin and heavy bodies in individuals with different levels of dietary restraint. The relationship between dietary restraint and negative body image was investigated and the two groups – low and high in dietary restraint – were compared on their performance on the attentional dot-probe task and the ratings of the female bodies on normality, attractiveness and closeness to personal body ideal.

The first hypothesis was supported. As expected, high restraint correlated positively with body dissatisfaction, higher drive for thinness, bulimic tendencies and more weight and shape concerns and the two groups differed significantly on drive for thinness, body dissatisfaction, body shape concerns, and dietary restraint. The high restraint group had also a significantly higher BMI, with a mean of 24.05, which approaches the overweight category. The low restraint group had a BMI of 21.64 which falls right in the middle of a healthy and normal BMI. This study's results confirm previous findings, which showed that women higher in dietary restraint express more body image concerns (van Strien, Herman, Engels, Larsen, & van Leeuwe, 2007; Vartanian & Hopkinson, 2010) and have higher drive for thinness (Hoffmeister, Teige-Mocigemba, Blechert, Klauer, & Tuschen-Caffier, 2012; Polivy & Herman, 1987). Thus, it can be concluded that women higher in dietary restraint score in a more pathological direction on various measures of body image and express more negative attitudes towards their own bodies.

The second hypothesis was supported as well. The data analysis showed that the high restraint group rated the thin bodies significantly higher than the low restraint group on attractiveness and closeness to ideal (see figure 15 and 16), even though the participants in both groups had a similar idea of what is thin and heavy, as measured by the ratings of normality (see figure 17). The results are in line with previous findings, which showed that women higher in dietary restraint tend to internalise the sociocultural concepts about thinness and attractiveness and express more negative attitudes towards heaviness (Griffiths et al., 2000; Vartanian, Herman, & Polivy, 2005).

Because of the high correlations between the measures it needs to be noted that the differences between the high and low restraint groups might be emerging due to other psychological variables measured in the study. A principal component analysis (PCA) was

thus carried out to reduce the following variables to a component reflecting the participants' psychological functioning: Body Shape Questionnaire, Eating Disorder Inventory (EDI-3) scales (drive for thinness, bulimia, body dissatisfaction), and Beck's Depression Inventory. A latent variable 'PSYCH' was created, with its higher values indicating more body image concerns and more negative psychological functioning.

The hierarchical multiple regression analyses showed that dietary restraint was not a statistically significant predictor of the attitudes to body size, as measured by the attractiveness and closeness to ideal ratings. Surprisingly, the latent variable reflecting body image concerns also did not contribute significantly to the model predicting the attractiveness and closeness to ideal peaks. One of the reasons for the lack of statistical significance could be that the reduction of the body image-related variables into one component could have masked a statistically significant predictive effect of one of the specific body image-related variables, such as body dissatisfaction or drive for thinness. The multiple regression analyses demonstrated a predictive validity of the participants' BMI in determining the attitudes towards body size, with the participants with higher BMIs having attractiveness and ideal peaks corresponding to a heavier body.

The third hypothesis was not supported, as no differences between the two groups were found with regards to the attentional bias to either thin or heavy bodies. The patterns of attention were similar in participants with high and low dietary restraint; the analyses of reaction times and attentional bias indices indicated that there is a general tendency for all females to direct attention towards thin bodies and away from heavier body types. There was also a small but significant effect of group found for reaction times, indicating that the attentional dot-probe task could have been harder for participants high in dietary restraint. Body size biases are ubiquitous in the Western society, which was confirmed by the results presented in this study, and a ceiling effect might be one possible explanation for the high accuracy and the lack of differences in reaction times between the groups. Our analysis did not show an expected interaction between the group and body type as the high restraint group did not direct more attention towards the thin bodies.

The findings support Glauert, Rhodes, Fink and Grammer (2010) who showed that undergraduate females, regardless of their BMI, level of body dissatisfaction and internalisation of the thin ideal, were faster to respond to the probe located in the position

of the thin body. The latest review of cognitive biases to appearance-related stimuli by Rodgers and DuBois (2016) revealed that individuals high in body dissatisfaction tend to orient their attention more towards desired (Cho & Lee, 2013; Gao et al., 2014) and feared (Gao, Wang, Chen, Wang, & Zhao, 2012; Gao, Deng, et al., 2011; Gao, Wang, et al., 2011; Gao et al., 2014) appearance-related stimuli, compared to individuals lower in appearance concerns. In our study, there was a general tendency for all females to direct their attention towards the desired stimuli (thin bodies), which seems to be a universal characteristic of a contemporary woman's behaviour. Although a hypothesis regarding attention to heavy bodies was not formulated in this study, the participants' attention was found to be directed away from the heavy bodies, which can be seen as an avoidance response caused by the general notion that heavy bodies are less attractive and less desirable.

Although this as well as Glauert and colleagues' study (2010) showed no connection between selective attention to thin bodies and body dissatisfaction, a different study, by Cho and Lee (2013), provided evidence for more frequent attention to thin bodies in women higher in body dissatisfaction. A possible explanation for the contrasting results might be the perceived attractiveness and the size of the body stimuli used.

Cho and Lee (2013) showed that both men and women presented an attentional bias towards the body types that they rated as more attractive – more muscular bodies for males and thinner bodies for females. By fitting a quadratic line to the participants' ratings we were able to determine the BMI that the participants found most attractive and closest to their personal body ideal. The peaks for attractiveness had a range between 17.89 and 21.39 ($N = 74$, $M = 19.49$, $SD = 0.74$) and for closeness of ideal ratings it was a range between 17.14 and 20.95 ($N = 72$, $M = 19.24$, $SD = 0.80$), for all participants; these ranges include bodies which are slightly underweight and with normal BMIs (but not above 22). When looking at the ratings of normality (see figure 17), the participants rated body number 7 (BMI = 19.7) as the most average-looking – neither thin nor heavy – and it also was the closest to the peak attractiveness and ideal ratings. In addition, the heaviest body with a BMI approaching the overweight category was rated by the participants as being “heavy” but not “very heavy or “too heavy” whereas the two thinnest bodies were rated as “very thin” on the ratings of normality. According to the social comparison theory, women with negative body image tend to seek out attractive females in the environment for the purpose of self-evaluation (upward comparison), which would suggest that their attention would preferentially orient

towards the body types that these women find attractive. It is possible that if we created more attractive thin bodies and did not include any severely underweight bodies in the “thin body” category (so that the thin bodies would fit the BMI attractiveness range, see above) and heavier and less attractive bodies for the “heavy body” category, the expected differences between the groups would emerge – increased vigilance towards the thin bodies and a possible larger avoidance response to heavy bodies in the high restraint group.

It was suggested that the possibility of observing an attentional bias relies on the type of stimuli used in the study – the validity and saliency of the stimuli should be balanced (Joseph, 2014). Thus, in the future studies of attentional biases to bodies the stimuli used should be salient, their size and shape should be controlled for – the stimuli shouldn’t be neither too thin nor too heavy or have an exaggerated or distorted shape. The stimuli used should also closely resemble the human body (3D scans and 3D models are the most desirable) and be relatable to the individual. In addition, the stimuli valence (negative/positive), perceived attractiveness (attractive/unattractive), and perceived size (thin/heavy) should be rated, which would allow for controlling the individual differences; e.g. there are differences in which body type the participants find attractive – a very thin figure could be desirable for one and thus have positive valence, but for the other it could be too thin and thus negative valence could be assigned to such body. A thorough control over the stimuli would increase the ecological validity of the study and the chance of observing the hypothesised results. In addition, to improve the precision of measuring the attentional bias, an eye-tracker could be added to the dot-probe task (or any other cognitive task, e.g. visual search). Adding an eye tracker would allow for measuring the time spent looking at a particular body and determining the body part that was looked at.

In sum, the analyses of the responses on the dot-probe task indicated that a positive attitude towards thinness is enough to mediate women’s visual attention towards thin bodies, likely for the purpose of social comparison. In addition, the results also showed that a negative attitude towards heaviness is sufficient to make the women pull their attention away from heavy bodies, which is possibly an avoidance response caused by the widespread opinion that heaviness is undesirable and unattractive.

Our study investigated the link between the attentional bias, the attitudes towards thin and heavy bodies, dietary restraint and other body image concerns. The results

indicated that the objective ratings of body size ('normality') were independent of personal attitudes towards body attractiveness in others and the personal body ideal; the high restraint group rated the thinner bodies as more attractive and closer to the personal body ideal, despite having a larger BMI on average. The study did not show the expected differences in the amount of allocated attention to thin and heavy bodies between the participants low and high in dietary restraint. However, a general tendency to orient attention towards thin bodies and away from heavy bodies was observed in the female participants. This finding suggests that the sociocultural notions that thinness is attractive and heaviness is unattractive might be sufficient for an attentional bias to occur in women. Although the difference between the groups in terms of attentional bias was not detected, the results from the rating analyses are consistent with the idea that restrained eaters internalise the societal standards of thinness more than unrestrained eaters, which might be taking part in maintaining body dissatisfaction with one's own body.

In this study, we confirmed that there exists a positive thinness bias in young women with higher levels of body image concerns. In the following study, we decided to explore this relationship further and affect body size biases that exist in women with more negative body image. The aim was to manipulate the participants' interpretation of thinness and heaviness, affect the negative bias towards heavier bodies and induce more positive attitudes towards these bodies through cognitive bias modification training. As perception of our own bodies is to some extent dependent on how we perceive the bodies of others, we expected to observe a positive effect of the training on the participants' own body image.

CHAPTER 3 – Study 2

Introduction

The sociocultural theories of body image suggest an association between the internalised cultural values, the choice of body ideals, and the development of body dissatisfaction (Tiggemann, 2011). The cognitive-behavioural theories of body image focus on the role of cognitive biases in the development and maintenance of negative body image (Cash, 2011; Williamson, White, York-Crowe, & Stewart, 2004). Cognitive biases to body-related information have been repeatedly identified but a few studies so far used cognitive bias modification techniques to target the biases with an aim of improving negative body image. Cognitive bias modification has been successfully used to affect the processing of symptom-related information in various psychopathologies and as a result improve the symptoms (e.g. MacLeod, Fox, & Koster, 2009; Penton-Voak, Bate, Lewis, & Munafò, 2012; Yiend, Parnes, Shapherd, Roche, & Copper, 2014). Cognitive-behavioural theories of body image suggest that women with eating disorders or with extreme levels of body dissatisfaction are characterised by rigid thinking about their bodies and a biased processing of body-related information (Williamson, White, York-Crowe, & Stewart, 2004), which is difficult to be influenced and changed. Cognitive Bias Modification (CBM) techniques permit the experimental manipulation of attention, memory, and beliefs and allow for the observation of the manipulation's effect on the symptoms of interest (behaviours, cognitions, emotions). The body size categorization task used in this study is a type of CBM technique, which was used to change the interpretation of body size and investigate whether this will affect the choice of body ideals and improve personal body satisfaction in women high in body image concerns.

Although research into cognitive biases in eating disorders and negative body image has grown in recent years, few studies have attempted cognitive training in order to induce or alter a specific bias related to body processing. One of the studies, by Smeets, Jansen and Roefs (2011), showed that training healthy participants to attend to their “ugly” body parts resulted in increased feelings of body dissatisfaction. Their findings were in line with studies by Smith and Rieger (2006, 2009) and Engel and colleagues (2006), all of which used a modified version of the attentional dot-probe task and supported the causality of selective attention to body-related stimuli in body dissatisfaction and eating concerns. Another study

(Yiend, Parnes, Shepherd, Roche, & Cooper, 2014) targeted negative self-beliefs in participants with subclinical eating disordered traits and showed a positive effect of the CBM training on eating disorder symptoms. The most recent study, by Cardi and colleagues (2015), illustrated that the use of a CBM procedure aimed at training attention and interpretation towards benign social stimuli – attention to positively/ negatively valenced emotional faces and interpretation of ambiguous social scenarios – lead to decrease in expression of negative cognitive biases, which was also generalised to other tasks and to more ecologically-valid measures of psychopathology. However, the study could not untie the influence of the inpatient treatment that the participants were receiving from the effects of the CBM task.

In this study, we used cognitive bias modification to manipulate the interpretation of body size and encourage the interpretation of thinness over heaviness in normal-sized bodies (with normal BMIs). The aim was to investigate the effect of the manipulation on personal body satisfaction and body ideals. The effects of weight-related norms on body image are often understood in relation to social comparison theory and the idea that we judge our own bodies relative to our perceptions of others' bodies (Franzoi & Klaiber, 2007). We can compare our bodies with the ones we perceive as more (upward comparison) or less (downward comparison) attractive. Women who are dissatisfied with their bodies tend to compare themselves with thinner women, which can strengthen their feelings of inadequacy (Glauert, Rhodes, Fink, & Grammer, 2010). If the body norm is experimentally manipulated, for example through adaptation to heavy bodies or exposure to thin photographs of models, the perception of our own body would be affected as well, resulting in, respectively, increase or decrease in body satisfaction. Winkler and Rhodes (2005), who used visual adaptation to manipulate perceptions of attractiveness and normality, suggested that a normal body shape (and what is considered "average") may serve as a reference point for attractiveness judgements. In their study, when women were adapted to thin bodies, they rated thinner bodies as more normal and also found them more attractive than before adaptation. This finding agrees with the idea that the BMI is the biggest cue to attractiveness (Tovée, Maisey, Emery, & Cornelissen, 1999; Tovée, Swami, Furnham, & Mangalparsad, 2006), therefore manipulating one's idea of body size (what is thin or heavy) would likely affect the attractiveness judgements in return. A successful update of one's unrealistic perceptions of

body normality and attractiveness should affect the negative body schema, i.e. the negative patterns of thinking about the body, and lead to more positive body image.

We have adopted a paradigm developed by Penton-Voak, Bate, Lewis, and Munafo (2012; Penton-Voak et al., 2013), which involved modifying the perception of ambiguous emotional expressions leading to an improvement in depressed mood. They used a two-alternative forced choice task to assess a point at which participants, reporting high levels of depressive symptoms, stopped perceiving faces as happy and started categorising them as sad and then provide feedback to shift this point in favour of happiness (Penton-Voak, Bate, Lewis, & Munafo, 2012). The intervention procedure used feedback to increase the perception of happiness over sadness in ambiguous facial expressions whereas in the control procedure the feedback was designed not to modify this perception. The study provided evidence for increased positive mood after the training. The original technique targeted biases in emotional processing characteristic of depression whereas the task used in this study targeted biases in body size processing, such as the choice of unrealistic body norms and ideals. At the time the study was designed and the data were collected, this was the first study that I was aware of that used this cognitive bias modification paradigm to investigate the effect of body size interpretation training on body satisfaction in women with average to high levels of body dissatisfaction. A recent study by Gledhill et al. (2016) used a similar task to affect the perception of body size, which resulted in improved body image for women higher in body image concerns.

The cognitive training consisted of a body size categorisation task, in which participants were asked to categorise 15 computer-generated body stimuli, ranging from very thin to heavy (BMI range: 14.4-24.4), into a “thin” or “heavy” category. The training was completed over 4 consecutive days (1st, 2nd, 3rd, and 4th session) and the 5th session took place approximately 2 weeks after to test the effect of the training on body satisfaction and body ideals. The aim of the task was to determine a threshold at which the participants stopped perceiving bodies as thin and started to perceive them as heavy. In the intervention condition (as opposed to the control condition), the participants received feedback, which aimed to manipulate the participants’ responses so that the bodies near the determined threshold, which had previously been categorised as “heavy”, would be categorised as “thin”. We expected that the body size categorisation task would shift the interpretation of body size so that more bodies would be categorised as “thin” and a wider range of bodies

would be assigned a more positive label. This shift in interpretation of body size was hypothesised to affect personal body image of participants, as measured by the Eating Disorder Inventory-III and the Body Image States Scale, and increase body satisfaction scores at the 2 week follow-up, as compared to the first baseline session, in the intervention group. In addition to these measures, the body stimuli were rated on attractiveness and closeness to personal ideal during the 1st (baseline), 4th (post-training) and 5th (2 week follow-up) sessions to investigate whether the training altered the participants' attitudes to body size. The training was expected to shift the peak attractiveness and ideal ratings towards heavier body types.

The following hypotheses were formed:

- 1) Body size categorisation task will shift the interpretation of body size so that more bodies will be categorised as “thin” by the intervention group at the 2 week follow-up, as compared to the first baseline session
- 2) The training is expected to shift the peak attractiveness and ideal ratings towards heavier body types in the intervention group at the 2 week follow-up, as compared to the first baseline session
- 3) The change in body size interpretation will improve body satisfaction scores in the intervention group at the 2 week follow-up, as compared to the first baseline session

Methods

Participants

Sixty one female postgraduate and undergraduate students from University of Hull, UK participated in the study. The participants were required to be between 18-30 years old. The participants were recruited through email or posters/ flyers advertising the study at the University of Hull campus. Before being invited to take part in the study, the participants completed a screening questionnaire (paper-based or online), which determined their levels of body dissatisfaction. If the screening questionnaire indicated average to high levels of body dissatisfaction, the participants were invited to take part in the study. The choice of a cut-off body dissatisfaction score was based on the EDI-3 norms. First, the raw scores had to be converted to T-scores, for which purpose a diagnostic group of EDNOS (Eating Disorder Not Otherwise Specified) for international (non-US) adults was chosen. Next, the T-scores

were compared to the T-Score Profile Sheet where the typical scores for adult female control sample and typical clinical range were specified. After inspecting the sheet, the following cut-offs for BD raw scores were specified: Below average 0-12, Average 13-26, Clinical range 27-36, High clinical range 37-40. The data used for the final analyses were from participants who scored between 13 and 40 on the Body Dissatisfaction scale of the Eating Disorder Inventory (EDI-3) during the 1st (baseline) session of the study. Out of 196 females screened, only 82 (42%) qualified and 61 (31%) agreed to take part in the study; they were then allocated to either the control or the intervention group. Thirty three participants were of healthy weight, 19 were overweight, 2 were underweight and 7 were obese, based on the body mass index (BMI) ranges: underweight (< 18.5), healthy weight (18.5-24.9), overweight (25-29.9), obese (≥ 30). Three participants included in the analyses reported a 'history of an eating disorder'. All participants had normal or corrected to normal vision. The selected participants were offered either course credit or £12-15 for participation. The study was by the Department of Psychology ethics committee, University of Hull.

Measures

Eating Disorder Inventory (EDI-3)

For the description of the measure, please refer to chapter 2.

Body Image States Scale (BISS)

Body Image States Scale (BISS) is a validated six-item measure of persons' evaluative/affective body image states. It was found to be acceptably internally consistent and appropriately correlated with various trait measures of body image (Cash, Fleming, Alindogan, Steadman, & Whitehead, 2002). The measure is the composite mean of the six 9-point items, where low scores reflect more negative body image states, and high scores reflect more positive states.

Stimuli and apparatus

The 3D program Poser Pro 2012 (Smith Micro Software, Inc.) was used to create three female body stimuli: very thin, neutral-looking, and heavy. The female bodies were only partially dressed to emphasize the body shape – the bodies wore a bra and briefs (see figure 18). All body stimuli had a front view with hands spread and held at the same height

as the hips. The thinnest body was morphed with the middle body and the heaviest body was morphed with the middle body as well, creating 7 thin morphs, 7 heavy morphs and the middle body, which added up to 15 body morphs. Therefore, the bodies can be arranged on a continuum starting with 1, which would be the thinnest body, 8, which would be the middle body, and finishing with 15, which would be the heaviest body (please refer to figure 18). The bodies were morphed using the multi-morphing freeware Sqirlz (<http://www.xiberpix.net/SqirlzMorph.html>). The images were 12,5 cm in height and 7,5 cm wide (from hand to hand) on the screen. The stimuli were presented on a 22-inch NEC FP2141SB monitor using E-Prime 1.2 (Psychology Software Tools, Inc.). The resolution was 1600 x 1200 and the refresh rate was 85Hz.

3D body analysis: BMI estimates

The three bodies (1, 8 and 15) were exported as an .obj file from Poser Pro 2012 and opened in 3ds max (autodesk.com). The body's height was set to 1.68 m (as this was the original height imported from Poser Pro 2012). To estimate the weight of the models a similar procedure was used as described in Crossley, Cornelissen, and Tovée (2012). The volumes of the 3D models were calculated by the software and then multiplied by the density of the average young adult female body: 1.04 g/cm^3 (Pollock, Laughridge, Coleman, Linnerud, & Jackson, 1975). Finally, the BMI was calculated as the weight (in kilograms) divided by the square of the model's height (in metres). The estimated BMIs (kg/m^2) of the three stimuli were: 14.4 kg/m^2 for the thinnest body, which is categorised as severely underweight, 18.5 kg/m^2 for the middle body, which is the lower bound of "normal" weight, and 24.4 kg/m^2 for the heavy body, which is the upper bound of "normal" weight (almost overweight). As the thinnest body was morphed with the middle body and the middle body was morphed with the heaviest body, the difference between the estimated BMIs of the body models was divided by 7, which resulted in estimated BMIs for the rest of the stimuli (see figure 18). For morphs 1-8 the estimated BMIs differed by approx. 0.6 kg/m^2 and for bodies 8-15 they differed by approx. 0.8 kg/m^2 .

Design and procedure

The study consisted of 5 sessions and it took 2 hours and 15 minutes to complete them all. There were 4 sessions that needed to take place on 4 consecutive days, and the last 5th session was completed approximately two weeks later. During the first session the

participants were asked to sign the informed consent and fill in the screening form, which included questions about their weight, height, levels of activity, and eating behaviour. During each session the participants were asked to categorise female body stimuli into a 'thin' or 'heavy' category (body size categorization task). During three of the five sessions (1st, 4th, and 5th) the participants were also asked to fill in two questionnaires: Eating Disorder Inventory-3 (drive for thinness, bulimia, and body satisfaction scale) and Body Image States Scale (BISS), and rate the female body stimuli (1-9 scale) on attractiveness and closeness to personal body ideal (rating task). The 1st session took 45 minutes, 2nd and 3rd sessions took 15 minutes, 4th session and 5th session took 30 minutes.

Body size categorisation task

Each body size categorisation task consisted of three phases: baseline (45 trials), training (186 trials), and test (45 trials). During baseline and test phase each stimulus was presented 3 times and the participants were asked to categorise the body into a 'thin' or 'heavy' category. In the training phase, the number of presentations for each level of the stimulus differed. The most extreme bodies (1-2 & 14-15) were presented once in each training block, bodies 3-5 and 11-13 were presented twice, and the most neutral-looking bodies were presented three times (6-10). During the training phase, the participants categorised the bodies in the same way as during the baseline phase, but they also received 'Incorrect' or 'Correct' feedback for their categorisations. The participants in both conditions (control and intervention) were told that the 'Incorrect/ Correct' feedback was based on the categorisations of a previously tested group of people. In fact, the feedback was based on the participants' own responses and the experimental manipulation (see below).

The training phase differed between the control and intervention group. In the control condition, the feedback was based on the participant's baseline threshold, which was the point at which the participant stopped interpreting the bodies as thin and started to interpret them as heavy. The threshold was calculated as the ratio of thin categorisations to all possible responses. The calculation of the threshold was based on the assumption that the bodies would be categorised systematically on the thin-heavy continuum, with the most "thin" categorisations at the extreme thin end and none "thin" categorisations at the extreme heavy end. For example, for 20 thin categorisations and 45 trials in total the calculation would be: $(20/45)*15 = 6.67$, and the threshold would be rounded to 7.

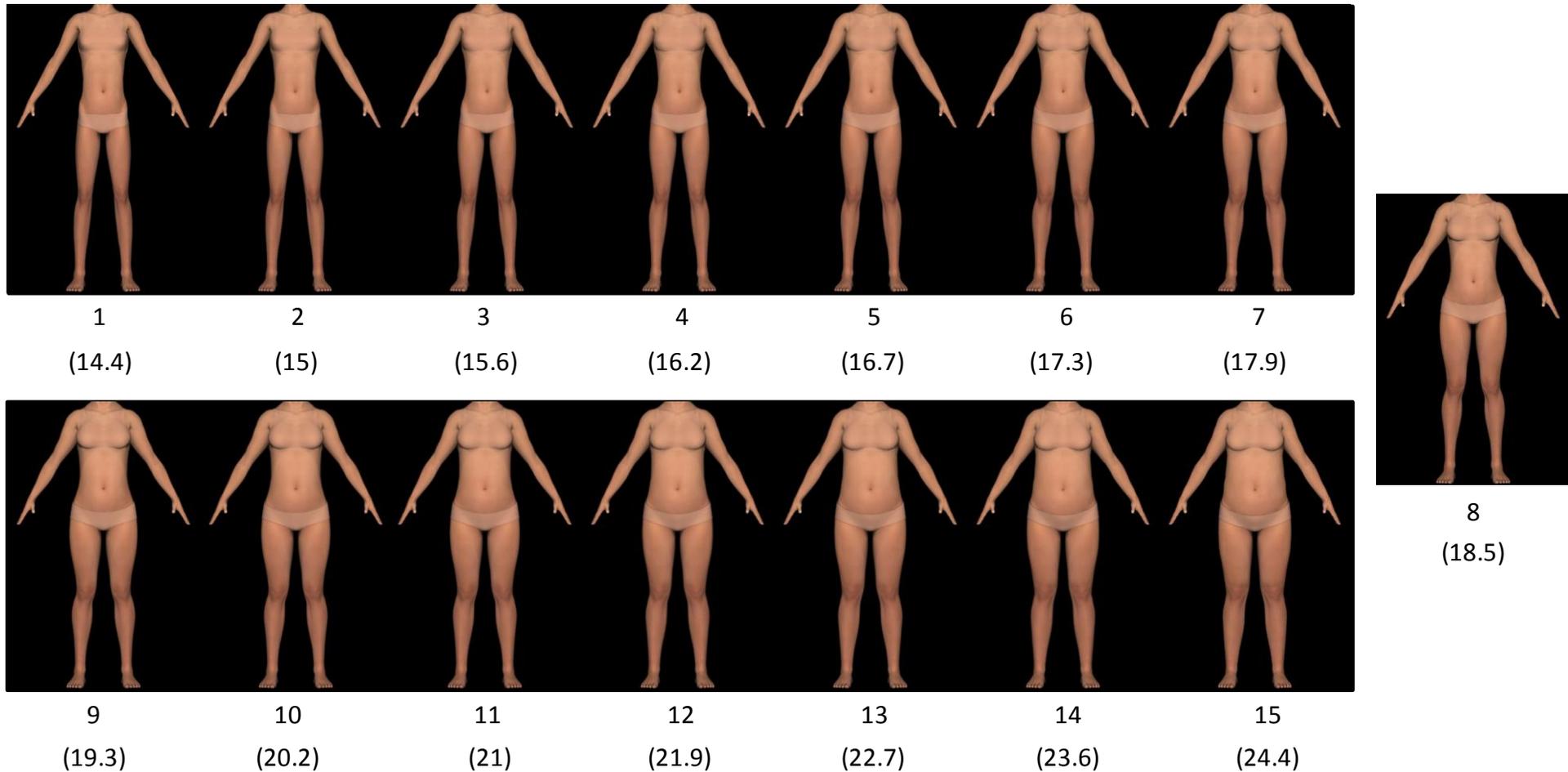


Figure 18. All levels of body stimuli (15) used in the study: 1 is the thinnest body, 8 is the middlemost body, and 15 is the heaviest body. Estimates of body mass index (kg/m^2) are in parentheses. The information about how the BMIs of the stimuli were calculated can be found above in the 3D body analysis section.

In the control condition, the responses were classified as 'Correct' if the participant identified the images below the threshold as thin and above the threshold as heavy. Otherwise, the responses were classified as 'Incorrect'. In the intervention condition, the feedback was also based on the participant's baseline threshold, but the 'Correct' classification was moved two morphs towards the 'heavy' end of continuum. Therefore, the two images nearest the threshold that the participant previously classified as 'heavy' at baseline were considered 'thin' when providing feedback.

After the training, during the test phase, another threshold was calculated, which could be compared with the baseline threshold to assess the effectiveness of the training during a particular session. All three phases of the body size categorisation task (baseline, training, and test) were run during the 1st, 2nd, 3rd, and 4th session. At the beginning of each session, a new baseline threshold was calculated and the feedback (training phase) was based on that threshold, thus the baseline thresholds could differ between the sessions. During the 5th session (2 week follow-up) only the baseline phase was run, which determined the last threshold.

Rating task: attractiveness and closeness to ideal

The rating task took 10 minutes to complete. The participants rated the same images they had seen in the body categorisation task on two qualities: attractiveness (15 stimuli presented 3 times) and closeness to personal body ideal (presented 3 times as well). The pictures were showed on the screen until the participant provided a rating. The participants responded with the keyboard keys (1-9) and could choose between the following responses (which they could always see below the rated stimuli):

Ratings of attractiveness: 1-extremely unattractive, 2-very unattractive, 3-unattractive, 4- quite unattractive, 5-average, 6-quite attractive, 7-attractive, 8-very attractive, 9-extremely attractive

Ratings of closeness to body ideal: 1-not my ideal at all, 2-very far from my ideal, 3-far from my ideal, 4-quite far from my ideal, 5-not far nor close to my ideal, 6-quite close to my ideal, 7-close to my ideal, 8-very close to my ideal, 9-my ideal

Results

Body size categorization task: thresholds

A 2x5 mixed ANOVA was run to compare the thresholds calculated for all 5 sessions, for both groups. There was a between subject variable of group (control vs. intervention) and a within subjects variable of session (5 sessions). Mauchly's test of sphericity indicated that the assumption of sphericity was violated for the two-way interaction, $\chi^2(9) = 54.52, p = .000$, thus the Greenhouse-Geisser correction was applied. A two-way interaction between group and session was statistically significant, $F(2.60, 153.55) = 5.28, p = .003, \eta_p^2 = .08$. Both the control and intervention group started with a similar baseline threshold: 7.87 and 7.90 respectively. Over the course of 4 training sessions, which took part on 4 consecutive days, the threshold in the intervention group was increasing systematically. This shift in threshold was sustained when the participants in the intervention group completed the baseline phase of the categorisation task for the last time, approximately 2 weeks later (please refer to figure 19).

To investigate at which point in time the differences in threshold between the groups started to be statistically significant, 5 separate between-subjects ANOVAs were run, using Bonferroni adjusted alpha levels of .01 per test (.05/5). When taking the adjusted alpha level into account, there was a statistically significant difference in the thresholds between the control ($M = 8.47, SE = 0.40$) and intervention group ($M = 9.87, SE = 0.35$) during the 2 week follow-up, $F(1, 59) = 7.18, p = .01, \eta_p^2 = .11$. The difference between the control ($M = 8.53, SE = 0.41$) and intervention group ($M = 9.87, SE = 0.35$) was approaching statistical significance at the 4th day of training as well, $F(1, 59) = 6.08, p = .017, \eta_p^2 = .09$. The differences in thresholds between the groups during baseline (1st day), 2nd and 3rd day of training were not statistically significant. The results show that both groups initially categorized the same amount of bodies as thin. However, the participants who received the training, in the intervention group, categorised more bodies as thin compared to the control group as the training sessions progressed.

To investigate the effect of session on thin/heavy thresholds, a within-subject ANOVA was run for each group separately. Mauchly's test of sphericity indicated that the assumption of sphericity was violated for both the control, $\chi^2(9) = 32.80, p = .000$, and the intervention group, $\chi^2(9) = 26.55, p = .002$. The Greenhouse-Geisser correction was thus

applied. There was a statistically significant effect of session on the thin/heavy thresholds for the intervention group, $F(2.64, 79.04) = 20.07$, $p = .000$, $\eta_p^2 = .40$, and the control group, $F(2.31, 67.03) = 3.25$, $p = .038$, $\eta_p^2 = .10$.

Pairwise comparisons, using Bonferroni adjusted alpha levels of .0125 per test (.05/4), were run for each group separately to investigate whether the differences in thin/heavy thresholds were statistically significant between the 1st baseline session and the rest of the sessions (2nd, 3rd, 4th and 5th). For the control group, there were no statistically significant differences between the baseline and the rest of the thresholds. For the intervention group, the pairwise comparisons revealed that the thin/heavy threshold was significantly higher during the 2nd ($M = -1.29$, $SE = 0.20$, $p = .000$), 3rd ($M = -1.48$, $SE = 0.28$, $p = .000$), 4th ($M = -1.97$, $SE = 0.34$, $p = .000$), and the follow-up session ($M = -1.97$, $SE = 0.29$, $p = .000$), in comparison to the baseline threshold ($M = 7.90$, $SE = 0.28$). These results indicate that the participants who received the training categorised more bodies as thin than at baseline, and this difference was apparent as early as during the second session, with the magnitude of the difference increasing as the time progressed. The difference in thresholds between the baseline session and the 2 week follow-up was also significant, indicating that the shift in thin/heavy categorisations can be sustained for at least two weeks after the completion of the training.

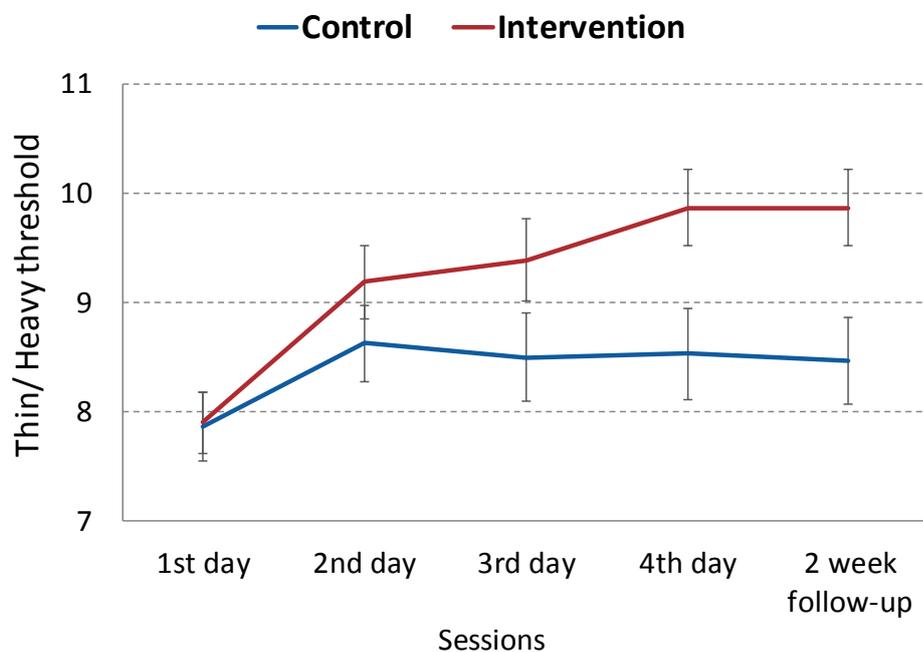


Figure 19. Mean thresholds for thin-heavy categorisations for both groups (control, intervention) for all 5 sessions, with standard errors (SE).

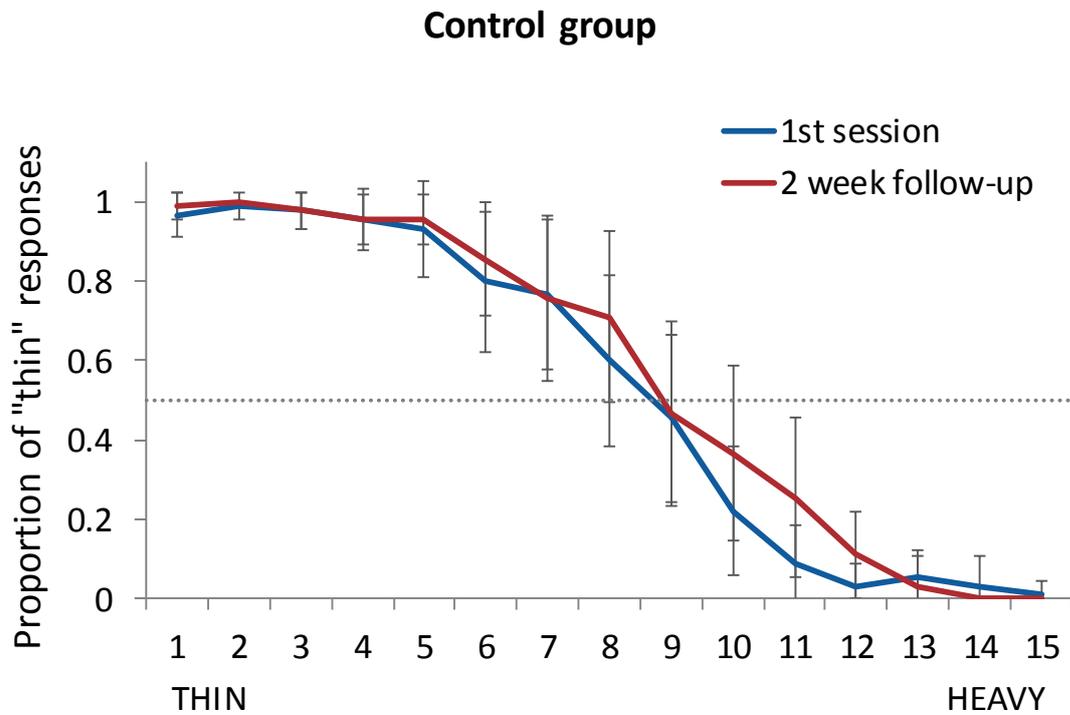


Figure 20. Mean proportion of "thin" responses to each body on a thin-heavy continuum (1 being the thinnest and 15 the heaviest) during the 1st session (baseline phase, before training) and at the 2 week follow-up for the control group, with standard errors (SE).

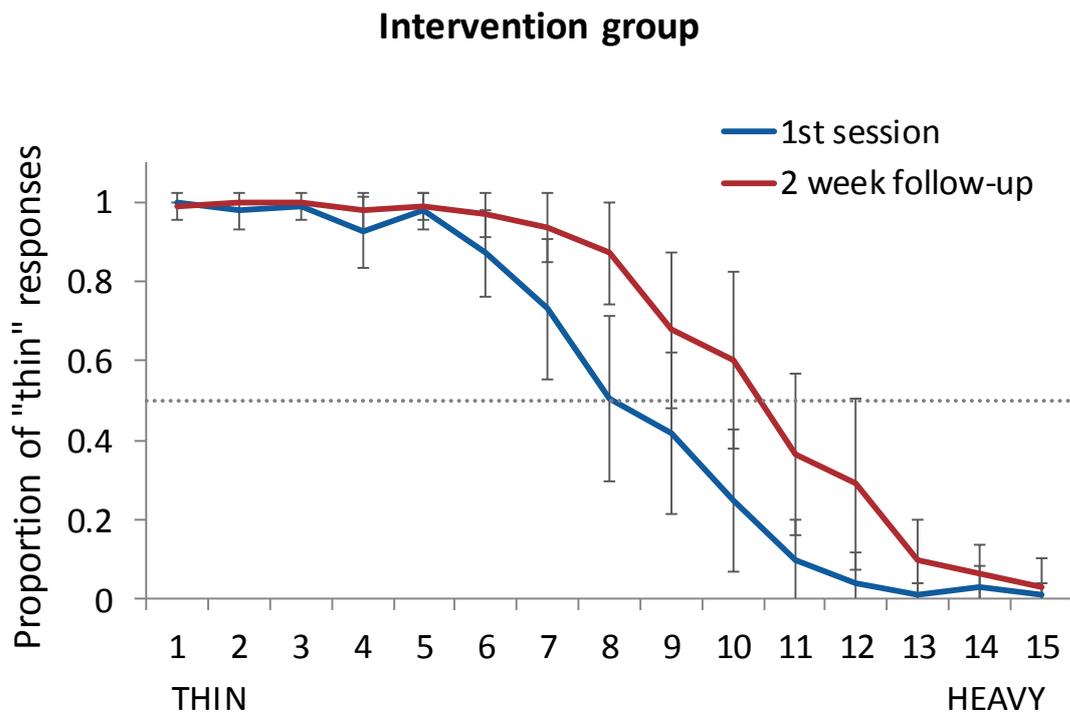


Figure 21. Mean proportion of "thin" responses to each body on a thin-heavy continuum (1 being the thinnest and 15 the heaviest) during the 1st session (baseline phase, before training) and at the 2 week follow-up for the intervention group, with standard errors.

The effect of training on body image measures

A series of 2x2 mixed ANOVAs were run to compare the groups and their questionnaire scores during the 1st and the follow-up session. There was a between subject variable of group (control vs. intervention) and a within subjects variable of session (1st vs. 5th). Body Image States Scale (BISS) was introduced after the data collection process have started therefore there are fewer data points for this variable: control $N = 27$, intervention $N = 25$.

For the state body satisfaction measure (BISS), only the interaction was found to be significant, $F(1, 50) = 8.46, p = .005, \eta_p^2 = .15$. Two paired samples t-tests were run to compare the 1st and 5th (follow-up) session for control and intervention groups separately. As expected, there was no significant difference found for the control group between the 1st and 5th session BISS scores, $t(26) = 1.06, p > .250, d = 0.16, 95\% \text{ CI } [-0.18, 0.55]$. For the intervention group, the difference was significant, $t(24) = -3.07, p = .005, d = 0.44, 95\% \text{ CI } [-0.89, -0.18]$, with the 5th session score being significantly higher ($M = 4.79$) than during the 1st session ($M = 4.26$). In EDI-3 scales a higher score indicates a more severe eating disorder psychopathology, whereas in BISS a higher score indicates greater body satisfaction; therefore, state body satisfaction increased in participants in the intervention condition (see table 10).

With regards to the EDI-3 body dissatisfaction scale, neither of the two main effects was significant. The EDI-3 body dissatisfaction score remained stable for the control group and lowered for the intervention group at the 2 week follow-up (see table 10). However, the interaction for EDI-3 body dissatisfaction score did not reach statistical significance, $F(1, 59) = 1.89, p = .174, \eta_p^2 = .03$. For the EDI-3 drive of thinness scores, there was a significant main effect of session, $F(1, 59) = 5.90, p = .02, \eta_p^2 = .09$, with higher scores reported during the 1st session ($M = 13.08$) and lower scores reported during the follow-up ($M = 12.13$), meaning that there was a reduction in drive for thinness for both the control and intervention group after the training. Neither the main effect of group nor the interaction was significant. However, the t-tests indicate that the difference between the 1st and 5th session scores was larger and statistically significant in the intervention group, $t(30) = 2.15, p = .04, d = 0.16, 95\% \text{ CI } [0.06, 2.39]$, as opposed to the control group, $t(29) = 1.26, p = .22, d = 0.09, 95\% \text{ CI } [-0.41, 1.75]$. For bulimia scores, only a main effect of session was significant, $F(1, 59) = 23.59,$

$p < .001$, $\eta_p^2 = .29$, with higher scores present during the 1st session ($M = 6.53$) and lower scores present during the 5th session ($M = 4.60$). This shows that after the training, there was a decrease in bulimic tendencies for both groups.

Table 9. Mean scores (standard deviation) on demographic variables and self-report questionnaires taken during the 1st session for: all participants ($N = 61$), control group ($N = 30$) and intervention group ($N = 31$).

	Age	BMI	EDI-3 DT	EDI-3 B	EDI-3 BD	BISS
$N = 61$	22.46 (3.60)	24.66 (4.58)	13.08 (7.32)	6.52 (5.34)	23.74 (6.51)	4.15 (1.14)
Control	22.60 (3.71)	24.80 (5.03)	12.63 (7.18)	6.67 (5.70)	24.10 (6.72)	4.06 (1.05)
Intervention	22.32 (3.55)	24.52 (4.18)	13.52 (7.54)	6.39 (5.06)	23.39 (6.38)	4.26 (1.25)

Note: BMI = Body Mass Index (kg/m^2), EDI-3 DT = Drive for Thinness, EDI-3 B = Bulimia, EDI-3 BD = Body Dissatisfaction, BISS = Body Image States Scale (only for BISS: control $N = 27$, intervention $N = 25$)

Table 10. Mean scores and standard deviations on self-report questionnaires for both groups: control group ($N = 30$) and intervention group ($N = 31$) given for the 1st and 5th session. The t and p values as well as Cohen's d are reported from the paired samples t -test ran between the 1st and 5th session scores for both groups separately.

	n	1 st session		5 th session		t	p	95% CI		Cohen's d
		M	SD	M	SD			LL	UL	
Control										
EDI-3 BD	30	24.10	6.72	24.00	7.49	0.15	.88	-1.29	1.49	0.01
EDI-3 DT	30	12.63	7.18	11.97	7.73	1.26	.22	-0.41	1.75	0.09
EDI-3 B	30	6.67	5.70	4.47	4.27	3.25	.003**	0.82	3.59	0.44
BISS	27	4.06	1.05	3.87	1.22	1.06	.30	-0.18	0.55	0.16
Intervention										
EDI-3 BD	31	23.39	6.38	21.74	(5.90)	1.85	.07	-0.17	3.46	0.27
EDI-3 DT	31	13.52	7.54	12.29	(7.74)	2.15	.04*	0.06	2.39	0.16
EDI-3 B	31	6.39	5.06	4.74	(5.11)	3.91	.000**	0.79	2.51	0.32
BISS	25	4.26	1.25	4.79	(1.20)	-3.07	.005**	-0.89	-0.18	0.44

Note: EDI-3 DT = Drive for Thinness, EDI-3 B = Bulimia, EDI-3 BD = Body Dissatisfaction, BISS = Body Image States Scale; in EDI-3 scales a higher score indicates a more severe eating disorder psychopathology, whereas in BISS a higher score indicates greater body satisfaction

Ratings of closeness to ideal

As we have seen with the thresholds, the shift in interpretation of thinness was sustained at the 2 week follow-up. To determine whether the body ideal preferences changed as well, second-order polynomials were fitted to closeness to ideal ratings for each observer in each group (Tovée, Maisey, Emery, & Cornelissen, 1999), allowing the peak ideal BMI to be calculated for each participant (see chapter 2, figure 14). Each fit was inspected for each participant separately to determine any atypical trends. Five participants had to be removed from this analysis resulting in 28 participants in control group and 28 participants in the intervention group. To compare the ideal peaks between the 1st and follow-up session and between the groups, a 2x2 mixed ANOVAs was run. There was a significant interaction between group and session, $F(1, 54) = 4.46$, $p = .04$, $\eta_p^2 = .08$, with the peak ideal BMI increasing for the intervention group, and lowering for the control group. Two paired samples t-tests were run to investigate whether the changes in peak ideal BMI were significant for both groups. For the control group, the peak ideal BMI decreased slightly but not significantly from 19.00 kg/m² to 18.92 kg/m², $t(27) = 0.49$, $p > .250$, $d = 0.08$, 95% CI [-0.26, 0.42]. For the intervention group, the peak ideal BMI significantly increased from 18.85 kg/m² to 19.22 kg/m², $t(27) = -2.70$, $p = .01$, $d = 0.43$, 95% CI [-0.66, -0.09]. Please refer to figure 22 for a representation of this relationship.

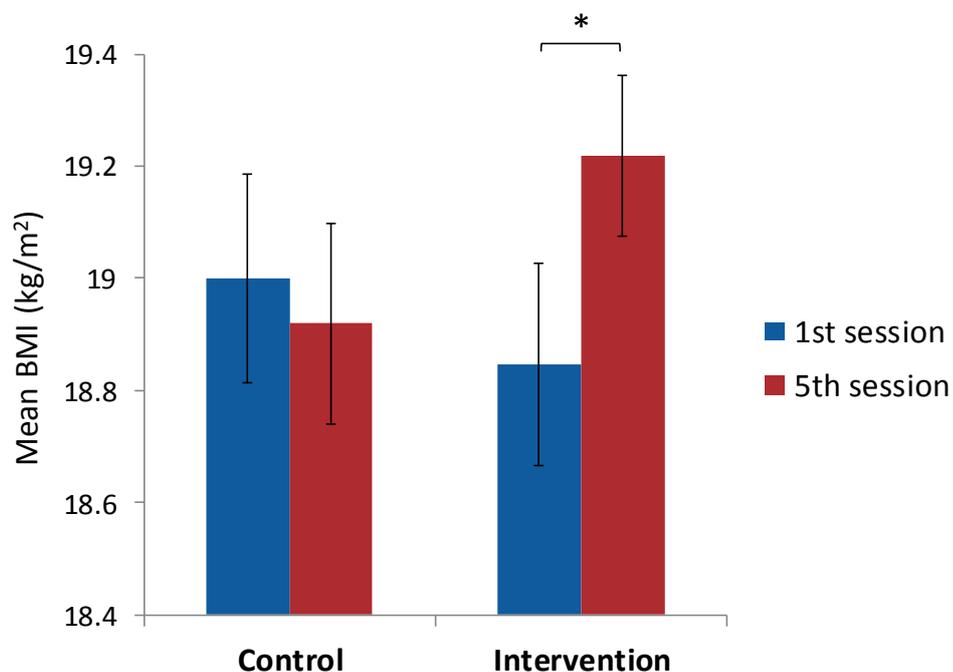


Figure 22. Mean body mass index estimations at peak ideal ratings (peak ideal BMIs) and standard error bars for control and intervention group, with 1st and 5th session contrasted.

Ratings of attractiveness

Same procedure as with closeness to ideal ratings was applied to calculate the BMIs that the participants found the most attractive. As before, each fit was inspected for each participant separately to determine any atypical trends. Five participants had to be removed from this analysis resulting in 28 participants in control group and 28 participants in the intervention group. To compare the attractiveness peaks between the 1st and follow-up session and between the groups, a 2x2 mixed ANOVAs was run. There was a significant interaction between group and session, $F(1, 54) = 20.57, p < .001, \eta_p^2 = .28$ with the peak attractive BMI increasing for the intervention group, and lowering for the control group. Two paired samples t-tests were run to investigate whether the changes in peak attractive BMI were significant for both groups. For the control group, the peak attractive BMI decreased significantly from 19.38 kg/m² to 19.12 kg/m², $t(27) = 3.11, p = .004, d = 0.38, 95\% \text{ CI } [0.09, 0.43]$. For the intervention group, the peak attractive BMI significantly increased from 19.04 kg/m² to 19.36 kg/m², $t(27) = -3.31, p = .003, d = 0.49, 95\% \text{ CI } [-0.51, -0.12]$. Please refer to figure 23 for a representation of this relationship.

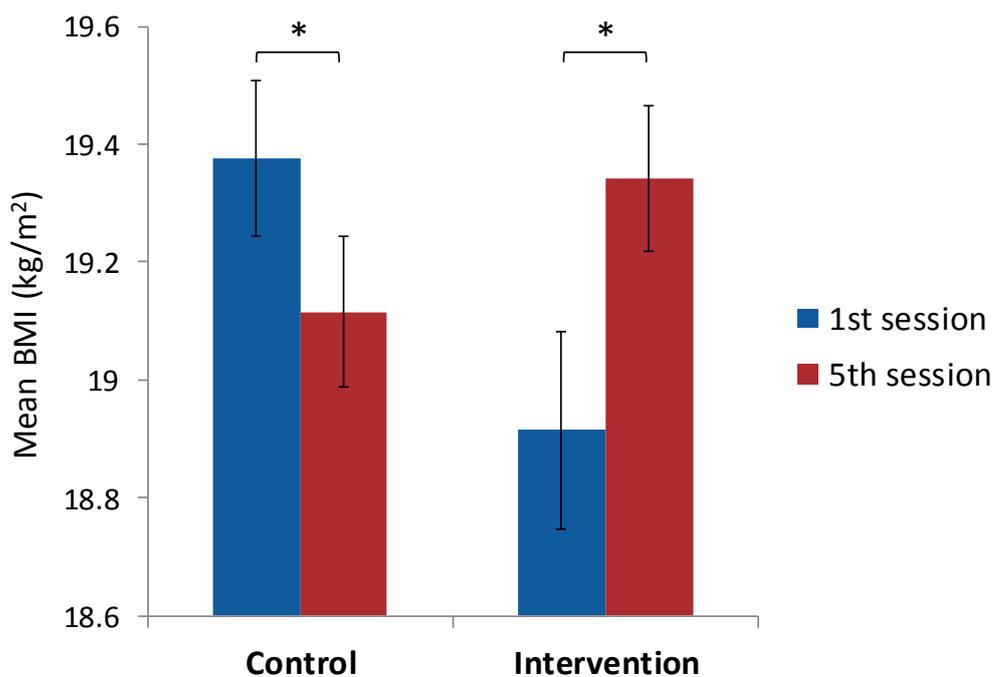


Figure 23. Mean body mass index estimations at peak attractiveness ratings (peak attractiveness BMIs) and standard error bars for control and intervention group, with 1st and 5th session contrasted.

The above results show that the shift in interpretation of thinness in the intervention group affected the perceived attractiveness of the body stimuli and the choice of body

ideals, with a higher BMI being perceived as the most attractive and closer to the personal body ideal at the 2 week follow-up.

Discussion

We investigated the effect of body size interpretation training on body satisfaction, personal body ideal and female body attractiveness in women with average to high levels of body dissatisfaction. We used a novel cognitive bias modification technique – body size categorisation task – based on the paradigm developed by Penton-Voak, Bate, Lewis, and Munafo (2012). In the intervention condition, the participants received feedback for their categorisations, which encouraged the interpretation of thinness in bodies previously categorised as heavy. In the control condition the feedback did not manipulate body size interpretation. In this study, we challenged the body size schema in females and aimed to modify the attitudes towards body size so that the average-looking bodies (not extreme in size) previously categorised as heavy would be trained to be categorised as thin and therefore seen as more positive and desirable.

The first hypothesis was supported as the social feedback intervention produced a shift in the participants' judgements of body size. As expected, the participants in the intervention condition categorised the bodies as thinner at the 2 week follow-up compared to their baseline judgements, and there was no statistically significant change in the thresholds in the control condition. Categorising a body stimulus which is not clearly thin or heavy into one category or the other might be a challenging task. In this study, the stimuli were presented quickly (150ms) so that a person's response would be automatic and more likely to express implicit cognitions and feelings about body size. As thinness is considered positive and heaviness negative in the Western culture, the responses might have been chosen on the basis of what the participants considered desirable. Therefore, if the participants liked the body they saw they would categorise it as 'thin', and when they saw a body which they did not consider desirable, they would categorise it as 'heavy'. As can be seen in figures 19 and 21, the participants who received the training categorised more bodies as thin than previously and their threshold shifted towards the heavier body types. The positive change in the interpretation of body size was clear right after the training finished (4th session) and it was sustained for two weeks (5th session).

Body dissatisfied individuals internalise the social standards of attractiveness more than individuals satisfied with their bodies (Smolak & Thompson, 2009; Stice, 2002) and they are thought to be more schematic in the processing of body related information (Williamson, White, York-Crowe, & Stewart, 2004). According to cognitive behavioural perspectives, specific situational cues or events can activate schema-driven processing (Cash, 2002). In here, we used what participants thought was social feedback, where 'incorrect' message indicated that majority of people provided an opposite categorisation of the displayed body stimulus. The feedback was supposed to challenge the participants' views of what is thin and heavy by contrasting them with the views of others which were revealed in feedback messages.

The second hypothesis was supported as well, as the shift in the judgements of thinness in the intervention group resulted in more favourable attractiveness and ideal ratings of heavier body sizes at the 2 week follow-up, as compared to the first baseline session. The results confirm that people's body image and body ideals are flexible and can be modified through experience. As Tovée, Swami, Furnham and Mangalparsad (2006) showed, people who move to another country, and as a result change the culture they live in, can acquire different attractiveness ideals. Our feedback training is mimicking this natural learning process by changing the participants' interpretation of "the standard" for thin or heavy. Past studies showed that affecting the participants' perception of the body norm or average has an effect on the choice of body ideals and perception of attractiveness. By manipulating what participants thought were population averages for body size (Mills, Jadd, & Key, 2012) or peer preference choices of body size (Bair, Steele, & Mills, 2014), the participants who were given the thinner norms chose a thinner body ideal, and those who were given the heavier norms chose a heavier body ideal. However, in the first above study the participants' body dissatisfaction was not measured, and in the second study, the participants' body dissatisfaction was not influenced by the manipulation. In our study, however, the manipulation and the shift in body size interpretation had a positive influence on body satisfaction.

The third hypothesis was also supported, as the shift in the interpretation of body size was associated with lower levels of body dissatisfaction after the training, in the intervention group. As explained above, when the norm for acceptable body size is changed it affects the perception of body ideals. In line with cognitive-behavioural theories of body

image, body image evaluation, i.e. individual's level of satisfaction with own body, stems largely from the extent of discrepancy between the internalised appearance ideals and one's self-perceived physical characteristics (Cash, 2011). The CBM task used in this study affected the biased interpretation of normal-sized bodies in women with high body dissatisfaction, which resulted in the participants rating the heavier bodies higher on attractiveness and closeness to personal ideal. Thus, the observed decrease in body dissatisfaction may be due to the reduction in the gap between the ideal and the self-perceived body.

Effects of the CBM task showed a clear difference between the intervention and the control group in terms of decrease in state body dissatisfaction. However, the results for the EDI-3 scales were not as straightforward. The change in the EDI-3 scores occurred in the expected direction for both the control and the intervention group, with body dissatisfaction and drive for thinness scores lowering in the intervention group (please refer to table 10). However, the bulimia score lowered with statistical significance in both the intervention and the control group. The bulimia scale of the EDI-3 assesses the eating habits while the other scales – body dissatisfaction and drive for thinness – are related to size and weight concerns. The manipulation used in this study targeted attitudes towards body size and it is possible that it did not affect eating attitudes in the same way, resulting in the pattern for bulimia scores which is difficult to interpret in the context of this study design.

Although there was an improvement in state body satisfaction in the intervention group, the improvement in body dissatisfaction or drive for thinness was not of the same magnitude. Although the EDI-3 is designed to be sensitive to change over time (Garner, 2004), it might not have been sensitive enough to detect subtle changes over a short period of two weeks. Test-retest stability provides evidence for that: drive for thinness scale had a stability coefficient of 0.95, bulimia 0.94, and body dissatisfaction 0.95 (Garner, 2004), which indicates very high stability rates of these traits.

It has been suggested that non-clinical participants, which were used in this study, are thought to rarely display cognitive biases approximating the significance found in clinical disorders (Cassin, von Ranson, & Whiteford, 2008; Lee & Shafran, 2004). It has also been shown that people with high levels of body dissatisfaction and internalization of socio-cultural norms are more resistant to body size manipulations (Glauert, Rhodes, Byrne, Fink, & Grammer, 2009; Wedell, Santoyo, & Pettibone, 2005), which underlines the importance of

longer exposures to experimental manipulations to observe the hypothesised effect. In the future, if the researchers were to use a clinical disorder sample, it would be valuable to assess body image change over a longer period than two weeks and after a more intense training.

It would also be advisable to add a questionnaire which would measure social desirability as the effectiveness of the social feedback intervention could rely on the extent to which the participants are influenced by others' opinions. Attractiveness is a socially-constructed concept (Jackson, 2002; Tiggemann, 2011), with attractiveness ideals changing constantly and adapting to the current cultural trends (Dittmar, Halliwell, & Ive, 2006; Sypeck, Gray, & Ahrens, 2004). As all Western females are influenced by the same culture, they could be expected to have very similar attractiveness ideals. However, women higher in body dissatisfaction internalise those standards of attractiveness more (Smolak & Thompson, 2009) and therefore they will be more prone to judge and compare themselves against this desirable attractiveness standard (Schaefer & Thompson, 2014; Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999). Choosing a personal body ideal will therefore be influenced by people's cognitions about their own body, their expectations regarding size and shape and the discrepancy between the standard and their own body. Participants in the control group were reassured, by what they believed was a group of previously tested people, that their notions of what is thin and what is heavy are culturally accepted. This did not change their choice of the ideal BMI and resulted in choosing even lower peak attractiveness BMI after receiving the feedback. In the intervention group, on the other hand, the feedback given by the "previous group" prompted the participants to consider heavier bodies as more desirable and the peak attractiveness and ideal BMIs increased. The women higher in social desirability could have been more susceptible to the social feedback used in the study and be quicker to internalise the "new" standard for thinness and heaviness.

Keeping in mind that cognitive bias modification is still a young and developing field (MacLeod & Mathews, 2012), more intensive and longer cognitive bias trainings for eating-disordered patients, especially attentional bias retraining or cognitive modulation of food reward processes, would be very beneficial to eating disorder research (Siep, Jansen, Havermans, & Roefs, 2010). Future researchers should aim to replicate the findings presented in this study and test whether the tasks similar to body size interpretation training

can be utilised in the treatment of severe body image issues, body dysmorphia or eating disorders, alongside more traditional cognitive-behavioural therapies.

At the time the data were collected, this was the only study I was aware of which used cognitive bias modification to manipulate the categorisation of body size and investigate its effects on personal body image. In a recent study by Gledhill et al. (2016) a similar body size categorisation task was used which also successfully shifted the categorical thin/fat boundary for women high in body image concerns, in the intervention group. The study yielded similar results to our study's as the shift in the categorical boundary was still present at the 2 week follow-up and the training improved the participants' attitudes to body shape and weight, as measured by the Eating Disorder Examination Questionnaire (EDE-Q).

Our results are in line with the sociocultural theory of body image, which posits that social norms can affect the judgement of other people's as well as our own bodies. The findings suggest that a shift in the interpretation of body size, achieved by what participants believed was social feedback, may lead to changes in cognitions – thoughts, feelings and attitudes towards bodies of different size, which, in line with the cognitive-behavioural models of body image, may also affect the way we think about our own bodies. The results showed that assigning more positive labels to normal-sized bodies (with normal BMIs), sometimes regarded as “heavy” or “fat” in the Western culture, can reduce body dissatisfaction, which is one of the risks for the development of eating disorders (Leon, Fulkerson, Perry, & Cudeck, 1993; Stice & Shaw, 2002; Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999). The findings provide support for the malleability of cognitive biases and extend the literature by showing that the effects on body image achieved through CBM can last for at least two weeks and are not short-term.

Study 1 and 2 (chapter 2 and 3) showed a link between greater body image concerns in women and their choice of thinner body ideals. The objectification theory of female body image (Fredrickson & Roberts, 1997), described in the literature review (see chapter 1), posits that women and girls are under more pressure than men and boys to take care of their appearance and meet the sociocultural standards of female body ideal, which explains the greater and normative dissatisfaction among females (Paap & Gardner, 2011; Swami, Frederick, et al., 2010). As the construction of the female body ideal is a sociocultural

process (Jackson, 2002; Tiggemann, 2011), males' attitudes towards the female bodies would also take part in its formation thus indirectly influencing women's body image and perception of themselves. In the next study, we contrasted the attitudes of men and women towards the female bodies varied in size. We investigated whether men who embrace the societal norms of appearance for their own gender (positive muscularity bias), would also be more biased towards the female body ideal (positive thinness bias), prescribed by the Western culture.

CHAPTER 4 – Study 3

Introduction

Sociocultural theories of body image provide a link between the repeated exposure to normative body ideals and the negative impact it may have on body image when people adopt these body ideals as a personal standard against which to compare themselves (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999). The sociocultural theory does not only apply to women's body image. Men who endorse the social construct of masculinity may be more inclined to pursue a lean and muscular body type, which denotes strength and dominance. The internalisation of the male body ideal was found to mediate the relationship between conformity to masculine norms and the drive for muscularity (Franko et al., 2015). Men who more easily embrace the sociocultural norms for their own gender, might be also endorsing the social construct of femininity. According to the objectification theory (Fredrickson & Roberts, 1997), there exists a widespread conviction that taking care of appearance is essential for women and as a result it is appearance that the women should build their self-worth on. Men who agree with the above convictions, as a part of the culture they live in, might form more unfavourable attitudes towards female bodies which do not meet the ideal standard of being lean and thin.

The constructs of female beauty and ideals are influenced by both men and women and their perceptions. In line with the aforementioned objectification theory of female body image (Fredrickson & Roberts, 1997), the extreme and gendered attitudes towards the female bodies are suggested to take part in sustaining the pressure on girls and women to attain a thin body. Therefore, males' attitudes towards female bodies would take an important part in influencing the construction of female body ideals, and, as a result, women's body image and perception of themselves. Studies showed that men tend to be more dissatisfied with their partner's size (Paap & Gardner, 2011), tend to objectify women more than other women do (Strelan & Hargreaves, 2005), and that there is a link between greater drive for muscularity in males, stronger objectification of women, and sexist attitudes (Swami & Voracek, 2013). In this study, we aimed to investigate whether men having more body image concerns and embracing the gendered muscular male ideal (positive muscularity bias) would also choose a gendered thinner female body ideal (positive thinness bias), prescribed by Western culture and society. To the best of my knowledge, no

studies to date investigated the difference in attractiveness ratings of female bodies between men high and low in body image concerns (drive for muscularity, appearance investment, body dissatisfaction).

The study aimed to:

- 1) Contrast male and female attitudes to body size and body ideals of their own and opposite gender
- 2) Investigate male body image concerns, specifically, the relation of drive for muscularity with appearance investment, body satisfaction, and objectification of male and female body
- 3) Examine how one's body image and the attitudes towards one's own body affect the attitudes towards the gendered attractiveness ideals – thin for women and muscular for men

The male and female body ideals are closely related to the polarised perception of feminine and masculine behaviours and characteristics. Much of the existing research on body image and disordered eating focuses on drive for thinness, which is a trait predominantly seen in girls and women. Men, however, aim to have a bigger and more muscular body (McCreary, Sasse, Saucier, & Dorsch 2004; Hildebrandt, Langenbucher, & Schlund, 2004); this drive for muscularity is one of the key factors influencing male body dissatisfaction. Drive for thinness and the female body ideal relate to being small, lean and thin, which implies that the female body should be above all aesthetically pleasing, even at the expense of health and strength. Women's body weight regulation strategies are aimed at weight loss, toning and looking attractive. The female body, therefore, is mainly evaluated from the appearance perspective, with the focus placed on beauty and sex appeal. Men, however, aim to develop their muscularity not only to increase their overall attractiveness but also to enhance their athleticism, sense of masculinity, and health (Morrison, Morrison, & Hopkins, 2003). The male body tends to be evaluated in terms of functionality (Striegel-Moore & Franko, 2002), with the weight being placed on athleticism and strength. Although some men may want to achieve a thin body ideal, and some women may wish to develop a muscular and a toned body (Homan, 2010; Field et al., 2005), drive for thinness and drive for muscularity are disproportionately spread across both genders. With the understanding that both sexes' strategies are aimed at enhancing one's attractiveness and receiving the social

benefits that come with gender-stereotyped body shapes, women and girls still seem to be under much more pressure from peers, family, and partners to alter their appearance.

Although the negative body image in boys and men is on the rise (McCabe & Ricciardelli, 2004; O’Dea & Abraham, 2002; Olivardia, Pope, Borowiecki, & Cohane, 2004; Tiggemann, Martins, & Kirkbride, 2007) and body dissatisfaction was found to be a risk and a maintenance factor of eating disordered behaviours in both genders (Blashill, 2011; Stice, 2002), girls and women are still found to be less satisfied with their weight and size (Paap & Gardner, 2011), display greater body size distortion (Paap & Gardner, 2011), engage more in certain aspects of disordered eating (Johnson et al., 2004; Milligan & Pritchard, 2006; Muth & Cash, 1997), and have lower self-esteem (Paap & Gardner, 2011) than boys and men. As a result, a large part of research on body dissatisfaction and body ideals has focused on women (Grabe & Hyde, 2006; Grabe, Ward, & Hyde, 2008).

However, McCreary and Sasse (2000) recognised the need for a more thorough examination of the male body image and developed a scale which investigated a concern specific to the male population – drive for muscularity. The term “drive for muscularity” has been coined by McCreary and Sasse (2000) and describes a desire to gain muscle mass and develop a muscular body. The Drive for Muscularity Scale (McCreary & Sasse, 2000) used in this study was found to be one of the most effective measures of male body image (Cafri & Thompson, 2004a). Men tend to obtain higher scores on the Drive for Muscularity Scale (and express higher levels of muscle dissatisfaction than women (Cafri & Thompson, 2004b; McCreary & Saucier, 2009). The drive for muscularity should be differentiated from the drive for thinness, which represents motivation for achieving a thin physique, and the drive for leanness, which reflects an interest in achieving low body fat and developing a fit and toned body (Smolak & Murnen, 2008).

A link between muscularity and masculinity has been repeatedly shown (McCreary, Saucier, & Courtenay, 2005; Smolak & Murnen, 2008), with men’s more traditional views on gender and masculinity resulting in elevated levels of drive for muscularity. Appearing attractive to others is not the only motivation for developing a muscular physique for men – feeling masculine seems to be as important. A study by Mussap (2008) showed that the anxiety about deviating from the masculine gender role results in increased leanness and muscularity concerns. A qualitative study on male body image revealed that adult men and

teenagers associated body muscularity with feelings of confidence and power in social situations and even young boys and teenagers thought that muscularity was related to masculinity (Grogan & Richards, 2002). The traditional concept of masculinity characterised by physical capability, strength, competitiveness, and dominance was thus linked to a lean and muscular body. Another qualitative study, investigating the drive for muscularity in college men, specified the perceived social and health benefits of having a muscular physique, which include: overall appearance satisfaction, being attractive to women, expression of social status, athleticism and strength, and increase in physical and mental health (especially self-esteem) (Morrison, Morrison, & Hopkins, 2003). Thus, the research on male body image revealed a clear association between men's attitudes towards gender roles, masculinity, and a drive for muscularity.

Drive for muscularity has been associated with low self-esteem, higher levels of depression (Chittester & Hausenblas, 2009; McCreary & Sasse, 2000; Olivardia, Pope, Borowiecki, & Cohane, 2004), increased general body dissatisfaction, negative affect, social physique anxiety, as well as poorer sexual functioning (McCreary, 2011, p. 199). It was also found to be associated with anxiousness, perfectionism, and focus on appearance (Davis, Karvinen, & McCreary, 2005). Men with higher drive for muscularity are at a greater risk of anabolic steroids abuse (Maida & Armstrong, 2005) and are more likely to develop muscle dysmorphia (Maida & Armstrong, 2005; Robert, Munroe-Chandler, & Gammage, 2009). A recent meta-analysis investigating the drive for muscularity in men revealed that increased drive for muscularity is related to specific appearance-altering behaviours, such as excessive exercise, disordered eating, and supplement consumption (Tod & Edwards, 2015). In line with the above literature, it was hypothesised that males' higher drive for muscularity will be associated with higher levels of body dissatisfaction, appearance investment, and greater objectification of women.

Pope, Phillips and Olivardia (2000) showed that men significantly underestimated their own muscle mass, picked a significantly more muscular male body as their ideal (an average increase of 12.7kg (28lbs)), and believed that women prefer more muscular bodies (on average 13.6kg (30lbs) heavier than the participants' actual size). In addition, higher drive for muscularity was found to be consistently related to perceiving the ideal physique as muscular as well as internalising this muscular body standard (Edwards, Tod, & Molnar, 2014), which was also found to predict body dissatisfaction in males (Warren, 2008). Hence,

we hypothesise that men higher in drive for muscularity will rate muscular bodies as the most attractive and closest to their body ideal.

To investigate the degree to which young men and women objectify the female body, a modified version of the objectification scale (Fredrickson, Roberts, Noll, Quinn, & Twenge, 1998) was used. In their study, Fredrickson and colleagues (1998) showed that women self-objectify their bodies more than men. In our study, we aimed to investigate the objectification of the male and female body in general. Therefore, instead of ranking the physical self-concept, the participants ranked a general physical concept of women and men, by indicating which attribute had the most impact on the concept of female and male physicality (see appendix A). For example, instead of asking the question 'When considering your physical self-concept, what rank do you assign to physical coordination?', the following question was asked: 'When considering female physicality, what rank do you assign to physical coordination?'. In this adapted version of the Objectification Questionnaire the higher the score, the greater the focus on women's (or men's) appearance, which indicates a greater objectification of the female (or male) body. A modified version of the scale was successfully used in previous studies, e.g. to measure 'other objectification' by rating the attributes according to how important they were when looking at others (Swami, Coles, et al., 2010; Strelan & Hargreaves, 2005).

There exist a number of studies which investigated gender differences in perception of male and female attractiveness. Most studies showed no difference between men and women in their ratings of female bodies on attractiveness (Smith, Cornelissen, & Tovée, 2007; Smith et al., 2007; Swami & Tovée, 2005; Tovée & Cornelissen, 2001; Tovée, Hancock, Mahmoodi, Singleton, & Cornelissen, 2002; Tovée, Maisey, Emery, & Cornelissen, 1999; Winkler & Rhodes, 2005). For example, one study showed that both men and women rated an underweight female figure as the most attractive and that males endorsed more sexist attitudes, as measured by various scales (Swami, Coles et al., 2010). When asked to create a 3D model of an ideal female body, male and female participants created bodies which were not significantly different in size, with both genders creating a body which had a BMI at the thin end of the healthy weight (almost underweight) (Crossley, Cornelissen, & Tovée, 2012). The created male 3D models also did not significantly differ between both genders, with the male bodies being heavier and in the normal-overweight BMI range, more muscular, and having a pronounced V-shape. Although one study suggested differences in fixation

distributions when judging female attractiveness, with men more frequently fixating on the bust area than women, the attractiveness and body fat ratings did not significantly differ between men and women (Cornelissen, Hancock, Kiviniemi, George, & Tovée, 2009).

Taking the above investigations into account, we did not expect to see differences between men and women in their attractiveness ratings of the male and female bodies. Most of the above studies, however, did not take the varying levels of body image concerns into account and did not investigate the link between one's own body image concerns and attitudes towards bodies of the same and opposite gender. As mentioned before, a link between greater drive for muscularity in males, stronger objectification of women and sexist attitudes has been found (Swami & Voracek, 2013). This study set out to test whether men who embrace the socioculturally influenced male muscular ideal will also be more inclined to embrace the female thin ideal as well. The study will take one's own body image into account to further investigate the connection between own and other body schema and the role that embracing the culturally endorsed appearance ideals might play in judging others' attractiveness.

In short, the following hypotheses were formed and tested:

- 1) It is expected that men higher in body image concerns will rate male muscular bodies as more attractive and closer to the personal body ideal than men lower in body image concerns (positive muscularity bias)
- 2) It is hypothesised that men with higher drive for muscularity will objectify women more and rate thinner female bodies as more attractive than men lower in drive for muscularity (positive thinness bias)

Methods

Participants

Sixty seven males and sixty seven females (134 in total) undergraduate and postgraduate students from University of Hull, UK participated in the study. The participants were recruited through email or posters/ flyers advertising the study at the University of Hull campus. The participants were offered either course credit or £5 for participation. The participants were required to be between 18-30 years old. Out of all males, 47 were of

healthy weight, 17 were overweight, 2 were obese, and 1 was categorised as obese, however it was due to muscularity. Out of all females, 50 were of healthy weight, 4 were underweight, 9 were overweight, and 4 were obese. Two males and six females reported a 'history of an eating disorder'. All participants had normal or corrected to normal vision. The study has been approved by the Department of Psychology ethics committee, University of Hull.

Measures

Drive for Muscularity Scale

The Drive for Muscularity Scale (McCreary & Sasse, 2010) represents an individual's perception that he or she is not muscular enough and that bulk should be added to his or her body frame, in the form of muscle mass (irrespective of a person's percentage of actual muscle mass or body fat). For males, the DMS has two lower-order factors: muscularity-related attitudes and muscle-enhancing behaviours. Those two lower-order factors also load onto a single, higher-order drive for muscularity factor for men. For women, the two subscales do not emerge from factor analyses. Thus, for men, researchers can compute separate attitude and behavioural subscale scores and an overall DMS score. Because in this study males and female are compared, only the overall DMS score will be used in the analyses. The DMS has shown consistently acceptable reliability.

Body Image States Scale

For the description of the measure, please refer to chapter 3.

The Appearance Schemas Inventory

The Appearance Schemas Inventory-Revised (Cash, Melnyk, & Hrabosky, 2004) is a 14-item instrument that assesses body image investment in relation to certain beliefs or assumptions about the importance, meaning, and influence of appearance in one's life. It includes two factors: self-evaluative salience (of appearance) and motivational salience (of appearance), with 12 and 8 items respectively. For both genders, the composite ASI-R and its two factors were found to have high internal consistency and to be significantly convergent with other pertinent measures of body image and psychosocial functioning. A higher score on indicates a person's greater psychological investment in one's own physical appearance.

Adapted version of the Self-Objectification Questionnaire

The Self-Objectification Questionnaire (Frederickson, Roberts, Noll, Quinn, & Twenge, 1998) assesses the extent to which individuals view their bodies in observable, appearance-based terms versus non-observable, competence-based terms without an evaluation of how satisfied they are with their bodies. Normally, participants rank order 10 body attributes by how important each is to their own physical self-concept from 0 (least impact) to 9 (greatest impact). In this study, instead of ranking the physical self-concept, the participants will be ranking a general physical concept of women and men, and they will indicate which attribute has the most impact on the concept of female and male physicality. Instead of asking the question 'When considering your physical self-concept, what rank do you assign to physical coordination?' the following question will be asked: 'When considering female/male physicality, what rank do you assign to physical coordination?', etc. The scores are obtained by separately summing the ranks for appearance-based items (3, 5, 6, 8 and 10) and competence-based items (1, 2, 4, 7 and 9), and then subtracting the sum of competence ranks from the sum of appearance ranks. Scores may range from -25 to 25, with higher scores indicating a greater emphasis on appearance, which usually is interpreted as higher trait self-objectification. However, in this study, a higher score will indicate a greater emphasis on appearance, which could be interpreted as higher objectification of the female or male body in general.

Stimuli and apparatus

The female stimuli that were used in study 2 were also used in this study (see chapter 3). The male stimuli were also created in the 3D program Poser Pro 2012 (Smith Micro Software, Inc.). Three body types were created: thin, neutral-looking and muscular. The male bodies wore only briefs to emphasise the body shape (see figure 24). All body stimuli have front view and hands spread and held at the same height as the hips. The thinnest body was morphed with the middle body (Sqirlz morph; <http://www.xiberpix.net/SqirlzMorph.html>), and the most muscular body was morphed with the middle body as well, creating 7 thin morphs, 7 muscular morphs and the middle body, which added up to 15 body morphs. The BMIs of the female stimuli were estimated in a previous study (see chapter 3, figure 18). However, as some male bodies were of muscular built, the BMI measure would be unreliable and difficult to estimate, thus the BMIs were not estimated for the male stimuli. The images

were 12,5 cm in height and 8,5 cm wide (from hand to hand) on the screen. The stimuli were presented on a 22-inch NEC FP2141SB monitor using E-Prime 1.2 (Psychology Software Tools, Inc.). The resolution was 1600 x 1200 and the refresh rate was 85Hz.

Design and procedure

Before the study started, the participants were asked to read and sign the consent form. Afterwards, the participants were told that there would be two computer tasks, followed by completion of a series of questionnaires. The participants were also assured that the experiment would take 45 minutes and that they can withdraw at any time.

The participants were seated approximately 57 cm away from the monitor and were instructed to first categorise the female body stimuli into a thin or heavy category, using 'c' for thin and 'm' for heavy. All 15 female body stimuli were presented three times, with 45 trials in total. The fixation cross appeared for 1000-1500ms, then the bodies were presented for 150ms, a mask appeared for 250ms, and a question mark appeared in the middle of the screen staying there until the participant made a response. After the participant responded, the next body was displayed. After the task was completed, the participants rated the same female bodies on normality (averageness), attractiveness (both male and female participants) and on closeness to personal body ideal (female participants only). The same rating scales were used as in study 1 and 2. Each female body was rated three times; therefore, the participants rated 45 bodies on each trait ($45 \times 3 = 135$ bodies rated). After the female bodies were rated, the participants were asked to categorise the male body stimuli into a 'thin' or muscular' category in the same way as the female bodies were categorised. The male bodies were also rated on normality, attractiveness (both male and female participants) and closeness to personal body ideal (male participants only). The only difference was with the normality scale as it had to be modified to refer to muscular bodies: 1-too thin, 2-very thin, 3-thin, 4-a bit thin, 5-normal (average), 6-a bit muscular, 7-muscular, 8-very muscular, 9-too muscular. After the computer tasks were completed, the participants filled in a short screening form asking about the participants' weight, dieting behaviour and levels of activity. Finally, the participants filled in four questionnaires: Drive for Muscularity Scale, Body Image States Scale, Appearance Schemas Inventory-Revised, and an adapted version of the Self-Objectification Questionnaire. At the end of the study the participants were fully debriefed and any questions the participants asked were answered.

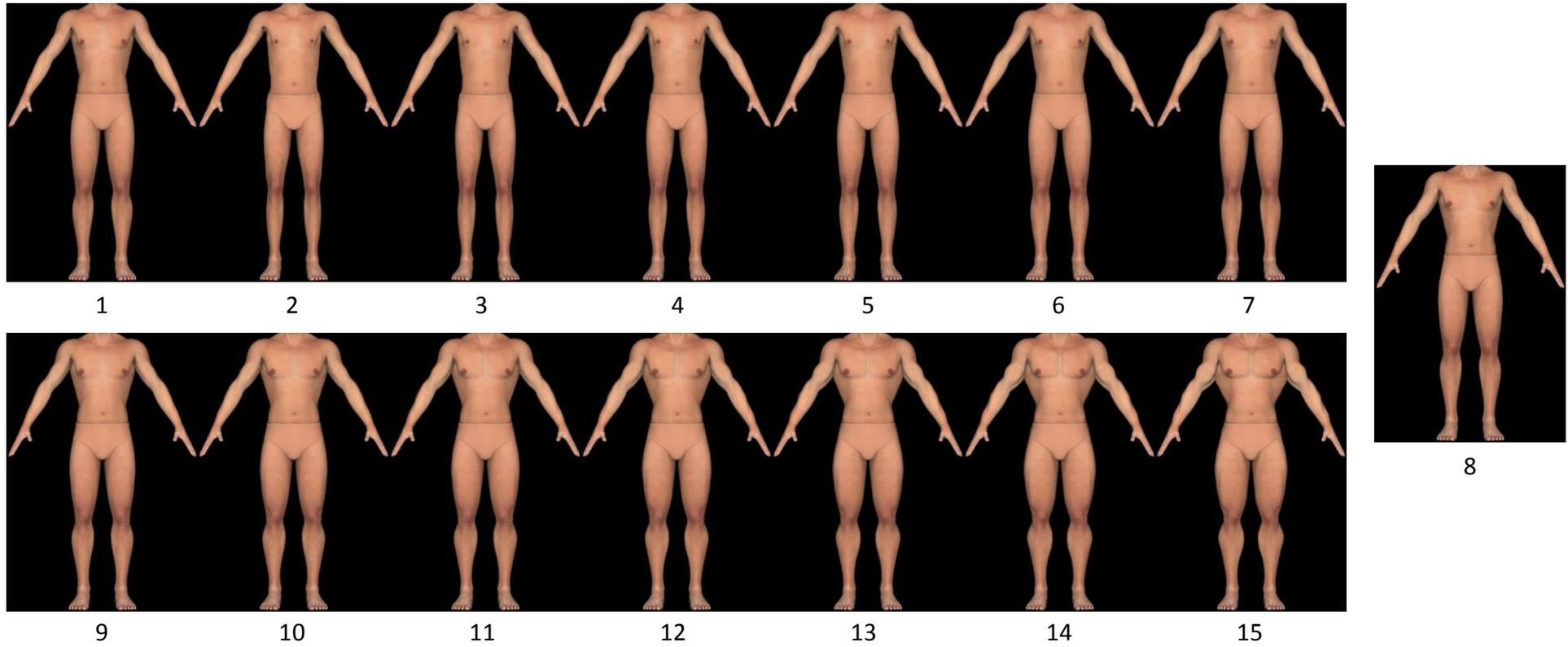


Figure 24. All levels of male body stimuli (15) used in the study: 1 is the thinnest body, 8 is the middlemost body, and 15 is the most muscular body.

Results

Comparison between the sexes (males vs. females)

Demographic variables and questionnaires

A series of independent t-tests were conducted to see how males and females differed on a variety of demographic and body image concern measures. Mean scores for all measures can be found in table 11, and correlations between the measures for men and women can be found in table 12 and table 13, respectively. Boxplots were used to detect outliers in female ($N = 67$) and male groups ($N = 67$). Four data sets had to be taken out from the female group as these participants had a considerably higher BMI than the rest of the group, which could markedly affect the attitudes towards body size and scores on the questionnaires. The final sample used for analyses consisted of 67 males and 63 females.

Equal variances were not assumed for age, composite score of the drive for muscularity, and male objectification score, therefore different degrees of freedom had to be reported. The only non-significant difference was found for the female objectification score, $t(128) = 0.14$, $p = .886$, $d = 0.03$, 95% CI [-3.27, 3.78], with both genders placing more importance on appearance in women. With regards to the male objectification score, males placed more importance on competence than appearance whereas females placed slightly more importance on appearance than competence in men, $t(124.25) = -2.20$, $p = .03$, $d = 0.39$, 95% CI [-8.49, -0.45]. On average, males had a significantly higher age, $t(91.08) = 4.15$, $p = .000$, $d = 0.72$, 95% CI [0.79, 2.24], and BMI, $t(128) = 3.44$, $p = .001$, $d = 0.54$, 95% CI [0.78, 2.85], as compared to females. However, some male participants were muscular, which may have inflated the BMI value for males. Male participants were more body satisfied than females, as indicated by the BISS scores, $t(128) = 2.30$, $p = .023$, $d = 0.43$, 95% CI [0.08, 1.05], and had a higher drive for muscularity, $t(109.97) = 7.52$, $p = .000$, $d = 1.31$, 95% CI [0.87, 1.50]. Male participants had also lower scores than females on the Appearance Schemas Inventory, which suggests that males are less invested in their appearance than females, $t(128) = -2.73$, $p = .007$, $d = 0.47$, 95% CI [-0.55, -0.09].

Table 11. Mean scores (standard deviation) on demographic variables and self-report questionnaires for all participants: males (N = 67) and females (N = 63).

	Age	BMI	BISS	ASI	DFM	Male Obj	Female Obj
Males	20.67 (2.73)	23.85 (3.34)	5.24 (1.31)	3.21 (0.68)	3.09 (1.09)	-1.60 (12.91)	8.46 (9.86)
Females	19.16 (1.81)	22.04 (2.60)	4.68 (1.48)	3.53 (0.66)	1.90 (0.66)	2.87 (10.17)	8.21 (10.45)

Note: BMI = Body Mass Index, BISS = Body Image States Scale, ASI = Appearance Schemas Inventory, DFM = Drive for Muscularity, Male Obj = male objectification score, Female Obj = female objectification score

Table 12. Correlations between the participants' BMI and various self-report questionnaires for males (N = 67).

	Age	BMI	BISS	ASI	DFM	Male Obj	Female Obj
Age	1						
BMI	.052	1					
BISS	-.036	-.307*	1				
ASI	-.020	-.075	-.010	1			
DFM	.045	-.141	.023	.481**	1		
Male Obj	.047	-.045	.067	.226	.091	1	
Female Obj	.065	-.091	.051	.277*	.148	.703**	1

Table 13. Correlations between the participants' BMI and various self-report questionnaires for females (N = 63).

	Age	BMI	BISS	ASI	DFM	Male Obj	Female Obj
Age	1						
BMI	.094	1					
BISS	-.122	-.303*	1				
ASI	.004	.187	-.425**	1			
DFM	.210	-.033	-.045	.013	1		
Male Obj	-.125	-.033	.082	.090	.092	1	
Female Obj	-.251*	-.141	.083	.069	-.206	.254*	1

Table 14. Independent samples t-tests of scores on demographic variables and self-report questionnaires between males and females, with a Bonferroni adjusted alpha level of .007 per test (.05/7).

	t	Sig.
Age	4.15	.000**
BMI	3.44	.001**
BISS	2.30	.023*
ASI	-2.73	.007**
DFM	7.52	.000**
Male Obj	-2.20	.03*
Female Obj	-0.14	.886

** sig. at .007 level, * sig. at .05 level

Thresholds

The thresholds were calculated in the same way as in study 2 (see chapter 3). Every participant's categorisations of all body stimuli were inspected. Obvious mistakes in categorisations were excluded: very thin bodies categorised as heavy (for female bodies) and very muscular bodies categorised as thin (for male bodies). To determine the cut-off points for thinness and muscularity, the normality ratings were inspected first (see figure 27 and 28). As can be seen in figure 27, bodies 1-5 were given a rating between 1 (too thin) and 3 (thin). Bodies rated like that on average would not be considered 'heavy' in the categorisation task, thus, body number 5 became the cut-off point and 'heavy' categorisations of body 5 or lower were treated as a mistake and changed to 'thin' categorisations. As a result, a new threshold was calculated, without the mistakes. The same procedure was applied to the male bodies' categorisations. As can be seen in figure 28, bodies 12-15 were given a rating between 7 (muscular) and 9 (too muscular). Bodies rated like that on average wouldn't be considered 'thin' in the categorisation task, thus, body number 12 became the cut-off point and 'thin' categorisations of body 12 or above were treated as a mistake and changed to 'muscular' categorisations. As a result, a new threshold was calculated for the male bodies as well.

Boxplots were used to detect outliers in female ($N = 63$) and male groups ($N = 67$). One data point from a female participant was taken out for the female (thin/heavy) thresholds, as there was no variability in the participant's responses – the participant only pressed one response key for categorisation. For the male thresholds, two data points were taken out (both from female participants) as the thresholds were too low, which suggests

that the participants were not paying attention to the task and were responding mostly with one response key.

Male ($M = 10.10$) and female ($M = 10.08$) participants did not differ in their thin and heavy category judgements of female bodies, $t(127) = 0.09$, $p = .928$, $d = 0.02$, 95% CI [-0.50, 0.50]. There was also no significant difference between males ($M = 6.67$) and females ($M = 6.59$) in their thin and muscular category judgements of male bodies, $t(126) = 0.29$, $p = .770$, $d = 0.05$, 95% CI [-0.47, 0.63].

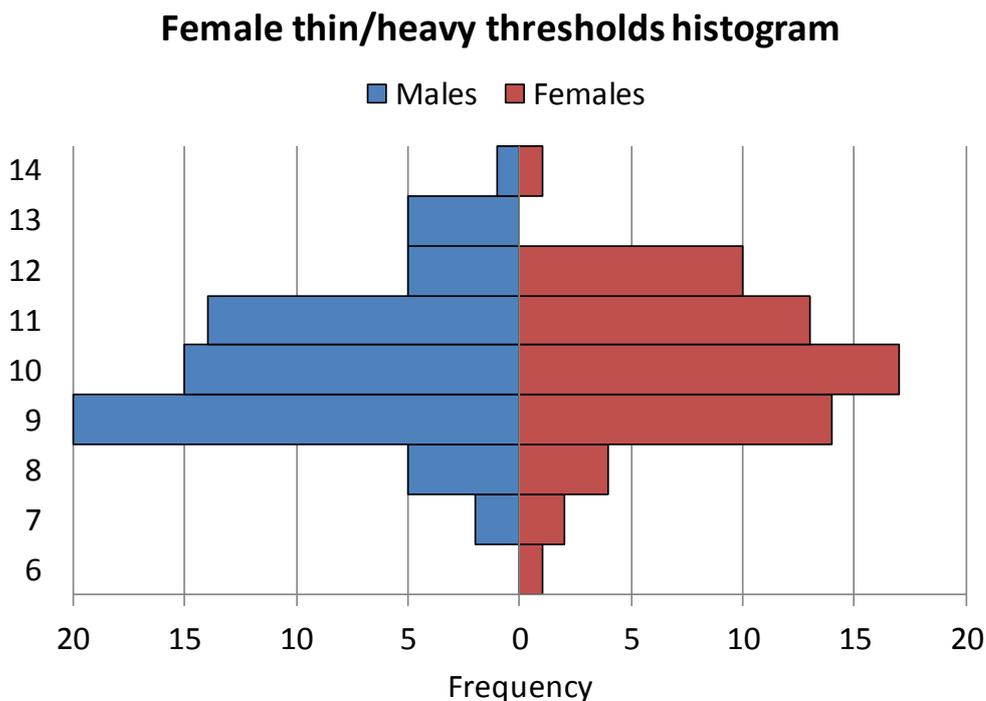


Figure 25. Male (in blue) and female (in red) 'thin' and 'heavy' category judgements of female body stimuli (calculated thresholds). The x-axis represents the frequency of a particular threshold being calculated for all participants of either male or female gender. The y-axis represents the body to which the calculated threshold corresponds, e.g. threshold number 10 would indicate that body number 10 was the point at which the participants stopped perceiving bodies as thin and started to perceive them as heavy. The higher the threshold, the more bodies were categorised as thin, not heavy. A high threshold would indicate that the average-looking bodies were categorised in favour of thinness as opposed to heaviness. A low threshold expresses more extreme attitudes towards body size where only very thin bodies are considered 'thin', thus indicating a more pronounced positive thinness and negative heaviness bias. Males ($N = 67$) and females ($N = 62$) did not differ extremely on their category judgements of female bodies.

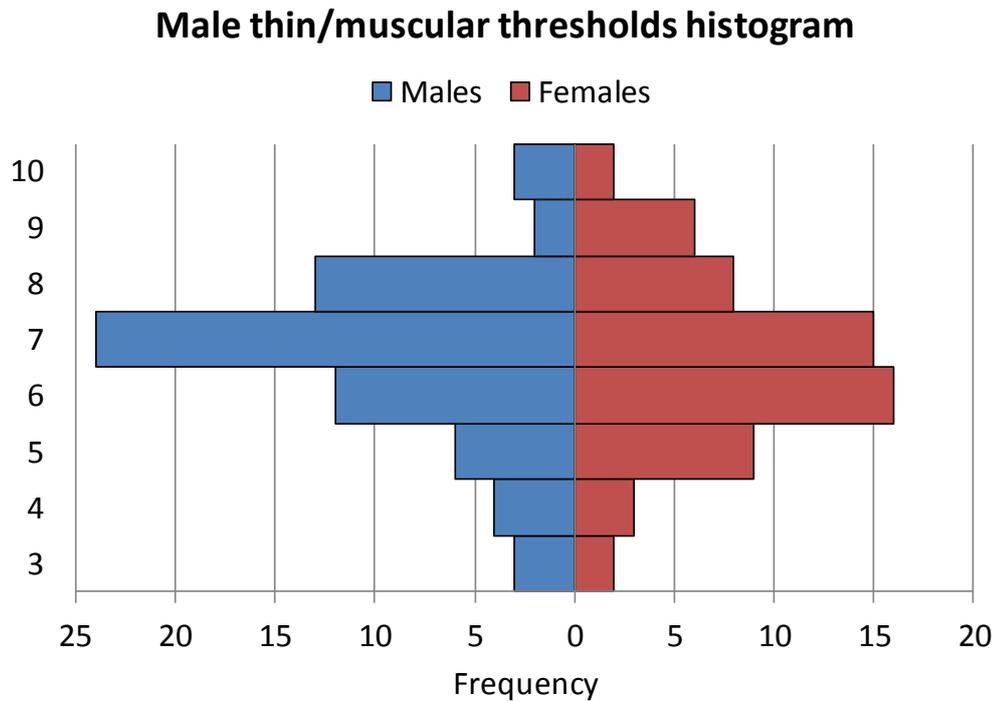


Figure 26. Male (in blue) and female (in red) ‘thin’ and ‘muscular’ category judgements of male body stimuli (calculated thresholds). The x-axis represents the frequency of a particular threshold being calculated for all participants of either male or female gender. The y-axis represents the body to which the calculated threshold corresponds, e.g. threshold number 7 would indicate that body number 7 was the point at which the participants stopped perceiving bodies as thin and started to perceive them as muscular. The higher the threshold, the more bodies were categorised as thin, not muscular. A high threshold would express more extreme attitudes towards body size where only very muscular bodies were considered ‘muscular’. A low threshold would indicate that average-looking bodies with some level of muscularity were interpreted in favour of muscularity, and not considered thin. Males ($N = 67$) and females ($N = 61$) did not differ extremely on their category judgements of male bodies.

Ratings – female and male bodies

Normality ratings

Ratings of normality followed a linear trend, with the thinnest body being rated the lowest and the heaviest body rated the highest. For the analyses, the slopes and the intercepts of the linear fit were used. There were no outliers for the slopes or the intercepts, for both female and male stimuli. The independent t-tests indicated that male and female participants did not differ in their ratings of normality of the female stimuli as the differences for the slope, $t(128) = 0.32$, $p = .749$, $d = 0.05$, 95% CI [-0.04, 0.53], and the intercept, $t(128) = -0.33$, $p = .740$, $d = 0.06$, 95% CI [-1.04, 0.74], were not significant. This

suggests that both men and women had a similar idea of which female body type is thin and heavy. The same was true for the normality ratings of the male bodies, as the sexes did not differ in the ratings of which male body type is thin and muscular. There were no significant differences between the sexes for the slopes, $t(128) = 0.87$, $p = .387$, $d = 0.16$, 95% CI [-0.02, 0.05], or the intercepts, $t(128) = -1.28$, $p = .204$, $d = 0.24$, 95% CI [-0.60, 0.13]. The bodies rated as 'average' (rating no. 5) correspond to the mean thin/heavy and thin/muscular thresholds (see above). This means that the female body number 10 was the body set as a category boundary for thinness and heaviness, which was also reflected in the explicit ratings of body normality, with the same body being rated as 'average'. The same is true for the male bodies, as the male body number 7 was the body set as a category boundary for thinness and muscularity and was rated as 'average'.

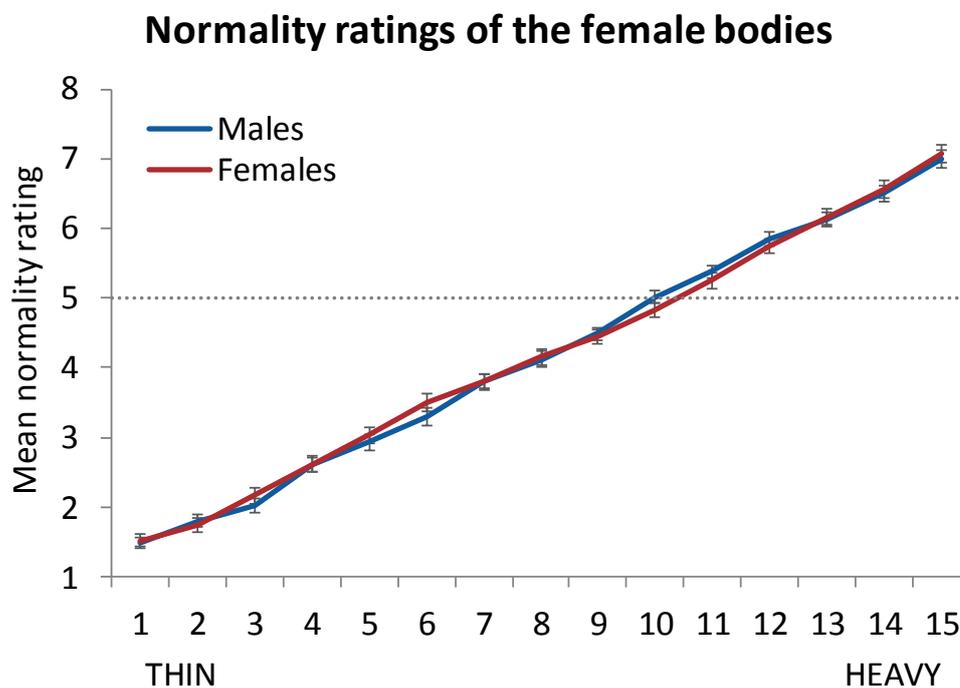


Figure 27. Mean normality ratings of the female stimuli, with standard error bars and the average rating (5) marked, for both males and females. There was no difference between males and females in their normality ratings of the female bodies.

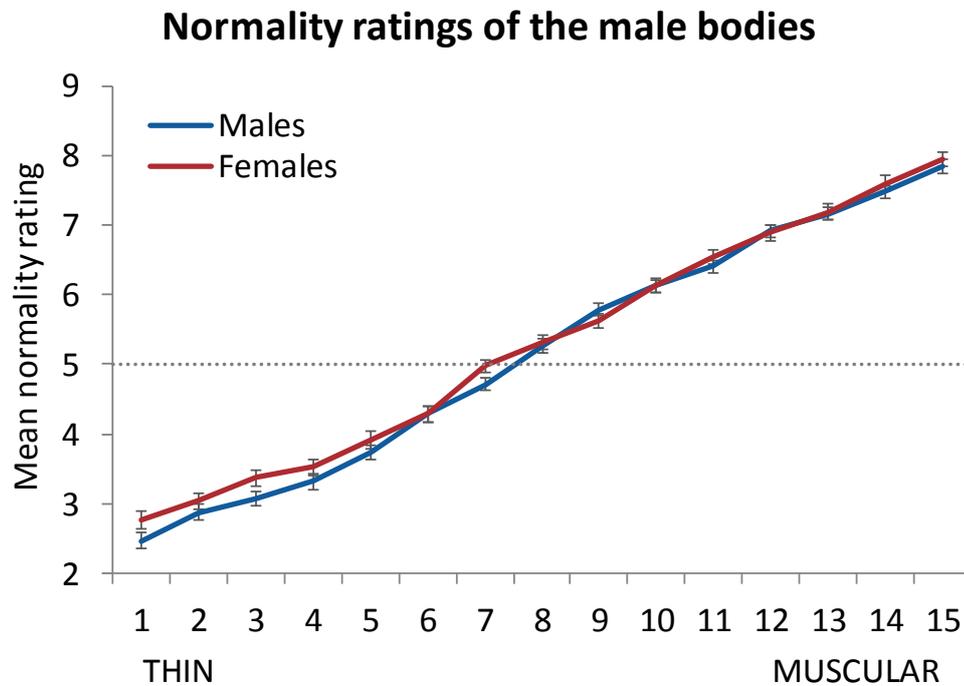


Figure 28. Mean normality ratings of the male stimuli, with standard error bars and the average rating (5) marked, for both males and females. There was no difference between males and females in their normality ratings of the male bodies.

Attractiveness peaks (female stimuli)

To determine whether the attractiveness preferences differed between the genders, second-order polynomials were fitted to attractiveness ratings of the female stimuli for each observer in each group, allowing the peak attractiveness BMI to be calculated for each participant (as was done previously in study 1 and 2; see chapter 3 and 4). To determine the outliers, each quadratic fit was inspected for each participant separately to determine any atypical trends. In addition, boxplots, normality tests and Q-Q plots were inspected for males ($N = 67$) and females separately ($N = 63$). Eight outliers were removed from peak attractiveness ratings, resulting in 65 males and 57 females (122 participants in total) used for this analysis.

An independent t-test showed that there were no differences between men ($N = 65$, $M = 19.67$, $SD = 0.77$) and women ($N = 57$, $M = 19.67$, $SD = 0.91$) in their attractiveness ratings of the female bodies, $t(120) = 0.01$, $p = .989$, $d = 0.003$, 95% CI [-0.30, 0.30].

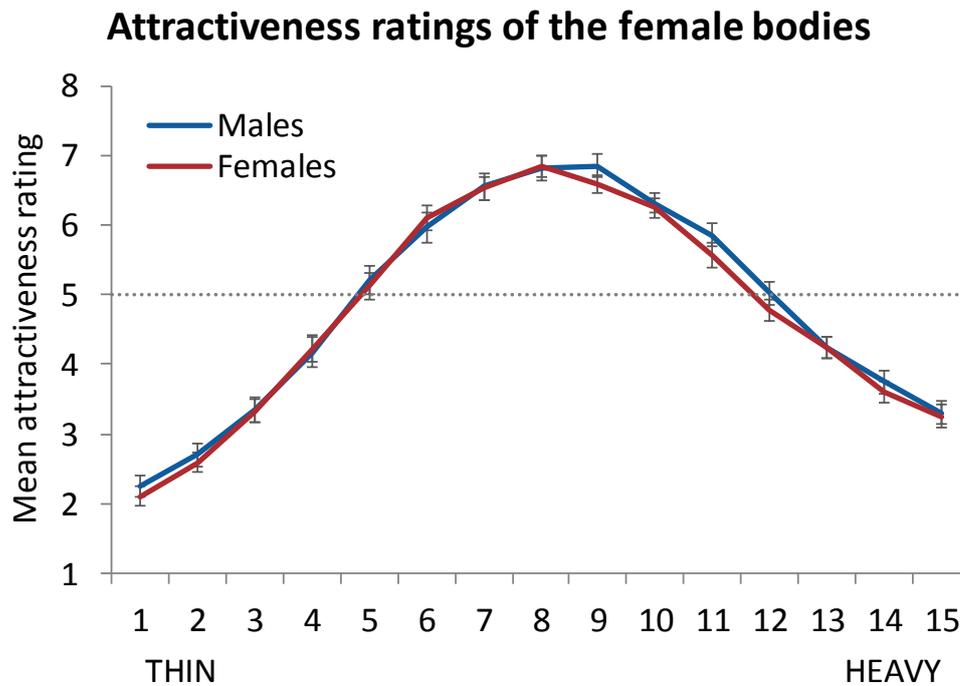


Figure 29. Mean attractiveness ratings of the female stimuli, with standard error bars and the average rating (5) marked, for both males and females. There was no difference between males and females in their attractiveness ratings of the female bodies.

Averaged ratings of attractiveness (male stimuli)

Attractiveness ratings of the female bodies almost always followed a quadratic trend; therefore, the BMIs of the stimuli that were rated highest on attractiveness could be estimated. The ratings of the male bodies, on the other hand, did not follow a clear trend, with the thinnest bodies almost always being rated lowest on attractiveness while the ratings of the most muscular bodies were much more varied for both male and female participants. As a result, some participants' ratings followed a linear trend, and some participants' ratings followed a quadratic trend. Because the ratings of the most muscular bodies were most varied and indicated an attitude towards muscular bodies, the ratings of 4 most muscular bodies were averaged (bodies 12-15) to produce one score. These bodies were chosen based on the averaged normality ratings of the male bodies provided by both genders (men and women). Both groups rated those bodies '7' or higher on normality, indicating that majority of the participants considered these bodies to be muscular (normality ratings: 7-muscular, 8-very muscular, 9-too muscular). There were no outliers for the averaged attractiveness ratings of the male bodies.

An independent t-test showed that there were no differences between men ($N = 67$, $M = 5.73$, $SD = 1.59$) and women ($N = 63$, $M = 5.37$, $SD = 1.82$) in their attractiveness ratings of the muscular male bodies, $t(128) = 1.22$, $p = .227$, $d = 0.23$, 95% CI [-0.23, 0.96]. However, the attractiveness ratings of the male bodies are more discrepant between males and females than the ratings of the female bodies, which are almost similar. Male bodies 4 through 8 (see figure 24), rated as 'a bit thin' or 'average' on normality (see figure 28), were rated higher on attractiveness by females than males, indicating a slightly less extreme attitude of females towards the more average male body types.

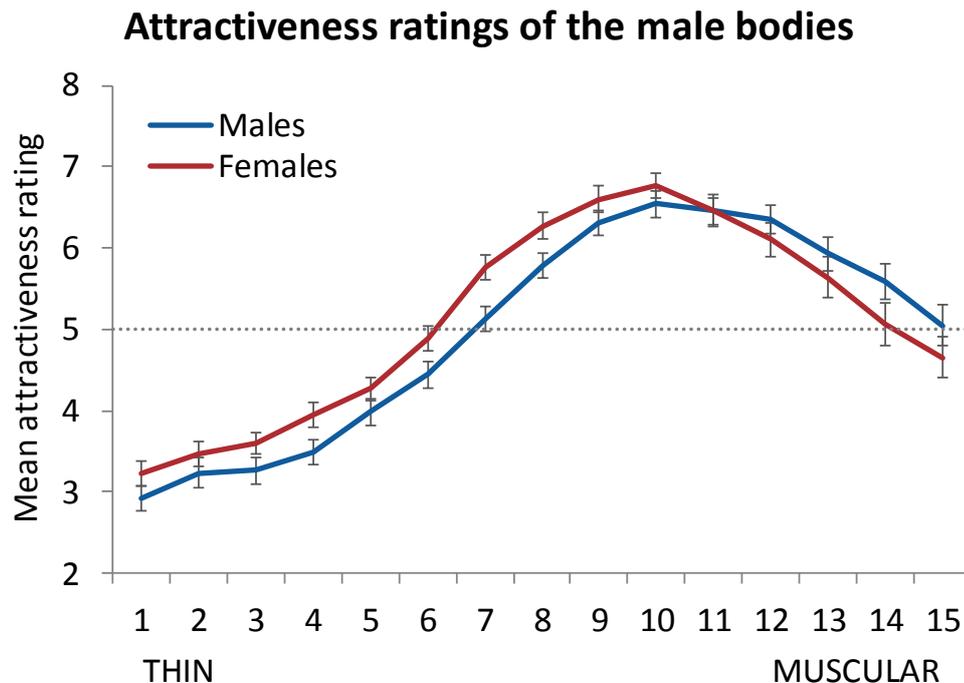


Figure 30. Mean attractiveness ratings of the male stimuli, with standard error bars and the average rating (5) marked, for both males and females. There was no difference between males and females in their attractiveness ratings of the most muscular male bodies (12-15).

Regressions

A number of multiple regressions were run, with the thresholds, attractiveness and ideal ratings as dependent variables, for male and female bodies and both genders separately. The aim of the analyses was to examine how one's BMI and body image, as measured by the questionnaires, influence the attitudes towards the gendered attractiveness ideals – thin for women and muscular for men. Pairwise deletion was used as quite a few outliers have been detected for the peaks already, therefore deleting the whole set would not be advisable as it would lower the statistical power of the test.

Table 15. Correlations between the thresholds, the peaks for female bodies and averaged ratings for male bodies and various self-report questionnaires as well as BMI.

	Female threshold	Male threshold	Female att	Male att	Female ideal	Male ideal
Females						
BMI	.107	.144	.330*	.116	.415**	-
BISS	.015	-.194	.108	.166	-.046	-
ASI	-.034	-.071	-.022	.075	-.083	-
DFM	-.013	.053	-.239	.058	-.065	-
Male Obj	-.064	.072	.137	.093	-.084	-
Female Obj	-.353**	-.319*	-.019	.235	-.182	-
Males						
BMI	.063	.186	.216	-.020	-	-.051
BISS	.017	.164	-.001	.167	-	-.03
ASI	.038	-.164	-.119	.550**	-	.482**
DFM	.053	-.157	-.105	.456**	-	.513**
Male Obj	-.034	.138	-.128	.0181	-	.086
Female Obj	-.043	-.035	-.259*	.125	-	.123

** sig. at .01 level, * sig. at .05 level

Female bodies

Threshold

Six predictors were used in the multiple regression models: participants' BMI, state body satisfaction (BISS), appearance investment (ASI), drive for muscularity (DFM), male objectification (Male Obj) and female objectification (Female Obj).

For female participants, the model explained 6% of variance in the female thin/heavy thresholds ($R^2 = .14$, $Adj. R^2 = .06$), with the female objectification score making the only statistically significant contribution to the model ($\beta = -0.37$, $p = .006$). However, the model itself did not reach statistical significance (ANOVA not significant). For male participants, none of the predictors contributed significantly to the model.

As mentioned earlier, the thresholds refer to the body set by the participants as a boundary for thinness and heaviness, with a particular body type being determined as the most average-looking – not explicitly thin nor heavy. It seems that personal body image and body concerns are unrelated to the choice of the most average body size with most people embracing the same norm for what body type is thin or heavy.

Attractiveness peak

For males, the model was not significant and none of the predictors contributed significantly to predict the female BMIs rated highest on attractiveness. This suggests that the personal body image of the male population does not affect the attitudes towards female body and appearance.

For females, the model explained 14% of variance in the peak attractiveness BMIs ($R^2 = .23$, $Adj. R^2 = .14$), with the participants' BMI making the largest statistically significant contribution to the model ($\beta = 0.38$, $p = .006$). This result suggests that the female participants' own BMI best predicts the body size and weight considered most attractive. When the women have higher BMIs they tend to consider heavier body types as more attractive, regardless of personal body image issues.

After inspecting the residual statistics, one further participant (p.94) was taken out from this regression analysis, as this participant's predicted value was very different from the adjusted predicted value; Mahalanobis distance was also unusually high (28.60) and Cook's value was quite high as well (0.68). After excluding this participant's full data set, the regression model noticeably changed. This participant's data had a larger influence on the model than any other data point; therefore, it was decided to take this participant's data out, after inspecting the diagnostic statistics.

Now, for females, the model explained 20% of variance in the peak attractiveness BMIs ($R^2 = .29$, $Adj. R^2 = .20$), with the participants' BMI making the largest statistically significant contribution to the model ($\beta = 0.39$, $p = .004$), with drive for muscularity ($\beta = -0.34$, $p = .011$) and state body satisfaction following ($\beta = 0.31$, $p = .042$). This result suggests that when the women have higher BMIs, are more satisfied with their bodies and have low drive for muscularity they tend to consider heavier body types as more attractive. It needs to be noted, however, that the value is still in the "normal" BMI range but higher than the BMIs that would be chosen by women with lower BMIs, less body satisfaction and more drive for muscularity.

Ideal peak

With regards to peak ideal ratings, 8 outliers were removed, resulting in 55 female participants used for this regression analysis. The model explained 12% of variance in the peak ideal BMIs ($R^2 = .22$, $Adj. R^2 = .12$), with the participants' BMI making the only statistically significant contribution to the model ($\beta = 0.43$, $p = .003$). However, the model itself did not reach statistical significance (ANOVA not significant but on the verge of significance).

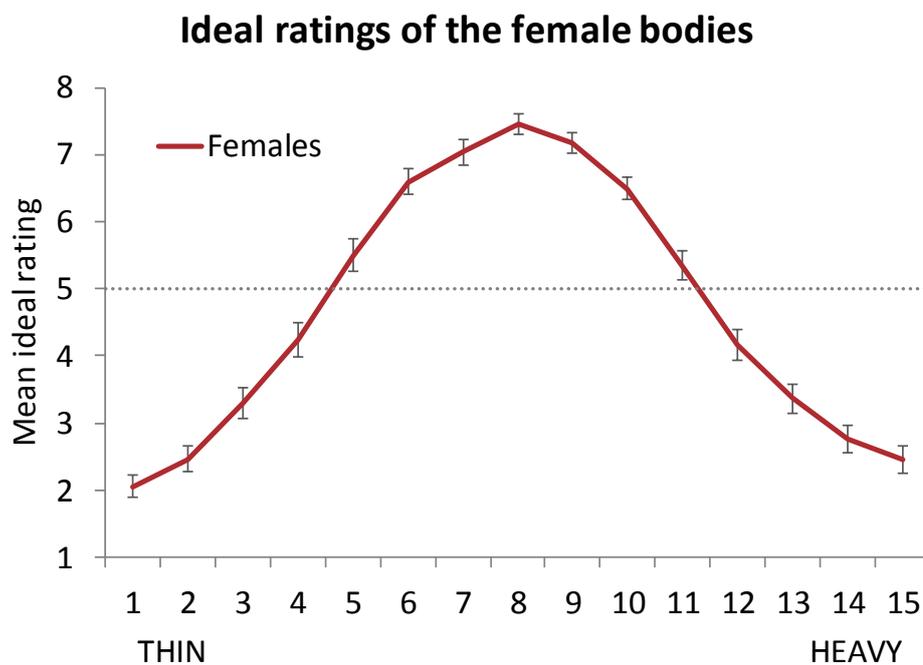


Figure 31. Mean closeness to ideal ratings of the female stimuli, with standard error bars and the average rating (5) marked.

Male bodies

To investigate the attitudes to male bodies, the same six predictors were used in the multiple regression models: participants' BMI, state body satisfaction (BISS), appearance investment (ASI), drive for muscularity (DFM), male objectification (Male Obj) and female objectification (Female Obj).

Threshold

For male participants, none of the predictors contributed significantly to the model. For females, the only significant predictor was the female objectification score ($\beta = -0.34$, $p = .014$) but the model itself did not reach statistical significance (ANOVA not significant). As

was seen with the thin/heavy thresholds for female bodies, thin/muscular thresholds for the male bodies, which express the choice of the most average body in size, seem to be unrelated to the personal body image and body concerns of both men and women.

Attractiveness averaged

For males, the model explained 34% of variance in the peak attractiveness BMIs ($R^2 = .40$, $Adj. R^2 = .34$), with the participants' appearance investment making the largest statistically significant contribution to the model ($\beta = 0.44$, $p = .000$) and drive for muscularity following ($\beta = 0.26$, $p = .026$). For females, the model did not reach statistical significance and none of the predictors contributed significantly to the model. This result suggests that males who are more invested in their appearance and have a higher drive for muscularity rate extremely muscular bodies higher on attractiveness than males with lower body image concerns.

Ideal averaged

As with attractiveness ratings, drive for muscularity ($\beta = 0.37$, $p = .003$) and appearance investment ($\beta = 0.31$, $p = .015$) had the largest influence on the choice of the male ideal, with the model explaining 27% of variance ($R^2 = .34$, $Adj. R^2 = .27$) in the ideal ratings of the extreme muscular bodies.

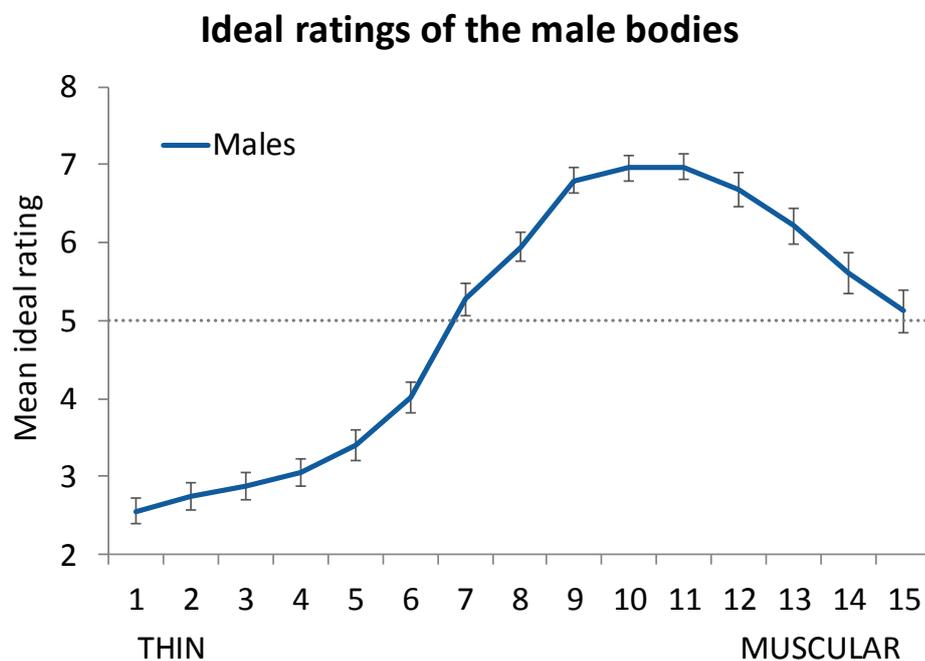


Figure 32. Mean closeness to ideal ratings of the male stimuli, with standard error bars and

the average rating (5) marked.

Discussion

This study investigated whether men who place a lot of importance on appearance and evaluate themselves against the muscular male body ideal may also be more inclined to evaluate women against the culturally endorsed appearance standards. We compared men and women on their category judgements of male and female bodies on thinness/muscularity and thinness/heaviness respectively and also compared the ratings of the male and female bodies on normality, attractiveness and closeness to ideal. A set of study aims was defined, with the following specific hypotheses formulated and tested in this study:

- 1) It is expected that men higher in body image concerns will rate male muscular bodies as more attractive and closer to the personal body ideal than men lower in body image concerns (positive muscularity bias)
- 2) It is hypothesised that men with higher drive for muscularity will objectify women more and rate thinner female bodies as more attractive than men lower in drive for muscularity (positive thinness bias)

One of the study aims was to contrast male and female attitudes to body size and body ideals of their own and opposite gender. The results showed that there was no difference between men and women in their thin/heavy category judgements of the female bodies and thin/muscular category judgements of the male bodies. For the female bodies, both genders had a threshold of 10, indicating that the most-average looking body, neither thin nor heavy, was the same for both genders and reflected a BMI in the normal range (BMI = 20.2). This finding agrees with the averaged normality ratings for both genders, where the female body number 10 received a rating of 5, which refers to 'normal' (average) rating (see figure 27). For the male bodies, both genders had a rounded threshold of 7, which also agreed with the normality ratings, as this body type received a rating of 5, which also stood for 'normal' – neither thin nor muscular.

There was no difference found for the female BMI rated as most attractive between males and females. Both genders rated the female body at the lower end of the healthy BMI as the most attractive. No gender difference was also found for the averaged attractiveness ratings of the most muscular male bodies. These results are in line with previous studies

which showed no difference between the genders on their attractiveness ratings of female bodies and the choice of female body ideals (Smith, Cornelissen, & Tovée, 2007; Smith et al., 2007; Swami & Tovée, 2005; Tovée & Cornelissen, 2001; Tovée, Hancock, Mahmoodi, Singleton, & Cornelissen, 2002; Tovée, Maisey, Emery, Cornelissen, 1999; Winkler & Rhodes, 2005) and no difference between the genders when creating an ideal male body type (Crossley, Cornelissen, & Tovée, 2012). Although our results showed no gender differences in the ratings of the most muscular male bodies on attractiveness, when taking the ratings of the whole set into account it can be noticed that the ratings of the male bodies are more variable than those for the female bodies (see figure 29 and 30). This shows that the female body ideal is more constricted, which agrees with the assumptions of the objectification theory (Fredrickson & Roberts, 1997), while the male body ideal is more diverse and perceived slightly differently by women than men.

Another study aim was to investigate male body image concerns, with these body image concerns then being hypothesised to relate to the choice of a more muscular personal body ideal. Our results showed that, for males, the BMI correlated negatively with body satisfaction (BISS), indicating that men with higher BMIs tend to be less satisfied with their body. The same trend was uncovered in females, which is consistent with the findings from study 1 and 2. Appearance investment in men did not significantly correlate with body satisfaction, but it did correlate positively with drive for muscularity, showing that males who are more invested in their appearance have a higher drive for muscularity. However, in contrast with a previous study, higher drive for muscularity was not associated with general body dissatisfaction in men (Warren, 2008). In females, appearance investment negatively correlated with body satisfaction, thus the more a woman is invested in her appearance, the less body satisfaction she feels. The above results show that females and males who place importance in their appearance will also have gender-specific concerns with regards to their own bodies, with females being more dissatisfied with their appearance and body size and shape in general, measured by the BISS questionnaire in this study, and males being more concerned about their muscularity, as measured by the Drive for Muscularity Scale.

To investigate which male body image concerns are related to the choice of the most attractive male body, multiple regressions were run, with averaged attractiveness and ideal ratings for muscular male bodies as dependent variables. The first hypothesis was confirmed as the results showed that men who were invested in their appearance and had a higher

drive for muscularity rated the muscular bodies higher on attractiveness and as closer to the personal body ideal than males with lower body image concerns, thus revealing the connection between own body schema centring on appearance and a stronger positive bias towards the male muscular ideal. These findings are consistent with the previous literature, which showed that males who scored higher on drive for muscularity also perceived muscular bodies as their ideal and internalised the muscular body standard (Edwards, Tod & Molnar, 2014).

In a previous study investigating females (study 1), the BMI was the strongest predictor of the attitudes towards female bodies. However, in this study, for men, it was not revealed as a significant predictor of the attitudes towards muscular male bodies. Body mass index was found to be unrelated to drive for muscularity in previous studies (McCreary, Karvonen, & Davis, 2006; McCreary & Sasse, 2000). One explanation might be that the BMI is not a reliable measure of body fat as it is only a weight-to-height ratio and not a reliable measure of adiposity. Muscles are heavier than fat, thus the muscular men who participated in the study, could have received an obese categorisation based on the BMI. Possibly, if the actual body fat percentage was used as a variable instead of the BMI, it would emerge as a significant predictor of the male body ideal for men.

It is not surprising that the above variables best predicted the choice of the muscular ideals for men, as concern with muscularity and the drive to achieve a muscular body is specific to males (Cafri & Thompson, 2004b; McCreary & Saucier, 2009). Females, on the other hand, aspire to obtain a thin physique, thus the more gender-specific concerns would predict the choice of the body ideals for women. In this study, for women, the variables that best predicted the attractiveness ratings of the female bodies were the BMI, body satisfaction and drive for muscularity. The drive for muscularity in women was revealed as a significant predictor of the attitudes towards female bodies, which was rarely investigated before. These results suggest that when women are heavier themselves (higher BMI), are more satisfied with their bodies, and have a low drive for muscularity, they tend to consider heavier body types as more attractive. Drive for muscularity, in this case, might be interpreted as a low interest in athleticism.

The last study aim was to examine how the attitudes towards one's own body affect the attitudes towards the gendered attractiveness ideals – thin for women and muscular for

men. A specific hypothesis was formulated with regards to males. We expected that men with higher drive for muscularity will objectify women more and display a stronger positive thinness bias towards female bodies.

The second hypothesis was not supported though as males with higher drive for muscularity were not found to greater objectify the female bodies or rate thinner female bodies higher on attractiveness than heavier bodies. A significant positive correlation between the drive for muscularity scores and objectification score for females was not found, which is in contrast with the previous literature (Swami & Voracek, 2013). In addition, the men were not found to objectify women more than other women (Strelan & Hargreaves, 2005) – both genders placed more importance on appearance in women and there was no significant difference between the female and male scores on female objectification.

Even though the objectification score for female bodies was not higher for men, we still expected men with higher drive for muscularity to endorse the female thin body ideal. Our study showed that the drive for muscularity and appearance investment predicted the choices of the muscular male body ideal. We ran a multiple regression to investigate which variables best predicted the attractiveness ratings of the female bodies. However, none of the predictors significantly predicted the female BMI rated highest on attractiveness. This result showed that the attitudes towards one's own body in the male population did not affect the attitudes towards the bodies of the opposite gender.

To investigate whether the above result was specific to males, a multiple regression with the same predictors was run for the female ratings of the male bodies. Women with lower BMIs, less body satisfaction and more drive for muscularity were found to choose thinner attractiveness ideals than women with higher BMI, more body satisfaction and less drive for muscularity. However, none of these variables predicted the attractiveness ratings of the muscular male bodies. The results indicate that own body image does not affect the attitudes towards the bodies of the opposite gender in the same way as it affects the attitudes towards the bodies of one's own gender.

One explanation of the non-significant result might be the fact that as the bodies of one's own gender are used for social comparison, they have more impact on one's developed body schema and self-concept. As one internalises the body norm for one's own gender and has a body schema centring on appearance, the processing of body related

information would be guided primarily by the self-schema. The information about the bodies of one's own gender is more self-referential and because of that more actively processed.

To internalise a social standard, one would need to first be aware of the set norms. Because men are exposed to the similar media content as women, they become aware of the sociocultural gendered norms of male and female body ideal, thus acquiring a social schema for bodies. When a person is dissatisfied with one's own appearance, and feels the social pressure to conform to the set ideal, the acquired social schema might become internalised and become a part of the self-schema (Cash, 2005). For men who are more invested and/or dissatisfied with their appearance, the muscular male body ideal would be internalised and accepted as a guide for self-evaluation hence men with higher appearance investment and drive for muscularity would rate more muscular bodies as closer to their body ideal. They would also be aware of the female body ideal, but as it is not relevant to their self-evaluation and does not become a part of the self-schema, the attitudes towards the female bodies would be unrelated to males' personal body image.

To sum up, this study investigated the link between personal body image and cognitive biases towards the bodies of own and opposite gender. In line with the objectification theory, both men and women placed more importance on appearance in women. There was no gender difference in the ratings of the female bodies, with both genders displaying a positive thinness bias towards the female bodies and rating the bodies at a lower end of the healthy BMI as the most attractive. The positive thinness bias was greater for women with more body image concerns but it was not greater for men who were more invested in their own appearance. Both genders also displayed a positive muscularity bias, with male bodies rated and categorised as "muscular" receiving the highest attractiveness ratings. The positive muscularity bias was greater for men who were more invested in their own appearance but it was not greater for women higher in body image concerns. The study showed that women and men did not differ in their degree of embracing the cultural body ideals – thin for women and muscular for men. However, own body image was found to only affect the degree of attitudes towards the bodies of own gender, as the bodies of one's own gender are used for social comparison, thus being more self-relevant and having more impact on one's developed body schema and self-concept.

Study 3 tested whether men and women who are biased towards the culturally endorsed body ideals for their own gender would also embrace the sociocultural body ideals for the opposite gender. The study further investigated the link between a schema developed for one's own body, the internalisation of the sociocultural body standards, and the attitudes towards body size in general. The last study of the thesis, study 4, also investigated the link between the socioculturally endorsed appearance ideals and one's own body image, but instead of focusing on the attitudes towards other people's bodies, the participants' perception of their own body was measured. The next study further explored how one's body status, level of body image concerns, and the choice of body ideals affect self-perception.

CHAPTER 5 – Study 4

Introduction

Body image disturbance is a diagnostic criterion for anorexia nervosa (American Psychiatric Association, 2013) and it has been linked to perceptual inability to accurately estimate one's own size. However, the distorted evaluation of one's own body size was discussed to be more attitudinal than perceptual in eating disordered individuals and women with higher body image concerns, with overestimation, no distortion or underestimation being reported for women. Cognitive body image distortion occurs when there is a discrepancy between one's perceived and actual weight status (Liechty, 2010), whereas body dissatisfaction is often measured as a discrepancy between one's perceived and ideal weight status (Gruber, Pope, Lalonde, & Hudson, 2001; Williamson, Gleaves, Watkins, & Schlundt, 1993); however, this discrepancy was discussed to be a cause of body dissatisfaction and not a measure of body dissatisfaction per se (Vartanian, 2012). Thus investigating the body image related and psychological variables associated with this discrepancy would provide more information on the nature of body dissatisfaction. There are inconsistencies in the literature concerning the accuracy of body size estimations in women – judging one's visual dimensions – and it was shown that the choice of one's body ideals can vary between cultures and be influenced by one's weight status and body image. Studies also showed that people are not very accurate at judging their current weight status (McCabe, McFarlane, Polivy, & Olmsted, 2001; Zhu, Norman, & While, 2013). Therefore it is safe to assume that women will also have troubles estimating the weight they would need to lose to achieve their personal body ideal, which is constructed through vast visual experience.

This study aimed to investigate the role of the BMI and body image-related variables in the attitudinal estimation of own body size (estimated-actual BMI discrepancy), the choice of the body ideals (estimated-ideal BMI discrepancy) and the accuracy of judging the weight one would need to lose to achieve the visual body ideal (visual ideal-weight ideal discrepancy). This study further explored the influence of developed body image concerns (negative body self-schema) on cognitive processes associated with the perception of own body size and the choice of body ideals, and relating the results to the cognitive and

sociocultural theories of body image. To our knowledge, no studies to date investigated the difference between the weight and visual ideals and its relation to one's body image.

The inaccuracy of body size estimation was thought to be related primarily to perceptual processes and linked to the individuals with eating disorders (Bruch, 1962; Cash & Deagle, 1997). However, the results from the earlier studies investigating the inaccuracy of perceptual body size estimations in eating disordered populations were mixed, which lead to disputing the usefulness and predictive validity of inaccurate body size estimation (BSE) (Penner, Thompson, & Covert, 1991). It was discussed that not all body size perception tasks used in the past actually measured perception and that some might have indirectly measured body attitude or mental body image, with psychophysical methods suggested as more accurate tasks for investigating body size perception (Smeets, 1997).

The inconsistent results have been attributed to the difference in the conceptualisation of body image (Keeton, Cash, & Brown, 1990) and methodological differences, such as a variety of different instruments used in the empirical studies (Farrell, Lee, & Shafran, 2005; Proctor & Morley, 1986; Smeets, Smit, Panhuysen, & Ingleby, 1997; Tovée, Benson, Emery, Mason, & Cohen-Tovée, 2003), including: analogue scale, optical distortion, silhouette-card sorting, or kinaesthetic methods. Some techniques, e.g. image distortion techniques, were discussed to assess visual body image and some, e.g. body part estimation, to assess more abstract body image (Henninghausen, Enkelmann, Wewetzer, & Remschmidt, 1999).

In BSE research, a ratio of estimated and actual size ($\times 100\%$) was frequently used to measure the accuracy of body size estimations. However, this ratio – the body perception index (BPI) – was argued not to be a reliable measure (Smeets, 1997). For example, if both the control and the anorexic participant overestimated their weight by 5 kg, weighing 60 and 40 kg respectively, different BPIs would be calculated, depending on the actual size of the participants, e.g. $60/55 \times 100 = 109$ vs. $40/35 \times 100 = 114$. Therefore, it was argued that the overestimation occurred as an artefact of an anorexic being thin rather than a consequence of the illness (Smeets, 1997).

A review from 2005 (Farrell, Lee, & Shafran, 2005) reported that only half of the studies found overestimation of body size in anorexic individuals. A more recent review (Gardner & Brown, 2014) concluded that more contemporary studies on BSE in anorexic

individuals have improved methodologically, which yielded consistent results showing an overestimation of body size in individuals diagnosed with anorexia nervosa. More recently, it was also found that this overestimation is also present when judging the body size of other women (Cornelissen, Gledhill, Cornelissen, & Tovée, 2016).

Body size distortion was discussed to be affected by sensory and attentional factors (Gardner, Sorter, & Friedman, 1997; Slade, 1985; Thompson & Gardner, 2002), to be a form of information-processing bias (Cash & Deagle, 1997; Lee & Shafran, 2004; Horndasch et al., 2012; Williamson, 1996), to reflect a disturbance in the emotional aspect of body image rather than perception (Fernández-Aranda, Dahme, & Meermann, 1999), or to relate to disturbance in visual mental image (Smeets, Smit, Panhuysen, & Ingleby, 1997). Thus, it was acknowledged that the cognitive and affective factors, such as individuals' beliefs about their own body, may contribute to body size perception (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999) and that inaccurate body size estimation could arise through interaction between perception and non-sensory factors (McCabe, Ricciardelli, Sitaram, & Mikhail, 2006); however, empirical evidence showed that the perceptual dysfunction can arise independently from any cognitive dysfunction (Tovée, Emery, & Cohen-Tovée, 2000), thus indicating that the perceptual and cognitive-evaluative processes may operate separately and influence a person's body image in different ways.

The inaccuracy of body size estimations was shown not to be an exclusive feature of eating disorders, with healthy controls showing varying degrees of over- and underestimation. Body dissatisfaction, other psychological variables and body weight status were linked to body size estimation inaccuracy (Cornelissen, Johns, & Tovée, 2013; Cornelissen, Bester, Cairns, Tovée, & Cornelissen, 2015; Gaskin et al., 2013; Harring, Montgomery, & Hardin, 2010; Johnstone et al., 2008; Roberts & Duong, 2013), which shifted the focus from investigating purely perceptual mechanisms taking part in the process of body size estimation to cognitive mechanisms as well. In one study the participants at a high risk of eating problems showed a pattern of overestimation in comparison to the low risk individuals (Sand, Lask, Høie, & Stormark, 2011). The low risk individuals, on the other hand, were more accurate in their judgement, which agrees with the finding showing that participants were quite accurate at choosing the body from a selection of other people's bodies which matched their actual BMI (Swami, Salem, Furnham, & Tovée, 2008). However, these findings are in contrast to previous results showing underestimation (MacNeill & Best,

2015; Saxton, Hill, Chadwick, & Wardle, 2009) or overestimation of own body size in nonclinical samples (Liechty, 2010).

The accuracy of body size estimation was also found to be dependent on the individuals' own weight status. The researchers found a correlation between the participant's BMI and the estimation of their own body mass – as the participant's BMI declined, the overestimation of the body mass increased (Tovée, Emery, & Cohen-Tovée, 2000; Cornelissen, Bester, Cairns, Tovée, & Cornelissen, 2015) whereas high BMI individuals were shown to underestimate their body mass (Cornelissen et al., 2015). The newer study (Cornelisse et al., 2015) relied on the presentation of visual bodily stimuli to investigate the attitudinal estimation of own body size, as measured by the point of subjective equality (PSE) which was calculated on the basis of the participants' responses to the randomly presented bodies by judging them as either smaller or larger than themselves.

Inaccuracies in self-reported weight in healthy participants were also found in past studies (McCabe, McFarlane, Polivy, & Olmsted, 2001; Zhu, Norman, & While, 2013), with normal sized women not estimating their size consistently and obese and very obese females underestimating their own size and feeling that the desired size was unattainable (Leonhard & Barry, 1998). In agreement with the above, heavier participants were found to underestimate their weight to a greater degree than thinner participants (Vartanian & Germeroth, 2011), however it was argued to be due to deliberate misreporting of one's own body weight, and not due to perceptual or cognitive biases. These studies relied on self-reporting of one's own weight, and the visual estimations of one's own or others' bodies were not included.

There is evidence showing that the BMI influences the way people view their bodies – individuals with lower BMIs are likely to overestimate their size whereas individuals with higher BMIs tend to underestimate their own size (Cornelissen, Bester, Cairns, Tovée, & Cornelissen, 2015; Leonhard & Barry, 1998; Tovée, Emery, & Cohen-Tovée, 2000;). As the weight status of the individuals in the Western societies is increasing, people are exposed to more overweight and obese bodies, which might be affecting a social norm for body size and influencing self-perception. A trend to underestimate one's own weight status, influenced by this shifting social norm, has been observed (Johnson, Cooke, Croker, & Wardle, 2008; Johnson-Taylor, Fisher, Hubbard, Starke-Reed, & Eggers, 2008). This misperception of own

body size may have negative consequences, such as a difficulty to detect weight gain. For overweight and obese individuals, underestimation of one's own weight may lead to reduced motivation to lose weight and a present conviction that one's heavier weight status does not pose a health risk (Duncan et al., 2011; Gregory, Blanck, Gillespie, Maynard, & Serdula, 2008). In contrast, accurate weight perception was shown to positively affect weight-loss efforts (Yang, Turk, Allison, James, & Chasens, 2014). With regards to individuals with healthy weight, weight overestimation has been associated with unhealthy weight control practices, such as fasting or the use of laxatives and diet pills (Fan & Jin, 2015; Kim, Cho, Cho, & Lim, 2009; Wharton, Adams, & Hampl, 2008), and the risk of being overweight or obese (Cuypers et al., 2012; Duong & Roberts, 2014).

Accurate perception of own body size and weight seems to be crucial to one's body image and successful weight management. Due to the inconsistencies presented in past studies regarding the direction and magnitude of body size estimation in nonclinical samples, this study will investigate the connection between attitudinal body size estimation, the participant's actual body size (current BMI) and body image-related variables in a non-eating disordered female sample.

The accurate perception of own body size would also affect another discrepancy, which has been shown to relate to a person's body image – the discrepancy between one's perceived and ideal body size. In line with the self-discrepancy theory (Higgins, 1987), which was successfully applied to body image, the discrepancies between the actual and the ideal self can result in negative psychological consequences, such as disappointment, dissatisfaction, and sadness. The theory also postulates that the greater the magnitude of a particular discrepancy, the more intense the discomfort associated with this discrepancy. The self-discrepancy theory (Higgins, 1987) postulates that there are three selves that the individuals compare themselves to:

- *Actual self* – representation of the attributes you believe you actually possess (subjective self-concept)
- *Ideal self* – attributes you would ideally like to possess
- *Ought self* – attributes you believe you should possess

When applied to body image, the actual self would relate to the perception of own body size, the ideal self would relate to the personal body size ideal, and the ought self could

represent the feelings of how a person “should” look like to be socially and culturally accepted – for females that would be a thin and attractive body, for males – lean and muscular. These selves, however, can be conceptualised from one’s own subjective perspective or from another person’s perspective, e.g. significant others. With regards to body image, the discrepancy which receives the most focus is the discrepancy between the actual and the ideal self from one’s own subjective perspective, while keeping in mind that the attributes assigned to the ideal self might be a result of the internalisation of the sociocultural body ideal.

The theory received empirical support (Higgins, Klein, & Strauman, 1985; Higgins, Bond, Klein, & Strauman, 1986; Strauman & Higgins, 1988) and its assumptions have been successfully applied to body image (Strauman, Vookles, Berenstein, Chaiken, Higgins, & Tory, 1991; Vartanian, 2012). For example, the sociocultural orientation towards thin female bodies causes a discrepancy between the perceived body (the actual self) and the ideal body (the ideal self) in women whose attributes are further away from the thin ideal, which can result in negative body image. The described mechanism is in line with the empirical evidence which showed that the actual-ideal body discrepancy is related to higher rates of body dissatisfaction (Anton, Perri, & Riley, 2000; Jacobi & Cash, 1994), drive for thinness (Anton et al., 2000), and eating disturbance (Anton et al., 2000; Forston & Stanton, 1992; Heinberg, 1996). In addition, individuals with a greater actual-ideal discrepancy were found to engage in social comparison more frequently (Yu, Kozar, & Damhorst, 2013). In line with the self-discrepancy theory, the actual-ideal discrepancy should be therefore seen as being related to body dissatisfaction and not being a measure of body dissatisfaction itself.

Women were found to choose thinner figures for their ideal body than they do for their actual body (e.g. MacNeill & Best, 2015; Safir, Flaisher-Kellner, & Rosenmann, 2005; Swami, Salem, Furnham, & Tovée, 2008; Wardle, Haase, & Steptoe, 2006) and report lower ideal weight than their current weight (Karkkainen, Mustelin, Raevuori, Kaprio, & Keski-Rahkonen, 2016). Thinner body ideals were suggested to result in a greater discrepancy between the perceived body size and the body ideal, which can potentially be causing body dissatisfaction (Glauert, Rhodes, Byrne, Fink, & Grammer, 2009). BMI was found to be related to body dissatisfaction in numerous studies (e.g. Annis, Cash, & Hrabosky, 2004; Mirza, Davis, & Yanovski, 2005; Schwartz & Brownell, 2004; Wardle, Waller, & Fox, 2002), thus the individual’s weight status should also be related to the magnitude of one’s

discrepancy between the perceived (estimated) and the ideal body. As mentioned previously, the Western population is getting heavier, which might result in this discrepancy to get even larger.

The misperception of body size and the choice of thin body ideals have been linked with negative body image. Thus the investigation of the nature of the discrepancy between one's perceived and ideal size, which would be described as a estimated-ideal BMI discrepancy from now on, and its relation to the individual's weight status and body image is essential.

Healthy, non-clinical populations of women were shown to be inaccurate when estimating their own weight and the size of their own body visually. These inaccuracies were argued to be related to one's own body image concerns and weight status, with women with higher BMIs underestimating their weight and size, and women with lower BMIs overestimating. In addition, women's visual ideals were shown to be universally thin in the empirical studies (e.g. Cho & Lee, 2013; Crossley, Cornelissen, & Tovée, 2012; MacNeill & Best, 2015; Swami, Salem, Furnham, & Tovée, 2008; Swami, Steadman, & Tovée, 2009), which would be unattainable for most, especially for heavier, overweight or obese women. Hence, it would be safe to assume that women will also be inaccurate in their estimations of their desired weight loss so that it matches their visual body ideals – the body ideals created through the visual experience of bodies. Such mismatch could have potentially negative consequences for women who will have a larger weight ideal-visual ideal discrepancies, as even when the initial weight goal would be achieved through various weight loss-related activities (dieting, exercise), a person with a strong thinness bias might still feel dissatisfied because the mental image of the chosen ideal body would still be thinner, thus sustaining the mismatch between the actual (perceived) and the ideal body.

The above-reviewed literature specifies that the magnitude of the cognitive bias in the estimation of one's own body, the positive thinness bias and the choice of body ideals are related to one's own body size (BMI) and level of body image concerns. Women with higher body image concerns were found to be less accurate at estimating their own weight and their body ideals are thinner than of those with similar BMI but a more positive body image (Cho & Lee, 2013; MacNeill & Best, 2015; Sand, Lask, Høie, & Stormark, 2011). We hypothesise that women with a greater negative bias directed towards their own body, will

also be less accurate at judging their ideal weight so that it matches their chosen visual body ideal, i.e. the mental image of the ideal body, which creation is heavily affected by the sociocultural influences.

Taking the above review of the literature into account, the following hypotheses were formed:

- 1) Women's negative body image and BMI status will be related to the magnitude of body size estimation inaccuracy (estimated-actual BMI discrepancy) with women higher in body image concerns overestimating their size more than women lower in body image concerns
- 2) Women's negative body image and BMI status will also be related to the magnitude of estimated-ideal body discrepancies with women higher in body image concerns having a greater discrepancy than women lower in body image concerns
- 3) We also expect the women not to be accurate when judging the amount of weight they need to lose ('weight ideal') to achieve their ideal body ('visual ideal'), which will be dependent on one's BMI and body image, with women higher in body image concerns hypothesised to present a greater discrepancy between the weight and visual ideal than women lower in body image concerns

Methods

Participants

Eighty seven undergraduate and postgraduate students from University of Hull, UK participated in the study. Three participants were removed from the analyses as their age was considerably higher than 30 and being 30 or below was a requirement for participation. In addition, two sets of data were incomplete therefore they were not included in the analyses. Lastly, while investigating the descriptive statistics, one participant's data appeared as a significant outlier in a number of variables, therefore the whole set for this participant was also taken out. The final sample used for the reported analyses consisted of 81 participants. The participants were recruited through email or posters/ flyers advertising the study at the University of Hull campus. The participants were between 18-30 years old and were offered either course credit or £5 for participation. Out of all participants, 3 were underweight, 9 were obese, 22 were overweight and 47 were of healthy weight. Seven

participants reported a 'history of an eating disorder'. All participants had normal or corrected to normal vision. The study has been approved by the Department of Psychology ethics committee, University of Hull.

Measures

For the description of the Eating Disorder Inventory (EDI-3) and Dutch Eating Behaviour Questionnaire (DEBQ), please refer to chapter 2. For the description of the Body Image States Scale (BISS), please refer to chapter 3.

Sociocultural Attitudes Towards Appearance (SATAQ-4)

The Sociocultural Attitudes Towards Appearance (SATAQ-4) was used in this study to complement the rest of the questionnaires with a measure of the internalisation of the sociocultural body ideal. SATAQ-4 (Schaefer et al., 2015) consists of 22 items assessing internalisation and perceived sociocultural appearance-related pressures. The previous version of the questionnaire – SATAQ-3 – was the most widely-used and validated measure of appearance internalisation. SATAQ-4 was developed to provide for an assessment of muscularity vs. thinness internalization component and to index three different domains of sociocultural pressures (family, peers, and media).

Stimuli and apparatus

The 3D program Poser Pro 2012 (Smith Micro Software, Inc.) was used to create four female body stimuli: emaciated, of healthy weight, overweight, and obese. The female bodies were only partially dressed to emphasize the body shape – the bodies wore a nude bra and briefs (see figure 33 and 34). All body stimuli are presented from a 30° angle. The arms and hands are spread at shoulder height and are held at 90° to the body. The bodies were morphed in 3ds max (autodesk.com), enabling a 3D morphing of a whole body, which provides a big advantage over 2D morphing techniques. The thinnest body was morphed with the second body, the second body was morphed with the third body, and the third body was morphed with the fourth, heaviest body, which created 16 body morphs (see figure 34). Each body was printed on an A5 sheet (148 x 210 mm) and laminated. The body was 17.5 cm in height and 13.5 cm wide (from hand to hand), presented in a grey background.

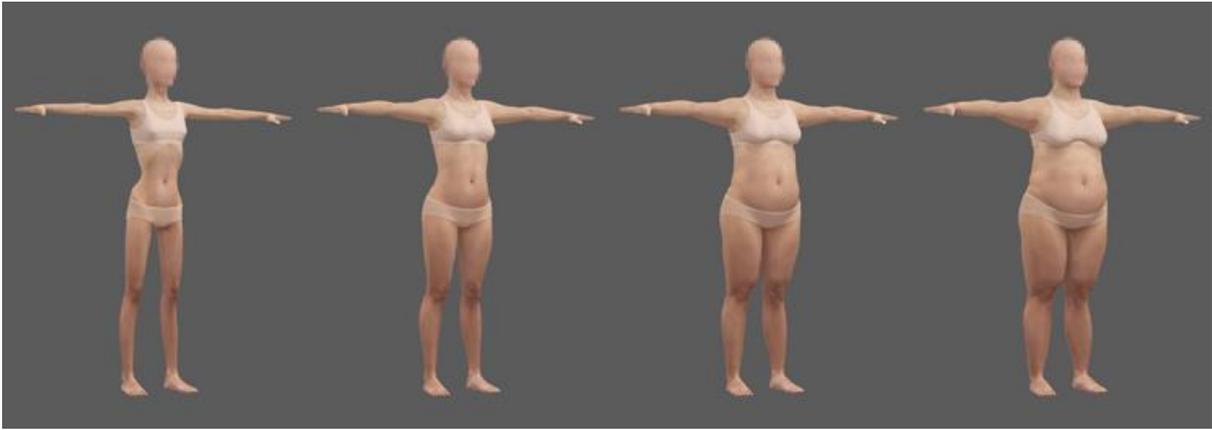


Figure 33. Four template body stimuli with their estimated BMI values in the brackets (from the left): emaciated (13 kg/m²), of healthy weight (19.24 kg/m²), overweight (25.47 kg/m²) and obese (31.73 kg/m²).

3D body analysis: BMI estimates

The four bodies were exported as an .obj file from Poser Pro 2012 and opened in 3ds max (autodesk.com). The body's height was set to 1.64 m (the average UK height according to the National Healthy Survey 2012). To estimate the weight of the models the same procedure was used as in study 2 (see chapter 3). The bodies differed on average by 1.25 BMI points, with a range from 13 kg/m² (severely underweight) to 31.73 kg/m² (obese). Please refer to figure 34 and to table 16 for the BMI estimates of all stimuli.

Table 16. Estimated body mass indices (BMIs) for all stimuli.

Body number	Estimated BMI	BMI category
1	13	Severely underweight
2	14.14	Severely underweight
3	15.36	Severely underweight
4	16.64	Underweight
5	17.94	Underweight
6	19.24	Normal
7	20.53	Normal
8	21.76	Normal
9	22.99	Normal
10	24.22	Normal
11	25.47	Overweight
12	26.73	Overweight
13	27.98	Overweight
14	29.22	Overweight
15	30.46	Obese
16	31.73	Obese

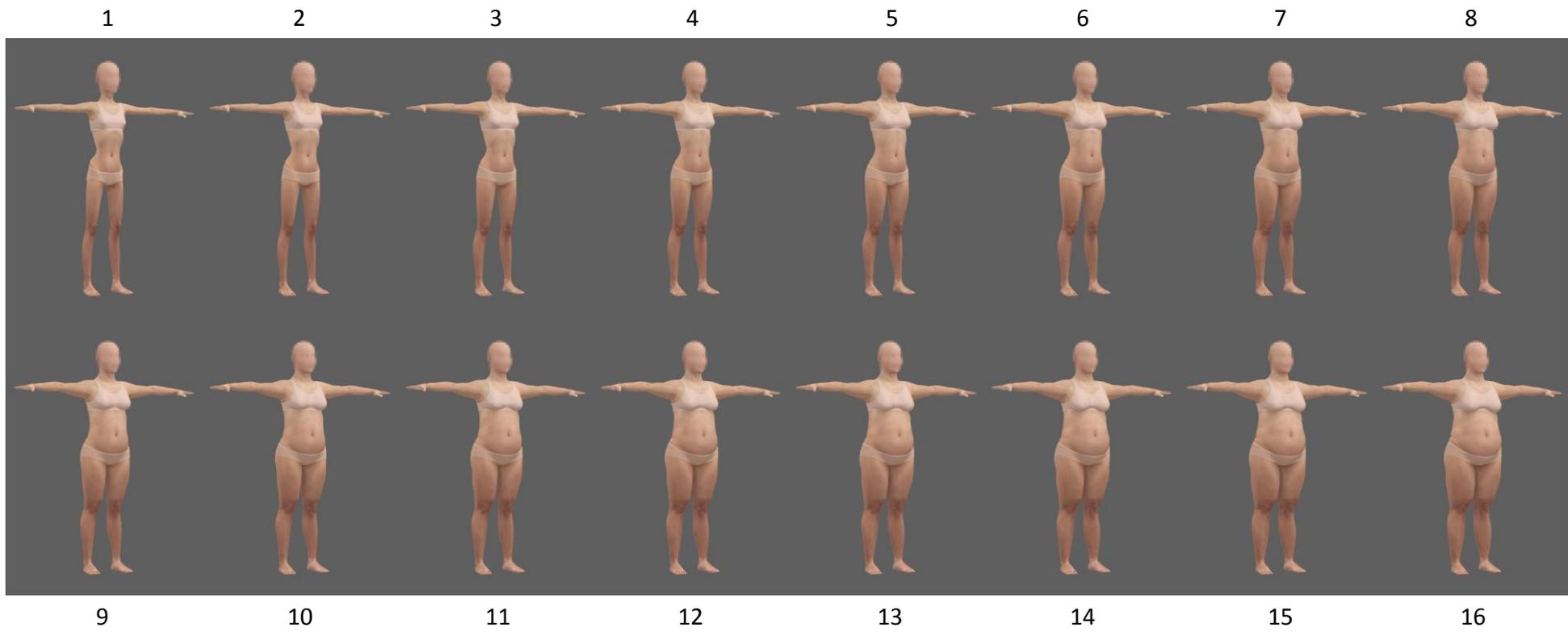


Figure 34. All 16 body stimuli used in the study. See table 16 for the BMI estimates of the stimuli.

Design and procedure

Before the study started the participant was asked to read and sign the consent form. The participants were assured that the experiment would take 1 hour and that they can withdraw at any time. First, the participants completed a series of questionnaires: EDI-3, DEBQ, BISS, and SATAQ-4. Afterwards, the participants filled in a screening form, which included questions about their weight, height, levels of activity, eating behaviour, and body ideals (see appendix B). If the participants did not know their weight and height they were asked to estimate it. Next, the participants went to a different part of the room and were asked to inspect 16 printed out bodies, arranged in order from the thinnest to the heaviest (a selection task). The participants were asked to choose the body that best approximated their actual size (perceived size), the body that they ideally would like to have (ideal size), as well as the thinnest and heaviest body that they would feel comfortable having. The participants were asked to place four separate cards which read 'actual size', 'ideal size', 'lowest acceptable size', and 'highest acceptable size' above the printed out bodies that best reflected their choices. The participants were given as much time as they needed to complete the task. After the participants completed the task, their height and weight were measured. Finally, the participants were debriefed and the questions were answered by the experimenter.

Results

Demographic variables and questionnaires

Boxplots, normality tests, and Q-Q plots were used to detect outliers for the BMI and the questionnaire variables: drive for thinness, bulimia, body dissatisfaction (trait and state), self-esteem, restraint, and thin ideal internalisation. Only one outlier was found for the bulimia score (EDI-3 bulimia scale) and it was removed from all further analyses. Please refer to table 18 for the mean scores and standard deviations of the measures and to table 19 for the correlations between the measures for all participants ($N = 81$).

Principal Component Analysis

As most of the variables seen in table 19 are moderately to highly correlated, a decision was made to carry out a principal component analysis (PCA) to reduce some of these variables to components and use in the following analyses.

A principal components analysis (PCA) with oblique rotation (direct oblimin) was conducted on seven questionnaire scores measuring various psychological traits: 4 scales of the Eating Disorder Inventory (EDI-3): drive for thinness (DT), bulimia (B), body dissatisfaction (BD), and low self-esteem (LSE); Body Image States Scale (BISS); the restraint scale of the Dutch Eating Behaviour Questionnaire (DEBQ-R); and the thin ideal internalisation scale from the Sociocultural Attitudes Towards Appearance (SATAQ-4 TI). The suitability of PCA was assessed prior to analysis. Inspection of the correlation matrix showed that all variables had at least one correlation coefficient greater than 0.3. The overall Kaiser-Meyer-Olkin (KMO) measure was 0.83 with individual KMO measures approaching or being greater than 0.8, classification of 'meritorious' according to Kaiser (1974). Bartlett's test of sphericity was statistically significant ($p = .000$), indicating that the data was likely factorisable. PCA revealed one component which had an eigenvalue greater than one and which explained 55% of the total variance. Visual inspection of the scree plot confirmed that only one component should be retained. As only one component was extracted, the oblique rotation was not carried out. Component loadings and communalities for the new latent variable 'PSYCH' are presented in table 17.

Table 17. Component coefficients and communalities for $N = 80$ (one outlier for the EDI-3 bulimia score excluded listwise).

	Component 1	Communalities
EDI-3 DT	.892	.795
EDI-3 B	.658	.433
EDI-3 BD	.866	.750
EDI-3 LSE	.594	.352
BISS	-.760	.578
DEBQ-R	.739	.546
SATAQ-4 TI	.628	.395

Note: EDI-3 DT = Drive for Thinness, EDI-3 B = Bulimia, EDI-3 BD = Body Dissatisfaction, EDI-3 LSE = Low Self Esteem, BISS = Body Image States Scale, DEBQ-R = restraint scale, SATAQ-4 TI = thin ideal internalization

Regressions

A number of multiple regressions were run to examine how one's BMI and body image, as measured by the latent variable 'PSYCH', influence the estimation of own body size, the discrepancy between one's perceived size and their ideal looks, and the discrepancy between the weight goal and the chosen visual ideals. All multiple regression analyses (with simple slopes analyses) in this study were carried out using a PROCESS custom dialog box (version 3.0) for SPSS (Hayes, 2017; <http://www.afhayes.com>). To determine the outliers, boxplots, normality tests and Q-Q plots were inspected for the dependent variables (described below), for all participants as a whole ($N = 81$). The predictors used and high residual values were also inspected and their impact on the model was evaluated. No outliers were detected.

Please refer to table 20 for the mean BMI values of the body stimuli indicated during the selection task as well as other BMI-related variables: 'Actual BMI' – the participant's actual BMI (kg/m^2) measured after the selection task; 'Estimated BMI' – the participant's assessment of their own size during the selection task; 'Ideal BMI (visual)' – the participant's choice of the ideal size during the selection task; 'Ideal BMI (weight)' – the participant's estimate of their ideal weight, reported on the screening form before the selection task took place; 'Lowest BMI' – lowest acceptable size indicated during the selection task; 'Highest BMI' – highest acceptable size indicated during the selection task. Two outliers were removed for the lowest BMI ($N=79$) and one was removed for the highest BMI ($N=80$). No other outliers were detected.

Table 18. Means and SDs for the BMI and self-report questionnaires for all participants ($N = 81$).

$N = 81$	M	SD
BMI	24.84	4.15
EDI-3 DT	11.26	7.53
EDI-3 B	4.94	4.87
EDI-3 BD	19.47	9.38
EDI-3 LSE	6.79	5.51
BISS	4.79	1.28
DEBQ-R	3.11	0.97
SATAQ-4 TI	3.26	0.78

Note: BMI = Body Mass Index (kg/m^2), EDI-3 DT = Drive for Thinness, EDI-3 B = Bulimia, EDI-3 BD = Body Dissatisfaction, EDI-3 LSE = Low Self Esteem, BISS = Body Image States Scale, DEBQ-R = restraint scale, SATAQ-4 TI = thin ideal internalization

Table 19. Correlations between the participants' BMI and self-report questionnaires for all participants ($N = 81$).

$N = 81$	BMI	EDI-3 DT	EDI-3 B	EDI-3 BD	EDI-3 LSE	BISS	DEBQ-R	SATAQ-4 TI
BMI	1							
EDI-3 DT	.191	1						
EDI-3 B	.098	.512**	1					
EDI-3 BD	.343**	.691**	.517**	1				
EDI-3 LSE	.005	.451**	.444**	.464**	1			
BISS	-.279*	-.612**	-.322**	-.700**	-.441**	1		
DEBQ-R	.204	.714**	.365**	.562**	.187	-.449**	1	
SATAQ-4 TI	-.008	.548**	.304**	.457**	.193	-.332**	.459**	1

Note: BMI = Body Mass Index (kg/m^2), EDI-3 DT = Drive for Thinness, EDI-3 B = Bulimia, EDI-3 BD = Body Dissatisfaction, EDI-3 LSE = Low Self Esteem, BISS = Body Image States Scale, DEBQ-R = restraint scale, SATAQ-4 TI = thin ideal internalization

Table 20. Mean scores and standard deviations on various BMI estimates for all participants ($N = 81$).

$N = 81$	M	SD
Actual BMI	24.84	4.15
Estimated BMI	21.54	3.33
Ideal BMI (visual)	17.87	1.58
Ideal BMI (weight)	21.64	2.46
Lowest BMI	16.33	1.20
Highest BMI	21.81	1.99

Note: lowest BMI ($N = 79$), highest BMI ($N = 80$)

Estimated-actual BMI discrepancy

A multiple regression was run to investigate whether the discrepancy between one's perceived and actual BMI can be predicted by one's higher body image concerns and actual weight status. The participants were asked to place an "Actual size" card above the body that best approximated their actual size and the BMI corresponding to the body indicated by the participants (see figure 34) was used as the perceived body size value (perceived BMI). The dependent variable was calculated by subtracting the actual BMI of the participant from this perceived BMI. This variable will be referred to as a "estimated-actual BMI discrepancy". A negative score would indicate an underestimation of body size, whereas the positive score would indicate an overestimation. Please see figure 35 for the representation of the relationship

between the estimated-actual BMI discrepancy and the actual BMI of the participants, indicating the level of over- or underestimation of body size.

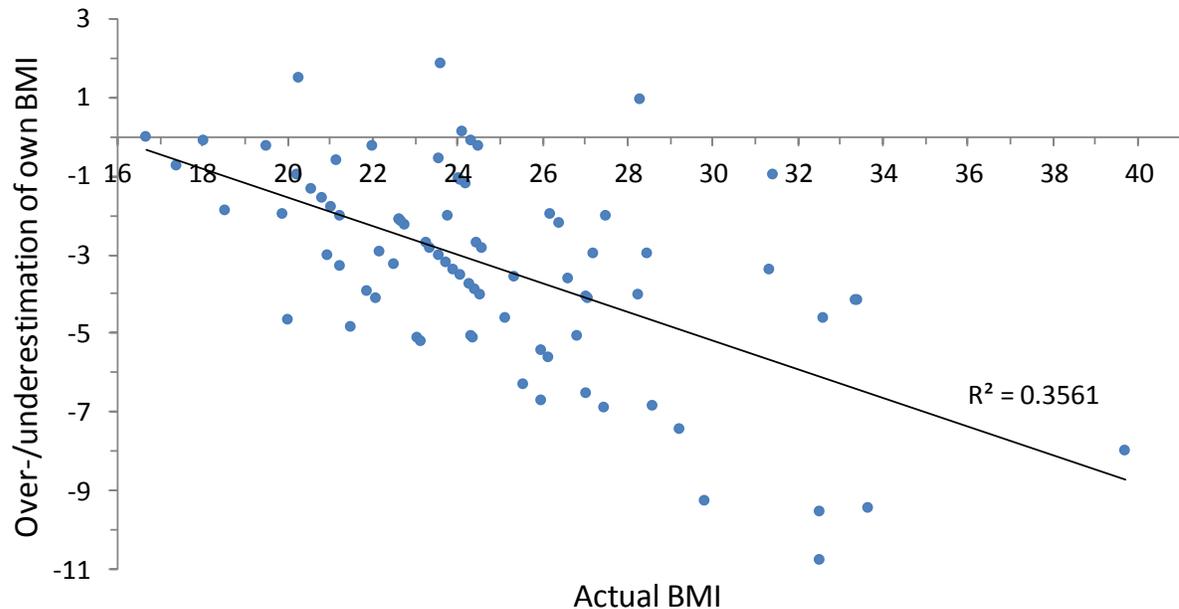


Figure 35. The scatterplot represents the relationship of the participants' BMI with their estimated-actual BMI discrepancy of own body size, for all participants ($N = 81$). A negative score on the y axis indicates an underestimation of body size (perceived size smaller than actual size). Only four participants overestimated their body size (positive values). The graph also shows that the higher the BMI of the participants, the bigger the underestimation of own body size (estimated-actual BMI discrepancy).

In the multiple regression model, the estimated-actual BMI discrepancy was the dependent variable. The new latent variable PSYCH (higher values indicate higher body image concerns) and the participant's own BMI (actual BMI) were entered as independent variables. The interaction effect between PSYCH and BMI was also entered to investigate the moderating effect that one's weight status (BMI) can have on the relationship between the estimated-actual discrepancy and psychological the body image-related variables (PSYCH). The latent variable's scores (PSYCH) are given in terms of SDs, thus the z-scores were also calculated for the actual BMI variable, to avoid multicollinearity in the model.

The multiple regression model statistically significantly predicted the estimated-actual BMI discrepancy, $F(3, 76) = 26.90$, $p = .000$, $adj. R^2 = .51$. The interaction effect between the latent PSYCH variable and the participants' BMI was statistically significant, $b = 0.62$, 95% CI

[0.19, 1.05], $t = 2.89$, $p = .005$, indicating that the relationship between the estimated-actual discrepancy is related to one's body image and moderated by one's actual size (BMI).

The simple slopes analysis revealed that when the participants' BMI ($M = 24.84$, $SD = 4.15$) was at one standard deviation below the mean, which relates to women with a healthy BMI, there was a non-significant small positive relationship between the estimated-actual discrepancy and the psychological body-image related traits (PSYCH), $b = 0.25$, 95% CI [-0.32, 0.83], $t = 0.89$, $p = .379$. At the mean BMI value, which reflects an overweight BMI category, there was a statistically significant positive relationship between the estimated-actual discrepancy and the latent PSYCH variable, $b = 0.86$, 95% CI [0.44, 1.28], $t = 4.09$, $p = .000$. When the BMI was at one standard deviation above the mean, which relates to the BMI approaching the obese category, the relationship was also statistically significant and became stronger, $b = 1.47$, 95% CI [0.86, 2.09], $t = 4.76$, $p = .000$. Please see the figure 36 below.

As most estimated-actual BMI discrepancy values were negative (see figure 35), most participants chose a thinner body as representing their own, thus expressing an underestimation of own body size. The main effect of BMI was statistically significant, indicating that an underestimation of own body size was greater in women with higher BMIs. Also, the statistically significant main effect of body image concerns (latent PSYCH variable) showed that the women with lower body image concerns tended to be less accurate in their estimations and had a greater underestimation of body size – estimating their body as thinner than it actually is.

However, the simple slopes analysis revealed that this is true only for the women with higher BMIs (overweight and obese). For the women of healthy BMI (normal weight) the relationship between the estimated-actual discrepancy and the psychological variables was not significant, thus indicating that the estimation of one's own size is not dependent on body image concerns in women with healthy BMIs. In women with higher BMIs (overweight and obese), the underestimation of own body size was related to the level of body image concerns, with the women with low body image concerns having a tendency to greater underestimate their body size. This effect was found to be stronger for obese than overweight women.

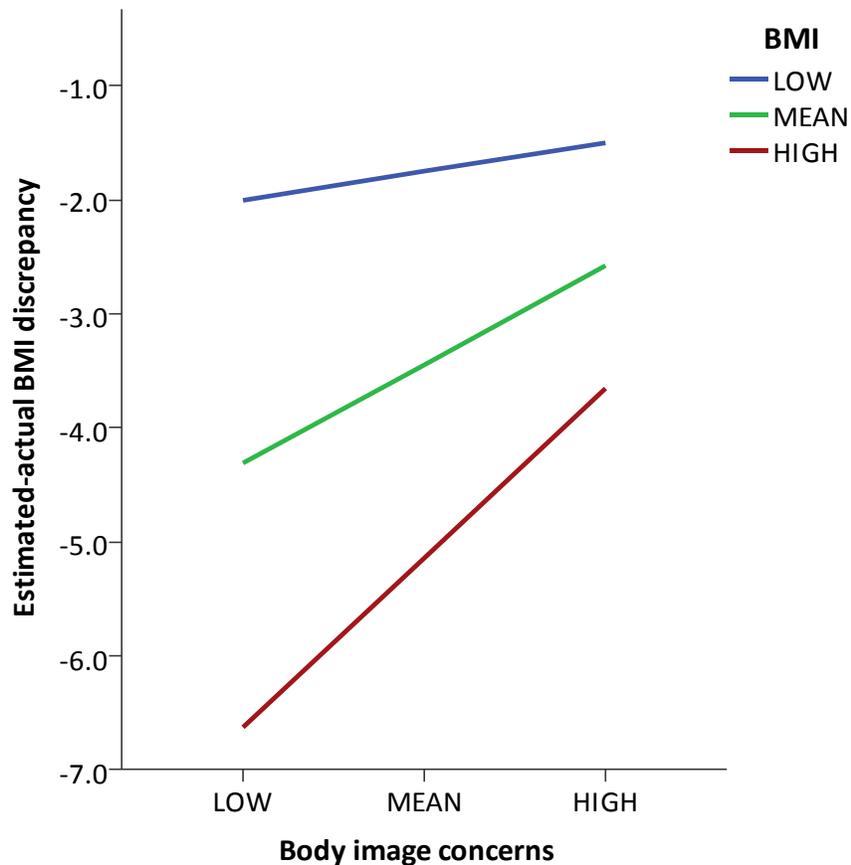


Figure 36. Simple slopes equations of the estimated-actual BMI discrepancy regression on the psychological body image variables (PSYCH) at three levels of the participants' BMI. For both PSYCH and BMI, the 'LOW' category represents a score at -1 SD from the mean and the 'HIGH' category represents a score at +1 SD from the mean. Thus for the BMI, the 'LOW' score would represent women of healthy BMI, the 'MEAN' score would represent the women approaching the overweight category, and the 'HIGH' score would refer to women approaching the obese category.

Table 21. Multiple Regression predicting the estimated-actual discrepancy from the participants' actual BMI, the latent variable PSYCH, and the interaction between the BMI and the PSYCH variable.

Variable	Estimated-actual BMI discrepancy			
	<i>b</i>	<i>SE_B</i>	<i>t</i>	<i>p</i>
Constant	-3.45	0.21	-16.45	.000**
PSYCH	0.86	0.21	4.09	.000**
BMI	-1.73	0.22	-7.99	.000**
PSYCH*BMI	0.62	0.22	2.89	.005*

Note: **p* < .05, ***p* < .001; *b* = unstandardised regression coefficient; *SE_B* = standard error of the coefficient

Estimated-ideal BMI discrepancy

Another multiple regression was run to investigate whether the discrepancy between what the participants' thought they looked like (estimated BMI) and their body ideal can be predicted by one's higher body image concerns and actual weight status. Just like with choosing the body that best approximated their actual size, the participants were asked to place an "Ideal size" card above the chosen body that best corresponded to their ideal body. The previously estimated BMI of the chosen body was used as the ideal body size value (ideal BMI). The dependent variable was calculated by subtracting the perceived BMI of the participant (perceived BMI) from the chosen ideal size (ideal BMI). This variable will be referred to as an "estimated-ideal BMI discrepancy". A negative score would indicate that the BMI of the visual ideal was lower than the participants' own estimated size. The more negative the values, the bigger the discrepancy between the ideal body and the body the participants think they have. Please see figure 37 for the representation of the relationship between the estimated-ideal BMI discrepancy and the actual BMI of the participants.

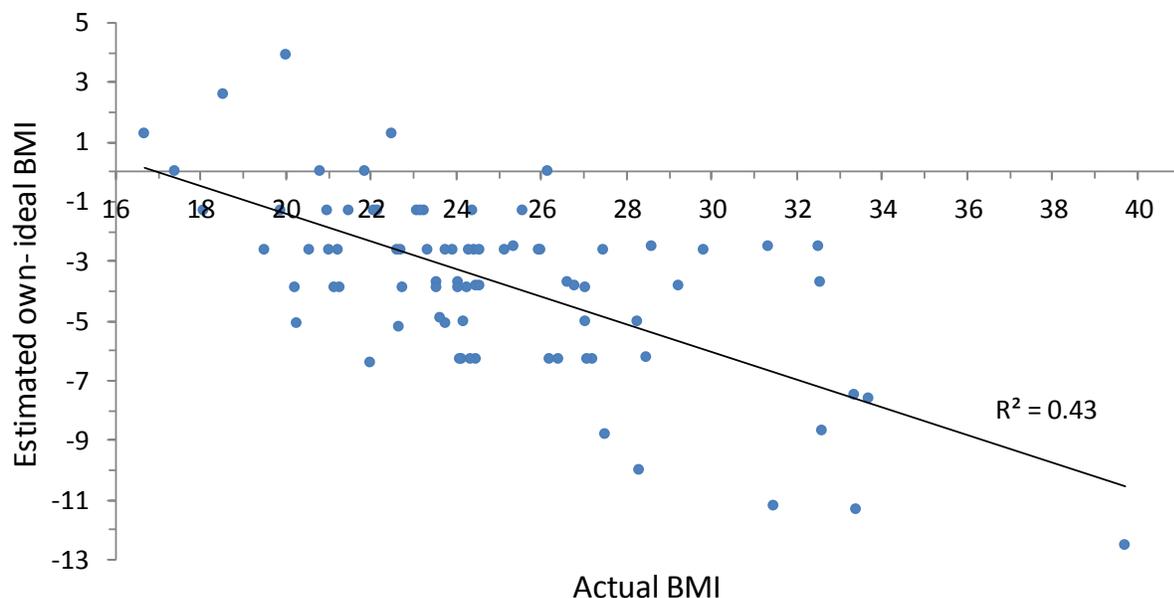


Figure 37. The scatterplot represents the relationship of the participants' BMI with the discrepancy between perceived own and ideal BMI, for all participants ($N = 81$). A negative score on the y axis indicates that the chosen visual ideal is thinner (has lower BMI) than the participants' own perceived size (BMI). The more negative the values, the bigger the discrepancy between the ideal body and the body the participants think they have. Only four

participants chose the body ideals heavier than their own perceived size and four participants chose the same body for their estimated and ideal body. The rest of the participants chose a thinner body ideal than their estimated body size, with participants with higher BMIs having a greater discrepancy between their estimated and ideal body type.

In the multiple regression model, the estimated-ideal BMI discrepancy was the dependent variable. The latent variable PSYCH (higher values indicate higher body image concerns) and the participant's own BMI (actual BMI) were entered as independent variables. The interaction effect between PSYCH and BMI was also entered to investigate the moderating effect that one's weight status (BMI) can have on the relationship between the estimated-ideal discrepancy and body image concerns (PSYCH). As in the previous analysis, the independent variables are given in terms of SDs (z-scores).

The multiple regression model statistically significantly predicted the estimated-ideal BMI discrepancy, $F(3, 76) = 35.37, p = .000, adj. R^2 = .58$. The interaction effect between the body image concerns (PSYCH) and the participants' BMI was not statistically significant, $b = -0.18, 95\% \text{ CI } [-0.61, 0.26], t = -0.80, p = .426$. There was a statistically significant main effect of body image concerns (PSYCH), $b = -1.24, 95\% \text{ CI } [-1.67, -0.81], t = -5.76, p = .000$, and BMI, $b = -1.52, 95\% \text{ CI } [-1.96, -1.07], t = -6.84, p = .000$, on the estimated-ideal BMI discrepancy. Please refer to figure 38 for an illustration of these relationships.

The participants were found to have a less variable body ideal ($M = 17.87, SD = 1.58, \text{ range} = 10.11$) than their estimated ($M = 21.54, SD = 3.33, \text{ range} = 16.37$) and actual body size ($M = 24.84, SD = 4.15, \text{ range} = 23.06$). As the body ideals are similar and less varied between the participants, the heavier the participants, the greater the discrepancy between the chosen body ideal and their estimated (as well as actual) size. It can also be seen that for all participants (normal weight, overweight and obese) the discrepancy between one's estimated and ideal size gets bigger as body image concerns increase, indicating that women with higher body image concerns chose thinner body ideals than women with lower body image concerns and of similar BMI.

Table 22. Multiple Regression predicting the estimated-ideal discrepancy from the participants' actual BMI, the latent variable PSYCH, and the interaction between the BMI and the PSYCH variable.

Variable	Estimated-ideal BMI discrepancy			
	<i>b</i>	<i>SE_B</i>	<i>t</i>	<i>p</i>
Constant	-3.52	0.21	-16.45	.000**
PSYCH	-1.24	0.22	-5.76	.000**
BMI	-1.52	0.22	-6.84	.000**
PSYCH*BMI	-0.18	0.22	-0.80	.426

Note: * $p < .05$, ** $p < .001$; *b* = unstandardised regression coefficient; *SE_B* = standard error of the coefficient

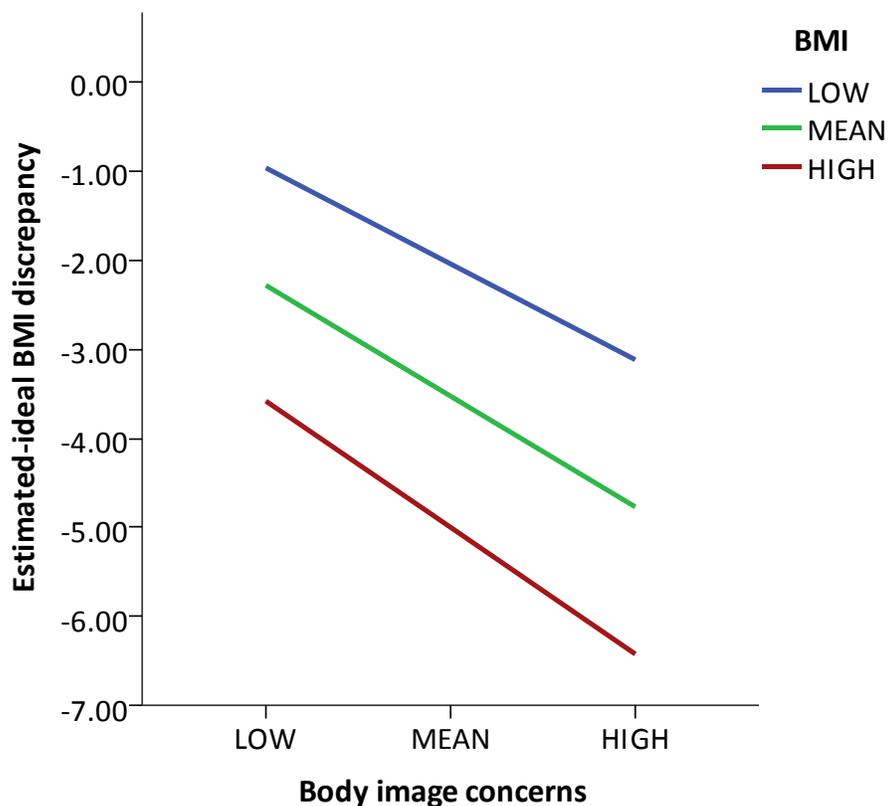


Figure 38. Simple slopes equations of the estimated-ideal discrepancy regression on the psychological body image variables (PSYCH) at three levels of the participants' BMI. The graph illustrates that there is no interaction between the body image concerns (PSYCH) and the participants' BMI. For both PSYCH and BMI, the 'LOW' category represents a score at -1 SD from the mean and the 'HIGH' category represents a score at +1 SD from the mean. Thus for the BMI, the 'LOW' score would represent women of healthy BMI, the 'MEAN' score would represent the women approaching the overweight category, and the 'HIGH' score would refer to women approaching the obese category.

Visual ideal-weight ideal discrepancy

The last multiple regression was run to investigate the predictive validity of one's higher body image concerns and actual weight status (BMI) on the accuracy of assessment of the weight one would need to lose to achieve the visual ideal. The participants not only chose the body that best approximated their body ideal from a number of stimuli but they also reported their ideal weight in response to the question "How much would you like to weigh?". The dependent variable was calculated by subtracting the BMI value of the visual ideal from the weight ideal (the BMI value calculated based on the participants' reported weight ideal and their measured height). This variable will be referred to as a "visual ideal-weight ideal discrepancy". Higher positive values would indicate a greater discrepancy between the weight and visual ideals (weight ideal being always heavier). Please see figure 39 for the representation of the relationship between visual ideal-weight ideal discrepancy and the actual BMI of the participants.

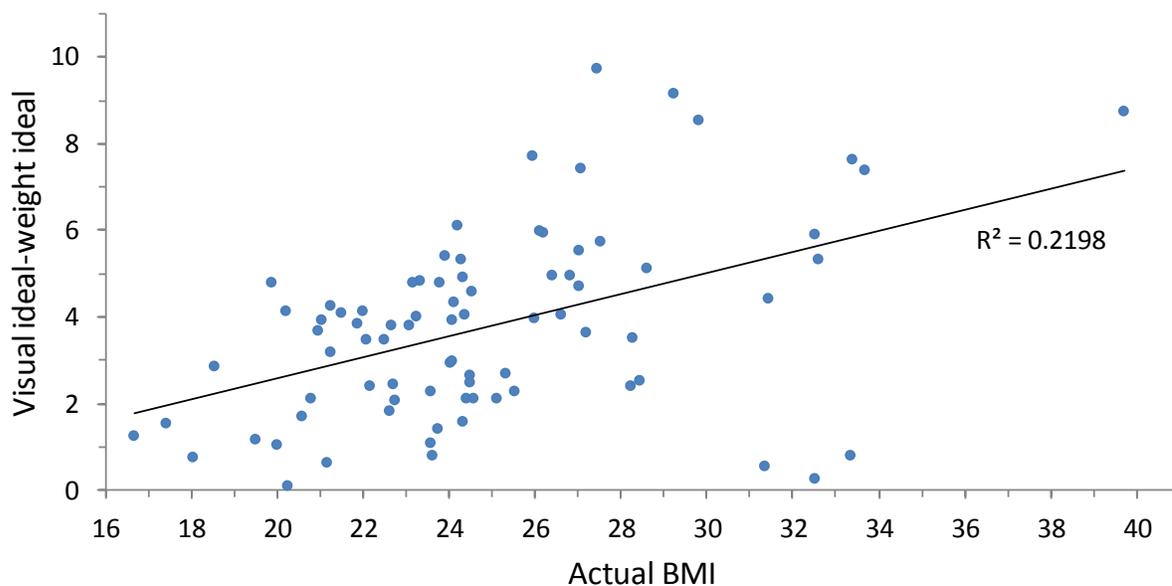


Figure 39. The scatterplot represents the relationship of the participants' BMI with the discrepancy between their visual and weight ideals, for all participants ($N = 81$). Higher positive values on the y axis indicate a greater discrepancy between the weight and visual ideals (choosing a thinner visual than weight ideal). As can be seen in the graph, the participants' desired weight in response to the "How much would you like to weigh?" question did not match the BMIs of the chosen visual ideals. The discrepancy was higher for the participants with higher BMIs.

In the last multiple regression model, the visual-weight ideal discrepancy was the dependent variable. The latent variable PSYCH (higher values indicate higher body image concerns) and the participant's own BMI (actual BMI) were entered as independent variables. The interaction effect between PSYCH and BMI was also entered to investigate the moderating effect that one's weight status (BMI) can have on the relationship between the visual-weight ideal discrepancy and body image concerns (PSYCH). As in the previous analyses, the independent variables are given in terms of SDs (z-scores).

The multiple regression model statistically significantly predicted the visual ideal-weight ideal discrepancy, $F(3, 76) = 8.58, p = .000, adj. R^2 = .25$. Only the main effect of BMI was statistically significant, $b = 1.01, 95\% CI [0.57, 1.46], t = 4.52, p = .000$. Please refer to table 23 and figure 40.

The mean BMI of the participants was 24.84, their mean weight ideal was 21.64 and their chosen visual ideal was 17.87, thus showing a mismatch between the desirable weight and the BMI of the chosen visual ideals. Although the heavier women have similar visual ideals to the women with lower BMIs, their weight goals are further away from their ideal BMIs, thus showing a greater mismatch between the weight goals and the chosen body ideals. Although the interaction between the body image concerns (PSYCH) and the participant's BMI did not achieve statistical significance ($p = .07$), it can be seen in figure 40 that the relationship between the weight-visual ideal discrepancy and body image concerns (psychological attitudes) is different at different levels of BMI. For women having higher BMIs (overweight, obese), the weight ideal more closely approaches the chosen visual ideal for women with higher body image concerns, as compared to women with lower body image concerns and a similar weight status (BMI).

Table 23. Multiple Regression predicting the visual ideal-weight ideal discrepancy from the participants' actual BMI, the latent variable PSYCH, and the interaction between the BMI and the PSYCH variable.

Visual ideal-weight ideal discrepancy				
Variable	<i>b</i>	<i>SE_B</i>	<i>t</i>	<i>p</i>
Constant	3.82	0.22	17.66	.000**
PSYCH	-0.37	0.22	-1.69	.10
BMI	1.01	0.22	4.52	.000**
PSYCH*BMI	-0.41	0.22	-1.83	.07

Note: * $p < .05$, ** $p < .001$; *b* = unstandardised regression coefficient; *SE_B* = standard error of the coefficient

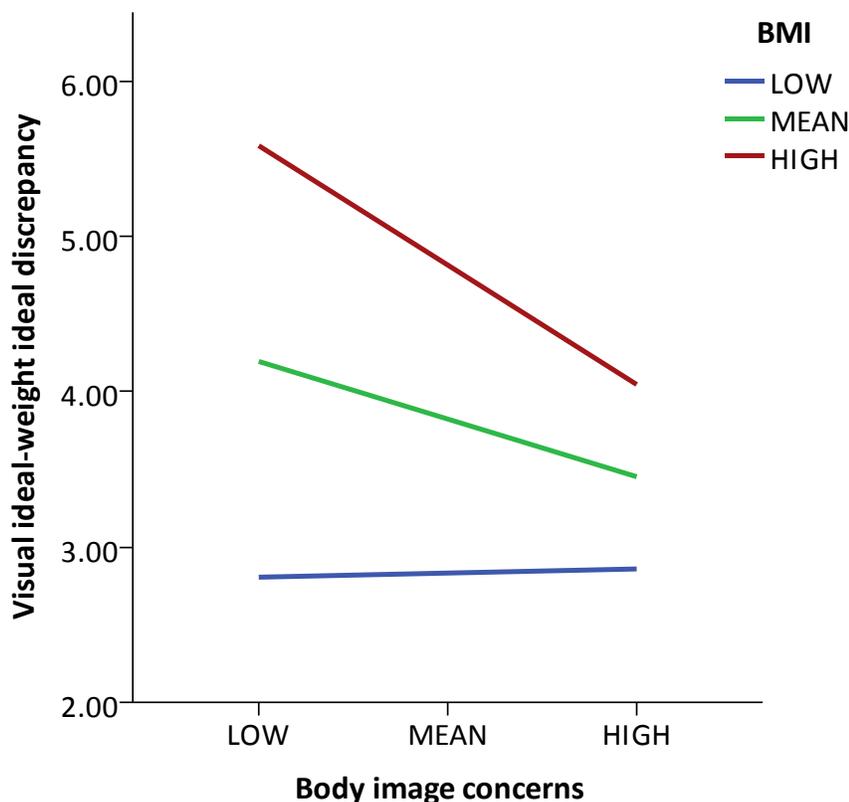


Figure 40. Simple slopes equations of the visual ideal-weight ideal discrepancy regression on the psychological body image variables (PSYCH) at three levels of the participants' BMI. Although the graph illustrates an interaction between the body image concerns (PSYCH) and the participants' BMI, this interaction was shown not to be statistically significant. For both PSYCH and BMI, the 'LOW' category represents a score at -1 SD from the mean and the 'HIGH' category represents a score at +1 SD from the mean. Thus for the BMI, the 'LOW' score would represent women of healthy BMI, the 'MEAN' score would represent the women approaching the overweight category, and the 'HIGH' score would refer to women approaching the obese category.

Discussion

This study investigated whether women's negative body image and their BMI status will be related to the magnitude of various body image related discrepancies: the discrepancy between one's estimated and actual size, estimated and ideal size, and between one's visual body ideal and their weight ideal. It was hypothesised that women with higher body image concerns will present greater discrepancies than women lower in body image concerns.

As in this thesis the focus falls on the cognitive-evaluative element of body image disturbance, the attitudinal accuracy of body size estimation in women was investigated to provide more information about the link between the accuracy of attitudinal body size estimation (estimated size), the level of body image concerns, and one's actual weight status (BMI). To investigate whether body image concerns and one's BMI status are linked to a greater inaccuracy of body size estimations, a multiple regression was run, with the discrepancy between the estimated and actual size as a dependent variable.

The first hypothesis was supported in part, as a significant interaction between body image concerns and the participant's BMI was found, indicating that the accuracy of own body size estimations was related to the participants' level of body image concerns and the participants' own BMI. Although it was hypothesized that women higher in body image concerns will overestimate their size more than women lower in body image concerns, the results showed that all participants apart from four underestimated their BMI. The magnitude of this underestimation was found to be greater for women with higher BMIs. The simple slopes analysis revealed that the magnitude of one's body size underestimation – estimating your body as thinner than it actually is – was also related to body image concerns but only for the women of higher BMIs (overweight and obese) and not for those who had the BMIs in the normal range.

The accuracy of own body size estimation is crucial to the accurate recognition of one's weight gain. In the context of rising obesity levels in Western countries, the issue of accurate own size and weight recognition gained even more importance and urgency. The underestimation of body size was reported multiple times in overweight and obese individuals (Cornelissen, Bester, Cairns, Tovée, & Cornelissen, 2015; Leonhard & Barry, 1998; Tovée, Emery,

& Cohen-Tovée, 2000; Vartanian & Germeroth, 2011) and normal weight women (MacNeill & Best, 2015), although less frequently. The inaccuracy of body size estimation may stem from the fact that an average (“normal”) body is getting larger (Ogden, Yanovski, Carroll, & Flegal, 2007; Twells, Gregory, Reddigan, & Midodzi, 2014; Wang, Beydoun, Liang, Caballero, & Kumanyika, 2008; Visscher, Heitmann, Rissanen, Lahti-Koski, & Lissner, 2014). Therefore the women of healthy weight might be underestimating their own body size as they are exposed to more overweight and obese people in everyday life.

Perceptual biases have been specified as one of the possible causes of weight underestimation in overweight and obese individuals (Cornelissen, Bester, Cairns, Tovée, & Cornelissen, 2015; Cornelissen, Gledhill, Cornelissen, & Tovée, 2016; Cornelissen, Johns, & Tovée, 2013). Judgements of size can be susceptible to contraction bias (Poulton, 1989), which arises when one makes a judgement based on a standard reference, especially when the reference is not directly accessible. With regards to human bodies, a person could be making a size judgement based on the average of all the bodies seen in life – a “reference body” (Winkler & Rhodes, 2005). Thus, when making judgements about one’s size, thin bodies will be overestimated, and heavier bodies will be underestimated, with greater levels of under- and overestimation when the bodies are more extreme in size and more accurate judgements of the bodies similar to the reference body. Therefore, the contraction bias will be a function of the observer’s own BMI. Another perceptual bias affecting the judgements of heavier body types is Weber’s law, which states that the just noticeable difference (JND) between the two stimuli is a constant proportion of their magnitude, meaning that it would be easier to notice a change of one BMI unit between two thin bodies than between two obese bodies (Gescheider, 1997; as cited in Cornelissen, Cornelissen, Hancock, & Tovée, 2016). Thus, it gets increasingly more difficult to detect a size or weight change in high BMI.

Our findings are in line with previous studies which showed a pattern of underestimation in nonclinical samples (MacNeill & Best, 2015; Saxton, Hill, Chadwick, & Wardle, 2009), but they are in contrast to the studies which reported that normal weight women are quite accurate at their body size estimations (Sand, Lask, Høie, & Stormark, 2011; Swami, Salem, Furnham, & Tovée, 2008) or that they overestimated their body size (Liechty, 2010). A study by Lerner,

Klapes, Mummert and Cha (2016) showed that young overweight and obese women tend to overestimate their size and that obese women, in contrast to overweight women, are more accurate at assessing their size. Our results are in contrast to the above, as we showed that as the BMI of the participants' increases, the underestimation of body size is greater.

The simple slopes analyses revealed that unlike for the normal weight women, the degree of underestimation of own body size was associated with body image concerns for the overweight and obese women. Women with lower body image concerns underestimated their size more, while women with higher body image concerns and of similar weight status were more accurate in their estimations. These results indicate that greater body image concerns might be making the heavier women more aware of their own size, whereas the heavier women with lower body image concerns might be shielded from acknowledging their true size, which results in a greater discrepancy between one's estimated (perceived) and actual body size. As high body image concerns have been linked to various negative psychological outcomes, having low body image concerns is a healthy and desirable state, which helps in creating or sustaining a person's positive body image. However, in the case of overweight and obese women, having lower body image concerns, including lower body dissatisfaction and lower drive for thinness, might be shielding a person from acknowledging the extent of their excess weight and undertaking weight-loss activities.

Contraction bias and Weber's law are normal attributes of our perceptual systems. In this study, however, psychological factors – body image concerns – also influenced the magnitude of body size estimations in overweight and obese individuals. This shows that both perceptual and cognitive processes affect the magnitude of inaccurate body size estimation, which is in line with previous research (Cornelissen, Bester, Cairns, Tovée, & Cornelissen, 2015; Cornelissen, Johns, & Tovée, 2013) and underlies the importance of including psychological factors in investigations of body size estimation in women with higher BMIs.

On one hand, the average ("normal") body is increasing in size, but on the other, the thin body ideal is pervasive in the Western culture. Both processes can be affecting women's perception of themselves and their body ideals. Women of healthy weight (BMI) may be selecting an ideal body based on their visual experience of models, actresses and other thin

body types promoted in the media (Glauert, Rhodes, Byrne, Fink, & Grammer, 2009). However, when assessing their own size, they might be using the “normal” body as a reference, hence the resulting underestimation of own body size (MacNeill & Best, 2015).

As with the previous discrepancy, the impact of the participants’ BMI and body image concerns on estimated-ideal BMI discrepancy was investigated. Most participants chose a thinner body as their ideal, in comparison with their own estimated size, thus showing a strong thinness bias in all participants. The choice of body ideals and the resulting estimated-ideal discrepancy was found to be dependent on both the participants BMI and their level of body image concerns. The discrepancy was greater for women with higher BMIs (overweight and obese), and the women with higher body image concerns chose thinner body ideals than women with lower body image concerns but of similar BMI. Thus the second hypothesis was supported.

Most participants, apart from eight, chose thinner and less variable body ideals than their estimated or actual size ($M = 17.87$, $SD = 1.58$, range = 10.11). This finding agrees with the previous research showing women to choose thin figures, usually underweight or at the low end of the healthy BMI, for their ideal body (Cho & Lee, 2013; Crossley, Cornelissen, & Tovée, 2012; MacNeill & Best, 2015; Swami, Salem, Furnham, & Tovée, 2008; Swami, Steadman, & Tovée, 2009). Thus as the observer’s BMI would increase, the discrepancy between their body ideal and the estimated (as well as actual) BMI would increase as well.

Body dissatisfaction has been associated with greater estimated (actual)-ideal discrepancies (Gruber, Pope, Lalonde, & Hudson, 2001; Williamson, Gleaves, Watkins, & Schlundt, 1993) and the self-discrepancy theory (Higgins, 1987) postulates that greater discrepancy between the actual self (estimated body size) and the ideal self (ideal body size) is related to higher levels of psychological discomfort. In this study, the estimated-ideal BMI discrepancy was related to higher levels of body image concerns, which agrees with the above-mentioned literature and the self-discrepancy theory’s assumptions.

The last multiple regression was run with the visual ideal-weight ideal discrepancy as a dependent variable. The third hypothesis was supported in part, as the magnitude of the

discrepancy between the visual and the weight ideal was related to the BMI but not to the level of body image concerns.

As with the accurate estimation of own body size, judging the amount of weight one would need to lose is important for overweight and obese women, as it would affect the successfulness of dieting, diet planning, monitoring weight progress and the choice of reasonable, realistic body ideals. In comparison to the visual ideal, the weight ideals of the participants were in the normal BMI range ($M = 21.64$, $SD = 2.46$, range = 18.5-24.99). This shows that all women are inaccurate at matching their weight ideal to their visual ideal and that this discrepancy is greater for heavier women. For women with higher BMIs, the mismatch between the weight and the visual ideal may result in dissatisfaction with attempted weight loss as the achieved weight goal will still be heavier than the visual ideal. This signals a possible problem for heavier women regarding their own weight monitoring and the choice of healthy visual body ideals.

Although the interaction between the participants' BMI and body image concerns was not significant, a clear trend for women with high BMIs can be seen in figure 40. It can be seen that obese women who have lower body image concerns are less accurate at matching their ideal weight to the chosen visual ideal (the discrepancy is greater). The weight ideal is thus further away from the chosen visual ideal for women with lower body image concerns, as compared to women with higher body image concerns and of similar BMI. As was seen in the analysis of the estimated-actual discrepancy (over-/underestimation of body size), having lower body image concerns could be shielding heavier persons from acknowledging their weight. However, it needs to be acknowledged that even though the heavier women with higher body image concerns are more accurate in their estimations, these are still quite inaccurate, as compared to women of lower BMIs. As the BMI increases, it is more difficult to successfully estimate one's weight ideal and match with the visual body ideal. This finding is in line with the effect of perceptual biases, which make the judgements of weight and size more difficult as the bodies increase in size.

The assessment of the weight one would like to have does not match the unrealistic expectations of the ideal body. This is problematic, as even though a woman might achieve their

set weight goal, which was more realistic than the visual body ideal and closer to one's current weight status in this study, a woman might be unsatisfied with her weight loss as the set visual ideal would still be out of reach. The choice of more realistic body ideals could reduce the discrepancy, which could then result in more successful weight loss attempts and a more positive body image. Further investigation of this discrepancy and its relationship with one's weight status, body image, and successful weight loss strategies would be required.

Previous studies showed that the individual's accurate assessment of own body size and their choice of body ideals is crucial to one's body image. When faced with a set of figures/stimuli, women tend to choose a body ideal thinner than their actual body and they will also report a lower weight than current weight as desirable. In addition, an individual might underestimate or overestimate their own body size and choose body ideals which are closer or further away from one's own estimated shape, depending on their own size (BMI) and body image concerns.

The observer's BMI emerged as an important factor influencing the accuracy of own body size estimation, the discrepancy between the estimated body size and the ideal size, and the discrepancy between the weight and visual body ideals. Body image concerns, including drive for thinness, internalisation of the thin ideal, body dissatisfaction, low self-esteem, dietary restraint and bulimic tendencies, were also found to be related to the discrepancies. With regards to the estimated-ideal discrepancy, a positive thinness bias was found across all levels of the participant's BMI, with the discrepancy increasing as body image concerns were higher. For the remaining discrepancies: the accuracy of body size estimation and the discrepancy between one's weight and visual ideals the relationship between body image concerns and the discrepancies was stronger for the heavier women. The results draw attention to the necessity of investigating the interactions between one's weight status and the level of body image concerns as the nature of the discrepancies and their psychological consequences are different for women of normal weight and women who are overweight or obese.

CHAPTER 6 – General Discussion

Main aim and hypothesis

The main aim of the thesis was to identify the specific cognitive biases towards female bodies and to explore the relationship between these specific body biases and one's developed level of body image concerns and weight status. This thesis investigated the relationships between the variables relating to body image and eating disorder pathology, such as dietary restraint, body dissatisfaction, or drive for thinness, provided further and more specific empirical evidence for the claim that negative body image can impact on the processing of body-related information, and distinguished specific patterns and body image variables related to such processing. The empirical results were placed in the context of the well-established theories of body image (cognitive-behavioural, sociocultural, and objectification theories) and the theories' assumptions were integrated with the empirical findings.

The main hypothesis of the thesis was that women with higher body image concerns will display cognitive biases towards their own bodies, including a choice of thin, mostly unachievable body ideals and inaccurate body size estimation, as well as body size in general, including an attentional bias to thin bodies and a positive thinness bias when judging body attractiveness. Although a specific attentional bias towards thin bodies in women higher in body image concerns was not identified (study 1), the following cognitive biases were identified in our participants in the empirical studies: a positive thinness bias to female bodies, which related to rating the thinner-than-average bodies highest on attractiveness and choosing such bodies for one's personal body ideal (both visual and weight ideal), as well as an attitudinal bias in the judgements of one's own body size, which related to the inaccuracy of own body size estimations. In the following sections, each identified bias will be discussed and the findings from relevant studies will be brought together and discussed in the context of the aforementioned theories of body image.

Main findings

Positive thinness bias exists in young females and is related to higher body image concerns

Due to inconsistent empirical findings investigating the relationship between attentional bias and negative body image, study 1 was designed to specify the nature of attentional biases to thin and heavy bodies in people with higher body image concerns and at risk of developing an eating disorder. Two groups of participants – low and high in dietary restraint – were compared on their attitudes towards thin and heavy bodies and their visual attentional patterns towards these bodies. A decision to split the two groups based on the dietary restraint was related to the fact that restrained eaters were shown to display higher levels of body image concerns (Hoffmeister, Teige-Mocigemba, Blechert, Klauer, & Tuschen-Caffier, 2012; Polivy & Herman, 1987; van Strien, Herman, Engels, Larsen, & van Leeuwe, 2007; Vartanian & Hopkinson, 2010), and present more negative attitudes towards heaviness (Griffiths et al., 2000; Vartanian, Herman, & Polivy, 2005). Restrained eating has been implicated in the development of eating disorders (Stice, 2002) thus the group of restrained eaters represents an at-risk population.

Contrary to expectations, a specific cognitive bias – an attentional bias towards thin female bodies – was not identified in the women higher in body image concerns. In study 1, bodies which were in the underweight and at the lower end of a healthy weight BMI category were rated as the most attractive and the closest to one's body ideal. The female participants in this study were found to direct attention towards thin bodies and away from heavier body types, which agrees with the suggestion that people might orient their attention towards the body types they found more attractive (Cho & Lee, 2013; Gao et al., 2014), however this attentional pattern was not related to one's level of body image concerns or weight status. Thus, all women displayed a positive attitudinal bias toward thin bodies, which is consistent with the assumption of the sociocultural theory of body image that there exists a culturally-dependent societal ideal of attractiveness (Jackson, 2004; Tiggemann, 2011), which in the Western culture is thin and lean (Swami, Frederick, Aavik, Alcalay, Allik, Anderson, et al., 2010; Tiggemann, 2011), and can be embraced by the people living in such culture. However, the sociocultural theory also suggests that although most people may be aware of such ideal, not everyone will internalise it.

It was confirmed that women high in dietary restraint hold more negative attitudes towards their own bodies as they scored in a more pathological direction than women low in dietary restraint on various measures of body image and eating disorder symptoms. Despite being heavier on average, women higher in dietary restraint and other body image concerns were shown to rate thinner bodies as more attractive and closer to their ideal, however, only the participants' BMI was identified later identified as a significant predictor of these attitudes towards body size. This finding agrees with the assumption of the cognitive-behavioural models, where a developed negative schema for one's own body may affect the way one interprets body-related information. Women higher in body image concerns did not differ from women lower in these concerns in objectively estimating the thinness and heaviness of the body stimuli (normality ratings). Thus, despite having a similar idea of what the "thin" and "heavy" body is, they consciously chose bodies thinner than average as the most attractive and closest to their personal ideal. Thus, the magnitude of the positive thinness bias was shown to be related to one's level of body image concerns and weight status. This finding was also confirmed in the following empirical studies included in this thesis and will be discussed in the following sections.

In all studies, apart from study 4, an averageness or "normality" of body size was estimated and its relationship to one's body weight status and level of body image concerns was investigated. In study 1, the body that received the normal/ average rating (rating "5" on 1-9 scale) had a BMI value of 19.7. In study 3, a different set of body stimuli were created and used but the body which received the same normal/ average rating had an estimated BMI value of 20.2, which is close to the value specified in study 1. In study 3, also a threshold for thinness/ heaviness categorisations of the female bodies was calculated for both males ($M = 10.10$) and females ($M = 10.08$); this threshold was found to correspond to the same body which received the most "average" rating when rating the bodies on normality – body number 10 with an estimated BMI value of 20.2, thus it can be also treated as a reliable measure of the choice of the most average/ normal body size, which is neither perceived to be obviously thin nor heavy. Thus the bodies rated as average in both study 1 and 3 were in the healthy BMI range (18.5 – 24.9), although at its lower end.

In both studies, the bodies rated as the closest to one's personal ideal and as the most attractive were slightly thinner than the body rated as "average" thus the participants consciously chose the body ideals which are thinner than average, thus less realistic to achieve. In study 1, when the low and high restraint groups were compared, the BMI rated as the most attractive and closest to one's body ideal had a value of 19.19 and 18.99 respectively for the high restraint group and 19.76 and 19.45 for the low restraint group, indicating that the high restraint group rated thinner bodies more positively than the average body and the group lower in dietary restraint. In study 3, the most average body had an estimated BMI of 20.2 and the bodies rated as the most attractive corresponded to the BMI of 19.67 for both men and women, thus the body was slightly thinner than the average body. Although in study 4 the averageness/normality of the stimuli was not assessed, the body corresponding to one's chosen visual ideal had a BMI of 17.87, which is even thinner than the values presented in the previous studies.

In the studies discussed above, the ideal body or the body rated as most attractive had a lower BMI value than the "average". It needs to be noted, that the "average" body specified in the studies is not the estimate of, for example, the average national body size of UK women, but it is an indicator of where the border of thinness and heaviness is drawn in the judgements of female body size, thus it is a subjective attitude expressed by the participants. The studies showed that the choice of the average/ normal body and the thin/ heavy thresholds are not related to one's body weight status or personal body image, indicating that most young men and women agree on which female body type is the most average in size – neither obviously thin nor heavy. The bodies rated as the most attractive and closest to one's personal body ideal were slightly thinner than the estimated average bodies, but the choices were found to converge with the most "normal" body type more for women lower in body image concerns than for those higher in body image concerns, for whom the body ideals were thinner than the estimated average body, thus being less realistic to achieve.

In study 2, only women with average to high levels of body dissatisfaction were investigated to provide a link between heightened body image concerns, body norms, and the choice of body ideals. In the study, the women's initial estimate of the thinness/ heaviness threshold in the intervention group ($M = 7.90$, BMI estimate = 18.5) was close to their chosen

attractiveness ($M = 19.04$) and closeness to ideal BMI peaks ($M = 18.85$). Thus the women higher in body image concerns rated bodies at the very low end of the healthy BMI as the most attractive and closest to their body ideal.

All of the above studies showed that young females, and males in study 3, present more positive attitude towards thin body size, rating female bodies at the low end of the healthy BMI or even the underweight ones as the most attractive. In addition to this finding, in all empirical studies included in this thesis, the choice of the thinner attractive and ideal body was related to more pronounced body image concerns in women.

In study 1, when the two groups of participants were compared on their choice of the ideal and most attractive body, the results indicated that the group higher in dietary restraint rated thinner bodies as more attractive and closer to their body ideal. The group higher in restraint had a more negative body image than the group lower in restraint, as the females in this group scored in a more pathological direction on dietary restraint, body dissatisfaction, drive for thinness, and body image and shape concerns. Surprisingly, the dietary restraint and the latent variable reflecting body image concerns were not revealed as significant predictors of the choice of the most attractive and ideal body type, with only the participants' BMI being a significant predictor of the attitudes towards body size. Although not statistically significant in this sample, the relationship between body image concerns and the attractiveness and ideal peaks was negative, indicating that higher body image concerns were related to choosing thinner bodies as the most attractive and closest to ideal.

Study 3 was designed to test whether a positive thinness bias towards female bodies could also be found in the male population and whether the magnitude of this bias would depend on one's level of body image concerns. The study showed that both young men and women rated bodies thinner than average as the most attractive. However, the magnitude of the positive thinness bias present in study 3 was dependent on one's own levels of body image concerns for women, but not men. For women, the best predictors of the attractiveness and ideal ratings were the participants' own weight status (BMI), body dissatisfaction (measured by BISS), and drive for muscularity. This result indicated that women with lower BMIs, less body

satisfaction and more drive for muscularity will have a greater tendency for a positive thinness bias.

The results from study 4 are consistent with the results from the previous studies in that higher body image concerns and one's BMI were related to the choice of the body ideal. The results showed that the discrepancy between the estimated size and the ideal size was greater for women with higher BMIs and that for all women, regardless of their BMI status, higher body image concerns were related to a greater estimated-ideal discrepancy, which indicates a choice of thinner body ideals.

Positive thinness bias can be cognitively modified, with a positive effect on body image

In study 2, the body size biases were manipulated to observe the effect of the manipulation on personal body image in a group of women with more negative body image. Only women with average to high levels of body dissatisfaction were invited to take part in this study. As the bodies thinner than an average body set by the participants' themselves were rated highest on attractiveness and closeness to personal body ideal in a previous study (study 1), I set out to manipulate the "averageness of body size" of the female body stimuli, based on the participants' own categorisations of body size. To achieve that, a threshold was calculated from the participants' "thin" and "heavy" categorisations, which indicated the point at which the participant stopped categorising the bodies as thin, and started to categorise them as heavy. This threshold was shown to correspond to the average normality rating of 5 in study 3 (see chapter 4), thus showing that the threshold can be a reliable measure of the "averageness" or "normality" of body size and indicate a body which is neither obviously thin nor heavy. The aim of the study was to shift the threshold so that the "average" body would be heavier and as the choices of body ideals were shown to be dependent on the perception of the body norms (Bair, Steele, & Mills, 2014; Mills, Jadd, & Key, 2012), it was hypothesised that the shift in the interpretation of the body size norm would affect the attractiveness ratings and the choice of body ideals.

In study 3, a thin/ heavy threshold in a sample of young male and females had a value of 10.10 and 10.08 respectively, which corresponded with the average normality rating of '5' for

body number 10 (BMI = 20.2). Young men and women rated bodies thinner than this threshold and the average body as the most attractive. Therefore, it was argued that there exists a generalised positive attitude towards thin female bodies in young males and females. The results from study 2, which used only women with average to high levels of dissatisfaction, indicated that the initial threshold of the women in the intervention group ($M = 7.90$) was lower than that identified in study 3 ($M = 10.08$), which included women low, average and high in body image concerns, thus best representing the young female population. In study 2, after the intervention, the threshold of 7.90 increased to 9.87 in the intervention group. The mean peak attractiveness BMIs also increased from 19.04 to 19.36, which corresponds more closely to the attractiveness peak identified in the general female and male population in study 3 – 19.67. Thus, it shows that the training brought the biased judgements of body size, attractiveness and the choice of body ideals of women higher in body image concerns to a less extreme level, as they became closer to the average attitudes of the young male and female population.

The aim of the study was to instill more positive attitudes towards heavier, more average-sized bodies through a cognitive bias modification training, which relied on a consequential modification of the participant's body size categorization through the "social feedback" training. As perception of our own body is to some extent dependent on how we perceive the bodies of others and interpret body size in general, we expected to observe a positive effect of the training on the participants' body image as well. The study confirmed the above hypotheses, with the average attractiveness and ideal peak BMIs increasing for the intervention group and personal body image improving, with the women in the intervention group scoring higher on body satisfaction and lower on bulimic tendencies and drive for thinness, after the training. The study showed that a modification of the positive thinness bias is possible and that shifting the norm of body size towards the heavier, more average, but still of healthy BMIs bodies, can affect one's personal body image, thus providing evidence for the connection between the perception of body norms, cognitive biases, and personal body image.

The manipulation affected the interpretation of body size and shifted the body ideals towards the heavier body type, thus the gap between one's perceived body type (estimated body) and ideal body size (ideal visual) was reduced. In study 4, the gap between one's

estimated size and the ideal size (estimated-ideal BMI discrepancy) was related to body image concerns – the higher the body image concerns, the greater the discrepancy, regardless of one's BMI status. Thus, the choice of a personal body ideal was related to one's level of body image concerns. It is likely, therefore, that in study 2 the improvement in body image for women higher in body image concerns was due to the reduction in the gap between one's actual (estimated) and the ideal body.

Attitudinal bias in the judgements of one's own body size

Study 4 was the only study that investigated the attitudinal judgement of own body size. The results showed that women with higher in BMIs were underestimating their body to a greater degree than women with lower BMIs. The influence of body image concerns on the estimated-actual discrepancy was only significant for the overweight and obese women, as compared to those of healthy weight. Estimation of one's own size was found not to be dependent on the level of body image concerns for the women with normal BMIs. The overweight and obese women, however, had a tendency to estimate their body as thinner than it actually was to a greater extent when their body image concerns were low, as compared to persons with higher body image concerns, and of similar weight status. This effect was found to be stronger for obese than overweight women. It was concluded that the underestimation of body size and its significance to body image is more important in overweight and obese people. The results imply that not only the perceptual biases, such as contraction bias or Weber's law, can affect the accuracy of body estimations but that psychological factors can also contribute to the inaccuracy. Study 4 showed the necessity of investigating the interaction between body image concerns and one's weight status as different perceptual and psychological mechanisms can affect the estimation of one's own size for normal weight and overweight/ obese women.

Limitations

It needs to be noted that three different sets of female body stimuli were used in the studies and although their BMIs were estimated in a similar way, the BMI estimates might have yielded a biased estimate of the body mass of those female bodily stimuli. The density of the average young adult female body was a value chosen for calculations to estimate the BMIs of

the body stimuli. However, the study which calculated the density was from year 1975, and this density could have changed for the average young female body since then. In addition, the density would not be the same for a very thin and obese body, and one value was used for the calculations in all studies. In the future studies of body image, the dimensions of the calculated 3D generated body stimuli could be compared with the photographs or the full body scans of the women who would also have their dimensions, weight and body fat percentage measured. Ideally, it is recommended to use 3D full body scans of the females as stimuli in the future studies, which would ensure that the visual dimensions of these stimuli would correspond to the real-life dimensions, assessed BMI, and body fat percentage.

As social comparison and the internalisation of the thin ideal were shown to be important mediators of the relationship between the sociocultural pressures and the development of body dissatisfaction (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999; Shroff & Thompson, 2006; Van den Berg, Thompson, Obremski-Brandon and Coover, 2002), future studies investigating the link between body image concerns and cognitive biases should take these variables into account. As it was suggested in study 2, social desirability could be playing a role in susceptibility to a cognitive bias modification task. Possibly, women higher in social desirability could have been more responsive to the “social feedback” and internalise the new body size norm more quickly.

Implications

The body size categorisation task used in study 2 was shown to be successful in manipulating the interpretation of body size, affecting the attitudes towards body size, and improving one’s own body image. At the time the study was designed and the data were collected, no studies used a cognitive biases modification technique to affect a specific bias related to body-processing in women with average to high levels of body image concern. A study published recently by Gledhill and colleagues (2016) applied a similar training task and confirmed that such a task can also be successfully used to alleviate the symptoms of eating disorders, which shows potential for the use of cognitive bias modification techniques in investigating body image and eating disorders.

All empirical studies presented in this thesis showed that participants with a negative body schema developed for their own body tended to be positively biased towards the thinner bodies, with these bodies then being potentially used for the purpose of social comparison. This can result in the maintenance of one's negative body image, as a woman who possesses attributes further away from the chosen attractiveness ideal would experience higher levels of discomfort. The results of this thesis are thus consistent with the assumptions of the cognitive-behavioural theories of body image, which stated that cognitive biases to bodies exist in people who are concerned about their body size and shape, that the processing of body-related information may be guided by negative schemas developed for one's own body, and that these biases can be modified with an effect on one's body image.

Study 3 showed that the female body was objectified more, with physical appearance being rated as more important than competence for women. The most attractive female body was also shown to be less variable between the participants whereas there was more variability in the attractiveness ratings of the male bodies, showing a preference for more varied male body types than female ones. These results are in line with the objectification theory of body image, which suggests that how a female body is perceived by others (including men and women) may influence the levels of body image concerns in women, with a greater focus on women's appearance and size leading to development of body shame and negative thoughts and feelings towards own body. The women in our study were shown to be more dissatisfied with their bodies than men and they were also more invested in their appearance, which can be partly explained by the fact that female bodies are more objectified, which was also shown in this study, and that the female body ideal is less varied for both men and women, which creates pressure for achieving a very specific and thin body ideal. The assumption of the objectification theory that the objectification of the female body is systemic and gendered was supported in this study.

In addition, gendered body image concerns were specified for female and males. For females, BMI, drive for muscularity, and body dissatisfaction best predicted the choice of the thin attractive female body, whereas for men, appearance investment and drive for muscularity best predicted the ratings of the muscular male body type. This indicates that, firstly, there exist

gendered attractiveness ideals for males and females, and that different psychological variables predict the choice of these ideals, which is consistent with the assumptions of the sociocultural theories of body image postulating a culturally-dependent societal ideal of attractiveness (Jackson, 2004; Tiggemann, 2011) and indicating that this body ideal may be internalised by some individuals and be a source of body image related concerns.

A crucial task needs to be undertaken by the media and the lawmakers to increase social awareness about the objectification of the female body and expose people to a variety of female shapes, sizes, and female body image experiences to prevent and remedy the development of a negative body image in women. In addition, increasing awareness about body image issues among men and the detrimental effects of excessive exercise and the use of anabolic steroids to increase muscle mass should also be taken into account.

Inaccurate body size estimation can have negative consequences as people, especially those of heavier weight, may be underestimating their weight and ignoring the weight gain. In study 4, it was shown that having lower body image concerns could shield overweight and obese women from acknowledging the extent of their weight and undertaking weight-loss activities as it was related to less accurate estimations of their own body and the amount of weight they would need to lose to achieve their body ideal. Estimating the weight one would need to lose could be very useful in studies using overweight and obese samples. Underestimation of body size, diet planning, realistic goals and aims are all important factors that need to be considered when planning weight loss interventions for obese and overweight women.

In short, the empirical studies designed for this thesis confirmed that cognitive body biases exist in young women, including the inaccuracy of own body size estimations, the positive thinness bias towards female bodies, and the biased choice of the body ideals, which magnitude relies on one's own body size (BMI) and level of body image concerns.

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Appendix A

Study 3: A modified version of the objectification scale

PART I – MALE PHYSICALITY

We are interested in how people think about other people's bodies. The questions below identify 10 different body attributes. In this part, we would like you to rank order these body attributes from that which is the most important when considering **male physicality** (rank this a "9"), to that which is the least important when considering male physicality (rank this a "0").

Please first consider all attributes simultaneously, and record your rank ordering by writing the ranks in the rightmost column.

IMPORTANT: Do not assign the same rank to more than one attribute!

9 = greatest importance
 8 = next greatest importance
 :
 1 = next to least importance
 0 = least importance

When looking at men's bodies . . .	
1. . . .what rank do you assign to physical coordination ?	
2. . . .what rank do you assign to health?	
3. . . .what rank do you assign to weight?	
4. . . .what rank do you assign to strength?	
5. . . .what rank do you assign to sex appeal?	
6. . . .what rank do you assign to physical attractiveness?	
7. . . .what rank do you assign to energy level (e.g., stamina)?	
8. . . .what rank do you assign to firm/sculpted muscles?	
9. . . .what rank do you assign to physical fitness level?	
10. . . .what rank do you assign to measurements (e.g., chest, waist, hips)?	

PART II – FEMALE PHYSICALITY

We are interested in how people think about other people's bodies. The questions below identify 10 different body attributes. We would like you to rank order these body attributes from that which is the most important when considering **female physicality** (rank this a "9"), to that which is the least important when considering female physicality (rank this a "0").

Please first consider all attributes simultaneously, and record your rank ordering by writing the ranks in the rightmost column.

IMPORTANT: Do not assign the same rank to more than one attribute!

9 = greatest importance
 8 = next greatest importance
 :
 1 = next to least importance
 0 = least importance

When looking at women's bodies. . .	
1. . . .what rank do you assign to physical coordination ?	
2. . . .what rank do you assign to health?	
3. . . .what rank do you assign to weight?	
4. . . .what rank do you assign to strength?	
5. . . .what rank do you assign to sex appeal?	
6. . . .what rank do you assign to physical attractiveness?	
7. . . .what rank do you assign to energy level (e.g., stamina)?	
8. . . .what rank do you assign to firm/sculpted muscles?	
9. . . .what rank do you assign to physical fitness level?	
10. . . .what rank do you assign to measurements (e.g., chest, waist, hips)?	

Appendix B

Study 4: Screening form

Participant Screening Information

For experimental reasons we need some details about our participants. We would really appreciate if you could fill the following form. If you have any questions about the requested information please contact Natalia Szostak (N.M.Szostak@2012.hull.ac.uk).

Anonymity/Confidentiality

Any information concerning you and your participation in this study will be kept private and confidential. Data for the study might be used in scientific reports, but no names or identifying information will be included in these reports.

General information

Date:

Name:

Age:

Ethnicity/ Nationality:

Do you have a history of an eating disorder? Yes No

If yes, which eating disorder was/is it?

Body weight and dieting behaviour

What is your current height?

What is your current weight?

What weight have you been for the longest period of time (as an adult)?

What do you think your weight would be if you did not consciously try to control it?

How much would you like to weigh?

Are you currently on a diet to lose weight? Yes No

If yes, how much weight would you like to lose?

Are you currently on a diet to gain weight? Yes No

If yes, how much weight would you like to gain?

Have you been dieting in the past? Yes No

If yes, on how many diets to lose weight have you been?

If yes, on how many diets to gain weight have you been?

Body weight and body ideals

Do you have a specific body ideal that you would like to achieve? Yes No

If any, how much weight do you think you would need to lose to achieve your ideal body?

.....

What is the lowest weight you would feel comfortable having?

What is the heaviest weight you would feel comfortable having?

Activity levels

Which of the below best describes your activity levels? (please underline one of the below)

My activity levels are: Low/ Moderate/ High

How many hours a week do you engage in moderate physical activity?

‘Moderate’ means you get warmer, breathe harder, your heart beats faster, but you should be able to have a conversation.

What type of activity it is? (e.g. jogging, zumba, team sports)

.....

How many hours a week do you engage in vigorous physical activity?

'Vigorous' means you breathe much harder, your heart beats rapidly, and making conversation is hard.

What type of activity it is? (e.g. jogging, zumba, team sports)

.....