# AN EXAMINATION OF THE RELATIONSHIP BETWEEN ATTENTIONAL BIASES AND BODY DISSATISFACTION

by

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**Abstract**

There is a large body of literature supporting the presence of cognitive biases among individuals with eating disorders and body dissatisfaction. The current study extended this research by examining attentional processing of body related stimuli as a function of body dissatisfaction using eye-tracking methodology and a modified spatial cueing paradigm to evaluate early and late stage processing patterns. A sample of 197 undergraduate females completed a decision-making task involving thin, fat, and control body images while eye gaze was recorded. Reaction time analysis did not reveal a relationship between body dissatisfaction and disengagement difficulty from thin or fat body images when compared to control body images. Further, no difference between early and late stage cognitive processing was demonstrated by reaction time. However, analysis of eye gaze patterns revealed a significant relationship between body dissatisfaction and difficulty shifting visual attention away from thin body images in late stage processing only. Results did not reveal a relationship between BMI and attentional biases. The current study's findings provide partial support for an attentional bias for thin body images in body dissatisfied individuals ($R^2 = .02$, $F(1, 195) = 3.86$, $p = .05$). Moreover, the present study provides further evidence for eye-tracking methodology as a more sensitive measure of cognitive biases than reaction time. Further examination of the relationship between cognitive biases and body dissatisfaction remains an important area of study as both are risk factors for eating disorders and can inform treatment interventions.

*Keywords*: body dissatisfaction, cognitive biases

## Lay Summary

Body dissatisfaction is a known risk factor for eating disorders. Previous research has shown that people who are dissatisfied with their bodies are biased to spend more time looking at body related information (e.g., body images). It is suggested that this attention bias maintains, and increases, body dissatisfaction. The current study used eye-tracking to investigate visual attention biases in body dissatisfied women. A sample of 197 women (ages 18-25) completed measures of body dissatisfaction and viewed images of large bodies, thin bodies, and images of body parts not associated with weight dissatisfaction (e.g., ears) while their eye movements were being monitored. Eye-tracking results showed that body dissatisfied women had difficulty shifting their visual attention away from images of thin bodies, but not large bodies. These results are important for our understanding of how body dissatisfaction is maintained and for future treatment and prevention programs aimed at improving body image.

## Preface

This research was conducted at the University of British Columbia Okanagan and was supervised by Dr. Maya Libben. For the present thesis, I was responsible for designing and programming the research paradigm, training and coordinating research volunteers for data collection, data preparation and analysis, and the resulting written thesis. The Behavioural Research Ethics Board of the University of British Columbia's Okanagan Campus granted ethics approval for this research. The certificate approval number for the project is H17-01958. To date, the results of this study have not been published.

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## Dedication

I would like to dedicate this work to the faculty, staff, and students of the University of British Columbia Okanagan Psychology Department.

## Chapter 1: Introduction

Eating disorders (ED) are life-threatening mental and physical illnesses associated with many severe, negative, long-term health consequences. These include increased mortality risk, suicidality, cardiovascular disease, loss of bone mass density, and adverse reproductive related outcomes (Bachrach, Guido, Katzman, Litt, & Marcus, 1990; O'Brien, Whelan, Sandler, Hall, & Weinberg, 2017; Sachs, Harnke, Mehler, & Krantz, 2016; Smink, van Hoeken, & Hoek, 2013). Specifically, Anorexia Nervosa is associated with the highest mortality rate of any non-substance use related mental health disorder (Chesney, Goodwin, & Fazel, 2014). Research published before the introduction of the DSM-5 has indicated that prevalence rates of EDs are rising, particularly among adolescent girls age 15 – 19 (Hoek & van Hoeken, 2003; Smink, van Hoeken, & Hoek, 2012). Using the new DSM-5 criteria, a recent investigation by Stice, Marti, and Rohde (2013) found prevalence rates of 13.1% for EDs in a sample of American females under the age of 21. Another study directly compared prevalence rates for EDs in an Australian sample when using the diagnostic criteria from the DSM-IV and DSM-5. They found that diagnoses increased from 12.8% to 15.2% when using DSM-IV and DSM-5 criteria respectively (Allen, Byrne, Oddy, & Crosby, 2013). However, as the DSM-5 was released in 2013, the literature on prevalence rates in Canada with the new diagnostic criteria has yet to be updated.

The demonstrated increase and high prevalence of EDs in young women is concerning given the negative health and functional outcomes present in this population. Furthermore, late recognition of symptoms and delay in treatment seeking for individuals with EDs is both common and problematic. Only 17 – 31% of individuals with EDs in the community seek ED-specific treatment and average delays for those who do seek treatment are 10 – 15 years (Hart, Granillo, Jorm, & Paxton, 2011; Oakley Browne, Wells, & McGee, 2006). Treatment delays of this length are especially problematic as longer duration of illness prior to treatment initiation is prognostic of poor treatment outcome (Berkman Lohr, & Bulik, 2007; Steinhausen, 2002). Furthermore, longer illness duration is associated with increased risk for mortality (Keel et al., 2003). Thus, prevention programs aimed at reducing risk factors to prevent the onset of EDs have become an increasingly important focus of investigation.

Prevention programs are predicated on reducing modifiable risk factors to decrease the likelihood that individuals or groups will develop an ED (Nicholls & Yi, 2012). Therefore, it is imperative to investigate risk factors in subclinical populations to inform how they can be targeted in prevention programs.

### 1.1 Body Dissatisfaction

A robust body of literature has demonstrated that body dissatisfaction is a primary risk factor for eating disorders (Stice, 2002; Stice, Marti, & Durant, 2011; Stice, Ng, & Shaw, 2010). Body dissatisfaction is defined as dysfunctional, negative beliefs about one's weight and shape (Garner, 2002). Not only is body dissatisfaction predictive of dieting and other eating pathology, including ED diagnoses, it is also associated with other mental health concerns such as depression (Neumark-Sztainer et al., 2006; Paxton, Neumark-Sztainer, Hannan, & Eisenberg, 2006; Stice & Shaw, 2002). Further, when ED symptoms are already present, body dissatisfaction is associated with a worsening of ED symptomology over time, suggesting it may exacerbate an existing problem (Cooley & Toray, 2001). This is of concern, given the extremely high prevalence of body dissatisfaction in North American college age females, with one study reporting prevalence rates as high as 87% for body weight or shape dissatisfaction (Neighbors & Sobal, 2007).

Body dissatisfaction is closely linked to the idolization of slim female figures in Western societies (Spitzer, Henderson, & Zivian, 1999). As media depictions of female bodies have become thinner, both the prevalence of body dissatisfaction and the size discrepancy between the average North American woman and the average woman presented in the media have increased (Dittmar, 2008; National Eating Disorders Association, 2002). Greater exposure to, and internalization of, the thin body ideal is associated with increased body dissatisfaction (Bissell & Zhou 2004; Frederick, Daniels, Bates, & Tylka, 2017; Thompson & Stice, 2001). It is theorized that this results from a process of upward social comparison, in which women critically compare their figures to the ultra-thin figures presented in the media (Tiggemann & Polivy, 2010; Tiggemann & McGill, 2004). Visual attention is inherently required to facilitate this social comparison process. As attentional resources are allocated preferentially to self-relevant stimuli, body dissatisfied women may prioritize visual attention onto body shapes to enable social comparison (Cho & Lee, 2013; Fox, 2005).

This is in line with cognitive theories of EDs which have proposed that increased body dissatisfaction is associated with a tendency to interpret information in a manner consistent with body self-schemata, termed *cognitive biases* (Williamson, White, Yorke-Crowe, & Stewart, 2004). Given the evidence identifying body dissatisfaction as a major risk factor for eating disorders, it is important to investigate the relationships between body dissatisfaction and cognitive biases to elucidate how they may interact to influence the development of eating pathology.

### 1.2 Cognitive Biases

Etiological models of EDs propose that cognitive biases towards food and body shape information are a risk factor in the development and maintenance of EDs (Williamson, Muller, Reas, & Thaw, 1999). For example, research has demonstrated that training participants to attend to negative body shape and weight stimuli (e.g., the word ‘fat’) has resulted in the induction of increased body dissatisfaction (Smith & Rieger, 2009). Vitousek and Hollon's (1990) cognitive theory of EDs suggests that these interpretational biases are the manifestation of maladaptive schemata associated with shape, weight, and self-image. These maladaptive schemata influence how individuals with disordered eating behaviours and cognitions interpret and attend to the world around them. For example, body dissatisfaction is associated with implicit interpretation biases such that individuals higher in body dissatisfaction are biased towards food and body related interpretations of ambiguous stimuli (Martinelli, Holzinger, & Chasson, 2014; Misener & Libben, 2017). Further, maladaptive weight and shape schemata are linked with negative cognitive biases (e.g., selective attention to one's perceived physical imperfections). These negative cognitive biases have been shown to predict eating pathology above what can be accounted for by body dissatisfaction alone (Jakatdar, Cash, & Engle, 2006).

Cognitive biases are seen in the interpretation, judgment, memory of, and attention to disorder relevant stimuli (Rodgers & DuBois, 2016). Attentional biases related to pathology-relevant stimuli include facilitated attention, attentional avoidance, or difficulty disengaging (Cisler & Koster, 2010). Facilitated attention refers to the quicker detection response demonstrated by individuals with pathology when presented with pathology-specific stimuli as compared to control stimuli (e.g., anxious individuals detect threat related stimuli faster than non-threat stimuli; Koster, Crombez, Verschuere, Van Damme, & Wiersema, 2006). Attentional avoidance is demonstrated when attention is drawn away from pathology-specific stimuli (e.g., diverting attention away from the threat-related stimuli). Finally, disengagement difficulty refers to individuals demonstrating impaired ability to divert attention that has been drawn by pathology-specific stimuli (e.g., individuals high in anxiety show delayed reaction times for non-threat stimuli after attention has been drawn to the location of threat-related stimuli; Koster, Crombez, Verschuere, & De Houwer, 2004).

**1.3 Attentional Biases in Body Dissatisfied Individuals**

There is consistent evidence for the association between body dissatisfaction and attentional biases when evaluating one's own body. Specifically, research shows that individuals with body dissatisfaction selectively attend to their self-identified unattractive body parts, thus producing a self-critical evaluation (Roefs et al., 2008). For instance, an eye-tracking study by Jansen, Nederkoorn, and Mulkens (2005) reported that participants who endorsed ED symptomology spent significantly longer viewing self-identified "ugly" body parts compared to control participants. There is also evidence that these attentional biases may play a causal role in body dissatisfaction. Smeets and colleagues (2011) were able to induce increased body dissatisfaction in female undergraduates by constraining attention onto self-identified unattractive body parts while participants looked at photos of their own bodies. Conversely, guided positive body exposure sessions, in which participants are directed to focus their gaze on self-identified most attractive body parts has been shown to increase body satisfaction (Glashouwer, Jonker, Thomassen, & de Jong, 2016). The literature indicates a compelling relationship between body dissatisfaction and attentional biases towards harsh evaluation of one's own body.

The literature is less clear, however, on which attentional biases may be present in the interpretation of other bodies. Considering the continuous bombardment of body images in the media and the rising popularity of social media, how attentional biases relate to other bodies may be a significant factor in body dissatisfaction and the associated risk of developing an ED. Research has demonstrated an attentional bias towards thin idealized bodies in women high in body dissatisfaction. Specifically, when multiple bodies were displayed in free viewing tasks, women with high body dissatisfaction spent significantly more time focused on thin bodies than women with low body dissatisfaction (Cho & Lee, 2013; Gao et al., 2014).

In contrast, there is inconsistent evidence for attentional biases to other bodies in cognitive tasks. Glauert, Rhodes, Fink, and Grammer (2010) found an attentional bias towards thin body images in women overall, but not as a function of body dissatisfaction as measured by the Body Shape Questionnaire (BSQ-34; Cooper, Taylor, Cooper, & Fairburn, 1987). They used an image-based dot probe task to investigate attentional biases towards thin and fat body images in college age women. The dot probe task, developed by MacLeod, Mathews, and Tata (1986), is a measure of attentional bias. In the traditional dot probe task, two words are presented simultaneously but in two different locations on a computer screen for 500 ms. After both words have been removed from the screen, a visual probe then appears in the location previously occupied by of one of the words. Participants are instructed to press a button immediately when they see the probe. Reaction times are recorded for each trial. Shorter reaction times indicate that the participant's gaze was drawn to the location occupied by the probe before the probe appeared, indicating attentional engagement with the word preceding it. Conversely, longer reaction times indicate that the participant's gaze was drawn away from the location before the probe appeared, indicating non-engagement with the preceding word. When the presented word pair includes one disorder relevant word and one neutral word, the reaction times indicate whether attention is drawn to or away from disorder relevant stimuli (MacLeod et al., 1986). Using this paradigm, Glauert et al. (2010) found that female undergraduate participants responded faster to the task when the placement of the probe was preceded by a thin body image as compared to a fat body image, indicating an overall attentional bias towards thin body stimuli over fat body stimuli. However, they found no relationship between attentionally biased reaction times and body dissatisfaction or Body Mass Index (BMI). Further, in the third experiment in their 3-part study, individuals highest in body dissatisfaction showed the weakest attentional biases towards thin bodies.

Similar findings have been demonstrated in other research. Joseph et al. (2016) also used a dot probe paradigm to investigate attentional biases in relation to body dissatisfaction scores from the BSQ. The researchers found an overall attention bias towards thin body images in their female college age sample in their first experiment, but in contrast to Glauert et al. (2010), Joseph and colleagues (2016) did report significant relationship between attentional bias towards thin body images and body dissatisfaction when controlling for BMI in their second experiment. The authors attributed their contrasting findings to displaying thin idealized images in their experiments while Glauert et al. (2010) displayed thin emaciated bodies in their experiments. As such, Joseph and colleagues (2016) reasoned that their stimuli more accurately represented what would be seen in daily in the media whereas Glauert and colleagues' (2010) extremely thin figures may have drawn attention from the sample, irrespective of body dissatisfaction, because of their striking appearance.

It is important to note that Glauert et al. (2010) and Joseph et al. (2016) both only assessed attentional engagement, not attentional disengagement, as their dot probe task did not include a control condition (Koster et al., 2004). Specifically, all comparisons were made only between thin and fat body stimuli shown in tandem, which allows solely for assessment of attention engagement. The inclusion of neutral stimuli would allow for the assessment of disengagement difficulty from thin and fat body stimuli, as compared to neutral stimuli.

Another study, conducted by Gao et al. (2013), found results that contrast those listed above. Like the previously described studies, Gao and colleagues used an image-based cognitive task to investigate attentional biases in college-age women along the spectrum of body dissatisfaction. However, they conducted their research with a Chinese sample and used a body image measure developed and normed for a Chinese population. Specifically, they used the Fatness Concern subscale of the Negative Physical Self Scale (NPSS; Chen, Jackson, & Huang, 2006). Furthermore, the modified spatial cueing paradigm used by Gao et al. (2013), and originally developed by Michael Posner in 1980, differs from the dot probe task used in the above mentioned in several important ways. First, they employed two stimulus onset asynchrony (SOA) lengths (760 ms and 1160 ms) to more precisely explore attentional disengagement over time and within participants. SOAs specifically refer to the period of time between the onset of the image and the presentation of the response cue. Disengagement difficulty is observed when attention is maintained, at the position where the image was presented, during the SOA. Second, the spatial cueing paradigm presented the images one at a time (on alternate sides of the screen, randomized across trials; see Figure 1), thus circumventing issues around images competing for attention and allowing a more accurate measure of attentional disengagement (Simons, 2000). Third, the addition of neutral trials allowed for the comparison of disengagement from fat and thin body stimuli to neutral stimuli.

Gao et al. (2013) found that on short SOA trials, participants higher in body dissatisfaction demonstrated disengagement difficulty from both fat and thin body images, relative to disengagement from neutral images. That is, their response times to the probe were longer following fat and thin images, suggesting their attention was still being maintained at the position of the image when the probe was presented. However, this effect was moderated by

BMI such that it was only observed in individuals with low or medium BMI. Additionally, their results showed that body dissatisfaction was only related to attentional disengagement difficulty in the short SOA trials and not the long SOA trials. This suggests that the short SOA trials access the automatic processing related to body image schemata, whereas the long SOA trials may allow for consciously directing attention away from body images in an effort to minimize anxiety (see also Vitousek & Hollon, 1990). These findings contrast the North American based results mentioned above (i.e., Glauert et al., 2010; Joseph et al., 2016). Specifically, Joseph et al. (2016) found that undergraduate females with high body dissatisfaction showed an attentional bias towards only thin body image stimuli, while Glauert et al. (2010) found an overall attentional bias towards only thin bodies, a relationship which was weakest in those high in body dissatisfaction. Therefore, disparate socio-cultural factors may result in distinct body dissatisfaction-related cognitive biases.

**1.4 Eye-tracking as a Measure of Attentional Biases**

The studies by Gao et al. (2013), Glauert et al. (2010), and Joseph et al. (2016) all relied on reaction time measures to *infer* attentional biases. For example, Gao et al. *inferred* that longer reaction times were produced by the maintenance of attention on the presentation position of the body image. That is, it was assumed that longer reaction times were the result of difficulty disengaging the eyes from the image location. Eye-tracking provides the means to specifically examine how attention is allocated over the course of the SOA, as opposed to making inferences based on post-stimulus behaviours (Libben & Titone, 2009; Ceballos, Komogortsev, & Turner, 2009; Miller & Fillmore 2011; Owens et al., 2016; Garner, Mogg, & Bradley, 2006). For example, *first run dwell* time is considered a measure of early automatic or covert attention and is defined as the sum of the fixations that occurred before the participant first diverts their eyes from the stimulus. As such, first run dwell time provides a sensitive continuous measure of early attentional processing that is collected in real-time.

There exists a limited body of research using eye-tracking to investigate the relationship between body dissatisfaction and attention. Janelle, Hausenblas, Ellis, Coombes, and Duley (2009) tracked participants' eye gaze over time during a free viewing task in which body images were presented. They found that, although attention was initially drawn to the pelvis in both their high and low body dissatisfaction groups, participants high in body dissatisfaction demonstrated an overt late stage processing bias towards the chest and legs, while the participants low in body dissatisfaction did not demonstrate the same pattern. These different patterns of early and late stage processing can offer distinct information about attentional biases, specifically disengagement difficulty and attentional avoidance, respectively.

**1.5 Research Paradigm and Hypotheses**

The current study used a modified spatial cueing paradigm paired with eye-tracking to investigate attentional biases in body dissatisfaction. Specifically, this study attempted to replicate the findings from Gao et al. (2013) in a North American sample. We expanded upon Gao et al.'s methods by incorporating eye-tracking, which provides a real-time measure of disengagement difficulty. Specifically, we examined first run dwell times following the disappearance of the image until the presentation of the response screen (see Figure 1). Longer first run dwell durations in the area where the image was presented, would indicate disengagement difficulty (Mahmoodi-Aghdam, Dehghani, Ahmadi, Banaraki, & Khatibi, 2017). Thus, we were able to examine whether behavioural (reaction time) data corresponded to actual difficulty diverting gaze away from a previously presented image's location. Finally, the current study facilitated a cross-cultural comparison with the inclusion of the BSQ, a common North

American body dissatisfaction measure, in addition to a translated version of the NPSS. Overall, we hypothesized that we would replicate Gao et al.'s reaction time findings. We further hypothesized that disengagement difficulty, observed in reaction time data, would correspond to longer viewing times in the post-image location. The first three hypotheses were developed based on the findings of Gao et al. The final four hypotheses were novel. Thus, the current study examined the following seven hypotheses:

1) Body dissatisfaction would be positively related to disengagement difficulty on the short SOA trials such that participants higher in body dissatisfaction would take longer to shift attention away from both fat and thin body images than from neutral images. This would be evidenced by longer reaction times for both fat and thin body images relative to neutral images.
2) Reaction times would not reveal a relationship between body dissatisfaction and disengagement difficulty on long SOA trials.
3) BMI would moderate the relationship between body dissatisfaction and disengagement difficulty from fat body images on reaction time in short SOA trials, in that this relationship will only be demonstrated in those with a low or medium BMI.
4) Body dissatisfaction's positive relationship to disengagement difficulty from thin and fat body images on the short SOA trials would be further evidenced by longer first run dwell times. Specifically, it was hypothesized that participants higher in body dissatisfaction would demonstrate longer first run dwell duration on trials presenting thin and fat body images, relative to trials presenting neutral images.

5) Although reaction time analysis will not be sensitive enough to detect disengagement difficulty on long SOA trials, we predict longer first run dwell times for fat and thin body images, as compared to control images, on long SOA trials.
6) As with reaction time analysis, BMI was hypothesized to moderate the relationship between body dissatisfaction and disengagement difficulty from fat body images on short SOA trials, as indicated by first run dwell duration. Specifically, it was hypothesized that only participants with low or medium BMIs would demonstrate this relationship.
7) Scores on the BSQ were hypothesized to be positively correlated with scores on the translated version of the Fatness Concern subscale of the NPSS.

# Chapter 2: Method

## 2.1 Participants

The sample was composed of 197 female undergraduate students at the University of British Columbia Okanagan. All participants were recruited online via Department of Psychology's SONA Online research system and received 1.5 bonus credits for their involvement in the study. Participants were an average of 19.6 (*SD* = 1.39) years old, with the age range restricted to 18 to 25 years-old to mirror the sample employed by Gao and colleagues (2013). Participants' ethnicity included Caucasian (63.7%), Asian (24.4%), Aboriginal (2%), African American (2.5%), and other (7.5%). Of the Asian participants, 36.7% were of East Asian descent (e.g., Chinese, Japanese, Taiwanese, Vietnamese, or Korean ancestry) and 63.3% were of South Asian descent (e.g., Indian ancestry). Total sample composition is presented in Figure 2. As the current study attempts a cross-cultural replication, it is notable that only 17.8% of the sample was born outside of Canada. Specifically, 10.9% of the sample was composed of individuals who immigrated from Asia with 72.7% of these individuals having moved from East Asian countries (e.g., China, Japan, Taiwan, or Korea). As only 7.9% of the sample was composed of East Asian immigrants, the sample was deemed appropriate as for the purpose of a North American comparison to a Chinese study.

## 2.2 Materials

A number of self-report questionnaires were included in the study as independent variables. Specifically, the current study included an English-translated version of the Negative Physical Self Scale (NPSS; Chen et al., 2006) and the Body Shape Questionnaire (BSQ-34; Cooper et al., 1987) as measures of body dissatisfaction. Further, we used the Eating Disorder Examination Questionnaire (EDE-Q 6.0; Fairburn & Belgin, 2008) as a measure of eating pathology to enable the exclusion of clinically significant participants from analysis. To characterize the sample, the current study also employed a demographics questionnaire. See Appendices B through E for questionnaires.

**2.2.1 The Body Shape Questionnaire.**

The 34-item Body Shape Questionnaire (BSQ-34; Cooper et al., 1987) was used as a measure of cognitively based body dissatisfaction. Participants were asked how often they had negative self-evaluative thoughts or emotions, or engaged in body dissatisfaction related behaviours over the past four weeks. Examples of questions include: (how often) "has feeling bored made you brood about your shape?" and "have you felt so bad about your shape that you have cried?" (Cooper et al., 1987). Answers were reported on a 5-point Likert scale from 1 (*Never*) to 5 (*Always*). The measure yields a total score ranging from 34 to 204, where higher scores reflect higher body dissatisfaction. The BSQ demonstrates adequate reliability and validity in female undergraduate samples (Rosen, Jones, Ramirez, & Waxman, 1996). Internal consistency reliability for BSQ total score was .97.

**2.2.2 The Negative Physical Self Scale.**

The 48-item Negative Physical Self Scale (NPSS; Chen et al., 2006) was developed as a multidimensional measure of body dissatisfaction and general dissatisfaction with physical appearance for Chinese adolescents and adults. It is composed of five subscales: Fatness, Thinness, Shortness, Facial Appearance, and General appearance. Participants responded to the frequency with which they endorsed appearance related beliefs using a 5-point Likert scale ranging from 0 (*never*) to 4 (*always*). Subscale scores were calculated by averaging the summed responses, while a total score was obtained by taking the average of the summed subscale scores. For the purpose of cross-cultural comparison, the author worked with translators to produce an English language version of the NPSS (Ly, Misener, & Libben, in prep). Specifically, two translators fluent in both English and Chinese drafted an original English translation. The author then worked with the two translators to examine and revise items as necessary. The purpose of the revisions was to ensure that each item was well-articulated while still maintaining the integrity of its original meaning. The translators and the author agreed that the final version achieved equivalence between the instrument in its original and translated language. Gao and colleagues (2013) only used the fatness scale as a measure of body dissatisfaction; therefore, this scale was the focus of analysis in the current study. Examples of items from the Fatness subscale include: "My peers think that I am fat," and "I have tried many ways to lose weight." Internal consistency reliability for Fatness subscale was .91 for the current sample.

**2.2.3 The Eating Disorder Examination Questionnaire.**

The Eating Disorder Examination Questionnaire (EDE-Q 6.0; Fairburn & Belgin, 2008) was utilized as a measure of disordered eating related behaviours and cognitions. Participants were asked to indicate frequency of ED related behaviours or thoughts on a 7-point Likert type scale ranging from 0 (*no days*) to 6 (*every day*), over the previous four weeks. Examples of questions include (over the past 28 days) "have you gone for long periods of time (8 waking hours or more) without eating anything at all in order to influence your shape or weight (whether or not you have succeeded)?" and "has your weight influenced how you think about (judge) yourself as a person?" (Fairburn & Belgin, 2008). The inclusion of the EDE-Q facilitated the removal of four individuals with clinically significant scores from the subsequent analysis, resulting in a true non-clinical sample. The EDE-Q has demonstrated adequate reliability (Luce, & Crowther, 1999) and validity (Mond, Hay, Rodgers, Owen, & Beumont, 2004) in non-clinical populations. Internal consistency reliability for EDE-Q total score was .89.

**2.2.4 Physical Assessment.**

Participants' height (inches) and weight (pounds) were measured in order to obtain Body Mass Index (BMI) scores. Standard BMI calculation multiplied weight in pounds by 703 and divided the sum by height$^2$ in inches (weight (lbs) x 703 divided height (in$^2$)).

**2.2.5 Stimuli.**

As in the original study conducted by Gao and colleagues in 2013, the visual stimuli for the current study consisted of 30 fat body pictures, 30 thin body pictures, and 30 neutral household pictures. In addition to the categories presented by Gao and colleagues, the present paradigm also displayed 30 control body images (e.g., images of body parts not typically subject to body and weight dissatisfaction, such as ears and hands). The images used during the experimental task were downloaded from free websites and cropped into uniform sizes. Body images were cropped to exclude the head. Following the protocol from Gao and colleagues (2014), a total of 200 images were independently evaluated for valence and arousal prior to their employment in the experimental task. Ratings were provided by 110 female undergraduate students at the University of British Columbia Okanagan, who did not partake in the present study. Valence ratings were made on a 7-point Likert scale ranging from -3 (*extremely negative*) to 3 (*extremely positive*). Arousal was rated on a 5-point Likert scale anchored by 0 (*not excited at all*) and 4 (*extremely excited*). Fat and thin body images were also rated for body shape on a 7-point Likert scale ranging from -3 (*extremely slim*) to 3 (*extremely fat*). Valence and arousal ratings were used in an attempt to compose a balanced sample of 120 images (i.e., 30 images from each of the four categories). However, no combination of images matched for emotional valence and arousal emerged from the data. As such, the most closely matched combination was chosen, which still presented some significant differences when analyzed using a univariate analysis of variance (ANOVA) with a Bonferroni correction. The summaries for the subjective participant ratings are presented in Table 1. The omnibus test revealed a significant difference for valence ratings between image groups, $F(3, 116) = 7.16$, $p < .001$. Post hoc tests using the Bonferroni correction revealed that valence ratings household images differed significantly from control body images ($p < .05$) and thin body images ($p < .001$). No other significant differences emerged for valence ratings on the image categories. The omnibus ANOVA for arousal ratings across the image categories revealed a significant difference for between image groups $F(3, 116) = 4.85$, $p < .01$. Post hoc analysis with a Bonferroni correction revealed that only arousal ratings for household images differed significantly from fat body images ($p < .01$) and thin body images ($p < .05$). As household images ratings for arousal and valence differed significantly from the other image groups, trials with household images were excluded from subsequent analysis. With the elimination of the household images, the remaining set of images was matched for emotional valence and arousal. Body shape ratings were also evaluated to ensure that participants viewed the images in the thin body image category as slim and images in the fat body image category as large. As expected, the ANOVA revealed significant differences between these two categories ($F(1, 58) = 713.78$, $p < .001$; see Table 1) such that thin body images were rated as thinner than fat body images.

**2.2.6 Measurement of Eye Movements.**

Continuous monocular eye movement data was recorded using an infrared optical eye tracker, EyeLink 1000 (Version 1.5.2, SR Research Ltd.). Eye-tracking software was configured to track the center-of-mass of the pupil (Centroid mode). Stimuli were presented on an ASUS VG278HE 27-in. monitor set at a viewing distance of 62 cm. To offset the large size of the monitor, the experiment was presented in a 15.5-in. by 15.5-in. square in the centre of the screen.

In order to minimize head movements to increase eye data precision, participants placed their chin on a chinrest and leaned forward into a forehead rest. This also allowed for continuity of head placement across participants.

**2.2.7 The Modified Spatial Cueing Paradigm.**

The modified spatial cueing paradigm was programmed with Experiment Builder (Version 2.1.45, SR Research, Ltd.). Participants were instructed to watch the computer screen and press the "O" or the "C" key on the keyboard as quickly as possible once the respective letter appeared. Following the protocol from Gao et al., (2013; see Figure 1), each trial began with a fixation point and two empty boxes to the left and right of the fixation point for 800 ms. Then, a body shape image, control body image, or household image cue was presented in either the left or right box for 300 ms. The next screen displayed two empty boxes for 200 ms, followed by the addition of the bold fixation point for 100 ms (indicating a SOA of 760 ms) or 500 ms (indicating a SOA of 1160 ms). The fixation point then appeared in regular type for 160 ms. For the response screen, the target stimuli (either the letter "O" or "C") appeared in either the same box as the image cue (termed a valid trial) or the box in which the image cue did not appear (termed invalid trials). Selections were made using the keyboard (e.g., selecting either the "O" key with their right index finger or the "C" key with their left index finger). The target stimuli remained on the screen until the participant responded by selecting which letter was displayed in the trial, or until 5 seconds passed with no response. Finally, the fixation point was presented in regular type once again for 2000 ms. This concluded the trial. Each participant was presented with 24 practice trials and 480 experimental trials. Half of the trials presented were valid and half were invalid (240 trials each condition). The experimental portion of the task contained four blocks, each composed of 120 trials, followed by short breaks to mitigate participant fatigue.

Two of the four blocks presented a 760 ms SOA and the remaining two blocks presented a 1160 ms SOA. Practice trials presented a 1010 ms SOA to orient the participant to the experimental task. Each of the of the four blocks included valid and invalid trials of each fat body cues, thin body cues, control body cues, and household cues each appearing 15 times each block (60 times valid and 60 times invalid for each category across the entire task). Each image cue appeared four times total, once in each short SOA block and once in each long SOA block. Order of trial presentation within each block was randomized and the order of presentation of the blocks was counterbalanced across participants.

**2.3 Procedure**

Participants were greeted by the research assistant upon arrival. The researcher then provided participants with the consent form (Appendix A), which outlined the study's procedures, purpose, and researcher contact information. Once informed consent was obtained, the researcher calibrated the Eyelink system to the participant's gaze. For calibration, participants were instructed to follow a white dot with their eyes as it moved across the screen. Monocular eye positions were recorded for each of the 5 points presented. The calibration procedure also required a validation, which followed the same 5-point pattern, to optimize accuracy. If the validation produced an average error value of > 0.5° or a maximum error value of > 1.0° the calibration procedure was repeated until acceptable values were achieved. Once the Eyelink system was successfully calibrated to the participant's gaze, the task instructions were explained to the participant. Participants were directed to indicate which letter (e.g., "O" or "C"), using the computer keyboard, was displayed on the screen. The researcher encouraged participants to respond as quickly and as accurately as possible. Participants completed the 24 practice trials before a brief break, at which time the researcher ensured that the participant understood the task. Participants then completed the four experimental blocks. After each experimental block, the calibration accuracy was verified. If necessary, the research assistant recalibrated the participant according to the aforementioned procedure. After completing the modified spatial cueing task, participants proceeded to the battery of questionnaires: a demographics questionnaire, the NPSS (Chen et al., 2006), the BSQ-34 (Cooper et al., 1987), and the EDE-Q 6.0 (Fairburn & Belgin, 2008; see Appendices B through E). Participants' responses were provided via Qualtrics, an online survey software (Qualtrics Lab Inc., 2005). After completing the survey, the research assistant measured each participant's height and weight for the purpose of computing BMI. Participants were not required to see their weight. Finally, participants were provided with a debriefing form (see Appendix F), which explained the purpose of the study and included the author's contact information for further questions.

**2.4 Design**

This study originally employed a 2 (Validity: valid/invalid) x 2 (SOA: long/short) x 4 (Image: household/control body/thin body/fat body) within-subjects design. As noted above, household images were excluded from analysis due to their valence and arousal ratings differing from the other image categories. The resulting design was a 2 (Validity: valid/invalid) x 2 (SOA: long/short) x 3 (Image: control body/thin body/fat body) within-subjects design. The dependent variables for this study were reaction time and first run dwell time for experimental trials. The current study also investigated whether body dissatisfaction, BMI, or the interaction of these variables moderated the reaction time or first run dwell time results.

# Chapter 3: Results

## 3.1 Data Preparation

Although 234 undergraduates participated in the experiment, a total of 37 were removed, with the resulting sample consisting of 197 participants. First, 16 participants were removed as their EyeLink data was not saved due to a technical difficulty. An additional two participants were removed as their Qualtrics survey data was not saved. The analysis also excluded one participant who did not complete the Qualtrics survey and one participant who reported their age as 34 years. Further, 11 participants were removed due to missing EyeLink data. Finally, two participants were removed due to accuracy rates below 85% on the spatial cuing paradigm. Of the remaining 201 participants, four produced an EDE-Q total score above the recommended clinical cut of (≥4.0; Luce, Crowther, & Pole, 2008). As the number of clinically significant participants was small relative to the sample size, they were not included in the analyses reported below. As such, the following results are based on a truly non-clinical sample, composed of 197 undergraduate females.

## 3.2 Statistical Analysis

EyeLink data were processed using standard DataViewer software (SR Research, Ltd.). The following statistical analyses were performed using the Statistical Package for the Social Sciences SPSS, version 23. Repeated measures Analyses of Variances (ANOVAs) were run on each dependent variable (reaction time and first run dwell time). Follow-up repeated measures Analyses of Covariances (ANCOVAs) were run to examine the role of body dissatisfaction and BMI in relation to reaction time and first run dwell durations. Significant interactions were explored using linear regressions. Finally, a Pearson correlation was conducted to explore the relationship between the translated version of the Fatness concern subscale of the NPPSS and the BSQ.

### 3.3 Sample Characteristics

Sample characteristics are presented in Table 2. BMI ranged from 15.88 to 36.03, with 16 individuals categorized as underweight, 135 normal weight, 32 overweight, and 11 obese. BSQ scores were within the expected range for undergraduate females (e.g., Rosen, et al., 1996 report a mean of 96.3 (*SD* = 32.8)). Total scores on the EDE-Q were also comparable to other non-clinical samples of young adult females (e.g., Mond, Hay, Rodgers, & Owen, 2006 found a mean of 1.59 (*SD* = 1.32)). Scores on the Fatness Concern subscale of the NPSS were similar to the scores obtained from the sample employed by Gao and colleagues (2013; *M* = 1.31, *SD* = 0.79).

### 3.4 Dependent Variable Reaction Time

As is standard for reaction time (RT) analysis, only trials with correct responses and RT within ±2 standard deviations of each participant's average RT were analyzed (Ratcliff, 1993). Descriptive statistics of RT data from the modified spatial cueing paradigm are presented in Table 3. A 3 (Image) X 2 (Validity) X 2 (SOA) repeated measures ANOVA on RT revealed a significant main effect of Validity, $F(1, 196) = 22.67$, $p < .001$, partial $\eta^2 = .104$ (see Table 4). A significant main effect also emerged for SOA, $F(1, 196) = 93.84$, $p < .001$, partial $\eta^2 = .324$. These significant main effects were qualified by a significant interaction between Validity and SOA, $F(1, 196) = 8.24$, $p < .01$, partial $\eta^2 = .040$. No other significant main effects or interactions emerged from the repeated measures ANOVA on RT.

To further explore the Validity by SOA interaction, we conducted a paired samples t-test with Bonferroni adjusted alpha levels of .025 per test (.05/2) to protect for Type I error. Effect sizes were calculated using Cohen's *d*. On short SOA trials, RTs were significantly longer for invalid trials (*M* = 494.04 ms, *SD* = 55.18) than valid trials (*M* = 486.56 ms, *SD* = 55.48), $t(196) = 5.36$, $p < .001$, $d = .38$. Similarly, on long SOA trials, RTs were longer for invalid trials (*M* = 506.97, *SD* = 58.12), than for valid trials (*M* = 503.13, *SD* = 58.86), $t(196) = 3.02$, $p < .01$, $d = .22$, although the magnitude of this difference was greater on short SOA trials.

### 3.4.1 Body Dissatisfaction on Reaction Time

To simplify the analysis, and to focus on disengagement difficulty in relation to body dissatisfaction and across time, the Validity factor was removed from analysis (see Gao et al., 2013 for similar analytic procedure). Subsequent analysis examined only invalid trials (i.e. where the response target was presented in a disparate position from the body image). To examine the influence of body dissatisfaction on RTs, we conducted a 3 (Image) X 2 (SOA) repeated measures ANCOVA with BSQ total score entered as the covariate.

In contrast to the repeated measures ANOVA described above, the ANCOVA including BSQ total score as covariate yielded a significant main effect for Image, $F(2, 194) = 3.81$, $p < .05$, partial $\eta^2 = .038$ (see Table 5). This was qualified by a significant interaction between Image and BSQ, $F(2, 194) = 3.85$, $p < .05$, partial $\eta^2 = .038$. No other effects reached significance.

To explore the Image by BSQ interaction, we conducted three linear regression analyses with RT difference scores as the outcome variables, and BSQ total score entered as the independent variable (Table 6). Fat and thin difference scores were computed by subtracting RTs from invalid trails displaying fat and thin images from RTs from invalid trials displaying control images, respectively (i.e., control RT – fat RT; control RT – thin RT). A positive value on the resulting difference scores reflected facilitated disengagement (i.e., shorter RTs) of fat or thin body images. Conversely, a negative value on the resulting difference scores reflected disengagement difficulty (i.e., longer RTs) from fat or thin body images. For the purpose of comparing disengagement from fat and thin body images directly, a third difference score was computed by subtracting RTs for invalid trials displaying fat body images from RTs for invalid trials displaying thin body images (i.e., thin RT – fat RT). For this thin-fat difference score, positive values indicate disengagement difficulty (i.e., longer RTs) for thin body images compared to fat body images, while negative values reflect the opposite.

As depicted in Table 6, BSQ scores significantly accounted for the variance in both thin and thin-fat difference scores. Specifically, as body dissatisfaction increased, participants demonstrated facilitated disengagement (i.e., shorter RTs) from thin body stimuli compared to control stimuli as well as disengagement difficulty (i.e., longer RTs) from fat body images compared to thin body images. Results were not significant for fat image difference scores.

In summary, our results did not support Hypothesis 1. That is, body dissatisfaction was not associated with disengagement difficulty from thin and fat body images compared to control images, as indicated by RT. On the contrary, body dissatisfaction was associated with shorter RTs (inferring facilitated disengagement) for thin body images relative to control body images. Further, disengagement difficulty from fat body images (i.e., longer RTs) was only demonstrated when compared to thin body images, not control body images as was hypothesized. Finally, no significant differences between short or long trials for RTs related to body dissatisfaction were discerned from the analysis. As such, Hypothesis 2 was not supported.

#### 3.4.2 BMI on Reaction Time

To examine whether BMI moderated the relationship between body dissatisfaction and RTs for invalid trials, we conducted a 3 (Image) X 2 (SOA) repeated measures ANCOVA with BMI and a BMI X BSQ interaction term entered as covariates. The analysis yielded no main effects or significant interactions (see Table 7). As neither BMI nor the BMI X BSQ interaction term were significantly related to RTs across image types, Hypothesis 3 was not supported.

**3.5 Dependent Variable First Run Dwell Time**

For the first run dwell (FRD) time analysis, only trials with correct responses and image fixations greater than 50 ms were included (Cundall & Guo, 2017). Descriptive statistics of FRD data from the modified spatial cueing paradigm are presented in Table 8. To simplify the analysis and focus on the dependent variables of interest, valid trials were excluded from the analysis (see Gao et al. 2013 for similar analytic procedure). A 3 (Image) X 2 (SOA) repeated measures ANOVA on FRD revealed a significant main effect of SOA, $F(1, 196) = 116.04$, $p < .001$, partial $\eta^2 = .372$ (see Table 9), such that FRDs were longer for long SOA trials ($M = 473.59$ ms, $SD = 174.47$) than short trials ($M = 387.20$ ms, $SD = 100.04$). The analysis also yielded a main effect for Image type, $F(2, 195) = 4.21$, $p < .05$, partial $\eta^2 = .041$. Planned comparisons revealed that FRDs were significantly longer for control body images ($M = 436.92$ ms, $SD = 135.07$) than fat body images ($M = 424.05$ ms, $SD = 123.51$; $p < .05$), with a Bonferroni correction for multiple comparisons. That is, participants overall spent more time viewing control body images than fat body images on their first visual engagement with the stimuli. The comparison revealed no significant differences in FRDs for thin body images ($M = 431.05$ ms, $SD = 136.33$) compared to fat or control body images ($p > .05$) after a Bonferroni correction. No significant interactions resulted from the analysis.

**3.5.1 Body Dissatisfaction on First Run Dwell Time.**

To examine the influence of body dissatisfaction on FRDs, we conducted a 3 (Image) X 2 (SOA) repeated measures ANCOVA, with BSQ total score term entered as the covariate. The significant main effect for SOA found above was preserved, $F(1, 195) = 5.88$, $p < .05$, partial $\eta^2$

= .029 (see Table 10), where FRDs were longer on long SOA trials than on short SOA trials. The interaction for Image X SOA X BSQ score was trending towards significance, $F(2, 194) = 2.44$, $p = .09$, partial $\eta^2 = .025$. No other effects reached significance.

As the Image by SOA by BSQ interaction approached significance, and is of particular interest to the current study, it was investigated through a series of linear regressions on FRD difference scores (see Table 11). As this interaction included SOA, difference scores were calculated separately for short and long trials. Fat and thin difference scores were computed by subtracting FRDs for fat and thin images from control images (control FRD – fat FRD; control FRD – thin FRD). Just as with the RT difference scores, a positive difference score indicated facilitated disengagement (i.e., eyes do not remain on the post-image location) of fat or thin body images. In contrast, a negative value reflected disengagement difficulty from fat or thin body images (i.e., eyes perseverate on the post-image location). A third difference score was calculated by subtracting FRDs for trials displaying fat body images from FRDs for trials displaying thin body images. For this thin-fat difference score, positive values indicate faster disengagement from fat body images compared to thin body images.

As summarized in Table 11, BSQ significantly predicted thin FRD difference scores in the long SOA condition. As body dissatisfaction increased, participants demonstrated increased disengagement difficulty from thin body stimuli compared to control stimuli on long SOA trials. No other effects reached significance. Therefore, Hypothesis 5 was partially supported. That is, body dissatisfaction was related to disengagement difficulty from only thin body images, not fat body images, on long trials. This is in contrast to the findings from the RT thin difference score analysis, which demonstrated that body dissatisfaction was associated with faster disengagement from thin body images compared to control body images across both trial lengths.

### 3.5.2 BMI on First Run Dwell Time.

A 3 (Image) X 2 (SOA) repeated measures ANCOVA on FRD with BMI and the BMI X BSQ interaction term entered as covariates to investigate the whether BMI moderated the relationship between body dissatisfaction and FRDs. The analysis yielded no main effects for BMI, the BMI X BSQ interaction and no significant interactions (see Table 12). As neither BMI nor the BMI X BSQ interaction term were significantly related to FRDs across image types, Hypothesis 6 was not supported.

## 3.6 BSQ and Fatness Concern Subscale of the NPSS

To investigate whether scores on the translated version of the Fatness Concern subscale of the NPSS were positively related to total scores on the BSQ, we ran a one-tailed Pearson correlation. As predicted, the analysis revealed that BSQ scores were positively related to Fatness Concern subscale scores, $r(195) = .85$, $p < .001$. Therefore, Hypothesis 7 was supported.

# Chapter 4: Discussion

## 4.1 Explanation of Findings

The current study is the first to explore the relationship between body dissatisfaction and attentional biases to body images by employing eye-tracking technology in tandem with a cognitive task. The inclusion of both eye-tracking and the modified spatial cueing paradigm allowed the authors to investigate the temporal aspects of attentional biases and compare eye-tracking data to reaction time (RT) findings. A primary goal of this study was to investigate whether patterns of attention inferred from RT results corresponded to eye-tracking data from real-time image viewing. In contrast to previous findings (e.g., Gao et al. 2013), RT results suggested that increased body dissatisfaction, independent of BMI, was associated with facilitated disengagement from thin body stimuli compared to control stimuli. Further, RT data revealed a relationship between body dissatisfaction and disengagement difficulty from fat body stimuli only when compared to thin body stimuli. Interestingly, analysis of first run dwell times revealed that body dissatisfaction was associated with longer viewing times in the post-thin body image location, compared to control images, only for long stimulus onset asynchrony (SOA) trials. Thus, RT results suggest that body dissatisfaction was associated with *facilitated* disengagement from thin body images, independent of SOA, while eye-tracking results suggest an association with disengagement *difficulty* from thin body stimuli at long SOAs. Finally, the translated version of the Fatness Concern subscale of the Negative Physical Self Scale was strongly correlated with the Body Shape Questionnaire, a widely used North American measure of body dissatisfaction.

The current RT results suggest that body dissatisfaction was associated with facilitated disengagement from thin body images (i.e., shorter RTs) compared to control images, and disengagement difficulty from fat images (i.e., longer RTs) compared to thin images. Worded differently, we can infer that increased body dissatisfaction was associated with facilitated disengagement from thin body stimuli relative to both control and fat body stimuli, in contrast to Hypothesis 1. As no differences were demonstrated across trial lengths, the aforementioned attentional biases were not found to differ between early and late stage attentional processing. As such, Hypothesis 2 was not supported.

These findings contrast those obtained by Gao and colleagues (2013), who demonstrated that body dissatisfaction was associated with a difficulty disengaging from thin body stimuli and that BMI moderated the relationship between disengagement difficulty from fat body images and body dissatisfaction. Contrary to Hypotheses 3 and 6, RT results from the current study did not suggest that BMI influenced the relationship between attentional biases and body dissatisfaction. However, it is important to highlight some differences between Gao et al.'s study and the current investigation.

First, and perhaps most importantly, the modified spatial cueing task employed by the current study included control body images (e.g., images of ears, hands, and feet) while Gao and colleagues (2013) used household images (e.g., images of a table or chairs) as their control stimuli. As such, their difference scores compared ability to disengage from body images to ability to disengage from household images. On the contrary, the current study's difference scores compared ability to disengage from fat and thin body images compared to control body images. As such, difference in the direction and significance of findings from RT data between the two studies may be the result of the different comparison conditions. For example, Gao and colleagues (2013) results may demonstrate that individuals with high body dissatisfaction have difficulty disengaging from body stimuli overall, regardless of the body shape, when compared to non-body stimuli. However, the current study's results demonstrate that when fat and thin body images are compared to control body stimuli, body dissatisfaction is not associated with disengagement difficulty from thin bodies. Conversely, participants in the current study demonstrated a facilitated ability to disengage from thin body stimuli compared to control body stimuli as measured by RT.

Secondly, the Gao and colleague's sample consisted of participants with a restricted BMI range (16.02 – 26.17, *M* = 19.99, *SD* = 2.08). In contrast, the BMI range from the current study was much wider (15.88 – 36.03, *M* = 22.92, *SD* = 3.61), similar to ranges reported in other Western studies of body dissatisfaction (Glauert et al., 2010; Smeets et al., 2011). Gao and colleagues (2013) reported that the inability to disengage from fat body images was only related to body dissatisfaction when BMI was low or medium. As such, the current study's increased proportion of individuals with high BMI may have obscured any potential moderation by BMI.

Finally, the current study was conducted with a North American sample, while Gao and colleagues (2013) investigated attentional biases in a Chinese sample. It may be that body dissatisfied Chinese female undergraduates demonstrate disengagement difficulty from thin and fat body images, while North American female undergraduates do not. Indeed, Western examinations of attentional biases related to body dissatisfaction report conflicting findings (e.g., Glauert et al., 2010 and Joseph et al., 2016). For example, Glauert and colleagues (2010) found that facilitated attentional bias towards thin body stimuli (as measured by RT) was weakest in women with high body dissatisfaction. However, Glauert and colleagues (2010) and Joseph and colleagues (2016) investigated facilitated attentional bias (e.g., how quickly attention is drawn to stimuli), while the current study investigated disengagement difficulty (e.g., inability to shift attention from stimuli) by nature of the modified spatial cueing paradigm and the chosen eye-tracking variable.

The current eye-tracking results provide an interesting contrast to the findings suggested by the RT results, and highlight the need for multi-modal methodology in cognitive research. Previous studies (e.g., Gao et al. 2013; Glauert et al., 2010; Joseph et al., 2016) used speeded RTs to infer the nature of attentional patterns during stimulus processing. Our study incorporated eye-tracking, and first run dwell time in particular, to specifically examine the viewing patterns following different body images in real time. As outlined above, our RT results suggest that body dissatisfaction was associated with an increased ability to disengage from thin stimuli at both long and short SOAs. That is, faster RTs to the probe were taken as evidence that the participant was looking away from thin images when prompted to make a speeded response to the probe. As previously mentioned, eye-tracking allows us to examine whether this was truly the case, and interestingly our results suggest a different pattern of behaviour.

Eye-tracking results from the current study suggest no relationship between body dissatisfaction and time spent viewing body images on short SOA trials, in contrast to Hypothesis 4. However, examination of first run dwell times on long SOA trials demonstrated significantly longer viewing times at post-thin body image locations with increased body dissatisfaction. That is, when given more time (i.e., long SOA trials) body dissatisfaction was associated with difficulty disengaging the eyes from the thin body image location. Interestingly, this was coupled with faster button-press responses to cue stimuli presented in a disparate position from the thin image. We explain our contrasting findings by suggesting that body dissatisfied participants exhibited a perseveration of attention at the location of thin images (when provided with sufficient time to do so). Despite spending more at the thin image location, by the end of the SOA, participants were able to disengage from the location, thus producing faster response times. In other words, disengagement difficulty was present, but behavioural responses to the probe occurred too late in the processing stream to detect it. Continued investigations are necessary to confirm this hypothesis, however, regardless of the mechanism, the current data suggest prudence in using late-stage responses to infer the attentional mechanisms that produce them. The contrasting results from the current study illuminate the important distinction between data obtained from a discreet "snapshot" and sensitive temporal measures. Further, they highlight the importance of using continuous temporal variables to draw conclusions about continuous attentional engagement as data from discrete time points may result in vastly different interpretations. The application of real-time measures such as eye-tracking provide researchers with increased specificity in the ability to observe participant behaviour in real time.

Our observation (based on eye-tracking) that body dissatisfied participants have difficulty disengaging their attention from thin body images is in line with social comparison theory, which suggests that body dissatisfied individuals allocate attention to thin bodies to facilitate upward comparison from one's own body (Rodgers & Dubois, 2016; Tiggemann, & McGill, 2004). Further, this is supported by research indicating that body dissatisfied women fixate on self-identified attractive body parts on other bodies and self-identified unattractive body parts on themselves (Jansen et al., 2005). Similarly, the relationship between body dissatisfaction and disengagement difficulty on long SOA trials was only demonstrated for thin bodies, not fat bodies, providing partial support for Hypothesis 5. This finding also corresponds with previous research by Jansen and colleagues (2005), which reported that body dissatisfied individuals fixated less on self-identified ugly body parts on other bodies when compared to control participants. Further, the lack of significance for attentional biases to fat bodies in the current study is in line with results reported by Joseph and colleagues (2016) and Glauert and colleagues (2010). As such, the current finding not supporting a relationship between body dissatisfaction and disengagement difficulty from fat bodies, is consistent with Western literature on attentional biases.

In regard to the comparison of the Body Shape Questionnaire (BSQ; Cooper et al., 1987) and the translated version of the Fatness Concern subscale of the Negative Physical Self Scale (NPSS; Chen et al., 2006), a strong positive relationship between the two measures was supported. That is, the North American BSQ queries similar cognitive and behavioural aspects of body dissatisfaction to the Fatness Concern subscale, developed and normed in China. Thus, Hypothesis 7 was supported. This finding provides support the comparison of results across Eastern and Western studies employing these measures.

**4.2 Limitations and Future Directions**

To the author's knowledge, this study was the first to explore attentional biases related to body dissatisfaction by employing eye-tracking methodology in tandem with cognitive tasks measuring reaction time. While the current study provides several important conclusions, these findings should be interpreted in light of its limitations. First, it is important to note that the aforementioned cognitive bias demonstrated by first run dwell time was based on exploring an interaction that was trending toward significance. It is possible that the eye-tracking data loss may have decreased power in the current study. Specifically, the modified spatial cueing paradigm employed in the current study was quite long. While short breaks were provided in between presentation blocks to mitigate participant fatigue, it is possible that participants decreased their engagement with the task over the course of the experiment. As such, a condensed version of the paradigm may increase the likelihood of maintaining participant engagement throughout, resulting in decreased data loss and increased accuracy. Second, four participants who scored high on the body dissatisfaction measure were excluded from analysis as their scores on an eating disorder measure were in the clinically significant range. Although this resulted in a true non-clinical sample, the strength of the current study's findings may have been attenuated by limiting the sample. Third, the current study investigated attentional biases in females. As such, conclusions regarding attentional biases drawn from the current sample is not generalizable to males. Future investigations may wish to replicate the current study, employing images of male bodies and in a male sample. Fourth, the current sample was restricted to young adults. Future research may wish to use eye-tracking methodology to explore attentional biases in young children to elucidate when cognitive biases become solidified as body dissatisfaction has been reported in girls as young as 6 years of age (Ricciardelli & McCabe, (2001). Thus, important information may be ascertained about the role of attentional biases to body stimuli in the onset of body dissatisfaction from research focusing on younger individuals.

**4.3 Implications and Conclusions**

The current study examined attentional biases in relation to body dissatisfaction and across time by employing both RT and eye-tracking methodology. The findings from the current investigation of body dissatisfaction have several important implications. First, the results of this study suggest that previously identified cognitive biases to fat body images in body dissatisfied individuals (e.g., Gao et al., 2013), may not be as robust as thought previously. Second, cognitive biases related to thin body images in body dissatisfied individuals may also be less robust, given the conflicting findings within the present study. Third, the current study was not able to replicate the previously reported moderating effect of BMI on attentional biases to body images

(Gao et al., 2013). As such, this moderating effect may not be as clear as previously theorized. Further, the present study provided a comparison between RT data and continuous eye movement data. Specifically, while our RT results could be used to infer facilitated disengagement from thin body images, real-time eye-tracking data demonstrated that body dissatisfied individuals actually experienced disengagement difficulty during longer intervals. These findings are important for the broader cognitive research literature, as they demonstrate that post-operative behaviours may not always provide an accurate interpretation of real-time processing. Clearly, the relationship between body dissatisfaction and attentional biases to body images is not conclusive and warrants further investigation. As body comparisons have been demonstrated to predict increased levels of disordered eating cognitions (Fitzsimmons-Craft, Ciao, & Accurso, 2016), investigating the attentional processes that facilitate up-ward social comparison remains an important area of inquiry. The implications of this research involve informing future interventions for EDs and cognitive bias modification for treatment and relapse prevention by elucidating specific attentional processes that may be targeted to enhance efficacy. The goal of future research will be to identify which attentional biases are consistent in body dissatisfied individuals and present across cultures.

## Tables

Table 1.

*Summary of Participant Ratings Across the Categories of the Final Selection of Stimuli: Mean (Standard Deviation)*

| | Thin | Fat | Household | Control Body | F |
|---|---|---|---|---|---|
| Valence | 0.18 (0.36) | 0.41 (0.39) | 0.64 (0.44) | 0.34 (0.38) | 7.16** |
| Arousal | 0.77 (0.19) | 0.72 (0.21) | 0.94 (0.27) | 0.80 (0.25) | 4.85* |
| Body Shape | -1.60 (0.40) | 1.05 (0.34) | - | - | 713.78** |

* $p < .01$ ** $p < .001$

*Note*. Valence ratings ranged from -3 (extremely negative) to 3 (extremely positive). Arousal ratings ranged from 0 (not excited at all) and 4 (extremely excited). Fat and thin body images were rated from -3 (extremely slim) to 3 (extremely fat).

Table 2.

*Sample Characteristics*

| | *Mean* (*SD*) | Minimum | Maximum |
|---|---|---|---|
| Age | 19.60 (1.39) | 18 | 25 |
| BMI | 22.92 (3.61) | 15.88 | 36.03 |
| BSQ | 87.75 (27.71) | 34.00 | 168.00 |
| EDE-Q | 1.53 (1.06) | 0.00 | 3.89 |
| NPSS Fatness Concern Subscale | 1.26 (0.81) | 0.00 | 3.18 |

*Note*. BSQ scores can range from 34 to 204. EDE-Q scores can range from 0.0 to 5.0. NPSS Fatness Concern Subscale scores can range from 0.0 to 4.0.

Table 3.

*Means and Standard Deviations (SD) in ms for Reaction Time for Each Condition on the Modified Spatial Cueing Task*

| Validity | SOA | Image | *M* | *SD* |
|---|---|---|---|---|
| Invalid | Short | Control | 495.75 | 58.02 |
| | | Fat | 492.50 | 57.34 |
| | | Thin | 494.52 | 55.13 |
| | Long | Control | 506.28 | 59.56 |
| | | Fat | 506.13 | 60.04 |
| | | Thin | 507.25 | 58.64 |
| Valid | Short | Control | 487.75 | 56.51 |
| | | Fat | 485.84 | 56.93 |
| | | Thin | 485.02 | 56.60 |
| | Long | Control | 503.14 | 59.91 |
| | | Fat | 501.16 | 60.40 |
| | | Thin | 502.73 | 60.75 |

Table 4.

*The Results of the 3 (Image Type: Control Vs. Fat Vs. Thin) X 2 (Validity: Valid vs. Invalid) X 2 (SOA: Short Vs. Long) Repeated Measures Analysis of Variance for Reaction Time*

| Variable | *df*1 | *df*2 | *F* | *Sig.* | $\eta^2$ |
|---|---|---|---|---|---|
| Validity | 1 | 196 | 22.67 | .000 | .104 |
| SOA | 1 | 196 | 93.84 | .000 | .324 |
| Image | 2 | 195 | 2.66 | .072 | .027 |
| Validity * SOA | 1 | 196 | 8.24 | .005 | .040 |
| Validity * Image | 2 | 195 | 0.60 | .548 | .006 |
| SOA * Image | 2 | 195 | 1.18 | .310 | .012 |
| Validity * Image * SOA | 2 | 195 | 0.97 | .380 | .010 |

Table 5.

*The Results of the 3 (Image Type: Control Vs. Fat Vs. Thin) X 2 (SOA: Short Vs. Long) Repeated Measures Analysis of Covariance for Reaction Time on Invalid Trials with Body Shape Questionnaire (BSQ) as Covariate*

| Variable | *df*1 | *df*2 | *F* | *Sig.* | $\eta^2$ |
|---|---|---|---|---|---|
| SOA | 1 | 195 | 2.82 | .095 | .014 |
| Image | 2 | 194 | 3.82 | .024 | .038 |
| BSQ | 1 | 195 | 0.02 | .898 | .000 |
| SOA * BSQ | 1 | 195 | 0.40 | .527 | .002 |
| Image * BSQ | 2 | 194 | 3.47 | .033 | .035 |
| SOA * Image | 2 | 194 | 1.26 | .285 | .013 |
| SOA * Image * BSQ | 2 | 194 | 1.20 | .302 | .012 |

Table 6.

*Linear Regression Analyses with Reaction Time Difference Scores (Ms) as the Outcome Variables and Body Shape Questionnaire (BSQ) Entered as the Independent Variable.*

| Dependent Measure | *F* | *df*1 | *df*2 | $\beta$ value | $R^2$ | *Sig.* |
|---|---|---|---|---|---|---|
| Fat image RT difference score (control – fat) | 0.00 | 1 | 195 | 0.00 | 0.00 | .995 |
| Thin image RT difference score (control – thin) | 6.31 | 1 | 195 | 0.18 | 0.03 | .013 |
| Thin-Fat image RT difference score (thin – fat) | 5.28 | 1 | 195 | -0.16 | 0.03 | .023 |

Table 7.

*The Results of the 3 (Image Type: Control Vs. Fat Vs. Thin) X 2 (SOA: Short Vs. Long) Repeated Measures Analysis of Covariance for Reaction Time on invalid trials with BMI and BMI X BSQ Interaction Term as Covariates*

| Variable | *df*1 | *df*2 | *F* | *Sig.* | $\eta^2$ |
|---|---|---|---|---|---|
| SOA | 1 | 194 | 0.73 | .393 | .004 |
| Image | 2 | 193 | 0.67 | .513 | .007 |
| BMI | 1 | 194 | 0.32 | .571 | .002 |
| BMI * BSQ | 1 | 194 | 0.004 | .952 | .000 |
| SOA * BMI | 1 | 194 | 0.01 | .918 | .000 |
| Image * BMI | 2 | 193 | 0.58 | .562 | .006 |
| SOA * Image | 2 | 193 | 0.01 | .994 | .000 |
| SOA * Image * BMI | 2 | 193 | 0.18 | .834 | .002 |
| SOA * BMI * BSQ | 1 | 194 | 0.41 | .525 | .002 |
| Image * BMI * BSQ | 2 | 193 | 1.95 | .145 | .020 |
| SOA * Image * BMI * BSQ | 2 | 193 | 0.92 | .401 | .009 |

Table 8.

*Means (M) and Standard Deviations (SD) in ms for First Run Dwell Time for Invalid Trials on the Modified Spatial Cueing Task*

| SOA | Image | *M* | *SD* |
|---|---|---|---|
| Short | Control | 390.21 | 107.20 |
| | Fat | 386.16 | 106.43 |
| | Thin | 386.83 | 108.67 |
| Long | Control | 482.43 | 180.60 |
| | Fat | 462.63 | 185.70 |
| | Thin | 479.14 | 184.70 |

Table 9.

*The Results of the 3 (Image Type: Control Vs. Fat Vs. Thin) X 2 (SOA: Short Vs. Long) Repeated Measures Analysis of Variance for First Run Dwell Time*

| Variable | *df*1 | *df*2 | *F* | *Sig.* | $\eta^2$ |
|---|---|---|---|---|---|
| SOA | 1 | 196 | 116.04 | .000 | .372 |
| Image | 2 | 195 | 4.21 | .016 | .041 |
| SOA * Image | 2 | 195 | 2.17 | .117 | .022 |

Table 10.

*The Results of the 3 (Image Type: Control Vs. Fat Vs. Thin) X 2 (SOA: Short Vs. Long) Repeated Measures Analysis of Covariance for First Run Dwell Time on Invalid Trials with Body Shape Questionnaire (BSQ) as Covariate*

| Variable | *df*1 | *df*2 | *F* | *Sig.* | $\eta^2$ |
|---|---|---|---|---|---|
| SOA | 1 | 195 | 5.88 | .016 | .029 |
| Image | 2 | 194 | 0.66 | .520 | .007 |
| BSQ | 1 | 195 | 0.281 | .596 | .001 |
| SOA * BSQ | 1 | 195 | 0.72 | .397 | .004 |
| Image * BSQ | 2 | 194 | 0.71 | .493 | .007 |
| SOA * Image | 2 | 194 | 2.38 | .096 | .024 |
| SOA * Image * BSQ | 2 | 194 | 2.44 | .090 | .025 |

Table 11.

*Linear Regression Analyses with First Run Dwell Times Difference Scores (Ms) as the Outcome Variables and Body Shape Questionnaire (BSQ) Entered as the Independent Variable.*

| SOA | Dependent Measure | *F* | *df*1 | *df*2 | $\beta$ value | $R^2$ | *Sig.* |
|---|---|---|---|---|---|---|---|
| Short | Fat image FRD difference score (control – fat) | 0.81 | 1 | 195 | 0.06 | 0.00 | .368 |
| | Thin image FRD difference score (control – thin) | 1.14 | 1 | 195 | 0.08 | 0.01 | .287 |
| | Thin-Fat image FRD difference score (thin – fat) | 0.02 | 1 | 195 | -0.01 | 0.00 | .890 |
| Long | Fat Image FRD difference score (control – fat) | 0.12 | 1 | 195 | -0.03 | 0.00 | .728 |
| | Thin image FRD difference score (control – thin) | 3.86 | 1 | 195 | -0.14 | 0.02 | .051 |
| | Thin-Fat image FRD difference score (thin – fat) | 0.85 | 1 | 195 | 0.07 | 0.00 | .357 |

Table 12.

*The Results of the 3 (Image Type: Control Vs. Fat Vs. Thin) X 2 (SOA: Short Vs. Long) Repeated Measures Analysis of Covariance for First Run Dwell Time on Invalid Trials with BMI and BMI X BSQ Interaction Term as Covariates*

| Variable | *df*1 | *df*2 | *F* | *Sig.* | $\eta^2$ |
|---|---|---|---|---|---|
| SOA | 1 | 194 | 4.58 | .034 | .023 |
| Image | 2 | 193 | 0.27 | .765 | .003 |
| BMI | 1 | 194 | 0.92 | .339 | .005 |
| BMI * BSQ | 1 | 193 | 0.69 | .407 | .004 |
| SOA * BMI | 1 | 194 | 0.78 | .377 | .004 |
| Image * BMI | 2 | 193 | 0.16 | .850 | .002 |
| SOA * Image | 2 | 193 | 1.12 | .328 | .011 |
| SOA * Image * BMI | 2 | 193 | 1.12 | .329 | .011 |
| SOA * BMI * BSQ | 1 | 194 | 0.94 | .333 | .005 |
| Image * BMI * BSQ | 2 | 193 | 0.14 | .873 | .001 |
| SOA * Image * BMI * BSQ | 2 | 193 | 2.21 | .113 | .022 |

## Figures

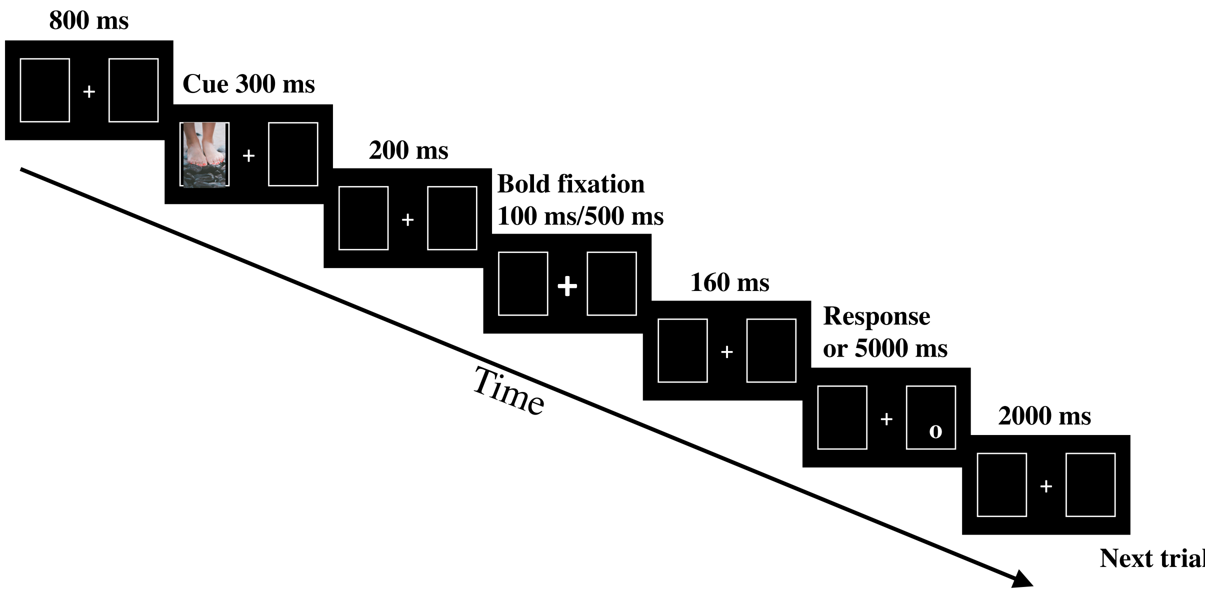


**Figure 1.** The modified spatial cueing paradigm (one complete invalid trial presenting a control body image). Long SOA trials involved a Bold Fixation of 500ms, short SOA trials involved a Bold Fixation of 100ms.

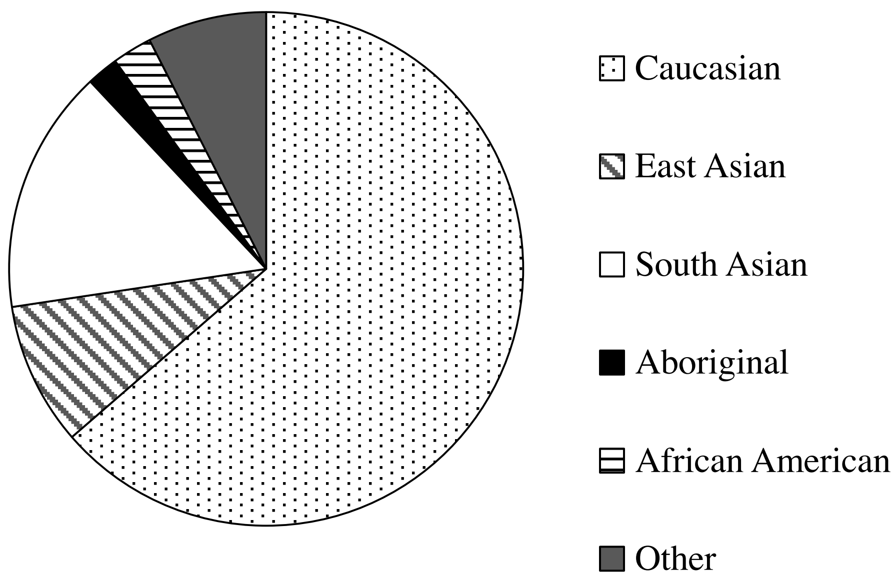


**Figure 2.** Ethnicity composition of the sample.

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## Appendices

### Appendix A: Consent Form

### Informed Consent Form: Image Viewing Study

**Principal Investigator:** Maya Libben, Ph.D., Psychology Department, UBC Okanagan, tel: (250) 807-9026, email: maya.libben@ubc.ca

**Co-Investigator:** Kaylee Misener, Graduate Student, Psychology Department, UBC Okanagan, email: kayleemisener@alumni.ubc.ca

**Purpose:**

The purpose of this study is to examine how reaction times and eye gaze may vary depending on the type of images presented in a decision task. This research is the basis for Kaylee Misener's Master's thesis.

**Study Procedures:**

This study will take approximately 90 minutes in the lab and will consist of brief questionnaires about your thoughts and behaviours followed by a computer task. In the computer based decision-making task, you will be presented with images and will be asked to make a decision regarding the presentation of a letter while your eye gaze is recorded.

**Potential Risks:**

If you participate in this study, there are risks no greater than what you would experience in your daily life. Some of the images in the study may make you uncomfortable. You may withdraw from this study at any time if you no longer wish to participate. If you choose to withdraw, your data will be deleted and omitted from analysis.

**Potential Benefits:**

Participation in this study will increase your knowledge in this area of study as well as introduce you to the research process. At the end of the study you will be provided with Dr. Libben's and the co-investigator's contact information so that you can find the results of this study in the future, if you are interested.

**Confidentiality:**

All information collected from this study will be kept completely confidential. All documents will be identified only by code number and stored electronically. It is the goal of the researchers to publish the current study as part of a Master's Thesis in a public journal and to present the results at an international conference. You will not be identified by name in any reports or presentations of the completed study. Once the data are collected, all information will be coded and stored as numbers in a statistical database. The only people who will be able to access these files are Dr. Libben and her research assistants, who have signed confidentiality forms making sure that they will not reveal the content of file information. The data will be kept in locked cabinets or in password-protected computer files for at least five years after publication, as required by the University, before being shredded or deleted.

Please note that the host server of the online questionnaires (Qualtrics) is US-based and is subject to US laws, which allows authorities access to the records of Internet service providers. If you choose to participate in the survey, you understand that your responses to the survey questions will be stored and accessed in the USA. The security and privacy policy for the websurvey company can be found at the following link: http://www.qualtrics.com/security-statement/.

Please note that graduate theses are public documents that are available on the Internet (through UBC cIRcle).

**Remuneration/Compensation:**

You will be awarded 1.5 onsite SONA credit towards an eligible psychology course.

**Contact for information about the study:**

If you have any questions or desire further information with respect to this study, you may contact Dr. Maya Libben at (250) 807-9026.

**Contact for concerns about the rights of research subjects:**

If you have any concerns or complaints about your rights as a research participant and/or your experiences while participating in this study, contact the Research Participant Complaint Line in the UBC Office of Research Services at 1-877-822-8598 or the UBC Okanagan Research Services Office at 250-807-8832. It is also possible to contact the Research Participant Complaint Line by email (RSIL@ors.ubc.ca).

**Consent:**

By signing the section below you acknowledge that all of your questions pertaining to the current study have been answered and that you have been given the portion of the consent form with the study information to keep. Your participation in this study is entirely voluntary and you may refuse to participate or withdraw from the study at any time without jeopardizing your class standing.

Participant:

______________________________________________

(Name: Print)

______________________________________________ _______/_______/_________

(Signature) Date (month/day/year)

## Appendix B: Demographic Questionnaire

Thank you for participating in this experiment. In this portion of the study, you will be filling out a series of questionnaires. Some of the questions may be repetitive. Please answer as accurately and honestly as possible.

1. Age ____________
2. Are you currently wearing glasses?

○ Yes

○ No

3. Are you currently wearing contact lenses?

○ Yes

○ No

4. What is your ethnicity? ________________
5. What is your country of origin? If outside of Canada, how old were you when you immigrated to Canada? ________________________
6. What culture do you self-identify with? _________________________
7. What is your first language? _______________________
8. If you speak a second language, what is your second language? ___________________
9. If English is your second language, at what age did you learn English? _____________
10. What language does your family speak at home? ______________________
11. What is your lowest adult weight? _______________________
12. What is your highest adult weight? _______________________

13. What is your ideal weight? ___________________________

14. Over the past three to four months have you missed any menstrual periods?

○ Yes

○ No

15. If yes, how many? ___________________________________

16. If yes, have you been taking the "pill"?

○ Yes

○ No

## Appendix C: Body Shape Questionnaire – 34

We would like to know how you have been feeling about your appearance over the PAST FOURWEEKS. Please read each question and select the appropriate choice. Over the past four weeks...

Response options: 1 (Never), 2 (Rarely), 3 (Sometimes), 4 (Often), 5 (Very often), 6 (Always)

1. Has feeling bored made you brood about your shape?
2. Have you been so worried about your shape that you have been feeling you ought to diet?
3. Have you thought that your thighs, hips or bottom are too large for the rest of you?
4. Have you been afraid that you might become fat (or fatter)?
5. Have you worried about your flesh being not firm enough?
6. Has feeling full (e.g. after eating a large meal) made you feel fat?
7. Have you felt so bad about your shape that you have cried?
8. Have you avoided running because your flesh might wobble?
9. Has being with thin women made you feel self-conscious about your shape?
10. Have you worried about your thighs spreading out when sitting down?
11. Has eating even a small amount of food made you feel fat?
12. Have you noticed the shape of other women and felt that your own shape compared unfavourably?
13. Has thinking about your shape interfered with your ability to concentrate (e.g. while watching television, reading, listening to conversations)?
14. Has being naked, such as when taking a bath, made you feel fat?
15. Have you avoided wearing clothes which make you particularly aware of the shape of your body?

16. Have you imagined cutting off fleshy areas of your body?

17. Has eating sweets, cakes, or other high calorie food made you feel fat?

18. Have you not gone out to social occasions (e.g. parties) because you have felt bad about your shape?

19. Have you felt excessively large and rounded?

20. Have you felt ashamed of your body?

21. Has worry about your shape made you diet?

22. Have you felt happiest about your shape when your stomach has been empty (e.g. in the morning)?

23. Have you thought that you are in the shape you are because you lack self-control?

24 Have you worried about other people seeing rolls of fat around your waist or stomach?

25. Have you felt that it is not fair that other women are thinner than you?

26. Have you vomited in order to feel thinner?

27. When in company have your worried about taking up too much room (e.g. sitting on a sofa, or a bus seat)?

28. Have you worried about your flesh being dimply?

29. Has seeing your reflection (e.g. in a mirror or shop window) made you feel bad about your shape?

30. Have you pinched areas of your body to see how much fat there is?

31. Have you avoided situations where people could see your body (e.g. communal changing rooms or swimming baths)?

32. Have you taken laxatives in order to feel thinner?

33. Have you been particularly self-conscious about your shape when in the company of other people?

34. Has worry about your shape made you feel you ought to exercise?

## Appendix D: Negative Physical Self Scale

This is a survey that measures the evaluation of your body from a variety of aspects. Because everyone's thoughts and feelings are different, everyone will answer differently. Please read the following questions carefully:

1. Please answer every question, and do not leave blanks, and do not over-think about your answers.

2. Only choose 1 answer to each question. Choose the answer that best describes you.

3. Please answer truthfully.

Response options: Never (0), Rarely (1), Sometimes (2), Often (3), Always (4)

1. Overall, I am satisfied with my body.
2. I worry about my facial appearance.
3. I think other people consider me to be very fat.
4. Others think my height is fair.
5. I want to gain weight through exercise training.
6. I am proud of my body.
7. Being short is one of my biggest disappointments in life.
8. The people whom I like think I am fat.
9. If there are ways to alter my facial appearance, I would persist in doing it.
10. I try my best to be aware of my diet, in order to gain weight.
11. I think I am too short.
12. I think the person whom I like best does not like my facial appearance.
13. My weight has always been a source of inner torment.
14. I persist in finding ways to grow taller.

15. I am satisfied with my height.
16. My parents think I am fat.
17. I am shorter than most people.
18. My facial appearance makes me distressed.
19. I pay close attention to my weight.
20. I am ashamed about my facial appearance.
21. I have tried many ways to lose weight.
22. My peers do not like the way I look.
23. I have tried to find ways to grow taller.
24. The people who I like think I am too thin.
25. I exercise to lose weight.
26. I can feel that other people are dissatisfied with how my face looks.
27. I do exercises to try to grow taller.
28. My peers think that I am fat.
29. I feel bad about my skinny body.
30. I control my food intake to lose weight.
31. I am concerned about issues regarding my height.
32. I feel distressed about weighing myself.
33. If there is a way to make me gain weight, I will persist in that strategy.
34. I think that my body does not need any change.
35. If possible, I will change my facial appearance in many aspects.
36. I feel that my parents consider me to be too thin.
37. I do not like being this thin.

38. If possible, I would undergo facial cosmetic surgery.

39. My weight loss plan always gets derailed.

40. I am very unhappy about being short.

41. People around me do not like the way my face looks.

42. I am distressed about myself being too thin.

43. My peers think that I am too short.

44. I think that other people consider me to be too thin.

45. There is nothing that disappoints me regarding my body.

46. I like my body very much.

47. I occasionally try to make myself gain weight, but the effort does not last long.

48. I do not like what I see when I look in the mirror.

Scoring: NPSS scale scoring ("R" denotes reverse-scored items):

General Appearance = average of the following items: 1R, 6R, 34R, 45R, 46R

Facial Appearance = average of the following items: 2, 9, 12. 18, 20, 22, 26, 35, 38, 41, 48

Fatness Concern = average of the following items: 33, 8, 13, 16, 19, 21, 25, 28, 30, 32, 39

Shortness Concern = average of the following items: 4R, 7, 11, 14, 15R, 17, 23, 27, 31, 40, 43

Thinness Concern = average of the following items: 5, 10, 24, 29, 33, 36, 37, 42, 44, 47

Total Score = average of all the subscales

## Appendix E: The Eating Disorder Examination – Questionnaire

The following questions are concerned with the past four weeks (28 days) only. Please read each question carefully.

On how many of the past 28 days...

Response options: No days (0), 1 – 5 days (1), 6 – 12 days (2), 13 – 15 days (3), 16 – 22 days (4), 23 – 27 days (5), Every day (6)

1. Have you been deliberately trying to limit the amount of food you eat to influence your shape or weight (whether or not you have succeeded)?
2. Have you gone for long periods of time (8 waking hours or more) without eating anything at all in order to influence your shape or weight (whether or not you have succeeded)?
3. Have you tried to exclude from your diet any foods that you like in order to influence your shape or weight (whether or not you have succeeded)?
4. Have you tried to follow definite rules regarding your eating (for example, a calorie limit) in order to influence your shape or weight (whether or not you have succeeded)?
5. Have you had a definite desire to have an empty stomach with the aim of influencing your shape or weight?
6. Have you had a definite desire to have a totally flat stomach?
7. Has thinking about food, eating or calories made it very difficult to concentrate on things you are interested in (for example, working, following a conversation, or reading)?
8. Has thinking about shape or weight made it very difficult to concentrate on things you are interested in (for example, working, following a conversation, or reading)?
9. Have you had a definite fear of losing control over eating?
10. Have you had a definite fear that you might gain weight?

11. Have you felt fat?

12. Have you had a strong desire to lose weight?

Fill in the appropriate number. Remember that the questions only refer to the past four weeks (28 days).

Over the past four weeks...

13. How many times have you eaten what other people would regard as an unusually large amount of food (given the circumstances)? ____________________

14. On how many of these times did you have a sense of having lost control over your eating (at the time that you were eating)? ______________________________

15. Over the past 28 days, on how many days have such episodes of overeating occurred (i.e., you have eaten an unusually large amount of food and have had a sense of loss of control at the time)? __________________________________________________

16. Over the past 28 days, how many times have you made yourself sick (vomit) as a means of controlling your shape or weight? ___________________________

17. Over the past 28 days, how many times have you taken laxatives as a means of controlling your shape or weight? _____________________________________

18. Over the past 28 days, how many times have you exercised in a "driven" or "compulsive" way as a means of controlling your weight, shape or amount of fat or to burn off calories?

___________________________________________________

Please fill in the appropriate response. Please note that for these questions the term "binge eating" means eating what others would regard as an unusually large amount of food for the circumstances, accompanied by a sense of having lost control over eating.

19. Over the past 28 days, on how many days have you eaten in secret (i.e., furtively)? Do not count episodes of binge eating.

*Note. Response options: No days (0), 1 – 5 days (1), 6 – 12 days (2), 13 – 15 days (3), 16 – 22 days (4), 23 – 27 days (5), Every day (6)

20. On what proportion of the times that you have eaten have you felt guilty (felt that you have done wrong) because of its effect on your shape or weight? Do not count episodes of binge eating.

*Note. Response options: None of the times (0), A few of the times (1), Less than half (2), Half of the times (3), More than half (4), Most of the time (5), Every time (6).

21. Over the past 28 days, how concerned have you been about other people seeing you eat? Do not count episodes of binge eating.

*Note. Response options: 0 (Not at all), 1, 2 (Slightly), 3, 4 (Moderately), 5, 6 (Markedly)

Please choose the appropriate answer. Remember that the questions only refer to the past four weeks (28 days).

*Note. Response options: 0 (Not at all), 1, 2 (Slightly), 3, 4 (Moderately), 5, 6 (Markedly)

Over the past 28 days...

22. Has your weight influenced how you think about (judge) yourself as a person?

23. Has your shape influenced how you think about (judge) yourself as a person?

24. How much would it have upset you if you had been asked to weigh yourself once a week (no more, or less, often) for the next four weeks?

25. How dissatisfied have you been with your weight?

26. How dissatisfied have you been with your shape?

27. How uncomfortable have you felt seeing your body (for example, seeing your shape in the mirror, in a shop window reflection, while undressing or taking a bath or shower)?

28. Has your weight influenced how you think about (judge) yourself as a person?

Scoring:

Restraint = average of the following items: 1, 2, 3, 4, 5

Eating Concern = average of the following items: 7, 9, 19, 20, 21

Shape Concern = average of the following items: 6, 8, 10, 11, 23, 26, 27, 28

Weight Concern = average of the following items: 8, 12, 22, 24, 25

Total Score = average of all the subscales

**Appendix F: Debriefing Form**

**Debriefing Form: Image Viewing Study**

You have just participated in a study assessing cognitive biases. Specifically, we are interested in how your perceptions of weight and body shape (as measured by the questionnaires) influence the way you view the presented images. We predict that critical perception of one's own body will be association with looking longer in the location of body images, resulting in longer reaction times on the task. We did not divulge the specific focus of our investigation at the beginning of the experiment because participants often to try to confirm the experimenters' hypotheses during the course of the study. In order to ensure that you were not unconsciously influenced to do this, we withheld the hypotheses until the end of the experiment.

At this point, we would like to thank you very much for participating in this study. You are still able to withdraw your consent to participate at any time and are welcome to do so by contacting one of the experimenters below. If you choose to withdraw your consent, your data will be deleted and omitted from analysis. If you have any additional questions please feel free to ask them now, or send an email to one of the experimenters below. Should you wish to find out more about the results of our experiment feel free to contact:

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