The Effect of Appearance-Related Media on Cognitive Responses to Food

Rachel Plummer

Follow this and additional works at: https://scholarworks.wm.edu/honorstheses

Part of the Cognition and Perception Commons, and the Other Psychology Commons

Recommended Citation
https://scholarworks.wm.edu/honorstheses/1175
The Effect of Appearance-Related Media on Cognitive Responses to Food

A thesis submitted in partial fulfillment of the requirement for the degree of Bachelor of Arts in Psychology from The College of William and Mary

by

Rachel S. Plummer

Accepted for Honors
(Honors, High Honors, Highest Honors)

Dr. Cathérine Forestell, Director

Dr. Cheryl Dickter

Dr. Kenneth Kambis

Dr. Meghan Sinton

Williamsburg, VA
May 4, 2018
Abstract

The goal of this study was to determine whether exposure to commercials featuring thin versus plus-size women affected women’s implicit cognitive responses to food. One hundred sixteen college-age women watched a neutral film interrupted by two commercials. The second commercial contained a thin woman \((n = 39)\), a plus-size woman \((n = 38)\), or was a neutral commercial with no human actors \((n = 39)\). After the video, participants completed visual analog scales for state body dissatisfaction and explicit ratings of liking and wanting of healthy and unhealthy foods. In addition, to measure responses to healthy and unhealthy foods, participants completed two implicit cognitive tasks: the Affective Misattribution Procedure (AMP) and the flanker task, which measured evaluation of and implicit attention to foods, respectively. Results revealed that the experimental manipulation did not affect women’s body dissatisfaction, nor their evaluation of food. Regardless of their group, women evaluated the unhealthy foods more positively than the neutral items. However, those who viewed the plus-size model commercial experienced response conflict in the flanker task only when healthy targets were flanked by unhealthy distractors. These results suggest that although watching plus-size models may not shift women’s body dissatisfaction or their evaluation of foods, they become distracted by unhealthy foods. This may reduce their subsequent ability to resist consuming unhealthy food.

Keywords: body image, food, attentional bias, media, plus-size models
The Effect of Appearance-Related Media on Cognitive Responses to Food

Due to a variety of societal influences, women in Western cultures experience pressure to conform to an unrealistic ideal of attractiveness. As a result, many women are dissatisfied with their bodies (Rodin, Silberstein, & Striegel-Moor, 1984). One significant contributor to this “normative discontent”, coined by Rodin, and colleagues (1984), is the media, which emphasizes physical appearance and a thin body ideal. Because mass media encompasses a wide range of sources, such as billboards, radio, magazines, the Internet, and television commercials and programs, it is a powerful and compelling transmitter of cultural norms for the ideal body, especially for women (Groesz, Levine, & Murnen, 2001).

Experimental and correlational studies have shown that increased exposure to mass media is accompanied by greater disturbance in body image (Ferguson, 2013; Morry & Staska, 2001). For example, correlational research has found that exposure to television programming that communicated the thin-ideal was a significant predictor of body dissatisfaction for college-age women (Bissell & Zhou, 2004). Similarly, in an experimental study, women who were shown thin model images experienced higher weight-related appearance anxiety and body dissatisfaction, relative to those who viewed neutral images (Harper & Tiggemann, 2007).

Further research has shown that the degree to which women internalize or endorse the thin ideal of attractiveness may moderate the degree to which thin-ideal media affects women (Dittmar & Howard, 2004, Ferguson, 2013; Halliwell & Dittmar, 2004).

In response to these findings and to consumer criticism, some companies like Dove® and Aerie® now feature plus-size models in their advertisements. Whether this change is beneficial for women who internalize the thin ideal is unclear. Whereas some research suggests that exposure to images of plus-size models is associated with a more positive state body image for
women who endorse the thin ideal (Diedrichs & Lee, 2011), other research has reported that women feel more negative about their bodies after exposure to models regardless of their size (Swami & Smith, 2012).

Women who are dissatisfied with their bodies are more likely to engage in weight control practices, which affects the types of foods they choose to eat, and in some cases is a risk factor for eating pathology (Glanz, Basil, Maibach, Goldberg, & Snyder, 1998; Stice & Shaw, 2002). Thus in addition to affecting body image, viewing appearance-related media may affect women’s subsequent food choices. However, as in the examples discussed above, findings have been inconsistent. While some research has reported that women who are exposed to a thin model are more likely to choose a diet snack over a regular snack, eat less, and feel more negative about their bodies relative to those who were exposed to a plus-size model (Anschutz, Engels, Becker, & van Strein, 2008; Krahe & Krause, 2010), other studies have not supported these findings. For example, when women ate freely while watching a nature video containing commercials with plus-size models, thin models, or neutral content, those who viewed the plus-size model commercial ate less than those in the other two groups (Anschutz, Engels, Becker, & van Strein, 2009). The conflicting results of these studies invite more investigation that explores the mechanisms involved in women’s responses to foods after viewing models with different body types. There are a number of ways in which viewing thin or plus-size models may affect women’s subsequent responses to food. In the present study we evaluated whether viewing appearance-related media shifted women’s affective responses and attentional biases to pictures of food.

**Does viewing appearance-related media shift women’s implicit affective responses to food?**

One possible mechanism that may be involved in the relationship between exposure to
appearance-related media and subsequent food intake is implicit evaluation of foods. Given that there is a great deal of emphasis on the thin ideal in our society, being overweight is generally considered to be a negative attribute, whereas being thin is associated with healthy diet practices and beauty (Ahern & Hetherington, 2006; Madden & Chamberlain, 2010). One of the most pervasive stereotypes about plus-size or overweight people is that they overeat unhealthy foods or binge eat (Puhl, Moss-Racusin, Schwartz, & Brownell, 2008). Research has shown that food-related decisions can be influenced by these stereotypes (Huneke, Benoit, Shams, & Gustafsson, 2014), which may increase stereotype-consistent behavior, even if the behavior is perceived as negative (Wheeler & Petty, 2001). In research related to overweight stereotypes, Campbell and Mohr (2011) found that activation of the overweight stereotype, induced by exposure to a picture of an overweight person, led to stereotype-consistent behaviors, such as choosing greater quantities of food, consuming greater amounts of unhealthy foods, and lower commitment to health goals. If this is true, viewing appearance-related media may simultaneously trigger both weight- and food-related stereotypes that may cause women to evaluate and choose foods associated with the body type of the model they view. One of the goals of the present study is to determine whether this cognitive process occurs when women view appearance-related media containing models with different body types.

Because social desirability may bias self-reports of attitudes towards food, researchers have developed implicit measures to examine pre-conscious affective cognitive responses to motivational stimuli such as food. In the present study, we used the Affect Misattribution Procedure (AMP), developed by Payne, Cheng, Govorun, and Stewart (2005). The AMP measures implicit affective responses to cues. In this task, a prime is presented, followed by a neutral image (i.e., a Chinese pictograph), and participants are asked to respond to the neutral
image, indicating whether the image is pleasant or unpleasant. Since the pictographs are abstract and have no meaning to participants, their evaluation of the pictographs is implicitly related to their evaluation of the prime. The AMP has been used in addiction research, which demonstrates that frequent smokers respond more positively to smoking-related cues, compared to neutral cues (Haight, Dickter, & Forestell, 2012; Payne, Govorun, & Arbuckle, 2007). Although previous research that exposes women to attractive female models has examined food intake, no previous work has used the AMP to look at implicit evaluations of foods.

**Does viewing appearance-related media shift women’s implicit attentional biases to food?**

Another mechanism that may be responsible for changes in women’s food intake after viewing appearance-related media is shifts in their attention to healthy and unhealthy foods. Affect regulation theories suggest that intake disinhibition (i.e., overeating) may be a maladaptive strategy for coping with the negative affect that may be induced by viewing thin models. According to Escape Theory (Heatherton & Baumeister, 1991), intake disinhibition may represent a motivated attempt to escape from self-awareness and cope with negative affect. In this framework, after viewing a thin model, women may be reminded of their failure to achieve the thin ideal or comply with dieting goals. This increased self-awareness may subsequently lead to negative affect (e.g., anxiety or depression). In an attempt to escape and lower this self-awareness, they may narrow their focus of attention away from higher-level, long-term, abstract goals (i.e., the long term consequences of reducing caloric intake to achieve an appearance standard) to immediate, concrete experiences (e.g., taste and pleasure associated with palatable food). Increased eating is then reinforced through the reduction of aversive self-awareness (Haedt-Matt & Keel, 2011). Blackburn, Johnston, Blampied, Popp, and Kallen (2006) found that this theory provides a successful model for binge eating. Escape theory suggests that viewing
thin models may induce increased self-awareness and negative affect. Women’s motivation to escape these feelings may cause them to narrow their focus from their long-term goals of healthful eating to unhealthy food consumption.

Alternatively, it is possible that viewing a thin model would have the opposite effect. Many women engage in some form of self-control when it comes to their food intake. These levels of self-control may increase when there is a discrepancy between a desired and a current state. For example, if women look at a thin model and realize that their body type is different, they may become more vigilant of and more closely monitor their caloric intake (Robinson, Schmeichel & Inslicht, 2010). However, self-control, by definition, is hard work; it involves deliberation, attention, and vigilance (Muraven & Baumeister, 2000) and it depletes resources (Inzlicht & Schmeichel, 2012). Therefore, viewing an attractive plus-size model may reduce women’s motivation to engage in the resource-depleting act of restricting their caloric intake. They may feel justified in letting down their defenses, exercising less self-control and monitoring. As a result, women who view an attractive plus-size model may become less attentive to cognitive and affective signals that are associated with a conflict or discrepancy between desired and current states (Inzlicht & Schmeichel, 2012).

In order to measure the degree to which women exert cognitive control and resist distraction from unhealthy foods after viewing appearance related media, we used a flanker task; an implicit cognitive task that measure executive control and attentional bias (Eriksen & Eriksen, 1974; Husted, Banks, & Seiss, 2016). In the flanker task, participants respond to a target stimulus presented among compatible or incompatible flanker stimuli. Participants are asked to respond to the target stimulus and ignore the flanker stimuli. Because there is a conflict in processing incompatible flankers, participants respond more slowly to the target stimulus on incompatible
trials (target and flankers are different), compared to compatible trials (target and flankers are the same) (Coles, Gratton, Bashore, Eriksen, & Donchin, 1985; Eriksen & Eriksen, 1974). During incompatible trials, participants must execute cognitive control and adapt to the conflict (Verbruggen, Notebaert, Liefooghe & Vandierendonck, 2006). Slower reaction times during incompatible relative to compatible trials indicate reduced cognitive control and greater distraction (Husted et al., 2016). The flanker was first used with letters or symbols (Eriksen & Eriksen, 1974) but more recently it has been used with a variety of stimuli tailored to assess responses to emotionally relevant stimuli (e.g., Dickter & Bartholow, 2007; Macrae, Bodenhausen, Milne, & Calvini, 1999).

Using the food flanker task, Meule, Vogele, and Kubler (2012) found that restrained eaters (i.e., those who cognitively restrict their intake in order to maintain their body weight) were quicker to respond to high-calorie food cues compared to neutral cues. That is, they were quicker to identify food images, compared to neutral images, and did not show distraction. Further work by Forestell, Lau, Gyurovski, Dickter, and Haque (2012) demonstrated that when hungry, restrained eaters were distracted by high calorie flankers when the target was a low calorie food, whereas unrestrained eaters were distracted by high calorie flankers regardless of the target.

The current study

The primary goal of the current study was to assess women’s implicit cognitive responses (i.e., affective responses and attentional biases) to healthy versus unhealthy foods after viewing appearance-related media. Although several studies have examined food intake, no studies to our knowledge have looked at implicit cognitive responses to food after viewing thin versus plus-size models. In order to determine whether changes in food intake are the result of changes in
evaluation of and attentional biases to food, we replicated and extended the study by Anschutz and colleagues (2009) using implicit cognitive measures. To do this, college-age women viewed a neutral film with a commercial that depicted either a thin model, a plus-size model, or a neutral item with no human content. Trait variables were evaluated one week before women viewed the video and various state variables, such as state body image, were measured after women viewed the video. Additionally, they performed two implicit tasks: the AMP and the flanker using pictures with healthy foods, unhealthy foods, and neutral items, and a survey related to explicit liking and wanting of these foods. Using this approach, the following hypotheses were tested:

1. If viewing appearance-related media activates weight- and food-related stereotypes, we hypothesized that women who viewed the plus-size model would indicate a higher proportion of unhealthy foods as pleasant relative to healthy foods. Conversely, we hypothesized that those who viewed the thin model would indicate a higher proportion of healthy foods as pleasant relative to the unhealthy foods. We also hypothesized that participants would explicitly indicate that they like and want unhealthy foods more than healthy foods regardless of their experimental group.

2. If escape theory is correct, then we hypothesized that women who viewed the thin model commercial would be more distracted by unhealthy foods, because they become more self-aware of their failure to achieve the thin ideal or comply with diet goals, which in turn would cause them to focus on immediate experiences (like the taste of palatable, unhealthy foods). However, if ideas about self-control presented by Robinson and colleagues (2010) are correct, we hypothesized that women who viewed the plus-size model would be more distracted by unhealthy foods, because they are less motivated to engage in self-control and calorie restriction.
3. Although not the main goal of the present study, we assessed differences between groups in state body image as a result of viewing the commercials. Although previous findings have been inconsistent, we hypothesized based on the results of Anschutz and colleagues’ 2008 study that state body dissatisfaction would be higher after viewing a thin model, compared to viewing a plus-size model or neutral commercial.

Methods

Participants

Participants were 117 women between the ages of 18 to 22 years. Women were recruited from the College of William and Mary through flyer postings around campus and introductory psychology classes. All procedures were approved by the school’s Protection of Human Subjects Committee, and informed consent was obtained from each participant.

Measures

Approximately one week before coming to the laboratory, participants completed an online questionnaire that asked about their demographics (i.e., age, weight, height, race/ethnicity, and hours spent consuming media), as well as various psychological trait measures, which are described below.

Positive Body Image (BAS) - The Body Appreciation Scale-2 (Tylka & Wood-Barcalow, 2015) was used to assess body appreciation, the operationalization of positive body image. This questionnaire measures individuals’ acceptance of, respect for, and positive attitudes about their body. Ten items related to positive feelings about one’s body are rated on a scale from 1 (never) to 5 (always). Participants’ responses are averaged for a final score ranging from 1 to 5. The original BAS was revised to make the measure appropriate for both women and men, and the BAS-2 was shown to be invariant across sexes. The scale showed high internal
consistency ($\alpha=0.94$). In addition, Tylka and Wood-Barcalow (2015) found it to have good test-retest reliability over a 3-week period ($r=0.90$), and construct validity. This questionnaire can be found in Appendix A.

**Appearance Ideal Internalization (SATAQ-3)** - The General Internalization Subscale of the Sociocultural Attitudes Toward Appearance Scale-3 (Thompson, van den Berg, Roehrig, Guarda, & Heinberg, 2004) was used to assess to what extent participants internalize appearance ideals related to generic media (i.e. TV, magazines, movies). An example item from the internalization-general subscale is “I compare my body to the bodies of TV and movie stars.” Nine items are rated on a scale from 1 (definitely disagree) to 5 (definitely agree). Participants’ responses are averaged for the subscale, where final scores range from 1 to 5. The SATAQ-3 had good internal consistency ($\alpha=.94$). This questionnaire can be found in Appendix B.

**Dietary Restraint (TFEQ)** - The Three Factor Eating Questionnaire (Stunkard & Messick, 1985) measures the construct of dietary restraint. Restrained eating is the tendency to restrict one’s food intake to control one’s weight and avoid weight gains and restrained eaters are less sensitive to their body’s hunger and satiety cues (Herman & Polivy, 1975). The questionnaire includes 21 questions, with a mix of true/false and Likert scale questions. A sample true/false question from the dietary restraint subscale is ‘I deliberately take small helpings as a means of controlling my weight’. A sample Likert scale question is ‘How often are you dieting in a conscious effort to control your weight?’ and this question is rated on a scale from 1 (rarely) to 4 (always). The scale had good internal reliability ($\alpha=.89$). This questionnaire can be found in Appendix C.

Additionally, participants completed a variety of measures in the laboratory. These measures are described below.
Hunger and fullness - Participants reported at what time they last ate and what they last ate, and rated their hunger and fullness on a visual analog scale.

Movie and commercial recall and evaluation (manipulation check) - We designed a 10-question multiple-choice quiz (see Appendix D) aimed at testing participants’ comprehension and memory of the video and commercials to ensure they were paying attention. Sample questions included “Which of the following was NOT one of the major bodies of water discussed in the film?” and “What did the second commercial advertise?” In addition, participants rated how much they liked each commercial and how effective they found each commercial.

State Body Image - Visual analog scales (VAS; Heinberg & Thomp, 1995) were used to measure state body dissatisfaction. Participants were asked to rate how dissatisfied they were with both their appearance and their weight on a VAS ranging from “not at all” to “very much”. Eight mood measures (i.e. happy, sad, distressed) were also included in the VAS to distract from the purpose of the measure. These scales can be found in Appendix E.

The experimental manipulation involved showing participants a neutral video interrupted by commercials, which is described below.

Video and Commercials

The film used in this study was a 13.5 minute segment from Planet Ocean: Desert Seas (Produced by Icon Films Ltd in association with Saudi Aramco for National Geographic Channels, © 2011). The film shows and describes marine life along the East and West coasts of Saudi Arabia in the Arabian Gulf and the Red Sea. The film is interrupted by two 30-second commercials. The first commercial appears 6.5 minutes into the film, and the second commercial appears 10.75 minutes into the film. The video fades to black before and after each commercial.
to make the transitions appear seamless and unedited. In addition, the credits from the film are pasted onto the end of the video clip so that the video has a natural ending.

The first commercial in all three groups is a neutral Honda car commercial without any female models. In the thin model experimental group, the second commercial is a Calvin Klein® underwear commercial featuring a very thin model. In the plus-size model experimental group, the second commercial is an Ashley Graham Addition Elle® underwear commercial featuring a plus-size model. The two experimental commercials were matched on many qualities. Both are commercials for simple, black and basic underwear. In addition, both commercials are black and white and feature only one model. The two commercials are the exact same length. Both of the models are attractive and are making similar movements and gestures in both commercials. Finally, the voice over from the Calvin Klein® commercial was extracted and used for the Addition Elle® commercial, ensuring that the audio was exactly the same for both commercials. The second commercial for the control group was a neutral dog food commercial without any human actors, which was chosen because it is the same length as the experimental commercials and because it did not contain any women, human food, or exercise information.

**Experimental Tasks**

**Affect Misattribution Procedure (AMP)** - The AMP was used to measure participant’s implicit affective responses to primes. E-prime was used to design a task in which there were 60 trials. In each trial, a prime (healthy food, unhealthy food, or neutral non-food object) was presented for 75 milliseconds. This was followed by a blank screen for 125 milliseconds, then a Chinese character for 100 milliseconds, and finally a black and white masking screen, which remained on the computer screen until the participant made a response (See Figure 1). Participants were asked to indicate whether they think the Chinese character is pleasant or
unpleasant relative the average Chinese symbol. Because participants do not know the meaning of the Chinese characters, their responses are thought to reflect their implicit evaluation of the food or neutral item prime that precedes the character. Any participants who reported that they were familiar with Chinese characters were excluded from AMP analyses.

The stimuli for the Affect Misattribution Procedure (AMP) consisted of 36 color photographs that were created in our laboratory. For these pictures, items were placed on a square white plate against a black background. Items consisted of 10 healthy food items and 10 unhealthy food items. The healthfulness of the foods was determined based on their calorie and fat content. In addition, there were 16 neutral non-food items. Food pictures for the flanker task were selected from the food pics database (Blechert, Meule, Busch, & Ohla, 2014). For each picture, the food is shown on a white background. These images have been rated by a large sample of American and European adults on various subjective measures, like arousal and visual complexity, and the images did not differ in size, brightness, or contrast. Images consisted of 12 healthy foods, 12 unhealthy foods, and 16 neutral non-food and were resized to 515 X 325 pixels. All images can be found in Appendix F.
Food Flanker Task - The food flanker task was used to assess participants’ executive control and susceptibility to distraction by food stimuli, and was adapted from studies by Forestell et al. 2012 and Meule et al, 2012. The task was programmed using E-prime software. For each trial, participants were presented with a fixation cross in the middle of the screen for 1000 milliseconds, immediately followed by a stimulus array of three images. These images consisted of one target image flanked by two identical images, appearing simultaneously for 250 milliseconds. The images were followed by a blank screen presented for randomly varied times between 1000-2000 milliseconds to avoid time conditioning. All screens were presented on a gray background (See Figure 2). Images were randomly selected from the set of neutral objects and healthy and unhealthy foods. The flanking images were always identical to each other and were either a healthy or unhealthy food item. The target image varied between images of a
healthy food, unhealthy food, or a neutral object. This design produced 6 image arrangements: neutral flanked by healthy (HNH), neutral flanked by unhealthy (UNU), healthy flanked by healthy (HHH), healthy flanked by unhealthy (UHU), unhealthy flanked by healthy (HUH), and unhealthy flanked by unhealthy (UUU). In each experimental block, the 2 neutral target trials (HNH, UNU) were presented 16 times each and the 4 food trials (HHH, UHU, HUH, UUU) were presented 12 times each. Thus, there were 80 image trials per block, and each block was presented four times with the image arrangements randomized.

At the beginning of the task, participants were given instructions asking them to focus on the center image and respond as quickly and accurately as possible to the question, “Is the center image a food item or not?” by pressing either the “x” or “m” key, with mapping counterbalanced across participants. A practice block consisting of 10 trials was given to each participant to orient them to the task. Between each block of trials, participants were given a break where they could press any key to move to the next block when they felt ready. The entire task took approximately 25 minutes to complete. Reaction times for keyboard responses were recorded in milliseconds to assess differences in reaction speeds across the different target by flanker arrangements. A slower reaction time indicates that more time was needed to properly categorize the target image and respond to the prompt question, suggesting that the participant was distracted by the flanker images.
Explicit Food Liking and Wanting - We presented 85 of the participants with a series of 16 food pictures. Only these participants were presented with this task due to a change in the procedure. We asked participants if they had ever eaten the food before, and then asked them to rate how much they like the food and how much they want some of the food right now. Foods included healthy foods (i.e. an orange) and unhealthy foods (i.e. potato chips). These pictures were drawn from the same database as the flanker stimuli and can be found in Appendix F.

Procedure

Participants were sent an online survey (Qualtrics, Provo, UT) that assessed various trait characteristics (i.e., BAS-2, SATAQ-3, and TFEQ). Upon completion of the survey, participants were invited into the lab. Approximately one week after they completed the first online survey, participants came into the lab in groups of up to four people. Once consent was obtained, participants indicated the degree to which they felt hungry and full. Participants were randomly
assigned to one of the three groups (thin model commercial, plus-size model commercial, or neutral control commercial). After the video was presented, the state measures (VAS for body image and mood), as well as questions about their comprehension and memory of the video and ratings of the commercials were administered. State measures were only administered after the video (post-test only design) so as not to prime participants. After all participants in the session were finished with the survey, they completed two computer tasks. Half of the participants completed the AMP task first, and half of the participants completed the flanker task first. After the computer tasks, participants completed the brief food liking and wanting survey. After all of these procedures, participants’ height and weight were measured and they were debriefed on the purpose of the study. Participants were paid $10 or given 1 credit for their introductory psychology course as compensation.

Results

Participant Characteristics

Of the 117 women who were recruited, 116 completed the entire experiment and were included in the subsequent analyses. These participants were on average 19.19 years of age (SD = 1.11) and had a BMI of 23.16 kg/m². Approximately half had family incomes of $100,000 or above, whereas 2.6% had a total family annual income below $15,000. Overall, 69.8% of participants were White, 12.1% were Black, 13.8% were Asian, and 4.3% were from other races. Of these, 13.8% were Hispanic or Latina. As shown in Table 1, there were no significant differences between groups on any of the trait variables, on hunger in the laboratory session, or on the comprehension quiz score.
Manipulation Check and Commercial Ratings

To determine if participants paid attention to the film and commercials, we analyzed their score on the video and commercial comprehension quiz. The mean number of questions answered correctly, out of 10, was 9.12 ($SD = 1.00$), demonstrating high comprehension of and attention to the video and commercials. The average quiz score did not significantly differ between groups (see Table 1). In addition, in a univariate Analysis of Variance (ANOVA), we found that participants’ ratings of the effectiveness of the manipulated commercial did not significantly differ between groups, $F(2, 113) = 8.58, p > .13$ ($M = 48.07, SD = 25.79$). Their ratings of their liking of the manipulated commercial also did not significantly differ between groups, $F(2, 113) = 16.72, p > .22$ ($M = 47.92, SD = 25.50$). The mean liking and effectiveness scores demonstrate that participants were neutral in their liking of the commercials and felt the commercials were of average effectiveness.

In addition, to determine if participants were aware of the study’s aims, we evaluated their answers to the question “what do you think the purpose of this study was?” Overall, 13.8% ($n = 16$) guessed that the purpose had something to do with body image, 31.9% ($n = 37$)
mentioned food in their answer, and 16.4% (n = 19) mentioned both body image and food. The remaining 37.9% (n = 44) said “I don’t know” or indicated something unrelated to food or body image. In the answers that included food, most answers were vague, including statements like “something to do with food” or were incorrect, like “evaluating perceptions of food when hungry” or “how influenced you are by food and how that affects your dieting”. Only 3 participants identified the association between food and distraction or implicit processes, but none of the participants guessed the true purpose of the study, that is, examining the relationship between viewing media and responses to food.

**Effect of Viewing Commercials on Implicit Evaluation of Food (Hypothesis 1a)**

To determine if there was a differential effect of viewing the advertisements on participants’ food evaluation in the AMP task, a repeated measures analysis of covariance (ANCOVA) was conducted. For the AMP data, trials were excluded if the response time was 2 standard deviations above the mean response time or less than 200ms. Participants were excluded from analyses if they had less than 10 valid trials per response category (n = 2). They were also excluded if they reported being able to read Chinese characters (n = 9), because a Chinese pictograph was used as the neutral image.

Stimulus type (healthy food, unhealthy food, non-food neutral) was entered as the repeated measures dependent variable. Experimental group (plus-size model, thin model, control) was a between-subjects variable. Participants’ rating of hunger before the task was entered as a covariate (Forestell, Lau, Gyurovski, Dickter, & Hauque, 2012). This analysis revealed only a main effect of stimulus type, $F(2, 90) = 3.42, p < .04$. In order to examine this main effect, we performed a series of paired samples t-tests with Bonferroni correction ($p < 0.0125$). As shown in Figure 3, this analysis revealed that proportion of unhealthy foods
participants implicitly liked ($M = .59$, $SD = .19$) was significantly higher ($p = .001$) than the proportion of neutral items they implicitly liked ($M = .50$, $SD = .17$). There was no main effect or interaction involving group, suggesting that the commercials did not differentially affect participants’ implicit evaluated foods.

![Implicit Liking of Foods](image)

**Figure 3.** Proportion of trials where participants indicated the pictograph was pleasant when it was preceded by an unhealthy food, a healthy food, or a neutral item. The asterisk refers to a significant difference between trials in which unhealthy foods and neutral primes were presented.

**Explicit Liking and Wanting (Hypothesis 1b)**

To determine whether the experimental manipulation affected participants’ explicit liking and wanting of healthy and unhealthy foods, we conducted a Food Type x Group Analyses of Variance (ANOVA), where the food type variable consisted of healthy vs. unhealthy foods and the group variable consisted of each of the commercial types: thin model, plus-size model, control. The first outcome variable we examined was participants’ explicit ratings of how much they liked the foods. This analyses revealed only a main effect of food type, $F(1, 78) = 22.57, p$
A paired samples t-test revealed that explicit liking of unhealthy foods ($M = 69.73$, $SD = 14.76$) was higher than explicit liking of healthy foods ($M = 61.63$, $SD = 13.05$). In a second ANOVA, the outcome variable was participants’ explicit ratings of how much they wanted the foods. Consistent with the previous analyses, there was a significant main effect of food type, $F(1, 78) = 4.63$, $p < .04$. A paired samples t-test revealed that participants explicitly rated their wanting of unhealthy foods ($M = 48.15$, $SD = 22.68$) higher than their wanting of healthy foods ($M = 43.90$, $SD = 15.00$).

**Implicit Attentional Bias to Food (Hypothesis 2)**

To determine whether the experimental manipulation affected participants’ implicit attentional bias to foods, we conducted a repeated measures ANCOVA on participants’ reaction times to the target stimuli in the flanker task. Trials where participants indicated the incorrect answer to the question “is this a food item?” were also excluded. Participants were excluded if their average reaction times during the flanker task were greater than 1,000 milliseconds (Hustesd et al., 2016) and if they had fewer than 60 trials correct for two blocks ($n = 11$).

Reactions times to the six target-flanker combinations were the repeated measures dependent variables. Experimental group (plus-size model, thin model, control) was a between-subjects variable. Participants’ rating of hunger before the task was entered as a covariate because previous work has shown that participants’ responses to the food flanker task depend on their level of hunger (Forestell et al., 2012). This analysis revealed a significant main effect of target, $F(2, 91) = 11.06$, $p < .001$. A series of paired samples t-tests with Bonferroni correction revealed that response times were fastest when the target was an unhealthy food ($M = 601.80$, $SD = 80.32$), followed by healthy food targets ($M = 614.02$, $SD = 79.15$), and finally slowest when the target was a neutral item ($M = 633.06$, $SD = 71.06$) (all p values <.05). In addition, there was
a significant flanker x target x group interaction, $F(2, 184) = 2.41, p = .05$. To understand this three-way interaction, separate flanker x target ANOVAs were conducted for each group. As shown in Figure 4, these analyses revealed a significant flanker x target interaction only for the plus-size model group, $F(2, 33) = 3.51, p = .04$ (see Figure 4A). No significant interactions were found for the thin model ($p > .99$) (see Figure 4B) or control groups ($p > .92$) (see Figure 4C).

To understand the two-way interaction found in the plus-size model group, we broke it down according to the target variable. When looking at healthy targets, there was a significant main effect of flanker, $F(1, 34) = 9.71, p < .005$. Reaction times to the healthy target were slower when the flankers were unhealthy ($M = 625.35, SD = 93.12$), compared to when the flankers were healthy ($M = 607.55, SD = 79.74$) (see Figure 4A). However, there was not a main effect of flanker for unhealthy targets ($p > .30$) or neutral targets ($p > .50$).

A.  

![Plus Size Model Group](image)
Figure 4: Response times in milliseconds in the plus-size model group (4a), thin model group (4b) and control group (4c) for the six food flanker image arrays (HHH, UHU, HUH, UUU, HNH, and UNU). Note an asterisk depicts significance at $p < .05$. 
Weight Dissatisfaction (Hypothesis 3)

To determine whether the experimental manipulation affected participants’ state weight dissatisfaction, we conducted a univariate ANCOVA. State weight dissatisfaction was entered as the dependent variable and experimental group was entered as a fixed factor. In order to control for variation in BMI and positive body image, BMI and Body Appreciation Scale score (BAS, positive body image) were entered as covariates. There was no significant difference between the groups, $F(2, 111) = 0.33, p = 0.72$. Thus the commercials did not have a differential effect on state weight dissatisfaction.

Post Hoc Exploratory Analyses - In addition, we were interested in determining whether people’s trait positive body image protected them from weight dissatisfaction that could arise from viewing the models in the commercials. To address this question, we ran an analysis that assessed whether experimental group moderated the relationship between trait positive body image (measured as body appreciation) and weight dissatisfaction.

A hierarchical linear regression was used to test experimental group as a potential moderator of the relationship between positive body image and state weight dissatisfaction. First, the Body Appreciation Scale (BAS) score was centered around the mean ($M = 3.70, SD = 0.75$). Two dichotomous dummy-coded variables were created for group with the control group as the reference group. One dummy-coded variable included the control group and the plus-size model group, and the other included the control group and the thin model group. Second, two product terms were created by multiplying 1. dummy-coded group (plus-size model group) by mean-centered BAS score and 2. dummy-coded group (thin model group) by mean-centered BAS score. In this analysis, these variables were regressed on state weight dissatisfaction as follows: In Step 1, BMI was entered as a covariate. In Step 2, the two dummy-coded group variables were
entered, as was the mean centered BAS score. Finally, in Step 3, the two interaction terms were entered.

As shown in Table 2, Step 1 explained a significant amount of variance for state weight dissatisfaction, $R^2 = .17$, $F(1, 114) = 22.96, p < .001$, Step 2 explained significant additional variance, $R^2_{\text{change}} = .26, F_{\text{change}}(3, 111) = 17.18, p < .001$, and Step 3 also explained significant additional variance, $R^2_{\text{change}} = .04, F_{\text{change}}(2, 109) = 3.59, p < .04$. In Step 2, mean centered BAS score was significant, $\beta = -.53, t(4) = -7.07, p < .001$. In Step 3, only the plus-size model group dummy-coded group x BAS score interaction was marginally significant, $\beta = .18, t(6) = 1.96, p = .05$. As shown in Figure 5, additional correlational analyses that were conducted for groups separately revealed that women in the control group who had higher BAS scores had lower state weight dissatisfaction scores, $r(N = 39) = -.73, p < .001$, whereas this relationship was only marginally significant in the plus-size model group, $r(N=38) = -0.30, p = .07$.

Table 2. Results of the regression on state weight dissatisfaction.

<table>
<thead>
<tr>
<th>Step 1</th>
<th>$\beta$</th>
<th>t</th>
<th>$R^2_{\text{Change}}$</th>
<th>$F_{\text{Change}}$</th>
<th>Significant $F_{\text{Change}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI (kg/m$^2$)</td>
<td>.41</td>
<td>4.48*</td>
<td></td>
<td>22.96</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Step 2</td>
<td>$R^2_{\text{Change}}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thin vs. Control Group</td>
<td>.02</td>
<td>.19</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plus vs. Control Group</td>
<td>-.05</td>
<td>-.59</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Centered BAS</td>
<td>-.53</td>
<td>-7.07*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td>$R^2_{\text{Change}}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thin Group x BAS</td>
<td>-.08</td>
<td>-.85</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plus Group x BAS</td>
<td>.18</td>
<td>1.96*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* significant results ($p < .05$).
Figure 5: Simple slopes analysis performed in order to test experimental group the as a moderator of the effect of positive body image on state weight dissatisfaction. The slope of the control group was significant, compared to the plus-size model group slope.

**Discussion**

The main goal of the present study was to determine if viewing commercials with appearance-related media affects women’s evaluation of and implicit attention to healthy and unhealthy food. Although the experimental manipulation in this study did not shift women’s state body image, nor women’s implicit or explicit evaluation of food, it did affect women’s executive control and attentional biases. After watching a commercial of a plus-size model, women were more distracted by unhealthy food flankers when they were presented with a healthy target. This effect was not observed in the groups in which women viewed a commercial of a thin woman or a neutral item. This finding suggests that even one brief exposure to appearance-related media can affect women’s immediate implicit cognitive responses to food, which may subsequently affect their food intake.
That the manipulation did not affect evaluation of healthy and unhealthy foods during the AMP was contradictory to our hypothesis. We predicted that weight-related biases and stereotypes may be elicited, thus leading to stereotype-consistent behaviors (Wheeler & Petty, 2001; Campbell & Mohr, 2011). As a result, we predicted women who viewed the plus-size model would rate unhealthy foods more positively than those in the control group, and women who viewed the thin model would rate healthy foods more positively. In contrast to these predictions, we found that all women, regardless of their experimental group, implicitly rated the unhealthy foods as more pleasant than neutral images and explicitly liked the unhealthy foods more than the healthy foods. It is possible that because it is difficult to overcome one’s innate liking for unhealthy foods, exposure to a brief commercial would not be sufficient to shift preferences. It is also possible that the plus-size model in the commercial did not elicit a weight-based stereotype. Although the model was overweight, she was attractive, appeared to be healthy, and was not obese. Thus this commercial may not have provided a salient enough trigger to elicit weight biases.

In the food flanker, all women across groups had faster response times when the target was an unhealthy food, and slower response times when the target was a neutral item. This indicates that women are not easily distracted from focusing on unhealthy foods. This finding is similar to that reported by Meule and colleagues (2012). In their study, restrained eaters were quicker to identify high calorie food images, compared to neutral images. In the current study, we found that all participants were quicker to identify unhealthy, high calorie food images, compared to healthy, low calorie food images or neutral non-food images.

More interestingly, for women who viewed the commercial of the plus-size model, response times were significantly slower when healthy food target images were flanked by
unhealthy food images compared to healthy food images. In contrast, when the target was unhealthy or neutral, there were no differences between responses times when healthy and unhealthy flankers were presented. This finding is consistent with Robinson and colleagues’ (2010) ideas about self-control. After watching an attractive plus-size model, women may be less motivated to maintain self-control and diet goals, and may feel a sense of permission to eat or indulge in unhealthy foods. This finding is consistent with Forestell and colleagues (2012) who reported a similar pattern of results with restrained eaters when they were hungry.

These results are especially interesting since typically with the flanker paradigm, stimuli lack motivational significance and participants respond more slowly on all incompatible trials, compared to compatible trials (Coles et al., 1985). However, in the present study, the motivational significance of the images affected reaction times, and we found that women responded differentially only after exposure to the plus-size model group when healthy foods are flanked by unhealthy foods. Thus when stimuli have motivational significance, appearance-related media can affect women’s responses to foods differentially. Because research has suggested that distraction by food may reflect increased craving for that food, it is possible that women who view a commercial of a plus-size model subsequently crave unhealthy foods (Smeets, Roefs, & Jansen, 2009).

In the current study state weight dissatisfaction did not differ as a function of the commercial women viewed. These results are consistent with results from Anschutz and colleagues (2009). It is likely that frequent, repeated exposure to appearance-related media may be required to affect state body image. Interestingly, in an exploratory analysis we found that although trait positive body image was negatively related to body dissatisfaction in the neutral and thin model commercial groups, there was no significant relationship between trait and state
body image in the plus-size model group. This suggests that another variable may moderate the relationship between trait positive body image and body dissatisfaction that may be activated when women view a plus-size model in the media.

A possible additional moderator may be social comparison, which has been shown to contribute to body image (Richins, 1991). Upward social comparisons, where individuals compare themselves to a standard they deem to be above or better than themselves, may negatively affect self-esteem and body image, whereas downward social comparisons can have the opposite effect (Major, Testa, & Bylsma, 1991). Tiggemann and McGill (2004) suggest that social comparison mediates the relationship between thin-ideal media exposure and body dissatisfaction. Thus, viewing a thin model image leads to greater engagement in upward social comparisons, which in turn leads to greater body dissatisfaction. Because Tiggeman and McGill (2004) included only thin model images in their study, it is not clear whether this effect would generalize to plus-size model images. It is likely that because of the prevalent thin ideal in our society, women respond in a consistent manner to thin models in terms of their social comparisons. However, people may vary in the features they focus on when they view a plus-size model; some may focus on her hair, others may focus on her attractive face, while others may focus on her body. Perhaps women who viewed the plus-size model differed in the degree to which they compared their bodies with the model. Future studies should evaluate individuals’ body comparisons to plus size models and examine its role in the relationship between trait positive body image and state body dissatisfaction.

Although the experimental manipulation in the present study was well controlled in that the commercials depicting the plus-size and thin models were well matched on many characteristics, the present study has some limitations that should be considered. First, the study
utilized undergraduate female students that were predominantly White and of higher income status. Thus these results are limited in their generalizability. Future studies should recruit a more diverse sample that includes people of different races, men, younger participants, or participants of more varied socioeconomic backgrounds. Another limitation of the current study is the experiment was performed in an artificial laboratory-based setting. Because of this, we are unable to determine how women respond to appearance-related media in their daily lives. Perhaps the artificial setting caused women to respond differently than they normally would. Future studies should address this possibility and evaluate responses to food in a more naturalistic setting. Another limitation is that participants may have recognized the plus-size model. If this was the case, participants may have been focusing on what they know about the model, as opposed to just focusing on her body and appearance. Future studies could use commercials with an unfamiliar plus-size model to account for this possibility. A final limitation of the present study is that a large number of participants guessed that the purpose of the study was related to body image and/or food. Although this was unavoidable due to the nature of the questionnaires and study content, it is possible that because participants knew the purpose of the study, they altered their explicit responses due to demand characteristics. It should be noted, however, that no one guessed the true goal of our study (to look at the relationship between viewing media and responses to food) and our approach to measuring body image is no different than previous body image studies (Anschutz et al., 2008; Anschutz et al., 2009; Diedrichs & Lee, 2010). Future studies should address this issue and work to better conceal the purpose of the study.

The present study was the first to examine the effects of commercials with thin versus plus-size models on implicit cognitive responses to food. In sum, the results of this study show
that immediately after viewing a plus-size model, women are more distracted by unhealthy food images. These findings suggest that the overconsumption reported in previous experiments (Anschutz et al., 2008) that is observed after women view a commercial of a plus-size model may be a function of reductions in women’s executive control and increased distraction by unhealthy foods. Future studies should examine whether the implicit cognitive responses observed in the flanker mediate the relationship between viewing appearance-related media and food intake.
References


Appendix A

Body Appreciation Scale

Please indicate whether the question is true about you never (1), seldom (2), sometimes (3), often (4), or always (5)

1. I respect my body.
2. I feel good about my body.
3. I feel that my body has at least some good qualities.
4. I take a positive attitude towards my body.
5. I am attentive to my body’s needs.
6. I feel love for my body.
7. I appreciate the different and unique characteristics of my body.
8. My behavior reveals my positive attitude toward my body; for example, I hold my head high and smile.
9. I am comfortable in my body.
10. I feel like I am beautiful even if I am different from media images of attractive people (e.g. models, actresses/actors).
Appendix B

SATAQ-3 general internalization subscale

Please read each of the following items carefully and indicate the number that best reflects your agreement with the statement. (1) Definitely disagree; (2) Mostly disagree; (3) Neither agree nor disagree; (4) Mostly agree; (5) Definitely agree.

1. I would like my body to look like the people who are on TV.
2. I compare my body to the bodies of TV and movie stars.
3. I would like my body to look like the models who appear in magazines.
4. I compare my appearance to the appearance of TV and movie stars.
5. I would like my body to look like the people who are in the movies.
6. I compare my body to the bodies of people who appear in magazines.
7. I wish I looked like the models in music videos.
8. I compare my appearance to the appearance of people in magazines.
9. I try to look like the people on TV.
Appendix C

TFEQ dietary restraint

Please answer true or false to indicate if the following statements relate to you.

1. When I have eaten my quota of calories, I am usually good about not eating any more.
2. I deliberately take small helpings as a means of controlling my weight.
3. Life is too short to worry about dieting.
4. I have a pretty good idea of the number of calories in common food.
5. While on a diet, if I eat food that is not allowed, I consciously eat less for a period of time to make up for it.
6. I enjoy eating too much to spoil it by counting calories or watching my weight.
7. I often stop eating when I am not really full as a conscious means of limiting the amount that I eat.
8. I consciously hold back at meals in order not to gain weight.
9. I eat anything I want, any time I want.
10. I count calories as a conscious means of controlling my weight.
11. I do not eat some foods because they make me fat.
12. I pay a great deal of attention to changes in my figure.

Please answer the following questions by clicking the button below the response that is appropriate for you.

13. How often are you dieting in a conscious effort to control your weight?
    (1) rarely (2) sometimes (3) usually (4) always

14. Would a weight fluctuation of 5 lbs affect the way you live your life?
15. Do your feelings of guilt about overeating help you to control your food intake?
(1) never (2) rarely (3) often (4) always

16. How conscious are you of what you are eating?
(1) not at all (2) slightly (3) moderately (4) extremely

17. How frequently do you avoid ‘stocking up’ on tempting foods?
(1) almost never (2) seldom (3) usually (4) almost always

18. How likely are you to shop for low calorie foods?
(1) unlikely (2) slightly unlikely (3) moderately likely (4) very likely

19. How likely are you to consciously eat slowly in order to cut down on how much you eat?
(1) unlikely (2) slightly unlikely (3) moderately likely (4) very likely

20. How likely are you to consciously eat less than you want?
(1) unlikely (2) slightly unlikely (3) moderately likely (4) very likely

21. On a scale of 0 to 5, where 0 means no restraint in eating (eating whatever you want, whenever you want it) and 5 means total restraint (constantly limiting food intake and never ‘giving in’), what number would you give yourself?
(0) eat whatever you want, whenever you want it (1) usually eat whatever you want, whenever you want it (2) often eat whatever you want, whenever you want it (3) often limit food intake, but often ‘give in’ (4) usually limit food intake, rarely ‘give in’ (5) constantly limiting food intake, never ‘giving in’
Appendix D

Movie and Commercial Recall Quiz (with correct answers bolded)

1. Which of the following was NOT one of the major bodies of water discussed in the film?
   - The Red Sea
   - **The Caspian Sea**
   - The Gulf

2. Which area did the two bodies of water surround?
   - **Arabia**
   - Russia
   - Iran

3. What brand/company did the first commercial advertise?
   - Hyundai
   - Toyota
   - **Honda**

4. In which body of water did the narrator talk about the sea turtles?
   - The Red Sea
   - The Caspian Sea
   - **The Gulf**

5. What do the turtles mostly eat?
   - Fish
   - Crabs
6. Which body of water contains the reef and was described as more extravagant?

- The Red Sea
- The Caspian Sea
- The Gulf

7. What did the second commercial advertise?

- Cat food    Victoria’s Secret Underwear    Victoria’s Secret Underwear
- Dog food    Calvin Klein Underwear     Ashley Graham Addition Elle
- Yogurt     Old Navy Clothing      Old Navy Clothing

8. Were there any humans in the second commercial? (Dog food)

- Yes
- No

8. What did the model’s hair look like? (Calvin Klein)

- Dark and slicked back
- Dark and wavy
- Light and curly

8. What did the model’s hair look like?

- Dark and wavy
- Dark and pulled back
- Light and curly

9. Which organism converts sunlight to sugar?
• Coral
• **Algae**
• Barnacles

10. Which fish were the “gangsters”?

• **Blue finned trevally**
• Clown fish
• Eels
Appendix E

Visual Analog Scales

Right now at this moment to what extent do you feel:

1. Dissatisfied with your appearance?
2. Dissatisfied with your weight?
3. Distressed?
4. Happy?
5. Upset?
6. Confident?
7. Irritable?
8. Proud?
9. Sad?
10. Discouraged?
Appendix F

Flanker and AMP Images

Flanker Healthy

Flanker Unhealthy

Flanker Neutral
Explicit Liking and Wanting Survey Images

Healthy Foods

Unhealthy Foods