Attentional Bias to Body-Related Stimuli in Younger and Middle-Aged Females: The Role of Eating Disorders and Thin Ideal Priming

Teresa A. Markis
*Cleveland State University*

Follow this and additional works at: [https://engagedscholarship.csuohio.edu/etdarchive](https://engagedscholarship.csuohio.edu/etdarchive)

Part of the Psychology Commons

*How does access to this work benefit you? Let us know!*

---

**Recommended Citation**

[https://engagedscholarship.csuohio.edu/etdarchive/193](https://engagedscholarship.csuohio.edu/etdarchive/193)

---

This Dissertation is brought to you for free and open access by EngagedScholarship@CSU. It has been accepted for inclusion in ETD Archive by an authorized administrator of EngagedScholarship@CSU. For more information, please contact library.es@csuohio.edu.
ATTENTIONAL BIAS TO BODY-RELATED STIMULI IN YOUNGER AND MIDDLE-AGED FEMALES: THE ROLE OF EATING DISORDERS AND THIN IDEAL PRIMING

TERESA A. MARKIS

Bachelor of Science in Office Administration
Kent State University
May 1985

Master of Arts in Experimental Research Psychology
Cleveland State University
May 2009

Submitted in partial fulfillment of requirements for the degree
DOCTOR OF PHILOSOPHY IN ADULT DEVELOPMENT AND AGING
at the
CLEVELAND STATE UNIVERSITY
MAY 2015
We hereby approve this dissertation for

TERESA A. MARKIS
Candidate for the Doctor of Philosophy in Adult Development and Aging Psychology
degree for the Department of Psychology and the
CLEVELAND STATE UNIVERSITY College of Graduate Studies

Dissertation Chairperson, Conor T. McLennan

Methodologist and Dissertation Committee Member, Katherine S. Judge

Dissertation Committee Member, Richard F. Rakos

Dissertation Committee Member, Toni L. Bisconti

Dissertation Committee Member, Kim Neuendorf

Student’s Date of Defense: April 14, 2015
Acknowledgments

This dissertation could not have been completed without the help of many people. First, I would like to express wholehearted thanks to my academic advisor, Dr. Conor M’Lennan, who offered constant support and advice on this project. It is because of his encouragement and the time he devoted to this and other projects that I am achieving this goal that I began nine years ago. I thank my dissertation committee members, including Dr. Katherine Judge, Dr. Richard Rakos, Dr. Kim Neuendorf, and Dr. Toni Bisconti, for their support and inspiration over the past few years as I developed my research idea into a completed study. I would also like to thank several brilliant members of Language Research Laboratory. First of all, I need to thank Sara Incera for her assistance with computer mouse tracking and the statistical analyses. Thanks to my undergraduate research assistant, Leslie McCrae, who devoted many hours to running participants and preparing the data for analysis. Thanks to Sam Tuft for always being there with an answer to questions related to this project. A special thank you to Dr. Maura Krestar for leading the way. Their support and friendship was so valuable as I navigated this process.

I am extremely grateful to the Office of Research at Cleveland State University for the Dissertation Research Award, which allowed me to pay participants, purchase a computer, and attend a national conference. Also, to Ann Hull with The Hull Institute who worked tirelessly over the last year to recruit participants for this study. Thanks also to staff at the Cleveland Center for Eating Disorders for allowing me to hang flyers and use office space to collect data.

I would like to acknowledge all of the women who participated in this dissertation research study, especially the 51 females with an eating disorder. These women were all very gracious, intelligent and interested in this research study. Many of them took the time after debriefing and offered personal life experiences, along with their thoughts and concerns about
eating disorders. I am grateful to each and every one of them for volunteering to take the time to be part of this important research study.

Finally, I would like to acknowledge my family. To Nathan, Kelly and Matthew, thank you for your patience and love during this long process. I hope you will always set your goals high and reach your dreams. To my husband, Carlos, who was always there to offer confidence and support when I needed it the most.
ATTENTIONAL BIAS TO BODY-RELATED STIMULI IN YOUNGER AND MIDDLE-AGED FEMALES: THE ROLE OF EATING DISORDERS AND THIN IDEAL PRIMING

TERESA A. MARKIS

ABSTRACT

Research has shown individuals with an eating disorder selectively attend to stimuli related to their concerns, and this attentional component might be one way in which eating disorders are maintained. Research using a variant of the Stroop task has demonstrated that women with an eating disorder have a stronger Stroop interference effect for words related to body shape than controls. The conclusion is individuals with an eating disorder have an information processing bias for stimuli related to their disorder, and thus slower responses. A main objective of this study was to investigate this effect in both younger and middle age females. In Experiment 1, younger and middle age females with an eating disorder were compared with females without an eating disorder. In Experiment 2, younger and middle age females who had been exposed to thin media images were compared with females exposed to control images. The predictions were reflected through the color naming of body related words in a variation of the Stroop task. Computer mouse tracking was used to examine processing in both experiments. I predicted participants with an eating disorder (Experiment 1) or those exposed to the thin ideal prime (Experiment 2) would be more distracted by the presence of body related words relative to the controls. In both experiments, the middle age participants took longer to complete the task than the younger participants. In Experiment 1, age differences interacted with the eating disorder, a new finding with important implications. The RT data from the priming manipulation in Experiment 2 suggested that the thin prime facilitated responses to the body related words, opposite from the predictions. However, when examining the raw trajectory data using mouse
tracking, age differences and interactions with prime began to emerge. The results showed, when looking at the role of an eating disorder in Experiment 1, middle age females with an eating disorder exhibited large attentional deficits. In Experiment 2, when examining the role of thin priming, the attentional deficits were more evident in younger females. Theoretical and methodological contributions to the literature investigating attentional bias to body related stimuli is discussed.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT</td>
<td>v</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>ix</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>x</td>
</tr>
<tr>
<td>CHAPTER</td>
<td></td>
</tr>
<tr>
<td>I. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>BODY IMAGE DISSATISFACTION</td>
<td>3</td>
</tr>
<tr>
<td>BODY IMAGE DISSATISFACTION IN MIDDLE AGE</td>
<td>7</td>
</tr>
<tr>
<td>BODY IMAGE DISSATISFACTION IN EATING DISORDERS</td>
<td>10</td>
</tr>
<tr>
<td>MEDIA INFLUENCE ON BODY IMAGE</td>
<td>11</td>
</tr>
<tr>
<td>COGNITIVE-BEHAVIORAL PERSPECTIVE</td>
<td>13</td>
</tr>
<tr>
<td>WORD STIMULI</td>
<td>15</td>
</tr>
<tr>
<td>THE STROOP TASK</td>
<td>16</td>
</tr>
<tr>
<td>COMPUTER MOUSE TRACKING</td>
<td>19</td>
</tr>
<tr>
<td>RESEARCH PURPOSE</td>
<td>22</td>
</tr>
<tr>
<td>PREDICTIONS FOR THE PRESENT STUDY</td>
<td>22</td>
</tr>
<tr>
<td>SPECIFIC HYPOTHESES</td>
<td>23</td>
</tr>
<tr>
<td>EXPERIMENT 1</td>
<td>24</td>
</tr>
<tr>
<td>EXPERIMENT 2</td>
<td>27</td>
</tr>
<tr>
<td>II. EXPERIMENT 1 METHOD</td>
<td>30</td>
</tr>
<tr>
<td>PARTICIPANTS</td>
<td>31</td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Means (SD) age, grade level, and race for Experiment 1</td>
<td>37</td>
</tr>
<tr>
<td>2. Mean RTs for Experiment 1</td>
<td>39</td>
</tr>
<tr>
<td>3. Mean initiation times for Experiment 1</td>
<td>40</td>
</tr>
<tr>
<td>4. Mean AUCs for Experiment 1</td>
<td>41</td>
</tr>
<tr>
<td>5. Means (SD) self-report EDI, Ethnic Identity, BDI, STAI for Experiment 1</td>
<td>43</td>
</tr>
<tr>
<td>6. Mean ( x )-coordinates for each time bin for Experiment 1</td>
<td>45</td>
</tr>
<tr>
<td>7. Means (SD) age, grade level, and race for Experiment 2</td>
<td>56</td>
</tr>
<tr>
<td>8. Mean RTs for Experiment 2</td>
<td>58</td>
</tr>
<tr>
<td>9. Mean initiation times for Experiment 2</td>
<td>59</td>
</tr>
<tr>
<td>10. Mean AUCs for Experiment 2</td>
<td>60</td>
</tr>
<tr>
<td>11. Means (SD) EDI, Ethnic Identity, BDI, STAI, and BMI for Experiment 2</td>
<td>62</td>
</tr>
<tr>
<td>12. Mean ( x )-coordinates for each time bin for Experiment 2</td>
<td>64</td>
</tr>
</tbody>
</table>
LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mean $x$-coordinates for participants’ response trajectories over time for Experiment 1</td>
<td>45</td>
</tr>
<tr>
<td>2. Mean $x$-coordinates for younger adults compared to middle age adults for Experiment 1</td>
<td>46</td>
</tr>
<tr>
<td>3. Mean $x$-coordinates over time by age for younger and middle age adults for Experiment 1</td>
<td>46</td>
</tr>
<tr>
<td>4. Mean $x$-coordinates for participants’ response trajectories over time for Experiment 2</td>
<td>65</td>
</tr>
<tr>
<td>5. Mean $x$-coordinates for younger adults compared to middle age adults for Experiment 2</td>
<td>65</td>
</tr>
<tr>
<td>6. Mean response trajectories ($x$-coordinates over time) to fat words for younger and middle age adults in the control group</td>
<td>66</td>
</tr>
<tr>
<td>7. Mean response trajectories ($x$-coordinates over time) to neutral words for younger and middle age adults in the control group</td>
<td>66</td>
</tr>
<tr>
<td>8. Mean response trajectories ($x$-coordinates over time) to thin words for younger and middle age adults in the control group</td>
<td>66</td>
</tr>
<tr>
<td>9. Mean response trajectories ($x$-coordinates over time) to fat words for younger and middle age adults in the thin ideal prime group</td>
<td>67</td>
</tr>
<tr>
<td>10. Mean response trajectories ($x$-coordinates over time) to neutral words for younger and middle age adults in the thin ideal prime group</td>
<td>67</td>
</tr>
</tbody>
</table>
11. Mean response trajectories (x-coordinates over time) to thin words for younger and middle age adults in the thin ideal prime group.................67
CHAPTER I

INTRODUCTION

Body dissatisfaction and eating disorders are common among women and have increased over the past several decades (Stice, 2002). Body dissatisfaction seems to remain stable across the life span, and eating disorders can occur in teens, young adults, middle age, and even into old age. The mass media provide a vast source of information, reaching large audiences through broadcast (e.g., television and films), news (e.g., magazines and newspaper), and online (e.g., websites and blogs) media. The media have been criticized for promoting an unrealistic thin body type (Harrison, 2003). These unrealistic images are linked to poor body image in women (Groez, Levine, & Murnen, 2002). Furthermore, research has revealed that individuals with an eating disorder selectively attend to stimuli (e.g., pictures and words) related to their concerns, and this attentional bias might be one way in which the disorder is maintained (Cooper & Fairburn, 1992). One specific area adapted from cognitive psychology involves attentional bias to body and shape stimuli in participants who are dissatisfied with their bodies and in participants with eating disorders (Dobson & Dozois, 2004).
A key methodological tool used in this area of research is a variation of the Stroop task (Stroop, 1935). The Stroop task provides a quantitative measure of information processing of stimuli related to concerns (i.e., fears or stressors) in many areas of psychopathology, including eating pathology. The Stroop task has also been used after priming. Priming is exposure to a stimulus that may influence a response. For example, after viewing pictures of thin female models, body dissatisfied females exhibit slowed processing to body-related stimuli (Johansson, Lundh, & Andersson, 2005; Markis & M'Lennan, 2011). The main objective of the present study was to bring together various research directions by answering questions regarding the perception of body-related stimuli in younger and middle age females with and without an eating disorder. In the present study, I examined whether or not exposure to a thin ideal standard would have adverse effects on younger and middle age females. The predictions were reflected through the color naming of body-related words on the emotional Stroop task. Another core objective of this research was to examine the continuous dynamics of the Stroop task using computer mouse tracking (Spivey, Grosjean, & Knoblich, 2005). Computer mouse tracking was used to examine how the predicted effects unfold over each trial, overcoming the limitations of using discrete endpoint measures used in previous research in this area (e.g., reaction time, percent correct). Through this study, I aim to evaluate the use of the mouse tracking methodology for studies of information-processing in eating (and other types of) disorders.

Most of the research on body image and eating pathology has focused on younger females; however, body dissatisfaction and eating pathology are prevalent among diverse age groups. In fact, body dissatisfaction remains quite stable across the life span,
beginning to decrease only in the 75 and older age group (McLean, Paxton, & Wertheim, 2011). Body dissatisfaction is associated with unhealthy outcomes, such as lowered self-esteem, development of negative cognitive schemas, compulsive exercising, maladaptive dieting, and eating disorders (Tiggeman, 2004; Vitousek & Hollon, 1990). According to the National Association of Anorexia Nervosa and Associated Disorders, Inc. (ANAD), diverse groups of people are susceptible to eating disorders (anorexia nervosa, bulimia, or binge eating disorder), not just white females. In the United States, nearly 24 million people of all ages and genders suffer from an eating disorder. Although up to 50 percent meet the criteria for clinical depression, and many will die from the disorder, only one in 10 receives treatment. Eating disorders have the highest mortality rates of any mental disorder (Crow, et al., 2009). Exact numbers of deaths varies between sources because often a person with an eating disorder dies from heart or other organ failure or suicide. Crude mortality rates from the *American Journal of Psychiatry* (2009) are approximately 4% for both anorexia nervosa and bulimia nervosa.

Research on eating disorders in middle age adults is limited. Indeed, to date, little is known about body image dissatisfaction and eating habits of middle age women (Allaz, Bernstein, Rouget, Marchinard, & Morabia, 1998). Consequently, research studies with middle age female participants are needed, especially those investigating the mechanisms leading to body dissatisfaction.

**Body Image Dissatisfaction**

Body image is a complex and multidimensional construct consisting of, at least, one’s thoughts, perceptions, feelings, and behaviors about one’s body. Cash and Pruzinsky (2002) describe body image as “the multifaceted psychological experience of
embodiment” (p. xv), stating that it is much more than just a picture of one’s body formed in one’s own mind. Even though the construct of body image is not new, the concept is difficult to define. There are numerous definitions, and it has meant different things to different scientists and practitioners, including weight or shape satisfaction and appearance evaluation (Cash & Pruzinsky, 2002). In today’s Western society, the major focus of body image is on body appearance, specifically body shape and weight (Tiggemann, 2004). Physical attractiveness in contemporary Western society emphasizes the desirability of being thin. In addition, the thin ideal is repeatedly promoted by the mass media. Women are aware of, and often accept, that female beauty equals the thin ideal standard, even though the ideal may be unnatural, unhealthy, and unattainable for most women (Glauert, Rhodes, Fink, & Grammer, 2010). The sociocultural perspective that what is valued by the culture will be valued by the individuals within the culture is one way to explain how the thin ideal standard in society can become individual female’s body ideal. It is well known that a large discrepancy exists between the female ideal body and the body and shape of the majority of women (Cash & Pruzinsky, 2002; Glauert et al., 2010; Tiggemann, 2004). When comparisons are made between this ideal body standard and a female’s perception of her own body, apparent discrepancies can lead to body image dissatisfaction.

Body image dissatisfaction is described as a person’s negative perceptions of his or her own body and can be transmitted through many sources including culture, family, media, and personality factors, among others (Cash & Pruzinsky, 2002). Numerous research studies have found significant dissatisfaction with body shape and weight with females (see Littleton, 2008; Tiggemann, 2004). Furthermore, survey research from
three large studies with women found that body dissatisfaction for appearance was 23% overall in the year 1972, 38% in 1985, and 56% in 1996 (Berscheid, Walster, and Bohnstedt, 1973; Cash, Winstead, and Janda, 1986; Garner, 1997). Results of these studies indicate that overall body dissatisfaction has increased over the last several decades, a trend that is expected to continue. Body image dissatisfaction is thought to be so common, described by Rodin, Silberstein, and Striegel-Moore (1985) as a state of “normal discontent” for women (see also Littleton, 2008).

Female body perception can be evaluated in several ways. Using a medical indicator, the Body Mass Index (BMI) is a measure of body shape based on an individual’s height and weight. BMI is used to determine how much one’s body shape differs from what is normal for one’s height. It is also used to define when one is obese and overweight. Important to this study, research has found that BMI is related to body dissatisfaction. Schwartz and Brownell (2004) found that in modern Western culture where thinness is emphasized and excessive weight is disparaged, as BMI increased, body dissatisfaction also increased. Identified several risk factors for body dissatisfaction, including the degree and age of onset of excess weight, being female, internalization of body ideals, and race (Schwartz & Brownell, 2004).

A second way to evaluate body image perception is through social comparison. Social comparison theory (Festinger, 1954) proposes that individuals are driven to evaluate themselves by searching out standards to which they can compare themselves. By comparing themselves to others, individuals learn how to define the self. Festinger’s (1954) theory differentiates two types of social comparisons; upward social comparisons are made with someone believed to be better than oneself and can lead to negative
consequences, such as decreased self-esteem, and downward social comparisons made with someone believed to worse off can lead to positive consequences, such as increased self-esteem. Myers and Crowther (2009) showed in a meta-analytic review of 156 studies that social comparison is related to higher levels of body dissatisfaction. Importantly, two of the key ideas in social comparison theory do not exactly hold for women evaluating their own bodies; namely, women tend to compare themselves to similar others, and women have great difficulty stopping the comparisons even if the comparisons are damaging to one’s self image (Festinger, 1954). When using social comparison to evaluate body ideals, most females compare themselves to unrealistic, thin media images and will continue to do so with the awareness that these images may be unnatural, unattainable, and detrimental to self-esteem (Hamilton, Mintz, & Kashubeck-West, 2007; Myers & Crowther, 2009). Social comparison is one of the main ways females get information regarding body ideals and physical attractiveness. Research supports the notion that making upward, appearance-focused comparisons results in increased body dissatisfaction. Moreover, research has continually shown that exposure to thin media images is linked to higher levels of body dissatisfaction (Groesz, Levine, & Murnen, 2002; Hamilton et al., 2007).

While body image is multifaceted in Western society, the focus is mostly on body appearance (Cash & Pruzinsky, 2002). The ideal body image is unnaturally thin and is equated with female beauty. Body appearance is assumed to be controllable by the female, even though a large discrepancy exists between the ideal and the body size of real women (Tiggeman, 2004). Media promote the thin ideal body and reach large audiences (Hamilton et al., 2007). Body image dissatisfaction has been recognized as a “norm” for
many women (Littleton, 2008). Body image dissatisfaction is of particular concern, given that a disturbance in the perception of body image is an essential feature of eating disorders (DSM-5). The evaluative part of body image (e.g., body dissatisfaction) has been identified as one of the strongest risk (and maintenance) factors for eating disorders among females (Slevec & Tiggemann, 2011; Stice, 2002).

**Body Image Dissatisfaction in Middle Age**

Even though most research on body image dissatisfaction and disordered eating has focused on younger adults, research has found that body dissatisfaction remains quite stable across the adult life span into middle age (Tiggemann, 2004). In addition to younger females, middle age females commonly report body dissatisfaction, which is associated with dieting and the development of disordered eating attitudes and behaviors (Webster & Tiggeman, 2003). With each passing year, the female body is likely to develop further away from the thin and youthful body ideal (Algars et al., 2009). Age-related changes are a natural and normal part of the aging process. With age, females lose lean tissue (muscles and organs), and these muscles and organs lose cells (Andres, 1989). Body fat increases and fat tissue build up around the center of the body (e.g., the middle age spread). Body fat may rise by as much as 30% beginning after age 30 (Algars et al., 2009). Loss of balance and the chance of falls become more likely as changes in body shape, leg muscles, and joints occur. These changes make it harder to move around and get exercise. Loss of height is common with age. After age 40, females can lose up to half an inch of height each year due to age changes in bones, muscles, and joints (Algars et al., 2009; Andres, 1989). Along with changes in body shape, females lose skin elasticity, develop wrinkles, and experience graying and thinning of hair (Tiggeman,
Lifestyle choices can slow or speed the process, but most body shape changes cannot be avoided.

There are several key reasons these age-related changes are particularly problematic for women. Unlike other aspects of the female body (e.g., height and eye color), women are held responsible for their body shape and weight as though these are completely controllable (Tiggemann, 2004). Overweight and out of shape females are often judged in society as less attractive, less competent, lazy, and unorganized (Tiggemann & Rothblum, 1997). Such women are also discriminated against and blamed for their overweight condition (Grover, Keel, & Mitchell, 2002). In addition, women gain status and value through physical appearance, whereby the effects of aging on older women is judged much more harshly than similar effects on older men (Ferraro et al., 2008). Wilcox (1997) described this as a “double standard of aging.” Losses of societal notions of physical attractiveness due to normal aging make women more susceptible to negative stereotypes, body image dissatisfaction, and disordered eating. This negative stereotype does not appear to exist for men (Wilcox, 1997; Ferraro et al., 2008). In fact, the opposite seems to be true for men in that the stereotypes for older men are much more positive (i.e., they are more intelligent or wise) (Ferraro et al., 2008).

In a review of body image across the adult life span, Tiggemann (2004) concluded the following three things about aging and body image. 1) With age come changes in body shape and appearance. 2) Body dissatisfaction remains relatively stable across the life span. 3) Body image appearance becomes less important with age. According to Tiggemann (2004), with age as the body deteriorates, women remain equally dissatisfied with their bodies, but it matters less to them. Importance of body appearance decreases
with age. These two processes, increasing body changes and dissatisfaction and decrease importance of appearance, produce stable levels of body dissatisfaction in middle age. Teasing out these processes is necessary for understanding of body image in middle age. Tiggemann (2004) expressed the importance of distinguishing between evaluation of the body and importance of the body. Cash (2002) in a large-scale research study, had previously shown this decrease in importance over the life span. Webster and Tiggemann (2003) suggested that older adults have more “cognitive control” over body issues than younger adults. These authors concluded that the cognitive control strategies of older women are sometimes used to protect self-concept and self-esteem from the influence of body dissatisfaction. Body image and body dissatisfaction in middle adulthood are currently poorly understood and the research is somewhat mixed. For example, Wilcox (1997) found no age differences on body feelings, whereas Davison and McCabe (2006) found older adults had a much lower concern about body attitudes. Lewis and Cachelin (2010), using the Eating Disorder Inventory (EDI, Garner, Olmstead, & Polivy, 1983), found that middle age women scored high on the drive for thinness subscale. These authors also found a significant relationship between fears of aging and disordered eating. Despite the mixed research, body image dissatisfaction is commonly reported among middle age females (Tiggemann & Lynch, 2001; Webster & Tiggemann, 2003), is related to dieting (Midlarsky & Nitsburg, 2008), body image perception (Allaz, Bernstein, Roget, Archinard, & Morabia, 1998; McKinley, 1999; Rand & Wright, 2000), satisfaction with physical appearance (Cash, 2002; Rand & Wright, 2000), and disordered eating attitudes and behaviors (Fornari, Kent, Kabo, & Goodman, 1994; McLean, Paxton, & Wertheim, 2009).
In general, body dissatisfaction persists into midlife and beyond (Tiggemann, 2004). The response to body dissatisfaction is dieting or disordered eating (DSM-5). Research on body image dissatisfaction and disordered eating in middle age has been largely neglected, though clearly important as it relates to adult functioning. Many of the issues mentioned previously consider only females without an eating disorder. Furthermore, much of the research with older samples is survey-based. Empirical research studies concerning body image with older samples are relevant and necessary (Ferraro et al., 2008).

The motivation to use a middle age sample, both with and without an eating disorder, in the current study is to investigate these concerns. With both self-report and experimental measures, the results of the current study will provide new data regarding body dissatisfaction in middle age, including, for example, whether body image becomes more or less important. Consequently, the current study is expected to lead to a better understanding of body image in middle age for women with and without an eating disorder.

**Body Image Dissatisfaction in Eating Disorders**

According to the DSM-5, body image dissatisfaction is of particular concern, given that a disturbance in the perception of body image is an essential feature of an eating disorder. Eating disorders are characterized by disturbances in eating behavior, refusal to maintain a body weight within normal limits (as in Anorexia Nervosa), and frequent episodes of binge eating followed by self-induced vomiting, use of laxatives, fasting, or excessive exercise (as in Bulimia Nervosa). Although clinical eating disorders are more typical in younger females, clinical eating disorders also occur in midlife
(Lapid, et al., 2010; Mangweth-Matzek, et al., 2006). In a community study of nearly 500 older women, Mangweth-Matzek et al. (2006) found 60% had body dissatisfaction, 80% controlled their weight with dieting, and 3.8% met the criteria for eating disorders. Until recently, a diagnosis would have been missed for middle age adults using the DSM-4 diagnostic criteria. Specifically, the DSM-4 diagnostic criterion requires the absence of at least three consecutive menstrual cycles. This criterion is meaningless for middle age females because of the irregularity and absence of a regular cycle associated with menopause. With good reason, the DSM-5 recently eliminated this requirement (American Psychiatric Association, 2013).

**Media Influence on Body Image**

Exposure to media images of thin women can lead to body image dissatisfaction in younger women (Yamimiya, Cash, Melnyk, Posavac, & Posavac, 2005). Pinhas, Toner, Ali, Garfinkel, and Stuckless (1998) examined the effect that the ideal of female beauty has on mood and body satisfaction. These researchers found that women who are exposed to thin images experience greater body dissatisfaction and depressed mood than women exposed to images that contained no pictures of people. Furthermore, numerous studies have examined the effect of thin ideal media on body image satisfaction and have found similar results (see Carney & Louw, 2006; Groesz et al. 2001; Posavac, Posavac, & Posavac, 1998). Because contemporary media images of ideal female attractiveness are exaggerated (e.g., removal of imperfections via airbrushing and photoshopping) and emphasize thinness, women are very likely to see a difference between their bodies and that of the media standard when comparing their bodies to those of fashion models (Posavac et al., 1998). Additionally, media influences are typically considered to be an
important source from which body image attitudes originate (Cafri, Yamamiya, Brannick, & Thompson, 2005). Younger women look to society’s standards of female beauty to form their own personal ideal for physical attractiveness (Polivy, Garner, & Garfinkel, 1986).

Noteably, not all women will respond to thin ideal media in the same way. For instance, Fujioka, Ryan, Agle, Legaspi, and Toohey (2009) found racial differences in the perception of thin media image depending on the individual’s ethnic identity. These researchers found that self-report appeal of women in the media lead to greater importance of thinness in both Black and White women, but greater fear of becoming fat in White women only. Examining these differences is not a major goal of the present study; however, ethnic identity will be measured, along with levels of anxiety and depression, as these variables may relate to Stroop processing.

As with younger people, the female body ideal in the media (e.g., the impossible to achieve thin ideal) is accepted by most middle age women. Two studies looked at this pressure to be thin and its impact on middle age women. These studies found the influence transmitted by the media was associated with body dissatisfaction and disordered eating (Green & Pritchard, 2003; Midlarsky & Nitzburg, 2008). Green and Pritchard (2003) investigated predictors of body dissatisfaction and found the media were a significant factor related to body image dissatisfaction in middle age women, similar to that on younger women. Midlarsky and Nitsburg (2008) surveyed women between the ages of 45 and 60 and found as much body image dissatisfaction and sociocultural pressure to be thin as reported with younger females. These factors were significantly associated with eating pathology.
The media’s role in body dissatisfaction could become a vicious cycle if after the development of an initial dissatisfaction, patients with an eating disorder increase their attention to exactly the types of stimuli that led to the dissatisfaction in the first place. Research using cognitive theories of eating disorders has found that biased information processing in favor of dysfunctional attitudes about body appearance plays an important role in the development and maintenance of eating disorders (Johansson, Ghaderi, & Andersson, 2005). Cooper and colleagues (1992) investigated selective processing of weight and shape related words in patients with eating disorders and found that patients selectively attend to stimuli related to their concerns, and that this attentional component might be one way in which eating disorders are maintained. In theory, media exposure and the consequent body dissatisfaction could increase the risk for eating disorder pathology in both younger and middle age females.

**Cognitive-Behavioral Perspective**

A full account of a cognitive-behavioral perspective of body image is beyond the scope of the present study; however, this perspective deserves mention, given that cognitive factors seem to play a central role in the meaning of body shape and weight in individuals with eating disorders (Cash, 2004; Vitousek & Hollon, 1990). A cognitive-behavioral viewpoint reflects no single theory, but draws from various ideas and many empirical research studies. These theories differ in many aspects, but for individuals with an eating disorder, cognitive theory proposes several important principles. First, personal value is determined by body shape. Second, body weight has meaning, and regulation of weight serves an important function in their lives. Third, individuals with an eating disorder develop organized patterns of thought (schemas) around issues of weight and
how it applies to the self and behavior (Vitousek & Hollon, 1990). Fourth, self-schemas influence perceptions, attributions, expectations, and memories, leading to biases. Finally, the operation of these self-schemas can account for the persistence of eating-disorder symptoms (Vitousek & Hollon, 1990). In Cash’s (2004) cognitive-behavioral model of body image, he suggests socialization, personality, interpersonal experiences, and physical characteristic (e.g., BMI) are associated with body image schemas and attitudes that then can be associated with emotion, thoughts, interpretations, appearance-schematic processing, and behavior. In other words, a cognitive perspective suggests the existence of a schema in a given domain tends to produce biased processing of information relevant to that domain (Labarge, Cash, & Brown, 1998; Vitousek & Hollon, 1990).

Applying a cognitive-behavioral perspective to the present research study, specific situations, cues, or context can activate a self-schemas and influence processing of information about one’s physical appearance. Individuals with an appearance schema, as in someone with an eating disorder, someone high in body dissatisfaction, or someone primed by the thin ideal, would pay more attention to information relevant to the body and appearance (Cash & Pruzinsky, 2002). The self-schema will draw an individual’s attention to body shape- and weight-related stimuli (Williamson, Stewart, White, & York-Crowe, 2002). Research has supported this perspective with many studies conducted over the last several decades and has established that these cognitive biases are not limited to individuals with an eating disorder, but also affect non-clinical individuals who are preoccupied with body size and shape (Williamson et al., 2002).
The selective processing for body image in individuals with an eating disorder has been measured by a variation of the Stroop task (Stroop, 1935), discussed in greater detail below, which has been adapted to provide a measure of selective processing for body image related words in individuals with an eating disorder. Using the Stroop task, the present study aims to examine how eating disorders and thin ideal priming affect the processing of body-related stimuli in younger and middle age females. As a practical application, this cognitive-behavioral approach could be used to identify maladaptive cognitions (and behaviors) in individuals with body dissatisfaction (Cassin et al., 2008). Early intervention may be possible since the development of appearance self-schemas leads to biased processing of body-related information about the self and may signify the presence of an eating disorder (Cash & Pruzinsky, 2002).

**Word Stimuli**

An important concern with Stroop studies is the consistency of the design. Some researchers have suspected that discrepancies in the findings are rooted in the lack of consistency in the design of each study, the administration of the task, and importantly, the choice of word stimuli (Lee & Shafron, 2004). There exists a mix of research findings depending on which disorder (i.e., individuals with anorexia nervosa or bulimia) and what type of words were used in the study (body, food, weight, etc.). These variations are associated with the differences in color naming performance (see Ben-Tovim, Walker, Fok & Yap, 1989; Channon, Hemsley, & de Silva, 1988). Cassin and von Ranson (2005) addressed these issues by developing standardized word lists for testing attentional biases in eating disorders. Based on the cognitive theory of eating disorders (Vitousek & Hollon, 1990), as females develop self-schemas around body
weight and shape, these females may selectively process schema-congruent stimuli (e.g., ‘fat’ words) and avoid schema-incongruent stimuli (e.g., ‘thin’ words) (Cassin, von Ranson, & Whiteford, 2008). These authors developed a standard set of ‘fat’ and ‘thin’ words matched on number of letters, number of syllables per word, frequency, familiarity and valence. The aim of developing standardized word lists is to improve upon the methodological limitations in previous studies and to allow greater precision in future studies for interpretation of the results (Cassin & von Ranson, 2005). Cassin and von Ranson recommend continued research to develop further homogeneous target word lists that can be used across studies, as well as the development of homogeneous control stimuli. Consistent with their suggestion, Cassin and von Ranson’s (2005) word lists were used in the current research study.

The Stroop Task

The classic Stroop task (Stroop, 1935) was developed to study the interference effect of color stimuli on reading words. In the traditional Stroop task, the words red, blue, green, brown, and purple are presented to participants. The color words are not printed in the colors they name, but are printed in each of the other four colors (e.g., the word red is printed in blue, green, brown, and purple font), allowing the words and colors to be presented simultaneously. When the word blue is printed in green ink and the correct response is ‘green’, participants find it hard to inhibit their automatic reading response (in this case, incorrectly responding ‘blue’), and the result is slowed processing and increased errors. This phenomenon is called the Stroop Effect. One of the original conclusions from this classic study was the association between word stimuli and the
automatic reading response is stronger than the association between color stimuli and the color naming response (Stroop, 1935).

Klein (1964) was the first to extend the Stroop task by attempting to find a Stroop-like effect in terms other than color words. He found that attention-catching words cause more color naming interference than neutral words. Many studies examining this effect for emotional words followed, and it is now generally recognized that color-naming performance is delayed for words related to one’s feelings of threat, fear, and emotional concern (Dyer, 1973; Mathews & Sebastian, 1993).

Research using a variation of the Stroop task has repeatedly demonstrated that women with eating disorders are slower than controls to name the color of words related to eating, weight, and shape (Channon, Hemsley, & De Silva, 1988; Cooper & Fairburn, 1992; Davidson & Wright, 2002). Typically, these studies compare a group of individuals with an eating disorder (experimental) to a group of individuals without an eating disorder (control). Reaction times (RTs) for color naming of food, body, and shape words (e.g., CAKE, THIGH, and FAT) are compared with color naming of neutral words (e.g., BOOK). The interference effect, faster RTs to neutral words compared to food, body, or shape words, is equivalent to the information processing found in other emotional disorders. Cognitive theories suggest that this effect is equivalent to the information processing found in other emotional disorders (such as depression and anxiety). Individuals with these disorders seem to share an attentional bias and preoccupation with stimuli that represent a fear or current concern (Williams, Mathews, & MacLeod, 1996). Individuals with an eating disorder demonstrate biased information-processing for stimuli related to food and body shape, and thus, delayed color-naming
performance (Johansson et al., 2004). A comprehensive literature search reveals that the Stroop interference effect has not been investigated in a middle age sample of females with an eating disorder. Therefore, this research study will extend previous research in this area by investigating the effect in a sample of this age group.

Moreover, several research studies have found a Stroop-like effect in normal controls. Ray (1979) found that students high in text anxiety were slower to color name words related to test taking compared to neutral words. In another study, individuals who were presented with difficult or insolvable anagrams showed more interference for threat-related words (Mogg, Mathews, Bird, & MacGregor-Morris, 1990). Furthermore, Lundh and Czyzykow-Czarnocka (2001) examined the effect of unconsciously priming a fear or threat on Stroop performance. These authors administered a questionnaire designed to measure separation fears, and then found Stroop interference for separation-related words. Johansson and colleagues (2004) found that after viewing images depicting the thin ideal in the media, participants high in body dissatisfaction were slower to color name negative self-words. Markis and M’Lennan (2011) found that after exposure to thin ideal images, Stroop performance was related to level of body dissatisfaction. Building upon previous work, in the present study, I examined if an eating disorder or exposure to thin media images would lead to the slower processing on the Stroop task for younger and middle age females.

It is important to note when using an older sample that researchers have demonstrated that the age-related increase in Stroop interference reflects general slowing (Salthouse, 1996). As a measure of processing speed, the Stroop task lends itself well to the study of the mechanisms of cognitive aging and prominent cognitive aging theories,
such as general slowing theory. General slowing (Salthouse, 1996) suggested that the fundamental mechanism that accounts for age-related variance in performance is a decrease in speed of processing. The general slowing theory further proposed that the effects of slowed processing speed are global and have an impact on all aspects of cognition. I expect some of the age-differences predicted in the current study will be related to general slowing theory. Crucially, because I will be able to compare middle age participants with an eating disorder to middle age participants without an eating disorder (Experiment 1), and middle age participants exposed to the thin ideal prime to middle age participants exposed to a control prime, I will be able to determine if there are effects above and beyond normal age-related slowing.

**Computer Mouse Tracking**

Freeman and Ambady (2010) introduced MouseTracker, computer software that allows researchers to examine real-time processing in psychological tasks using the computer mouse tracking method. The behavioral assessments (e.g., RT and percent correct, PC) that researchers are currently using, noting the outcome data from a modified Stroop task, give only the end point of information processing. Inferences must be made concerning cognitive processes. It is even more problematic to assess how one processes information in real time (i.e., over the course of the trial). The attentional phenomena occur rapidly; therefore, a continuous measure with substantial temporal resolution is needed (Freeman & Ambady, 2010). Although brain imaging methods and eye tracking are not readily available in all laboratories, almost all researchers have access to a computer and a computer mouse, making mouse tracking a very practical and useful method. The underlying principle of mouse tracking stems from the idea that the motion
of the hand can reveal the time course of cognitive and perceptual processing, and the corresponding supporting evidence (see e.g., Song & Nakayama, 2006; Song & Nakayama, 2008). MouseTracker, a free software program, computes the mouse trajectory as a participant makes a choice between alternative responses. Data are sampled 60-75 times/second and provide data for the continuous movement of the computer mouse. Mouse tracking was originally used to study spoken word recognition (Spivey, Grosjean, & Knoblich, 2005). The streaming x-, y-coordinates on the computer screen of the computer mouse is recorded to facilitate understanding of the real-time processing of the spoken word (Spivey et al., 2005).

For the purpose of extending research on information processing in eating (and other) disorders, mouse tracking can be used in the visual or spoken recognition of an emotional word. Along with numerous variations that could be created, analysis of the mouse trajectory to the target - and the expected deviations from the idealized response trajectory (a straight line) - could reveal attraction or attentional bias to the fat stimulus. Applying mouse tracking to the present research study, its use was intended to extend our understanding of attentional bias in eating disorders.

In two experiments, participants performed a Stroop task to three types of words stimuli (fat, thin, and neutral). For instance, participants see the word OBESE written in blue font in the middle of the computer screen, followed by four response options: green, red, yellow, and blue (the correct response) in the top left and top right corners of the computer screen. As participants begin moving the mouse to the target (the correct response), MouseTracker is measuring the x-, y-coordinates of the computer mouse about every 13–16 ms. Examinations of the trajectory data reveal where the participants’ hand
is headed over the entire trial. Changes in direction, early and late courses, and RT and PC endpoints can all be examined. Area under the curve (AUC) from the idealized response trajectory was used as the measure of spatial attraction to examine the Stroop effect. Spatial attraction toward the correct and incorrect responses was measured by examining the \( x \)-coordinates of the participants’ mouse movements. Velocity (speed in a direction over time) can also track the time course of mouse movements as participants decide between response alternatives.

Examining trajectory data reveals where the participants’ hand (“cognitive processing”) is headed throughout each trial. These data were intended to supplement what we have learned so far from the Stroop effects. Mouse tracking allows examinations of mouse trajectories during online competition between response options. Specifically, as cognitive schema theory suggests, individuals with an eating disorder attend differently to ‘fat’ and ‘thin’ stimuli (Vitousek & Hollon, 1990). A ‘fat’ stimulus may be attended to differently than a ‘thin’ stimulus (i.e., a ‘fat’ stimulus is attended to more so than a control stimulus, and a ‘thin’ stimulus is avoided, relative to a control stimulus). Viewing the varying trajectory data for ‘fat,’ ‘thin,’ and ‘neutral’ stimuli over the entire trial may reveal the underlying progression of the attentional process. These data expose answers to questions regarding the processing of different word stimuli, but also questions regarding processing differences at the beginning, middle, and ends of the trials. With numerous ways to present and analyze the data (see e.g., Freeman & Ambady, 2010), mouse tracking will supply a look into processing over the trial, previously missing in RT and PC data.
Research Purpose

A main objective of the present research study was to answer questions regarding the perception of body-related stimuli in younger and middle age females with and without an eating disorder. Two experiments were conducted comparing four groups of females: younger (age 18-30) and middle age (age 40-65) females diagnosed with an eating disorder (Experiment 1); and younger and middle age females without an eating disorder (Experiment 2). Experiment 1 examined the effect of an eating disorder; Experiment 2 examined the effect of thin ideal priming on the color naming of body-related words on the emotional Stroop task. Computer mouse tracking was used for the Stroop task in both experiments to examine continuous processing during each trial. In the present study, I tested whether or not the attentional bias to body-related stimuli found in younger females with an eating disorder extends to middle age females. Additionally, in the present study, I was investigating if exposure to the thin ideal standard has a Stroop interference effect on both younger and middle age females.

Predictions for the Present Study

In Experiment 1, I predicted that all females with an eating disorder would be more distracted by the fat and thin body words relative to the neutral words. Research has repeatedly demonstrated that women with an eating disorder take longer than controls to color name words related to body shape and weight (see Cooper & Fairburn, 1992; Dobson & Dozois, 2004). This distraction was expected to lead to less efficient processing of body image related words. The effect was expected to be stronger in middle age due to aging (e.g., normal age-related body changes; fear and anxiety related to aging) and disorder duration. Processing to fat words was predicted to differ from thin

In Experiment 2, I predicted females without an eating disordered primed by the thin ideal would be more distracted by the presence of body words relative to the control prime group, leading to less efficient processing of body image related words. The effect was expected to be larger in younger females relative to the middle age females due to social comparison with thin ideal media, in line with a social comparison theory (Festinger, 1954).

In both experiments, I used computer mouse tracking to examine whether an eating disorder or prime affects early or late stages of processing as the data are collected throughout the trial. To my knowledge, this is the first body image study examining how the Stroop effect unfolds over time (i.e., over the course of each trial). In theory, the effect may manifest early, late, or continue to have an effect throughout the entire time-course of processing (see e.g., Incera, Markis, & McLennan, 2013). Supplementing the Stroop task with computer mouse tracking was expected to reveal new information about attentional bias after priming and in participants with eating disorders.

**Specific Hypotheses**

All of the predictions for the present study concern four dependent variables that all move in a set direction and indicate efficiency of processing. The dependent variables are RT, PC, MD, and AUC. Efficient processing in a traditional Stroop task would be faster RTs, inferring less distraction and interference, higher PC (i.e., fewer errors), smaller MD and AUC, again, inferring less distraction and interference. In the present study, when less efficient processing is predicted, I am referring to these dependent
variables (e.g., RT, PC, MD, and AUC) and am indicating interference and attentional bias (e.g., moving away from efficient processing). In other words, less efficient processing means longer RTs, smaller PCs, greater MD and greater AUC.

**Experiment 1.**

**Hypothesis 1.1.** Participants’ efficiency of processing for the three word types is expected to differ significantly. Specifically, I predict overall less efficient processing to body related words (e.g., fat and thin) relative to the neutral words (i.e., a main effect of Word Type). This prediction was made in accordance with cognitive theory (Vitousek & Hollon, 1990), which states individuals with eating disorders have enhanced processing to schema-matched stimuli (fat words), but not to schema-incongruent stimuli (thin words) (see e.g., Cassin et al., 2008).

**Hypothesis 1.2.** Overall efficiency of processing for participants in the middle age group was expected to differ significantly from overall efficiency for participants in the younger adult group (i.e., main effect of Age). In general, middle age females were expected to be more distracted and exhibit slower processing to the words due normal age-related body changes and slowed processing. This prediction is in line with the domain-general theory that older adults (e.g., middle age) have a slower processing speed than younger adults, apparent not only at the motor level, but the cognitive level as well (Salthouse, 1996).

**Hypothesis 1.3.** Overall efficiency of processing for participants with an eating disorder was expected to differ significantly relative to participants without an eating disorder (i.e., main effect of Eating Disorder). Specifically, individuals with an eating disorder were expected to exhibit significantly less efficient processing to the words than...
individuals without an eating disorder, in line with previous research on attentional bias in eating disorders (see e.g., Cooper & Fairburn, 1992; Dobson & Dozois, 2004)

**Hypothesis 1.4.** Processing of fat and thin words was expected to be less efficient compared to neutral words in the group with an eating disorder relative to the group without an eating disorder. In general, participants with an eating disorder were expected to have significantly less efficient processing to the fat, then thin, then neutral words; whereas participants without an eating disorder were expected to process the fat and thin words as they do neutral words (i.e., an Eating Disorder x Word Type interaction). I am predicting different slopes for individuals with an eating versus individuals without an eating disorder for the word types in line with the predictions in Hypotheses 1.1 and 1.3 above.

**Hypothesis 1.5.** Processing for middle age females with an eating disorder compared to the middle age females without an eating disorder was expected to be less efficient (i.e., larger slope) than the efficiency of processing in the younger females with an eating disorder compared to the younger females without an eating disorder (i.e., an Age x Eating Disorder interaction). In other words, I expect to find that eating disorder is playing a role in middle age adults above and beyond what might be accounted for due to cognitive aging (e.g., general slowing).

**Hypothesis 1.6.** Processing inefficiency of fat and thin words as compared to neutral words was expected to be greater in middle age group relative to the younger adult group. In general, middle age participants were expected to have the least efficient processing to the fat and thin words relative to the neutral words; whereas younger participants were expected to have the least efficient processing to fat words, then the
next least efficient processing to the thin words, and then neutral words (i.e., an Age x
Word Type interaction).

**Hypothesis 1.7.** Middle age females with an eating disorder were expected to exhibit the least efficient processing times to both fat and thin words relative to neutral words compared to middle age females without an eating disorder and younger adults overall. Women in the younger adult group with an eating disorder were expected to exhibit less efficient processing to the fat words and but not to the thin words relative to the neutral words and compared to younger adults without an eating disorder and middle age females overall (i.e., an Age x Eating Disorder x Word interaction). I am making this prediction based on previous research indicating the seriousness of eating disorders in midlife (Fornari et al., 1994). Naturally occurring increases in BMI, body dissatisfaction, aging anxiety, disorder duration, menopause, negative affect and comorbidity (see Midlarsky & Nitzburg, 2008; Slevec & Tiggemann, 2011) may lead to stronger schemas and attentional bias. While previous research has found that with treatment (i.e., individual no longer has an eating disorder) attentional biases fade, this prediction is based on the opposite happening, that is, the longer the disorder, the more attentional bias (Slevec & Tiggemann, 2011).

**Hypothesis 1.8.** In line with previous research, I predict a significant positive correlation between levels of body dissatisfaction (Markis & McLennan, 2011), depression, anxiety (Johansson et al., 2005), and Stroop processing for individuals with an eating disorder.
Experiment 2.

Hypothesis 2.1. Participants’ efficiency of processing for the three word types was expected to differ significantly. Specifically, I predict overall less efficient processing to body related words (e.g., fat and thin) relative to the neutral words (i.e., a main effect of Word Type).

Hypothesis 2.2. Overall efficiency of processing for participants in the younger adult group was expected to significantly differ from overall efficiency for participants in the middle age group (i.e., main effect of Age). This prediction is also in line with the domain-general theory that the middle age participants will have a slower processing speed than younger participants (Salthouse, 1996).

Hypothesis 2.3. Overall efficiency of processing for participants in the model prime group was expected to differ significantly from individuals in the control prime group (i.e., main effect of Prime). In general, younger females will be more distracted and exhibit less efficient processing due to social comparison (Festinger, 1954) and influence from thin media. Previous research has shown that appearance-related media images lead to decreased body satisfaction (Hamilton et al., 2007), and this body dissatisfaction is related to slower processing on a Stroop task (Markis & McLennan, 2011; Johansson et al., 2005).

Hypothesis 2.4. Efficiency of processing of body image related words (fat and thin words) as compared to neutral words was expected to be less efficient in thin ideal primed versus the control primed (i.e., model images compared to neutral images), a Prime x Word Type interaction. The primed group was expected to perform similar to an individual with an eating disorder and have enhanced processing to schema-matched
stimuli (fat words), but not to schema-incongruent stimuli (thin words) (see e.g., Cassin et al., 2008; Vitousek & Hollon, 1990).

**Hypothesis 2.5.** Processing for the younger females in the model prime group compared to the younger females in the control primed group was expected to be less efficient (i.e., larger slope) than the efficiency of processing for the middle age females in the model prime group compared to the middle age females in the control prime group (i.e., an Age x Prime interaction). In line with social comparison theory, individuals compare with more similar others (Festinger, 1943). I predicted the effect would be stronger for younger females primed with the thin ideal because the thin ideal in the media is a young, size 2 female (Hamilton et al., 2007). Again, if this prediction is borne out, and the younger adults are affected by the prime more than the middle age adults, then the results could not be reduced to cognitive aging (e.g., general slowing).

**Hypothesis 2.6.** Processing for younger females in the model prime condition compared to the younger females in the control prime condition was expected to be less efficient (i.e., larger slope) than the efficiency of processing in the middle age females in the model primed condition compared to the middle age females in the control condition. For instance, color-naming delays of body image related words was expected to be greater compared to neutral words in younger females versus middle age females (i.e., an Age x Word Type interaction). In general, younger females were expected to be more distracted and exhibit slower processing to the words due to social comparison (Festinger, 1954) and influence from thin media (see e.g., Hamilton et al., 2007).

**Hypothesis 2.7.** Efficiency of processing of body image related words compared to the neutral words for younger females was expected to be less efficient in model prime
versus control prime compared to middle age women in both priming conditions. In other words, I expected the degree to which participants would devote additional attentional resources to body words would decrease as age increased, and I further expected this relationship would be modulated by prime type, such that the effect is more robust in participants who recently viewed thin models with ideal bodies (i.e., a three-way Prime x Age x Word Type interaction).

**Hypothesis 2.8.** In line with previous research (Johansson et al., 2005; Markis & M’Lennan, 2011), I predict a significant positive correlation between body dissatisfaction, depression, anxiety, BMI and the body effect (body words minus the neutral words) for individuals high in body dissatisfaction in the model prime condition.
CHAPTER II

EXPERIMENT 1 METHOD

I used a variation of the Stroop task and computer mouse tracking to investigate the effects of an eating disorder on processing of body image related words in younger and middle age adults. In line with cognitive theory, I predicted all females with an eating disorder would be more distracted by body image related stimuli relative to neutral stimuli. This effect was predicted to be stronger for the middle age adults due to aging, anxiety, and disorder duration (see e.g., Slevec & Tiggemann, 2011). I also predicted that the effects would be strongest for the fat words as they are considered more threatening (see e.g., Cassin & von Ranson, 2005). Previous research has found an attentional bias to body related stimuli in younger adult females with an eating disorder (Dobson & Duzois, 2004), and research has also found that eating disorders can persist into middle age (Ferraro et al., 2008; Slevec & Tiggemann, 2011). In the current study, I extended previous work by investigating the effect of an eating disorder on processing body image related words using a middle age sample, standardized word stimuli, and computer mouse tracking.
Participants.

One hundred fifteen female participants from two different groups took part in Experiment 1.

Participants with an Eating Disorder. Thirty one younger (age 18 – 30, $M = 23$, $SD = 4$) and twenty middle age (age 40 – 65, $M = 50$, $SD = 5$) female adults who have or are presently receiving treatment at The Hull Institute, the Cleveland Center for Eating Disorders (CCED), or other counseling practices specializing in the outpatient treatment of eating disorders in Cleveland, Ohio, took part in the study. All participants met the criteria of the Diagnostic and Statistical Manual of Mental Disorders–5 (DSM-5; American Psychiatric Association, 2013) for either of two types of eating disorders: Anorexia Nervosa (AN), characterized by self-starvation and excessive weight loss; or Bulimia Nervosa (BN), characterized by a cycle of binging and compensatory behaviors such as self-induced vomiting. Data were collected in a private room at The Hull Institute or CCED, and participants were paid $15.00\textsuperscript{1} for one half hour of participation in the study.

Control Participants. Thirty younger (age 18 – 30, $M = 22$, $SD = 33$) and 30 middle age (age 40 - 65, $M = 53$, $SD = 6$) female participants were recruited from the Department of Psychology’s research participation pool at Cleveland State University and the greater Cleveland Community. Participants were given research participation credit or were paid $15.00 for one half hour of participation in the study.

\textsuperscript{1}The present research study was carried out with support from the by Cleveland State University Dissertation Research Award Program, including funds to pay participants.
Materials.

Apparatus. The experiment was conducted on a standard Windows laptop using MouseTracker software (Freeman & Ambady, 2010). The priming in Experiment 2 was presented with SuperLab software for Windows. During each trial, RTs, initiation times, velocity, and x-coordinates of the computer mouse were recorded. The data are sampled 60-75 times per second.

Word Stimuli. The Stroop task used three types of word stimuli related to body image. Twenty words related to fatness (‘fat’ words), 20 words related to thinness (‘thin’ words), and 20 neutral (control) words (see Appendix A). The words were chosen from Cassin and von Ranson’s (2005) homogeneous word stimuli developed in their study on word lists for testing cognitive bias in eating disorders. These standardized word stimuli are intended to improve internal validity, allowing for comparison across studies, and greater precision in interpretation of the findings (Cassin & von Ranson, 2005). Additionally, the word stimuli were matched on mean log frequency (Kucera & Francis, 1982), familiarity (Nusbaum, Pisoni, & Davis, 1984), mean number of letters per category, number of abstract and concrete words per category, and neighborhood density (i.e., the number of words that can be made by replacing one phoneme) (Vitevich & Luce, 1998). Each word was presented once in each of the four colors (red, blue, green, or yellow), producing a total of 240 trials for each participant. Practice trials included a series of four X’s or O’s (XXXX, OOOO) in each of the four colors for a total of four trials. Four blocks were incorporated into the experiment in order to counterbalance the color response options. In order to acclimate participants to the changing response options, each block consisted of four practice trials prior to the target trials. Additionally,
within each block, the 20 neutral words were always shown first in random order. After
the neutral words, the fat and thin words were shown, again in random order. I
intentionally blocked the neutral words within each block so that I could obtain a pure
baseline for processing just the neutral stimuli. This blocking of neutral words is also
intended to prevent any processing overlap onto the neutral words from the processing of
body-related stimuli. In sum, for block 1, a participant was shown the four-practice trial,
20 neutral words (randomized), 40 body-related words (fat and thin in random order),
followed by the same for block 2, block 3, and block 4.

**Self-report measures.** Previous research has shown that emotional Stroop
interference is associated with body image concerns (e.g., Green & Rogers, 1993),
anxiety (e.g., Mathews & MacLeod, 1985), and depression (e.g., Gotlib & McCann,
1984). Additionally, ethnic identity is related to response to thin media images like those
in Experiment 2. Each participant was asked to complete the following self-report
measures (see Appendix B for the self-report questionnaire given to participants):

The Eating Disorder Inventory (EDI: Garner, Olmstead, & Polivy, 1983) is a 64-
question multifaceted measure of psychological and behavioral traits in eating disorders
consisting of eight subscales measuring: 1) Drive for Thinness, 2) Bulimia, 3) Body
Dissatisfaction, 4) Ineffectiveness, 5) Perfectionism, 6) Interpersonal Distrust, 7)
Interoceptive Awareness, and 8) Maturity Fears. Higher scores indicate more body
dissatisfaction and eating disorder symptomology.

The Beck Depression Inventory (BDI; Beck & Beamesderfer, 1974) is a 21-
question inventory used to assess signs of depression. Higher scores indicate greater
levels of depression.
The trait and state versions of the State-Trait Anxiety Inventory (STAI: Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983), two 20-question inventories that measure state and trait anxiety. Higher scores reflect greater levels of anxiety.

The Brief Symptom Inventory 18 (BSI 18; Derogatis, 2001), an effective assessment used to measure psychological distress and psychiatric disorders in medical and community populations. The BSI 18 will be used to measure three primary symptom dimensions: somatization, depression, and anxiety.

Importance to Identity subscale from Luhtanen and Crocker (1991) Self-Esteem Scale as used by Fujioka et al. (2009), a four-questions assessment of the importance of ethnic identity.

**Design.**

Experiment 1 used a 2 (Age: younger, middle age) x 2 (Eating Disorder: yes, no) x 3 (Word: fat, thin, neutral) mixed design. Age and Eating Disorder are quasi-independent between-participant variables and Word Type is a within-participant variable. For each participant, there were a total of 240 target trials (i.e., 20 each ‘fat’, ‘thin’, and ‘neutral’ words presented in each of the four colors).

**Procedure.**

All participants were tested individually in a private room. Participants were asked to read and sign an informed consent (See Appendix C). In order to get familiar with the experiment, eight practice trials, including a series of four X’s and O’s (XXXX, OOOO) in each of the four colors, are given at the beginning of each block. Paired color response alternatives (e.g., “BLUE GREEN” and “RED YELLOW”) appeared in the top-left and top-right corners of the computer screen. Participants were instructed to
ignore the content of the word (or letters) and to click on the color in which the word (or letters) was printed as quickly and accurately as possible. At the beginning of each trial, the two-color response options appeared in the top-left and top-right corners of the screen and “START” appeared at the bottom-center of the computer screen. Upon clicking “START”, the target word appeared in the center of the screen. Target words were presented in random order. Participants are instructed to begin moving the mouse immediately after clicking “START.” With computer mouse tracking, early mouse movements are necessary to ensure the beginning of the trajectories is captured. If a participant takes too long (longer than 500ms) to initiate mouse movement, a warning appears on the screen instructing the participant to start moving the mouse earlier on future trials. During the trial, the x-coordinates of the mouse were recorded 60-75 times per second.

Upon completion of the Stroop task, participants were asked to complete the written questionnaire collecting demographic information, including four questions related to ethnic group and its importance to identity (see e.g., Fujioka et al., 2009), the BDI, the STAI, the BSI 18, and the EDI. Participants were debriefed, thanked, and paid (or given credit) for their participation. Each experimental session of Experiment 1 took approximately 30 minutes.
CHAPTER III

EXPERIMENT 1 RESULTS

One hundred fifteen females from Cleveland State University, the Cleveland Community, and several local eating disorder treatment facilities (e.g., The Hull Institute and Cleveland Center for Eating Disorders) took part in this experiment. Participants were selected to participate in one of four groups: younger adults diagnosed with an eating disorder, middle age adults diagnosed with an eating disorder, younger adults not diagnosed with an eating disorder, and middle age adults not diagnosed with an eating disorder. Mean (standard deviation) ages, grade levels, and race for all four groups are listed in Table 1.
### Table 1

**Mean (SD) ages, grade levels, and race for Experiment 1.**

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Younger - Eating Disorder (n = 31)</th>
<th>Middle age - Eating Disorder (n = 20)</th>
<th>Younger - Control (n = 31)</th>
<th>Middle age - Control (n = 33)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years</td>
<td>23 (4)</td>
<td>50 (5)</td>
<td>22 (3)</td>
<td>53 (6)</td>
</tr>
<tr>
<td>Class</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freshman</td>
<td>7</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sophomore</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Junior</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Senior</td>
<td>6</td>
<td>1</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>13</td>
<td>19</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White/Caucasian</td>
<td>30</td>
<td>20</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>African American</td>
<td>5</td>
<td></td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>2</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>European American</td>
<td>1</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td></td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**Data Screening.**

To control for outliers, all trials with incorrect responses were removed from the analyses. For all four groups, incorrect responses were less than 1%. In total, .64% of the trials were removed because of incorrect responses, and 99.36% of the trials remained in the analysis. Next, trials with initiation times greater than 500 ms were removed. By group, 1.7% were removed for younger adults with an eating disorder, 2.6% were removed for middle age adults with an eating disorder, and less than 1% were removed for both younger and middle age adults without an eating disorder. In total, 1.4% of the trials were removed and 98.61% remained. Lastly, outliers from the Stroop task response times, RTs more than three standard deviations above or below the mean, were deleted. Two groups had response times that exceeded three standard deviations above or below
the mean. For the middle age adults with an eating disorder, 4.4% were removed and for middle age adults without an eating disorder, 6.3% were removed. In total, 2.57% of the trials were removed because of response time outliers, and a total of 97.43% of the trajectories remained. The total sum of outliers removed for Experiment 1 was 4.6%, and 95.40% of the data remained in the analyses.

RT and AUC are the measures of primary interest. Mean RT and AUC are reported as a function of word type, age, and eating disorder.

**Reaction Time.**

Response time data were analyzed with an Age (2: younger, middle age) x Eating Disorder (2: yes, no) x Word Type (3: fat, thin, neutral) mixed ANOVA with Age and Eating Disorder as between-participants factors and Word Type as a within-participants factor. The data revealed a main effect of Word Type, $F(2, 220) = 7.57, p = .001, \eta^2 = .06$, observed power = .94. I performed planned comparisons based on the significant effect of word type. Overall, RTs to fat words were significantly shorter than RTs to neutral words, $p = .045$, and were marginally longer than RTs to thin words, $p = .07$. RTs to neutral words were significantly longer than RTs to thin words, $p < .001$. There was also a main effect of Eating Disorder, $F(1, 110) = 16.05, p < .001, \eta^2 = .13$, observed power = .98. Participants with an eating disorder were significantly slower compared to participants without an eating disorder, $p < .001$. There was also a main effect of Age, $F(1, 110) = 86.88, p < .001, \eta^2 = .44$, observed power > .99. Middle age participants were significantly slower than younger adults, $p < .001$.

The results also revealed a significant Eating Disorder by Age interaction, $F(1, 110) = 3.86, p = .05, \eta^2 = .03$, observed power = .50. I performed t-tests to compare
groups based on the significant interaction. In order to prevent a Type I error due to multiple comparisons, I used an alpha of .017 (.05 divided by 3). Middle age females with an eating disorder had significantly longer RTs overall (i.e., larger slope) compared to both younger adults with an eating disorder, $t(1, 110) = 55.70, p < .001$, and compared to middle age adults without an eating disorder, $t(1, 110) = 16.19, p < .001$. Moreover, although younger adult females with an eating disorder were on average 84.54 ms slower overall compared to the younger females without an eating disorder, this difference was not significant, $t(1, 110) = 2.32, p = .13$. In other words, in this task, middle age adults with an eating disorder were significantly slower than middle age participants without an eating disorder; however, that difference was not significant between younger adults with an eating disorder and younger adults without an eating disorder (see Table 2).

The Word by Eating Disorder, $F(2,220) = 1.20, p = .30, \eta^2 = .01$, observed power = .26, the Word by Age, $F(2, 220) = .20, p = .82, \eta^2 = .01$, observed power = .08, and the Age by Eating Disorder by Word Type interactions, $F(2, 220) = .15, p = .83, \eta^2 = .001$, observed power = .18, were not significant.

Table 2

Mean RTs in ms for Experiment 1.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Word Type</th>
<th>Eating Disorder - Younger $(n = 31)$</th>
<th>Eating Disorder - Middle age $(n = 20)$</th>
<th>Control - Younger $(n = 33)$</th>
<th>Control - Middle age $(n = 33)$</th>
<th>Overall Total $(n = 115)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fat</td>
<td></td>
<td>1,144</td>
<td>1,608</td>
<td>1,059</td>
<td>1,359</td>
<td>1,264</td>
</tr>
<tr>
<td>Thin</td>
<td></td>
<td>1,138</td>
<td>1,602</td>
<td>1,042</td>
<td>1,351</td>
<td>1,255</td>
</tr>
<tr>
<td>Neutral</td>
<td></td>
<td>1,147</td>
<td>1,620</td>
<td>1,075</td>
<td>1,380</td>
<td>1,278</td>
</tr>
<tr>
<td>Overall Total</td>
<td></td>
<td>1,143</td>
<td>1,610</td>
<td>1,059</td>
<td>1,363</td>
<td>1,267</td>
</tr>
</tbody>
</table>
Initiation Time.

Initiation times were analyzed with an Age (2: young, middle age) x Eating Disorder (2: yes, no) x Word Type (3: fat, thin, neutral) mixed ANOVA. These data revealed a main effect of Word Type initiation times, $F(2, 220) = 7.90, p < .001$, $\eta^2 = .07$, observed power = .95. I performed planned comparisons based on the significant effect of word type. Initiation times to thin words were faster than both initiation times to fat words, $p = .02$, and to neutral words, $p < .001$. Initiation times to fat words were faster than initiation times to neutral words, $p = .02$. In other words, participants initiated a computer mouse movement in response to the thin words in the shortest amount of time and took the longest amount of time to initiate a response to the neutral words (see Table 3). No additional main effects or interactions were significant for the initiation times.

Table 3
Mean initiation times in ms for Experiment 1.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Eating Disorder Younger (n = 31)</th>
<th>Eating Disorder Middle age (n = 20)</th>
<th>Control Disorder Younger (n = 31)</th>
<th>Control Disorder Middle age (n = 33)</th>
<th>Total (n = 115)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fat</td>
<td>153.94</td>
<td>165.64</td>
<td>151.07</td>
<td>153.94</td>
<td>155.21</td>
</tr>
<tr>
<td>Thin</td>
<td>150.88</td>
<td>165.43</td>
<td>145.10</td>
<td>148.96</td>
<td>151.30</td>
</tr>
<tr>
<td>Neutral</td>
<td>164.35</td>
<td>164.20</td>
<td>158.47</td>
<td>160.58</td>
<td>161.63</td>
</tr>
<tr>
<td>Total</td>
<td>156.39</td>
<td>165.09</td>
<td>151.55</td>
<td>154.49</td>
<td>156.05</td>
</tr>
</tbody>
</table>

Spatial Attraction - Area Under the Curve (AUC).

In order to examine spatial attraction to the incorrect response, the AUC data were analyzed with an Age (2: young, middle age) x Eating Disorder (2: yes, no) x Word Type (3: fat, thin, neutral) mixed ANOVA. These results show a main effect of Word Type, $F(2, 220) = 3.14, p = .045$, $\eta^2 = .03$, observed power = .60. I performed planned comparisons based on the significant effect of word type. The thin words were
significantly less distracting than the neutral words, \( p = .03 \). Fat words were not significantly different from thin, \( p = .26 \), or from neutral words, \( p = .14 \). No other main effects or interactions were significant when analyzing AUCs. However, in terms of mean values, fat and thin words were less distracting than neutral words, yet only the difference between thin and neutral reached significance (see Table 4). Comparing the AUC results with the RT results, specifically the Eating Disorder by Age group interaction was significant when looking at RTs, but was not significant when looking at AUCs: the RT data reveal that middle age participants with an eating disorder slow down (i.e., longer RTs) significantly (\( M = 1,610 \)) compared to both younger adults with an eating disorder (\( M = 1,153 \), \( p < .001 \), and compared to middle age adults without an eating disorder (\( M = 1,363 \), \( p < .001 \), but maintain equal AUCs (\( M = .665, .687, .657 \), respectively, all \( ns \)). This pattern demonstrates that the significantly longer RTs in the middle age participants with an eating disorder group is not due to a trade-off between RT and AUC, but instead due to the combination of age and eating disorder in that group.

Table 4

<table>
<thead>
<tr>
<th>Condition</th>
<th>Eating Disorder - Younger (( n = 31 ))</th>
<th>Eating Disorder - Middle age (( n = 20 ))</th>
<th>Control - Younger (( n = 31 ))</th>
<th>Control - Middle age (( n = 33 ))</th>
<th>Total (( n = 115 ))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fat</td>
<td>.703</td>
<td>.626</td>
<td>.727</td>
<td>.652</td>
<td>.677</td>
</tr>
<tr>
<td>Thin</td>
<td>.661</td>
<td>.646</td>
<td>.707</td>
<td>.629</td>
<td>.661</td>
</tr>
<tr>
<td>Neutral</td>
<td>.698</td>
<td>.692</td>
<td>.718</td>
<td>.691</td>
<td>.700</td>
</tr>
<tr>
<td>Total</td>
<td>.687</td>
<td>.655</td>
<td>.717</td>
<td>.657</td>
<td>.679</td>
</tr>
</tbody>
</table>

Self-Report Data.

Means and standard deviations for self-report measures of eating disorder symptoms, EDI, depression, BDI, state and trait anxiety, STAI, and ethnic identity are
reported in Table 5. There were significant differences in each age group for participants with and without an eating disorder. For younger adults, the group with an eating disorder had significantly higher EDI scores, $t(59) = -7.22, p < .001$; higher state anxiety, $t(59) = -4.40, p < .001$; higher trait anxiety, $t(59) = -5.41, p < .001$; and higher BDI scores, $t(59) = -4.70, p < .001$. Ethnic identity scores did not differ among younger adults, $p = .13$. For the middle age adults, the eating disorder group also had significantly higher EDI scores, $t(50) = -5.43, p < .001$; higher state anxiety, $t(50) = -4.97, p < .001$; higher trait anxiety, $t(50) = -5.37, p < .001$; and BDI scores, $t(50) = -6.68, p < .001$. Ethnic identity scores did not differ among middle age adults, $p = .66$.

Additionally, in the two eating disorder groups, the middle age adults have significantly lower EDI scores than younger adults, $t(45) = 2.30, p = .03$. In the two groups without an eating disorder, younger adults had significantly higher BDI scores than the middle age adults, $t(61) = 2.30, p = .004$. Younger and middle age adults with an eating disorder, along with younger adults without an eating disorder, scored in the severe depression range (i.e., 29 – 63) for BDI (see Table 5).

To test for relationships among eating disorder symptoms, depression, anxiety, ethnic identity and the response times to the words, the self-report data, EDI, along with eight subscales, BDI, STAI, and ethnic identity scale, were subjected to bivariate correlations with the effect of response times to the body words, which is an average of fat and thin words minus neutral words (body effect) (see Appendix G for a complete list of significant correlations for Experiment 1). By group, for younger adults without an eating disorder, body effect is correlated with ethnic identity $r = -.32, p = .04$; for middle age adults without an eating disorder, no significant relationships were found; combining
these two groups to look at all participants without an eating disorder, body effect is correlated with ethnic identity $r = -.23, p = .04$. Looking at relationships among younger adults with an eating disorder, body effect is correlated with body dissatisfaction, $r = .32, p = .05$. For middle age adults with an eating disorder and all participants with an eating disorder, there are no significant correlations. Overall, for Experiment 1, the key finding for the self-report measures and Stroop response times is that as ethnic identity get stronger (e.g., the ethnic group I belong to is an important reflection of who I am), Stroop response times decrease (i.e., body and thin words are less distracting), and this happens only in the groups without an eating disorder.

Table 5

Means (SD) self-report EDI (with subscales), Ethnic Identity, BDI, STAI for Experiment 1.

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Eating Disorder - Younger ($n = 31$)</th>
<th>Eating Disorder - Middle age ($n = 20$)</th>
<th>Control - Younger ($n = 31$)</th>
<th>Control - Middle age ($n = 33$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDI</td>
<td>255 (36)</td>
<td>227 (48)</td>
<td>176 (47)</td>
<td>163 (34)</td>
</tr>
<tr>
<td>Body Dissatisfaction</td>
<td>43 (9)</td>
<td>41 (14)</td>
<td>26 (11)</td>
<td>33 (12)</td>
</tr>
<tr>
<td>Drive for thinness</td>
<td>35 (6)</td>
<td>32 (9)</td>
<td>18 (8)</td>
<td>20 (8)</td>
</tr>
<tr>
<td>Bulimia</td>
<td>20 (7)</td>
<td>21 (8)</td>
<td>12 (6)</td>
<td>13 (5)</td>
</tr>
<tr>
<td>Maturity Fears</td>
<td>32 (8)</td>
<td>22 (7)</td>
<td>27 (9)</td>
<td>22 (5)</td>
</tr>
<tr>
<td>Ineffectiveness</td>
<td>37 (9)</td>
<td>36 (11)</td>
<td>23 (11)</td>
<td>22 (8)</td>
</tr>
<tr>
<td>Perfectionism</td>
<td>29 (6)</td>
<td>22 (6)</td>
<td>25 (7)</td>
<td>21 (6)</td>
</tr>
<tr>
<td>Interoceptive Awareness</td>
<td>37 (7)</td>
<td>33 (10)</td>
<td>26 (11)</td>
<td>20 (7)</td>
</tr>
<tr>
<td>Interpersonal Distrust</td>
<td>23 (6)</td>
<td>19 (7)</td>
<td>19 (7)</td>
<td>16 (5)</td>
</tr>
<tr>
<td>Ethnic Identity</td>
<td>14 (4)</td>
<td>16 (5)</td>
<td>16 (5)</td>
<td>15 (5)</td>
</tr>
<tr>
<td>BDI</td>
<td>45 (13)</td>
<td>46 (15)</td>
<td>31 (9)</td>
<td>27 (5)</td>
</tr>
<tr>
<td>STAI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State Anxiety</td>
<td>48 (12)</td>
<td>49 (16)</td>
<td>36 (10)</td>
<td>31 (10)</td>
</tr>
<tr>
<td>Trait Anxiety</td>
<td>55 (11)</td>
<td>51 (14)</td>
<td>39 (12)</td>
<td>34 (9)</td>
</tr>
</tbody>
</table>
**Raw Time Data Analysis.**

To assess the patterns of temporal dynamics in raw time, four time bins (e.g., 500 ms each; 1: 1-500, 2: 501-1000, 3: 1001-1500, 4: 1501-2000) were computed to compare the $x$-coordinates over time. The $x$-coordinates illustrate how the mouse moves along the horizontal axis and can show whether the trajectory was going toward the correct response or toward the incorrect response (see Table 6). As the mouse travels toward the correct answer, the $x$-coordinates are higher. Additionally, when $x$-coordinates are positive, the mouse is on the half of the screen closer to the correct response. These data were submitted to an Age x Eating Disorder x Word Type x Time mixed ANOVA. The data revealed a main effect of Time, $F(3, 306) = 2426.83$, $p < .001$, $\eta^2 = .96$, observed power $> .99$. I performed planned comparisons based on the significant effect of time. Time two is larger than time one, $p < .001$, time three is larger than time two, $p < .001$, time four is not larger than time three, $p = .54$ (see Figure 1). There is a main effect of Age, $F(1, 102) = 5.00$, $p = .03$, $\eta^2 = .048$, observed power = .60. Younger adults ($M = .480$, $SD = .007$) reach the response sooner, $p < .001$, than middle age adults ($M = .458$, $SD = .007$), $p < .001$, (see Figure 2).

There is also a Time by Age interaction, $F(1, 102) = 26.64$, $p < .001$, $\eta^2 = .21$, observed power $> .99$. I performed planned comparisons based on the significant time by age interaction. For time one, younger adults are closer to a response than the middle age adults, $p < .001$, for time two, younger adults are closer to a response than the middle age adults, $p < .001$, at time three, younger and middle age adults do not differ, $p = .87$, and at time four, middle age adults are closer to the response than younger adults, $p = .02$, (see Figure 3).
The effect of Time is expected as the participants move toward the correct response; the effect of age was also found with the RT data, and the most apparent explanation for the Time by Age interaction is that the majority of younger adults are finished by time bin four, whereas, middle age adults are not. The raw data are consistent with the other analyses in Experiment 1, and also provides an opportunity to examine the time-course of the observed effects.

Table 6

Mean x-coordinates for each time bin.

<table>
<thead>
<tr>
<th>Time bin</th>
<th>Eating Disorder - Younger (n = 31)</th>
<th>Eating Disorder - Middle age (n = 20)</th>
<th>Control - Younger (n = 31)</th>
<th>Control - Middle age (n = 33)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>.060</td>
<td>.027</td>
<td>.066</td>
<td>.036</td>
<td>0.047</td>
</tr>
<tr>
<td>Two</td>
<td>.502</td>
<td>.391</td>
<td>.531</td>
<td>.451</td>
<td>0.468</td>
</tr>
<tr>
<td>Three</td>
<td>.681</td>
<td>.663</td>
<td>.677</td>
<td>.693</td>
<td>0.670</td>
</tr>
<tr>
<td>Four</td>
<td>.674</td>
<td>.691</td>
<td>.652</td>
<td>.715</td>
<td>0.684</td>
</tr>
</tbody>
</table>

Figure 1. Mean x-coordinates for participants’ response trajectories over time for Experiment 1.
Figure 2. Mean $x$-coordinates for younger adults compared to middle age adults for Experiment 1.

Figure 3. Mean $x$-coordinates over time by age for younger and middle age adults for Experiment 1.
CHAPTER IV

EXPERIMENT 1 DISCUSSION

The main objective of Experiment 1 was to investigate the effect of attentional processing to body-related stimuli using younger and middle age samples of participants with an eating disorder. The purpose was to investigate if eating disorders continue to affect processing in middle age. It was predicted that the results with middle age adults with an eating disorder would follow the same general pattern as with younger adults, with stronger effects. Another objective was to determine if processing changes due to different word types. The purpose was to clarify discrepancies found in previous research by using standardized word lists. Another purpose was to look at relationships between self-report measures (e.g., eating disorder symptoms, depression) and Stroop processing.

Recapping the results of Experiment 1: Participants responded differently to the various word types, as predicted in Hypothesis 1.1, but the RTs did not follow the predicted pattern for all word types. Overall, RTs to the neutral words were longer than
RTs to the fat and thin words, contrary to predictions. While only marginally significant, RTs to the fat words were numerically longer (i.e., more distracting) than RTs to the thin words (i.e., less distracting), in line with the predicted pattern. Participants’ initiations times significantly differed by word type, and the body-related words followed the predicted pattern. Participants were faster to initiate a response when looking at thin words than when looking at fat words. Likewise, examination of AUC revealed less AUC for the thin words (i.e., less distraction or less attraction to the incorrect response) compared to the AUC for the fat words. These word type differences, for the body-related words, support Lee and Shafron’s (2004) and Cassin et al.’s (2008) argument that certain types or categories of stimuli (i.e., the fat, thin, and neutral words in this task) may lead to different results and may help to account for discrepancies between Stroop studies. These results provide evidence for the importance of standardized word lists categorized as fat (schema-congruent) and thin (schema-incongruent) for improving consistency of interpretation across Stroop studies in eating and other disorders.

Age was found to be a significant factor in examinations of RTs, as predicted in Hypothesis 1.2. As expected, middle age participants had longer RTs overall compared to younger adults participants. This significant effect supports the general slowing theory (Salthouse, 1996), which states that as people age they cannot process information as quickly. Cognitive aging may account for some of the RT differences, but it does not account for the additional differences found in Experiment 1, especially the combined effects of age and eating disorder.

An eating disorder was found to be a significant factor when looking at participants’ RTs with an overall main effect of an eating disorder, as predicted in
Hypothesis 1.3. As expected, participants with an eating disorder had significantly longer RTs compared with participants without an eating disorder. This finding supports previous experimental research on attentional bias in eating disorders showing longer RTs for groups with an eating disorder compared to groups without an eating disorder (see Dobson & Duzois, 2004).

There was also a significant age and eating disorder interaction, as predicted in Hypothesis 1.5. Considering the interaction of age and eating disorder, especially how it relates to the AUC results, reveals the key finding of Experiment 1. Middle age adults with an eating disorder had longer RTs compared to both younger adults with an eating disorder and middle age adults without an eating disorder. Younger adults with an eating disorder, although numerically slower, did not differ from younger adults without an eating disorder. Importantly, this was not found in the AUC analysis, where middle age adults with and without an eating disorder and younger adults with an eating disorder all had equivalent AUCs. Previous research with computer mouse tracking and the Stroop task suggests older adults’ slower response times (e.g., longer RTs) may lead to a trade-off of less distraction from the correct response (e.g., less AUCs) (see Incera, Markis, & M^3Lennan, 2013; Incera, Krestar, Markis & M^3Lennan, 2015). While this may explain the difference between the middle age and younger adults participants with an eating disorder, it does not explain the difference between two middle age groups. In order to perform this task, despite the age differences, the middle age group with an eating disorder slows down significantly more (i.e., over 300 ms) than the younger group with an eating disorder and the middle age group without an eating disorder. The combined effect of age and eating disorder results in a particularly large attentional
processing deficit. At least two important observations can be made from this result. First, in this task, the middle age adults with an eating disorder performed differently than the younger adults with an eating disorder; and second, this result clearly demonstrates the need for future studies that include a middle age sample.

The self-report analyses and results did not follow the prediction made in Hypothesis 1.8, but several important findings deserve mention. First, as one would expect, the groups with an eating disorder had significantly higher scores on the EDI, BDI, and the STAI measures than the groups without an eating disorder. Both younger and middle age adults with an eating disorder reported more eating disorder symptoms, more depressive symptoms, and more anxiety. In addition, even though when examining just the two groups with an eating disorder, the younger adults state significantly higher self-report EDI scores than the middle age adults, results of the Stroop task in this study revealed a larger processing deficit in the middle age adults. Once again, demonstrating the seriousness of eating disorder symptoms in middle age adults (see Fornari et al., 1994) and the need for additional research with middle age samples in the future.

Lastly, the raw time analyses failed to provide support for Hypotheses 1.4, 1.6, and 1.7 as the predicted two-way interactions and the three-way interaction did not reach significance. Nevertheless, the raw time analyses provided a clear indication of how participants were performing throughout the trials, supplementing the RT and AUC data.
CHAPTER V

EXPERIMENT 2 METHOD

I used a variation of the Stroop task, thin ideal media images, and computer mouse tracking to investigate the effects of priming (and body dissatisfaction) on processing of body image related words in younger and middle age adults. I predicted all females primed with the thin ideal would be more distracted by body image related stimuli relative to neutral stimuli. Overall, I expected the effect to be larger for the younger females. I also predicted that the effects would be largest for the fat words (since, as mentioned previously, they are considered more threatening). Previous research has found increased body dissatisfaction after viewing pictures of thin female models, and that body dissatisfied females exhibit slowed processing to body-related stimuli (Johansson, Lundh, & Andersson, 2005; Markis & M'Lennan, 2011). With the current study, I am extending previous research by investigating the effect using a middle age sample, standardized word stimuli, and computer mouse tracking.
Participants.

One hundred twenty four new participants from two different age groups participated in Experiment 2. Sixty-two younger (age 18 – 30, $M = 20$, $SD = 3$) and sixty-two middle age (age 40-65, $M = 52$, $SD = 7$) female adults were recruited from the Department of Psychology’s research participation pool at Cleveland State University and the greater Cleveland Community. Participants were told that they were taking part in a study investigating consumer preferences. Previous research has found this mild deception prevented demand characteristics from operating in a study that used swimsuit models and automobiles (Posavac et al., 1998). Participants’ were given research participation credit or paid $15.00 for one half hour of participation in the study.

Materials.

Pilot Study. Pilot testing was carried out to choose the pictures that were used in the priming paradigm. Ten younger (18-30) female undergraduate students and 10 middle age (40-65) female students were asked to rate 30 pictures of thin swimsuit models found on swimsuit websites (e.g., Victoria’s Secret, Everything But Water) on how much they think the picture depicted the thin appearance ideal standard portrayed by the mass media on a scale of 1 (not at all) to 5 (very much). Fifteen pictures with ratings of four and above combined from both age groups from the pilot study were chosen for use in the main experiment.

Priming Paradigm. The priming paradigm was modeled after Posavac, Posavac, and Posavac’s 1998 study on media images and body concerns and consisted of 15 pictures of thin swimsuit models (the model condition) and 15 pictures of sports cars (the control condition) (see Appendices D & E for a sample of the photos used in the priming
paradigm). The Superlab 4.0 software on the PC displays the color photos on a 17 inches screen. Each of the 15 photos was presented automatically for 10 seconds to ensure that each participant received the same duration of exposure. After 10 seconds of exposure, participants completed three questions following each of the 15 photos: 1) “How much do you like this swimsuit (or car) on a scale from 1 (really dislike) to 10 (really like)?” This question was aimed at supporting the description that this study is about media and consumer preferences. 2) “How likely is it that you would wear a similar swimsuit (or drive a similar car) on a scale from 1 (very unlikely) to 10 (very likely)?” This question was aimed at focusing the participants’ attention to their own bodies. 3) “How does your body compare with the swimsuit model’s (or your car compare to the sports car) on a scale from 1 (much less attractive) to 10 (much more attractive)?” This question was aimed to encourage comparison to the models and activate body and appearance schemas. Participants were informed that they had 30 seconds to respond before the next photo would be presented. At the end of priming paradigm (e.g., after all 15 pictures had been presented), a final question was asked in order to maximize potency in the priming condition and to calculate BMI: 4) “Please tell us your height (in inches) and your present weight?”

**Apparatus.** Same as in Experiment 1. The priming paradigm was presented with Superlab for Windows.

**Word Stimuli.** Same as in Experiment 1.

**Self-report measures.** Same as in Experiment 1.
**Design.**

Same as in Experiment 1, except the design included Prime Type instead of Eating Disorder for an Age x Prime Type x Word mixed design. Prime Type was a between-participants variable.

**Procedure.**

Upon arrival to the laboratory, participants were asked to read and sign an informed consent (see Appendix F). All participants were tested individually in a private room. The experiment was described as one investigating “consumer preferences” for items such as swimsuits and automobiles. Participants were randomly assigned to either the swimsuit model (experimental) or car (control) condition and completed the priming paradigm. During a subsequent block of trials, all participants performed the Stroop task on an individual basis. The Stroop task was the same as in Experiment 1.

Upon completion of the Stroop task, participants were asked to complete a written questionnaire. The self-report written questionnaire is the same as in Experiment 1. Each experimental session of Experiment 2 took approximately 30 minutes.
A new group of 124 females was recruited from Cleveland State University and the Cleveland Community to take part in Experiment 2. Two age groups were selected: younger adults, age 18–30, and middle age adults, age 40–65, females. Within each age group, participants were randomly selected to participate in one of two groups: experimental group primed by the thin ideal or the control group with a neutral prime. Mean (standard deviation) ages, grade levels, and race for all four groups are listed in Table 7.
Table 7

Mean (SD) age, grade level, and race for Experiment 2.

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Prime Younger ((n = 32))</th>
<th>Prime Middle age ((n = 31))</th>
<th>Control Younger ((n = 30))</th>
<th>Control Middle age ((n = 31))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years</td>
<td>20 (2)</td>
<td>51 (7)</td>
<td>20 (3)</td>
<td>53 (7)</td>
</tr>
<tr>
<td>Class</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freshman</td>
<td>18</td>
<td>0</td>
<td>15</td>
<td>2</td>
</tr>
<tr>
<td>Sophomore</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Junior</td>
<td>6</td>
<td>1</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Senior</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>25</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White/Caucasian</td>
<td>20</td>
<td>23</td>
<td>19</td>
<td>9</td>
</tr>
<tr>
<td>African American</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Asian</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>European American</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Data Screening.

As in Experiment 1, to control for outliers, all trials with incorrect responses were removed from the analyses. By group, 1.4% incorrect response were removed from primed younger adults, less than 1% for primed middle age adults, 1.7% for control younger adults, and less than 1% for control middle age adults. In total, 1.01% of the trials were removed because of incorrect responses and 98.99% of the trials remained in the analysis. Next, trials with initiation times greater than 500ms were removed. By group, 1.7% was excluded for the primed young, 2.03% for primed middle age, less than 1% for control young, and 2.4% were removed for control middle age. In total, 1.64% of the trials were removed because of long initiation times and 98.36% of the trials remained. Lastly, one group had response times that exceeded three standard deviations
above or below the mean. For the primed middle age adults, 3.3% of the response trajectories were removed. In total, less than 1% of the trials were removed because of response time outliers and a total of 99.18% of the response trajectories remained. The total sum of outliers removed for Experiment 2 was 3.47% and 96.53% of the data were used in the analyses.

RT and AUC are the measures of primary interest. Mean RT and AUC will be reported as a function of word type, age, and prime.

**Reaction Time.**

RTs were analyzed with an Age (2: younger, middle age) x Prime (2: thin ideal, control) x Word Type (3: fat, thin, neutral) mixed ANOVA with Age and Prime as between participants factors and Word as within participants factor. The data revealed a main effect of Word Type, $F(2, 240) = 10.61, p < .001, \eta^2 = .08$, observed power > .99. I performed planned comparisons based on the significant effect of word type. RTs to the neutral words were significantly longer than RTs to the fat words, $p = .003$, and the thin words, $p < .001$. RTs to fat words were numerically longer (i.e., more distracting) than the RTs to thin words (i.e. less distracting), but this difference was not significant, $p = .16$. There was a main effect of Prime, $F(1, 120) = 4.59, p = .03, \eta^2 = .04$, observed power = .57. Participants in the control prime group have significantly longer RTs compared to participants in the experimental prime group, $p < .001$. There was a main effect of Age, $F(1, 120) = 47.67, p < .001, \eta^2 = .28$, observed power > .99. Middle age participants have significantly longer RTs compared to the younger adults, $p < .001$ (see Table 8).
Table 8

Mean RTs for Experiment 2.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Prime Younger (n = 32)</th>
<th>Prime Middle age (n = 31)</th>
<th>Control Younger (n = 30)</th>
<th>Control Middle age (n = 31)</th>
<th>Total (n = 124)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fat</td>
<td>1,110</td>
<td>1,361</td>
<td>1,147</td>
<td>1,519</td>
<td>1,284</td>
</tr>
<tr>
<td>Thin</td>
<td>1,105</td>
<td>1,361</td>
<td>1,138</td>
<td>1,503</td>
<td>1,277</td>
</tr>
<tr>
<td>Neutral</td>
<td>1,111</td>
<td>1,391</td>
<td>1,168</td>
<td>1,556</td>
<td>1,307</td>
</tr>
<tr>
<td>Total</td>
<td>1,109</td>
<td>1,371</td>
<td>1,151</td>
<td>1,526</td>
<td>1,289</td>
</tr>
</tbody>
</table>

The Word by Prime, $F(2, 240) = 1.45, p = .24, \eta^2 = .01$, observed power = .31, the Word by Age group, $F(2, 240) = 1.87, p = .15 \eta^2 = .02$, observed power = .39, and the Word by Prime by Age group, $F(2, 220) = .15, p = .87, \eta^2 = .001$, observed power = .18, interactions were not significant.

**Initiation Time.**

Initiation times for Experiment 2 were analyzed with Age (2: younger, middle age) x Prime (2: thin ideal, control) x Word Type (3: fat, thin, neutral) mixed ANOVA. These data revealed a main effect of Word Type initiation times, $F(2, 220) = 10.49, p < .001, \eta^2 = .08$, observed power > .99. I performed planned comparisons based on the significant effect of word type. Initiation times to thin words were faster than the neutral words, $p < .001$. Initiation times to fat words were also faster than initiation times to neutral words, $p = .001$. Initiation times to the fat and thin words were not significantly different, $p = .281$ (see Table 9). In Experiment 2, as in Experiment 1, participants initiated a computer mouse movement toward the thin words in the shortest amount of time and took the longest amount of time to initiate a response to the neutral words. No additional main effects or interactions were significant with the initiation times.
Table 9

Mean initiation times for Experiment 2.

<table>
<thead>
<tr>
<th>Condition Word Type</th>
<th>Prime Younger (n = 32)</th>
<th>Prime Middle age (n = 31)</th>
<th>Control Younger (n = 30)</th>
<th>Control Middle age (n = 31)</th>
<th>Total (n = 124)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fat</td>
<td>152.65</td>
<td>156.14</td>
<td>149.28</td>
<td>142.91</td>
<td>150.25</td>
</tr>
<tr>
<td>Thin</td>
<td>150.45</td>
<td>152.15</td>
<td>148.72</td>
<td>143.34</td>
<td>148.67</td>
</tr>
<tr>
<td>Neutral</td>
<td>160.35</td>
<td>159.00</td>
<td>156.42</td>
<td>152.50</td>
<td>157.04</td>
</tr>
<tr>
<td>Total</td>
<td>154.49</td>
<td>155.73</td>
<td>151.47</td>
<td>146.25</td>
<td>151.98</td>
</tr>
</tbody>
</table>

Spatial Attraction – Area Under the Curve (AUC).

In order to examine spatial attraction to the incorrect responses, the AUC data were analyzed with an Age (2: younger, middle age) x Prime (2: thin ideal, control) x Word Type (3: fat, thin, neutral) mixed ANOVA. These results showed a main effect of Word Type, $F(2, 220) = 4.94, p = .01$, $\eta^2 = .04$, observed power = .81. I performed planned comparisons based on the significant effect of Word Type. AUCs to the fat and thin words were not different from each other, $p = .95$, but both fat and thin words had less AUC and were less distracting than the neutral words, $p = .01$ and $p = .01$, respectively (see Table 10).

Comparing the AUC results with the RT results (see Tables 9 and 10) - the lack of a significant Prime by Age interaction requires caution in any interpretation of the outcomes; nevertheless, it is worth mentioning that by numbers only, the younger adults in the prime group had the highest AUCs, that is, more spatial attraction toward the incorrect response, but they had the shortest RTs. It appears that younger adults, in the prime group only, race to a response in order to finish the trial, and that they do so at a cost in the efficiency of their mouse trajectories.
Table 10

Mean AUCs for Experiment 2.

<table>
<thead>
<tr>
<th>Condition Word Type</th>
<th>Prime Younger ((n = 32))</th>
<th>Prime Middle age ((n = 31))</th>
<th>Control Younger ((n = 30))</th>
<th>Control Middle age ((n = 31))</th>
<th>Total ((n = 124))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fat</td>
<td>.819</td>
<td>.748</td>
<td>.690</td>
<td>.711</td>
<td>.742</td>
</tr>
<tr>
<td>Thin</td>
<td>.825</td>
<td>.751</td>
<td>.690</td>
<td>.700</td>
<td>.741</td>
</tr>
<tr>
<td>Neutral</td>
<td>.817</td>
<td>.843</td>
<td>.735</td>
<td>.751</td>
<td>.786</td>
</tr>
<tr>
<td>Total</td>
<td>.821</td>
<td>.780</td>
<td>.705</td>
<td>.720</td>
<td>.757</td>
</tr>
</tbody>
</table>

**Self-Report Data.**

Means and standard deviations for self-report measures of eating disorder symptoms, EDI, depression, BDI, state and trait anxiety, STAI, ethnic identity, BMI are reported in Table 11. There were significant age differences on the self-report measures. Younger adults had significantly higher state anxiety, \(t(122) = 3.81, p < .001\), and trait anxiety, \(t(122) = 5.23, p < .001\), than middle age adults. Younger adults had significantly higher depression scores (BDI) than middle age adults, \(t(122) = 2.95, p = .004\). Younger adults had higher EDI scores than middle age adults, \(t(122) = 3.47, p < .001\). Middle age adults had significantly higher BMI scores compared to young adults, \(t(122) = -3.57, p = .001\).

To test for relationships among eating disorder symptoms, depression, anxiety, ethnic identity, BMI, and the response times to the words, the self-report data, EDI, along with eight subscales, BDI, STAI, ethnic identity, and BMI scores were subjected to bivariate correlations with the effect of response times to body words, which is an average of fat and thin words minus neutral words (body effect) (see Appendix G for a complete list of significant correlations for Experiment 2). By group, for younger adults primed with the thin ideal, body effect is correlated with ethnic identity, \(r = -.45, p =\).
.005; for the middle age prime group, body effect is correlated with drive for thinness, \( r = -.32, p = .048 \), and bulimia, \( r = -.32, p = .04 \).

Combining these two groups to look at all participants in the prime group, body effect is correlated with drive for thinness, \( r = -.24, p = .03 \). Looking at relationships among younger adults in the control prime group, body effect is correlated with maturity fears, \( r = .31, p = .046 \) and ethnic identity, \( r = -.40, p = .01 \). For the middle age control group, body effect is correlated with EDI, \( r = .42, p = .01 \), body dissatisfaction, \( r = .46, p = .006 \), perfectionism, \( r = .38, p = .02 \), and state anxiety, \( r = .41, p = .01 \). Combining these two groups to look at all control group participants, body effect is correlated with EDI, \( r = .28, p = .02 \), body dissatisfaction, \( r = .30, p = .01 \), ineffectiveness, \( r = .26, p = .02 \). BMI was not related to Stroop response times, but was significantly related to participants scores on the EDI, \( r = .28, p = .001 \). As BMI increased, so did eating disorder symptoms and levels of body dissatisfaction.

Overall, for Experiment 2, the key finding for the self-report measures and Stroop response times is for the prime group only, all of the significant relationships are negative, meaning that as the eating disorder symptoms, anxiety, and depression increase, attentional bias to the body-related words decreases. Interestingly, the exact opposite is found in the control group. For the control group, all the correlations are positive. Positive correlations mean that as eating disorder symptoms, depression, and anxiety increase so do attentional biases (i.e., distraction) to the body-related words.
Table 11

Mean (SD) self-report EDI (with subscales), Ethnic Identity, BDI, STAI, and BMI for Experiment 2.

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Prime Younger (n = 32)</th>
<th>Prime Middle age (n = 31)</th>
<th>Control Younger (n = 30)</th>
<th>Control Middle age (n = 31)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDI</td>
<td>190 (48)</td>
<td>163 (35)</td>
<td>194 (39)</td>
<td>170 (32)</td>
</tr>
<tr>
<td>Body Dissatisfaction</td>
<td>30 (12)</td>
<td>34 (9)</td>
<td>31 (9)</td>
<td>34 (11)</td>
</tr>
<tr>
<td>Drive for thinness</td>
<td>22 (10)</td>
<td>21 (8)</td>
<td>22 (7)</td>
<td>21 (6)</td>
</tr>
<tr>
<td>Bulimia</td>
<td>16 (6)</td>
<td>15 (5)</td>
<td>16 (6)</td>
<td>13 (6)</td>
</tr>
<tr>
<td>Maturity Fears</td>
<td>25 (7)</td>
<td>19 (5)</td>
<td>28 (8)</td>
<td>20 (6)</td>
</tr>
<tr>
<td>Ineffectiveness</td>
<td>25 (10)</td>
<td>20 (8)</td>
<td>26 (7)</td>
<td>22 (7)</td>
</tr>
<tr>
<td>Perfectionism</td>
<td>24 (7)</td>
<td>21 (6)</td>
<td>24 (7)</td>
<td>20 (6)</td>
</tr>
<tr>
<td>Interoceptive Awareness</td>
<td>26 (9)</td>
<td>21 (7)</td>
<td>25 (7)</td>
<td>21 (6)</td>
</tr>
<tr>
<td>Interpersonal Distrust</td>
<td>21 (6)</td>
<td>15 (5)</td>
<td>21 (7)</td>
<td>18 (5)</td>
</tr>
<tr>
<td>Ethnic Identity</td>
<td>17 (5)</td>
<td>15 (6)</td>
<td>16 (6)</td>
<td>17 (6)</td>
</tr>
<tr>
<td>BDI</td>
<td>33 (7)</td>
<td>27 (7)</td>
<td>31 (7)</td>
<td>29 (7)</td>
</tr>
<tr>
<td>STAI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State Anxiety</td>
<td>36 (11)</td>
<td>28 (6)</td>
<td>37 (11)</td>
<td>31 (11)</td>
</tr>
<tr>
<td>Trait Anxiety</td>
<td>42 (10)</td>
<td>33 (9)</td>
<td>43 (9)</td>
<td>35 (9)</td>
</tr>
<tr>
<td>Body Mass Index (BMI)</td>
<td>24 (7)</td>
<td>28 (5)</td>
<td>26 (6)</td>
<td>31 (6)</td>
</tr>
</tbody>
</table>

**Raw Time Data Analysis.**

As in Experiment 1, to assess the patterns of temporal dynamics in raw time, four time bins were computed to compare the x-coordinates over time (see Table 12). Again, as the mouse travels toward the correct answer, the x-coordinates are higher. When the x-coordinate is positive, the mouse is on the half of the screen closer to the correct response. These data were submitted to an Age x Prime x Word x Time mixed ANOVA.

The data revealed a main effect of Time, $F(3, 336) = 3034.11, p < .001, \eta^2 = .96$, observed power > .99. I performed planned comparisons based on the significant effect of time. Time two is larger than time one, $p < .001$, time three is larger than time two, $p < .001$, time four is larger than time three, $p = .001$ (see Figure 4).
There is also a main effect of Age group, \(F(1, 112) = 13.99, p < .001, \eta^2 = .11,\) observed power = .96. Younger adults (\(M = .488, SD = .007\)) were closer to the response on average over all time bins than middle age adults (\(M = .454, SD = .006\)), \(p < .001\) (see Figure 5).

The data revealed three significant two-way interactions: Time by Age, \(F(3, 336) = 11.56, p < .001, \eta^2 = .09,\) observed power > .99, Word by Time \(F(6, 672) = 6.41, p < .001, \eta^2 = .05,\) observed power > .99, and Prime by Age, \(F(1, 112) = 14.66, p < .001, \eta^2 = .12,\) observed power = .97. Three significant three-way interactions were found: Word by Prime by Age group, \(F(2, 224) = 6.47, p = .002, \eta^2 = .06,\) observed power > .99, Time by Prime by Age group, \(F(3, 336) = 2.72, p = .05, \eta^2 = .02,\) observed power = .66, and Word by Time by Prime, \(F(6, 672) = 2.14, p = .047, \eta^2 = .02,\) observed power = .77. The four-way Word by Time by Prime by Age group interaction was marginally significant, \(F(6, 672) = 1.83, p = .09, \eta^2 = .016,\) observed power = .69.

The most efficient explanation for these interactions is that in the control prime group, the younger adult participants significantly outperformed (i.e., closer to 1.0 on the \(x\)-coordinate or closer to the correct response) the middle age adults for all three word types, over all time bins (see Figures 6, 7, and 8). In the prime group, younger adults and middle age adults performed the same for all word types over all time bins with one exception where middle age adults outperformed the younger adults. The only time the middle age adults significantly outperformed the younger adults is during the fourth time bin while processing the fat words, \(p = .001\) (see Figures 9, 10, and 11) which happened only in the prime group and not in the control group. The lack of differences between younger and middle age adults in the prime group and this one significant time where
younger adults performed differently is driving the interactions. These raw data analyses, similar to RT and AUC analyses, demonstrate that the prime is having a greater effect on younger adults.

Table 12

*Mean x-coordinates for each time bin for Experiment 2.*

<table>
<thead>
<tr>
<th>Time bin</th>
<th>Prime Younger (n = 31)</th>
<th>Prime Middle age (n = 20)</th>
<th>Control Younger (n = 31)</th>
<th>Control Middle age (n = 33)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>.060</td>
<td>.045</td>
<td>.068</td>
<td>.035</td>
<td>.052</td>
</tr>
<tr>
<td>Two</td>
<td>.486</td>
<td>.447</td>
<td>.523</td>
<td>.386</td>
<td>.461</td>
</tr>
<tr>
<td>Three</td>
<td>.665</td>
<td>.681</td>
<td>.711</td>
<td>.649</td>
<td>.676</td>
</tr>
<tr>
<td>Four</td>
<td>.674</td>
<td>.715</td>
<td>.719</td>
<td>.673</td>
<td>.695</td>
</tr>
</tbody>
</table>
Figure 4. Mean x-coordinates for participants' response trajectories over time for Experiment 2.

Figure 5. Mean x-coordinates for younger adults compared to middle age adults for Experiment 2.
Figure 6. Mean response trajectories (x-coordinates over time) to fat words for younger and middle age adults in the control group.

Figure 7. Mean response trajectories (x-coordinates over time) to neutral words for younger and middle age adults in the control group.

Figure 8. Mean response trajectories (x-coordinates over time) to thin words for younger and middle age adults in the control group.
Figure 9. Mean response trajectories (x-coordinates over time) to fat words for younger and middle age adults in the thin ideal prime group.

Figure 10. Mean response trajectories (x-coordinates over time) to neutral words for younger and middle age adults in the thin ideal prime group.

Figure 11. Mean response trajectories (x-coordinates over time) to thin words for younger and middle age adults in the thin ideal prime group.
CHAPTER VII

EXPERIMENT 2 DISCUSSION

The main objectives of Experiment 2 were to investigate the effect of thin ideal priming on attentional processing of body-related stimuli for younger and middle age adults without an eating disorder, to determine if processing changes due to different word types, and to look at the relationships between the self-report measures and Stroop processing.

A main effect of Word Type was obtained for RTs, initiation times, and AUCs, as predicted in Hypothesis 2.1; however, similar to the conclusion discussed in Experiment 1, this effect does not follow the pattern predicted and is primarily driven by participants’ distraction to the neutral words.

Age is found to be a significant factor with RT data, as predicted in Hypothesis 2.2. Overall, middle age adults have significantly longer RTs than the younger adults. General slowing theory (Salthouse, 1996) could account for this result. Priming is another significant factor for participants’ RTs, as predicted in Hypothesis 2.3, but, contrary to the predicted pattern, the thin ideal prime group had faster RTs overall. For
both younger and middle age adults, the prime seems to be facilitating response times. While arousal effects have been found in Stroop studies, an explanation for this finding is beyond the scope of this study. The two-way interactions, predicted in Hypotheses 2.4 and 2.6 and the three-way interaction, predicted in Hypothesis 2.7 were not significant.

Unlike Experiment 1, the raw time data analyses seem to tell the more interesting story in Experiment 2. It was anticipated that computer mouse tracking would be useful to look at continuous processing, and indeed I find this was the case in Experiment 2. In all, the raw data analyses reveal two main effects, three two-way interactions, three three-way interactions, and the marginally significant four-way interaction. The net message when examining age differences by prime group is in the control group. Younger adults significantly outperformed middle age adults for the fat, the thin, and the neutral words in all four time bins. However, in the prime group, these differences were not observed. In fact, in the prime group, the one and only significant difference was that the middle age adults outperformed the younger adults for the fat words in the time bin 4. It is encouraging to report that computer mouse tracking can be beneficial as a supplement to Stroop research studies.

The self-report results did not follow the prediction in Hypothesis 2.8, which may not be surprising in light of the overall findings for Experiment 2. Nevertheless, the self-report measures revealed some age differences. As expected, middle age adults reported a higher BMI compared to the younger adults. Normal aging and increases in body fat with age would predict this result (Algars et al., 2009). What is interesting is that in this study, it is the younger adults who report more eating disorder symptoms, higher anxiety, and more depression. Again, most research in this area is focused on younger adults, a
full understanding of body image in middle age, and the related factors, are ripe for future explorations.
CHAPTER VIII

GENERAL DISCUSSION

In the current study, I investigated attentional bias to body-related words in younger and middle age females. Two experiments were conducted comparing four groups: younger and middle age females who have been diagnosed with an eating disorder, and younger and middle age females without an eating disorder. In Experiment 1, a sample of younger and middle age females with an eating disorder were compared with younger and middle age females controls (i.e., female that have not been diagnosed with an eating disorder). In Experiment 2, a new sample of younger and middle age females who have been exposed to thin ideal media images were compared with younger and middle age females exposed to control images. For both experiments, the predictions were reflected through the color naming of body-related words in a variation of the Stroop task. Slowed processing to the body-related words is assumed to be demonstrating an attentional bias (e.g., selective attention) and was expected to occur for the participants with an eating disorder and those exposed to the thin ideal prime. In theory, attentional bias can predispose an individual to develop an eating disorder (the concern of Experiment 2) or operate to maintain the eating disorder (the concern with
Experiment 1). Additionally, computer mouse tracking was used to examine the continuous processing of the Stroop task in both experiments. In the current study, I predicted an eating disorder and the thin ideal prime would lead to more distraction by the presence of body-related words in the Stroop task relative to neutral words and to the control group. The results of the current study showed the middle age participants took longer to complete the task than the younger adults overall, and the middle age participants with an eating disorder took the longest of all. The results also showed that the priming paradigm in Experiment 2 lead to faster response times to the body-related words, opposite of predictions. However, when analyzing the raw time data, provided by the use of MouseTracker, I was able to reveal age differences and interactions with the prime type that followed predictions. The results of the correlational analyses of the self-report data showed that participants with an eating disorder had significantly more eating disorder symptoms, anxiety, and depression, and younger adults overall scored higher on these measures compared to middle age adults, despite lower BMI.

Word Stimuli

Findings in the literature with research similar to the current study are mixed. Results seem to depend on the specific disorder (anorexia, bulimia, or dieter), and importantly, on the type of words used in the study (e.g., body or food). Some researchers believe much of the discrepancy is rooted in the lack of consistency when choosing word stimuli (see Ben-Tovim et al., 1989; Lee & Shafron, 2004). I addressed this concern by utilizing Cassin and von Ranson’s word lists in the current study. To a large extent, the current study is based on a cognitive theory that an eating disorder or a thin ideal prime will lead to an attentional bias for threatening word stimuli (i.e., the fat
words). Based on this theory, I predicted that the thin words would lead to less distraction. The results of the current study revealed in both experiments, and across measures, that the participants demonstrated less distraction when processing the thin words compared to the fat and neutral words. Participants had smaller AUCs (i.e., more efficient processing), were faster to initiate a response to, and had marginally significantly longer RTs to thin words compared to the fat words. These results are consistent with the notion that the thin words are less threatening (compared with the fat words), leading participants to process them more efficiently (see e.g., Cassin, von Ranson, & Whiteford, 2008). The results of the current study support the importance of standardized word lists for improving the consistency of interpretation across Stroop research studies in this area (Cassin & von Ranson, 2005; Lee & Shafron, 2004).

**Body Image Dissatisfaction**

As discussed in the Introduction, body image dissatisfaction is so common in females that body dissatisfaction has been described as a state of normal discontent in women (Rodin et al., 1985). Body dissatisfaction is a multifaceted construct, but much of the focus is on body appearance or body shape and weight. A person’s BMI relates to body dissatisfaction in that, as BMI increases, so does body dissatisfaction (see Schwartz & Brownell, 2004). Social comparison can also lead to body dissatisfaction. As women search for body ideals and compare their own bodies with that of the thin ideal in the media, they feel more dissatisfied with their own body appearance and shape. Important in the current study, body dissatisfaction is also known to be an essential feature of an eating disorder (DSM-5). Additionally, it is assumed in this study that body dissatisfaction should also increase, at least temporarily, as a result of the thin ideal.
priming in Experiment 2. In this study, I measured body dissatisfaction with the EDI (Garner et al., 1983). I also infer that delayed processing of the body-related words in the Stroop task indicate a higher level of body dissatisfaction, whether the results of an eating disorder or the thin ideal prime. In Experiment 1, the results of the self-report data showed that all participants with an eating disorder had higher levels of body dissatisfaction. This result clearly supports the idea that body dissatisfaction is a fundamental part of an eating disorder (DSM-5). The younger females in the current study with an eating disorder reported higher body dissatisfaction than the middle age females with an eating disorder. However, the results of the Stroop task showed middle age females had the larger attentional deficit. It is possible that younger females with an eating disorder exhibit more eating disorder symptoms, but it could also be that the self-report EDI may not be as sensitive a measure as the Stroop task, as I was able to clearly detect larger processing differences in the middle age females.

Another possibility is that high scores on several of the subscales of the EDI (e.g., maturity fears, interoceptive awareness, or interpersonal distrust) may be adding to the results. For instance, maturity fears could be naturally higher in younger adults than in middle age adults. In line with social comparison theory, the thin ideal prime in Experiment 2 leads to higher levels of body dissatisfaction, and hence, more delayed Stroop response times. In the current study, this was not the case. I found that the younger adults in Experiment 2 had higher EDI scores. In theory, and following my predictions, this finding could be the result of the thin ideal prime affecting the younger adults more than the middle age adults; however, when examining just the younger prime and control groups, EDI scores were equivalent. Again, the only explanation is the
possibility that some of the subscales are more sensitive to younger participants. Future research is needed to further understand the relationship between self-report body dissatisfaction and Stroop processing.

**Body Image Dissatisfaction in Middle Age**

There are three central ideas regarding body dissatisfaction in middle age. First, with age the body naturally begins to change in shape and appearance (see Algars et al., 2009). Women are held responsible for these changes, and socially there exists a “double standard” when it comes to aging (e.g., women are seen as old, men are seen as sophisticated). Secondly, body dissatisfaction remains stable across the life span. Middle age females can feel fat, dissatisfied with their body shape and use methods to keep a more youthful appearance. Lastly, body image appearance may become less important with age (Webster & Tiggemann, 2003). According to Tiggemann (2004), with age as the body deteriorates, women remain equally dissatisfied with their bodies, but it matters less to them. Importantly, these central issues only consider females without an eating disorder. The motivation to use a middle age sample in the current study was to investigate these conclusions and reach a better understanding of body image in middle age for women with and without an eating disorder.

In both experiments, I found that middle age participants took longer to complete the than the younger adult participants. This age difference was expected, and is in line with general slowing theory (Salthouse, 1996). In Experiment 1, these age differences interacted with the eating disorder, leading to some additional conclusions. For instance, the pattern of results in Experiment 1 for the younger adults with an eating disorder was expected to follow the same pattern as in previous research (i.e., younger adults with an
eating disorder would be more distracted by the presence of the body words than younger adults without an eating disorder) (Ben-Tovim, et al., 1989; Dobson & Duzois, 2004). I predicted middle age adults would follow the same general pattern as the younger adults with an eating disorder, and that the effects would be stronger. This was indeed the case in Experiment 1. In Experiment 1, I found that the combined effect of having an eating disorder and being in middle age resulted in a large attentional processing differences. Linking what we know about body image in middle age and the results of the current study, I can speculate that for some women (e.g., without an eating disorder), age-related changes to body shape and appearance may not be problematic because body image becomes less important with age (Tiggemann, 2004). This was the case in the current study based on the results for the control groups in both Experiments 1 and 2 (e.g., participants without an eating disorder). However, for the middle age females with an eating disorder in Experiment 1, the combination of natural body and appearance changes, combined with the continued (possibly life-long) focus on the importance of body image, could lead to severe eating disorder symptoms. Middle age females with an eating disorder exhibited more attentional bias to the word stimuli than both younger females with an eating disorder and middle age females without an eating disorder. The latter comparison, middle age females with an eating disorder compared to middle age females without an eating disorder, provides evidence that the results are not simply reducible to normal cognitive aging. What is more, in the current study, the effect (attentional bias) was only found for the middle age females, and I was not able to pick up the effect as readily in the younger adult experimental groups. Incorporating the cognitive theory of attentional bias, I suggest the middle age females, due to the extended
length of possessing the eating disorder and focus on body shape have developed more elaborate and inaccurate schemas around the body. These schemas continue to influence their attention to body weight and shape. Central to the current study, these schemas influence the processing of body-related stimuli. Moving beyond the scope of the current study, but certainly an important issue for future studies, these schemas, and attentional biases, could affect behavior. Research on body image and disordered eating in middle age has been largely neglected, but the results of the current study demonstrate that such research is clearly important (Ferraro et al., 2008). Future empirical research studies, both cross-sectional (as in the current study) and longitudinal, concerning body changes with age, body image, and eating disorders with older samples (middle age and beyond) are vital for a more complete understanding of the relationships between aging, eating disorder, and attentional biases.

**Media Influence on Body Image**

Exposure to thin media images can lead to body dissatisfaction. Although media images of the ideal female are exaggerated and emphasize thinness, they are an important source from which body image attitudes originate (Cafri et al., 2005). Groesz et al. (2001) found body image for females is more negative after viewing thin media images than after viewing images of control pictures (e.g., cars or houses). This negative body image can lead to slower processing on a Stroop task (see e.g., Markis & McLennan, 2011; Johansson et al., 2005). In the current study, it was predicted that overall efficiency of processing for participants in the thin ideal prime group in Experiment 2 would differ significantly from individuals in the control prime group. It was further predicted that the younger females would be more distracted due to more influence of the
thin media and social comparison (Festinger, 1954). With regard to the thin media images, several important results of current study merit discussion. I found that groups primed by the thin ideal exhibited significantly faster Stroop response times, opposite of predictions. Furthermore, comparing the self-report measures with the Stroop response times, I found that in the prime group only, as eating disorder symptoms, anxiety and depression increase, attentional bias to body-related words decreased (i.e., a negative relationship). This was not the case in the control group. For the control group, the opposite occurred. As eating disorder symptoms, anxiety, and depression increase, attentional bias also increased (i.e., a positive relationship). These findings were not expected, but are important because they may be representing some other cognitive or emotional strategy that participants are using to deal with threatening stimuli. There have been studies where Stroop interference is reduced or where participants become faster in performing the task (see Williams et al., 1996). These studies attribute the better performance to the presence of threatening stimuli leading to anxiety, which leads to better performance on the Stroop task. Looking at the results of the current study, the younger adults in Experiment 2 had significantly higher anxiety scores and the fastest Stroop response times. Put together, I conclude that in Experiment 2, the thin ideal prime is interpreted as threatening, which leads to high anxiety and avoidance, manifested as faster Stroop response times, especially when processing the body-related words. The prime group had the fastest response times (i.e., the prime was present for this group). Moreover, the younger adults had significantly more anxiety, and this anxiety is negatively correlated with Stroop processing times (i.e., more anxiety, less attentional
bias). Previous research has found that anxiety leads to faster Stroop processing (Williams et al., 1996).

Furthermore, as presented in the Introduction, race and ethnic identity can have an effect on the processing of media images. When comparing the ethnic identity self-report data to the Stroop processing times in Experiment 2, I found a negative relationship. As ethnic identity increased, again, attentional bias decreased (i.e., faster Stroop processing). This result was only significant in Experiment 2 for the younger adults. The pictures in the thin ideal prime manipulation represent contemporary thin media (i.e., perfect thin body in Western society). This prime is having an effect on the younger adults, who may be the most likely to identify with the thin ideal images, find them threatening, feel anxious and aroused, and thus race to finish the task. These results could explain the mixed findings in the literature for research in this area with participants without an eating disorder after thin ideal priming. It is evident from the results of the current study that anxiety, arousal, and ethnic identity all play an important role.

One final note regarding these self-report measures, when looking at the self-report measures and comparing younger and middle age females without an eating disorder, I find that the middle age females reported a significantly higher BMI. This result was expected (see e.g., Allaz et al., 1998). However, what is interesting is the younger adults are the ones reporting more eating disorder symptoms, anxiety, and depression.

**The Stroop Task and Computer Mouse Tracking**

As stated in the Introduction, the classic Stroop task has been modified from cognitive psychology to examine attentional bias in various forms of psychopathology.
including eating disorders (Dobson & Duzois, 2004). Individuals with an eating disorder selectively attend to stimuli related to their disorder. Age-related increases in Stroop interference may at least partially reflect general slowing (Salthouse, 1996). General slowing suggests that the mechanism accounting for age-related variance in performance is a decrease in speed of processing, which can have an impact on all aspects of cognition, including attention. Computer mouse tracking was used as a supplement to the Stroop task in the current study. Attentional bias occurs rapidly, and computer mouse tracking provides a practical and useful method of examining continuous processing during the Stroop task. The combined use of the Stroop task and computer mouse tracking allowed me to examine the middle age participants’ performance more closely. In Experiment 1, using the RT data alone, I may have concluded that the slower processing for the middle age participants was simply due to general slowing. Fortunately, the mouse tracking data provide a richer view of processing that was consistent with my predictions. The results of the current study provide a novel contribution to the research in this area showing the importance of comparing not only younger adults with and without an eating disorder, but also middle age adults with and with out an eating disorder, as these age differences in Stroop processing have not previously been explored.

As discussed previously, the thin ideal primes in Experiment 2 appears to have facilitated responses to the body-related words in both the younger and middle age adults. I predicted in Experiment 2 that the younger adult females would be most affected by the thin ideal prime and would exhibit the greatest distraction to the body-related words. While this was not the case when examining RTs, I found that this group (younger
females in the prime group) stood out during the raw time analysis of the response trajectory. When looking at differences by prime group and age, younger adults in the control group were faster than middle age adults for all three words types. In the prime group, these age differences were not observed; in fact, the one significant difference found was that the middle age adults outperform the younger adults for the fat words in the last time bin. A key reason for using computer mouse tracking in this experiment was to capitalize on its usefulness in providing novel data regarding the time course of participants’ responses. In the current study, examining RTs alone might lead one to conclude that participants were avoiding the body words, thus leading to faster processing. However, when examining the raw trajectories, we can see age differences emerge as well as interactions with prime type over the time bins. The Stroop task has been criticized, citing limited usefulness because of mixed findings (Lee & Shafron, 2004). The current study demonstrates that supplementing the Stroop task with computer mouse tracking can lead to a better understanding of the underlying processes involved in the Stroop interference effect.

**Strengths**

The current study has several strengths. First, standardized word lists, including fat, thin, and neutral words, were used in the study, as suggested by Cassin et al. (2008). Significant processing differences were found depending on word type. This study showed the importance of this type of consistency for comparison across Stroop studies. Second, most of the research in this area focuses on adolescents and younger adults. Whether or not the attentional bias effect exists in middle age females had not been investigated. The present study extended research in this area by employing a middle age
sample, and I believe the results of the current study will mark a new call for a better understanding of body image in middle age for women both with and without an eating disorder. Third, to the best of my knowledge, computer mouse tracking had not previously been used in Stroop studies with participants with eating disorders. The motivation to use computer mouse-tracking in the present study stems from the fact that while the Stroop task has been used for decades, it may not tell the whole story (see Incera, Markis, & McLenman, 2013). In this research study, I was able to use computer mouse tracking to pinpoint a specific time bin when processing was significantly different for younger and middle age adults for one specific word type. Mouse tracking is free, easy to use, time-sensitive, and could provide new insights and details regarding participant responses.

**Limitations**

There are a several limitations to the present study that merit discussion. In both experiments, the results showed the neutral words had the longest response times. One possible explanation for this finding could be the method of presentation of the neutral stimuli. As stated in the Methods section, I intentionally blocked the neutral words within each block so that I could obtain a pure baseline for processing solely the neutral stimuli, and to prevent any processing overlap onto the neutral words from the processing of body-related stimuli. However, this presentation method may have contributed to the longer RTs to neutral words. For example, participants may have realized over the course of the experiment that body words followed neutral words. In Experiment 2, one explanation for the facilitated response times to the body-related words is that participants may be intentionally avoiding reading the words and thus were able to
process the color more rapidly. If, in fact, these participants realized that neutral words came first, they could have read the neutral words (leading to slowed processing), and quickly color-named the body words in order to finish the block. Future research should continue to investigate the best method of obtaining meaningful baseline data for the neutral words that both minimizes carryover effects from body to neutral words and the likelihood of participants developing different strategies for responding to separate blocks of neutral and body-related words.

In Experiment 1, nearly all of the participants with an eating disorder were Caucasian, with only one exception. A diverse sample of younger and middle age participants with an eating disorder would have been extremely difficult to obtain in this area for this study. The two eating disorder treatment facilities in the Cleveland area are located in predominately white areas. The primary health care institutions (e.g., The Cleveland Clinic, University Hospitals) are accessible to more diverse populations, but to the best of my knowledge all of eating disorder treatments are directed to these two centers. There are at least three possible explanations for the sample demographics obtained in the current study. First, an eating disorder is a disease affecting mostly Caucasian females. Second, eating disorders exist among racial minorities, but minorities are less likely to access the available eating disorder treatment facilities. Third, diverse populations are receiving treatment in these facilities, but only Caucasian females volunteered to participate. Nevertheless, generalizing to all females in the population was not a goal of this research study.

It was very difficult to find middle age females who have been diagnosed with an eating disorder to volunteer to participate in the current research study. Data collection
was open and ongoing for over one year. It is possible that this group exists in large number, but they did not volunteer because eating disorders were not as common or frequently diagnosed when their disorder began, especially for those who suffered with bulimia. It is also possible that a stigma exists for body image concerns in middle age, leading middle age females to be hesitant to volunteer. Obviously the younger adults who are presently diagnosed with an eating disorder will eventually become middle age, once again bringing about the need for continued research in this area (and others) using both younger and middle age samples.

Furthermore, the current study is cross-sectional, and I acknowledge that all results revealing age differences are from a comparison of scores from two samples (younger and middle age) who belong to different cohorts (generations) measured at this one point in time. The age differences found in the current study could be the result of cohort differences, or they could be due to both age and cohort differences; however, without longitudinal methods, I was not able to measure developmental change. The results of the current study do not make it known whether the middle age participants perform differently than the younger adults because they are older (developmentally) or whether it is because they were born during a different time period.

Finally, it is important to acknowledge that the current study is quasi-experimental in nature, as one cannot randomly assign participants to age groups or eating disorder status. The differences found in the current study could be due to confounding variables that were not targeted in the present research study (e.g., length of diagnosis, severity of symptoms). Regardless, it is important note that research studies
with middle age (and older) samples with and without various types of eating disorders are crucial (see Mangweth-Matzek, et al., 2006).

**Future Directions**

Further analysis is required to fully understand the results of the present study. For example, the Stroop task consisted of blocks in order to counterbalance color for each word type. That is, each participant responded to each of the 60 words four separate times for a total of 240 trials. Each individual block can be identified and analyzed separately. For example, an analysis of block 1 (i.e., the first time the participant responds to the word), could lead to distinct results (e.g., stronger effects) compared to an analysis of block 2 (i.e., the second time the participant responds to the word), and so on. Future work will include this type of analysis, beginning with block 1. It is possible that when I examine the blocks separately, interactions may emerge, and the delayed processing of the neutral words found in the current study may decline.

Future work could separate participant groups in Experiment 1 by type or length of disorder when examining Stroop processing. Additionally, participants responded to 153 questions in the self-report questionnaire that measured the eight separate subscales of the EDI, including *Drive for Thinness* and *Bulimia*, both state and trait anxiety, depression, and ethnic identity. Each of these measures could be used as a control variable and may reveal greater group and age differences.

Future work could extend Experiment 1 using a longitudinal research method. A longitudinal method would allow for the measurement of age change. For example, it is possible that the younger adults in the current study will perform as they are now when they reach middle age, because they are a separate cohort. However, it is also possible
that the younger adults will perform differently or as the middle age adults did in the current study, when they are in middle age, representing developmental age change. Longitudinal research methods in the future would allow me to make this important distinction.

Future work extending Experiment 2 could begin with an analysis of how the participants responded during the experimental priming paradigm. Thirty-two younger adults and 31 middle age adults participated in the thin ideal prime condition. Each participant was exposed to the 15 swimsuit models and asked a series of questions, including “how does your body compare with the swimsuit model’s?” These ratings could undergo correlational analysis with any of self-report measures and with the Stroop response times and mouse tracking data. These ratings could also be used to divide participants into high and low groups on the rating scale and then compare the groups’ responses to the EDI (for example).

It is essential that future work continue testing the utility of the standardized word lists as those used in the current study (Cassin and von Ranson, 2005). After addressing the limitations of presenting the neutral stimuli separately at the beginning of each block, I plan to continue to use these word lists in future studies of attentional bias. It would add to the efficacy of research in this area to know that these words were being used with other dependent measures in addition to the Stroop task (e.g., lexical decision and dot-probe).

Future research should continue to include computer mouse tracking in Stroop studies. The raw time data analysis was found to be a beneficial supplement to the current study, especially in Experiment 2. Future research could use MouseTracker to
examine visual or spoken recognition of an emotional word. For instance, a fat stimulus (ENORMOUS) and neutral stimulus (ADHESIVE) could be shown at the top left and top right corners of the computer screen. Participants could be instructed to move the mouse immediately upon hearing the target word, ‘ADHESIVE.’ Spatial attraction to the emotional word could be measured with computer mouse tracking. Importantly, future research, like the above-mentioned example, would more closely parallel the classic Stroop task, in order for the results to demonstrate true interference to a distracting stimulus.

Future research on eating disorders needs to include middle age samples. A full understanding of body image in middle age, and the related factors are necessary, vital, and ripe for future explorations. Although the results did not follow the predictions exactly, the general message from each experiment was as expected. In Experiment 1, middle age females with an eating disorder exhibited the largest attentional differences, and in Experiment 2, the attentional differences were more evident in younger females.
References


to examine appearance-schematic information processing in college women.

*Cognitive Therapy and Research*, 22, 179-190.


Nebraska Symposium on Motivation (pp. 267–307). Lincoln: University of Nebraska Press.


Tiggemann, M., & Lynch, J. E. (2001). Body image across the life span in adult women:


APPENDIX A
Fat, Thin, and Neutral Word Stimuli

<table>
<thead>
<tr>
<th>Fat</th>
<th>Thin</th>
<th>Neutral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obese</td>
<td>Skeletal</td>
<td>Humid</td>
</tr>
<tr>
<td>Big</td>
<td>Skinny</td>
<td>Low</td>
</tr>
<tr>
<td>Huge</td>
<td>Thin</td>
<td>Fast</td>
</tr>
<tr>
<td>Overweight</td>
<td>Bony</td>
<td>Subjective</td>
</tr>
<tr>
<td>Porky</td>
<td>Slim</td>
<td>Vivid</td>
</tr>
<tr>
<td>Flabby</td>
<td>Fragile</td>
<td>Floral</td>
</tr>
<tr>
<td>Heavy</td>
<td>Scrawny</td>
<td>Dusty</td>
</tr>
<tr>
<td>Large</td>
<td>Bone-rack</td>
<td>Clear</td>
</tr>
<tr>
<td>Plump</td>
<td>Lean</td>
<td>Moist</td>
</tr>
<tr>
<td>Pudgy</td>
<td>Narrow</td>
<td>Quiet</td>
</tr>
<tr>
<td>Tubby</td>
<td>Slender</td>
<td>Foggy</td>
</tr>
<tr>
<td>Beefy</td>
<td>Underweight</td>
<td>Curly</td>
</tr>
<tr>
<td>Chunky</td>
<td>Tiny</td>
<td>Glossy</td>
</tr>
<tr>
<td>Enormous</td>
<td>Undersized</td>
<td>Numerous</td>
</tr>
<tr>
<td>Fleshy</td>
<td>Petite</td>
<td>Cloudy</td>
</tr>
<tr>
<td>Gigantic</td>
<td>Wiry</td>
<td>Metallic</td>
</tr>
<tr>
<td>Lard</td>
<td>Small</td>
<td>Tame</td>
</tr>
<tr>
<td>Chubby</td>
<td>Toned</td>
<td>Formal</td>
</tr>
<tr>
<td>Fat</td>
<td>Lanky</td>
<td>Wet</td>
</tr>
<tr>
<td>Blubber</td>
<td>Delicate</td>
<td>Adhesive</td>
</tr>
</tbody>
</table>
APPENDIX B
Self-Report Questionnaire used in Experiments 1 and 2

Removed for Copyright
APPENDIX C
Informed Consent used in Experiment 1

Participant Consent Form

This research is being conducted by Teresa Markis as part of her doctoral dissertation project for a Doctor of Philosophy in Adult Development and Aging in the Psychology Department at Cleveland State University under the direction of her advisor Dr. Conor T. Mclennan. Contact information for both Teresa and Dr. Mclennan appear below.

As a participant in this study, you will be asked to complete a short task on the computer and a short questionnaire. The purpose of this research is to investigate information processing and attention in females. Your participation in this part of the study will be limited to one session lasting approximately 30 minutes. You will be paid $15.00 for your participation. Please be aware that you are not required to participate in this research, and you may discontinue your participation at any time without penalty.

Your data and responses on the participant intake form will remain confidential. However, as with all confidential research, there is the potential risk of breach of confidentiality. We will take various measures to ensure this confidentiality. Your name will appear only on this informed consent form and the researcher’s experiment log. These will be kept in a file cabinet in a locked room. Furthermore, data from this study will likely only be presented, published, or discussed in aggregate. However, should an individual’s data be singled out, this would only be done using a participant code, without using names or any other identifying information.

Risk associated with participation in this study is minimal. Potential risks include fatigue and possible discomfort in disclosing sensitive information. If fatigue occurs, you can take as much time as you need to complete the experiment. If you do not feel comfortable answering any questions, you can skip the question, and you may stop at any time without penalty. Your data are important to this research project, and I hope that your participation contributes to your learning about psychological research.

After you complete the study, Teresa and a staff member from The Hull Institute will be available should you have any questions or need further assistance.

For further information regarding this research, please contact Teresa Markis at (216) 712-1533, email: t.markis@csuohio.edu, Dr. Conor T. Mclennan (216) 687-3750, email: c.mclennan@csuohio.edu, or Ann Hull at (216) 407-6278. There are two copies of this consent form. After signing them, keep one copy for your records and return one to the researcher. Thank you in advance for participating in our research study.
Please indicate your agreement to participate by signing below.

I am 18 years or older and have read and understood this consent form and agree to participate.

I understand that if I have any questions about my rights as a research participant I can contact the Cleveland State University Institutional Review Board at (216) 687-3630.

Name (please print): __________________________ Date:________________

Signature: __________________________________________
APPENDIX D
Swimsuit Model Prime
APPENDIX F
Informed Consent used in Experiment 2

Participant Consent Form

This research is being conducted by Teresa Markis as part of her doctoral dissertation project for a Doctor of Philosophy in Adult Development and Aging in the Psychology Department at Cleveland State University under the direction of her advisor Dr. Conor T. McLennan. Contact information for both Teresa and Dr. McLennan appear below.

As a participant in this study, you will be asked to complete a short task on the computer and a short questionnaire. The purpose of this research is to examine various consumer preferences. Your participation in this part of the study will be limited to one session lasting approximately 30 minutes. You will be paid $15.00 for your participation. Please be aware that you are not required to participate in this research, and you may discontinue your participation at any time without penalty.

Your data and responses on the participant intake form will remain confidential. However, as with all confidential research, there is the potential risk of breach of confidentiality. We will take various measures to ensure this confidentiality. Your name will appear only on this informed consent form and the researcher’s experiment log. These will be kept in a file cabinet in a locked room. Furthermore, data from this study will likely only be presented, published, or discussed in aggregate. However, should an individual’s data be singled out, this would only be done using a participant code, without using names or any other identifying information.

Risk associated with participation in this study is minimal. Potential risks include fatigue and possible discomfort in disclosing sensitive information. If fatigue occurs, you can take as much time as you need to complete the experiment. If you do not feel comfortable answering any questions, you can skip the question, and you may stop at any time without penalty. Your data are important to this research project, and I hope that your participation contributes to your learning about psychological research.

If you have any questions or would like more information regarding this research, please contact Teresa Markis at (216) 712-1533, email: t.markis@csuohio.edu or Dr. Conor T. McLennan (216) 687-3750, email: c.mclennan@csuohio.edu.
There are two copies of this consent form. After signing, keep one copy for your records and return one to the researcher. I am 18 years or older and have read and understood this consent form and agree to participate. Please indicate your agreement to participate by signing below. Thank you in advance for participating in our research study.

I understand that if I have any questions about my rights as a research participant I can contact the Cleveland State University Institutional Review Board at (216) 687-3630.

Name (please print): ___________________________ Date: __________________

Signature: ___________________________________________
APPENDIX G
Significant Correlations with Stroop Processing in Experiments 1 and 2

Bivariate correlations for Experiment 1:

EDI, along with eight subscales, BDI, STAI, and ethnic identity scale, was subjected to bivariate correlations with the effect of response times to fat words, which is the fat words minus neutral words (*fat effect*), the effect of response times to thin words, thin words minus neutral words (*thin effect*), and the total response times to the body words, average of fat and thin words minus neutral words (*body effect*).

**By group:**

Younger adults with an eating disorder

- *body effect* correlated with body dissatisfaction, $r = .32, p = .05$
- *fat effect* correlated with body dissatisfaction, $r = .35, p = .03$

Middle age adults with an eating disorder

- *fat effect* correlated with ethnic identity, $r = .41, p = .05$

All participants with an eating disorder

- no significant relationships were found

Younger adults without an eating disorder

- *fat effect* correlated with body dissatisfaction, $r = .36, p = .03$
- *thin effect* correlated with ethnic identity, $r = -.32, p = .04$
- *body effect* correlated with ethnic identity $r = -.32, p = .04$

Middle age adults without an eating disorder

- no significant relationships were found

All participants without an eating disorder

- *thin effect* correlated with ethnic identity, $r = -.23, p = .03$
- *body effect* correlated with ethnic identity, $r = -.23, p = .04$
Bivariate correlations for Experiment 2:

EDI, along with eight subscales, BDI, STAI, ethnic identity, and BMI scores were subjected to bivariate correlations as above in Experiment 1.

By group:

Younger adults primed with the thin ideal

- *body effect* correlated with ethnic identity, $r = -.45, p = .005$
- *thin effect* correlated with ethnic identity, $r = -.55, p = .001$

Middle age prime group

- *body effect* correlated with drive for thinness, $r = -.32, p = .048$
- *body effect* correlated with bulimia, $r = -.32, p = .04$

All participants in the prime group

- *body effect* correlated with drive for thinness, $r = -.24, p = .03$
- *fat effect* correlated with drive for thinness, $r = -.23, p = .04$
- *fat effect* correlated with bulimia, $r = -.22, p = .04$
- *thin effect* correlated with ethnic identity, $r = -.23, p = .03$

Younger adults in the control group

- *body effect* correlated with maturity fears, $r = .31, p = .046$
- *body effect* correlated with ethnic identity, $r = -.40, p = .01$
- *fat effect* correlated with ethnic identity, $r = -.37, p = .02$
- *thin effect* correlated with maturity fears, $r = .34, p = .03$
- *thin effect* correlated with ethnic identity, $r = -.38, p = .02$

Middle age adults in the control group,

- *body effect* correlated with EDI, $r = .42, p = .01$
- *body effect* correlated with body dissatisfaction, $r = .46, p = .006$
- *body effect* correlated with perfectionism, $r = .38, p = .02$
- *body effect* correlated with state anxiety, $r = .41, p = .01$
- *fat effect* correlated with body dissatisfaction, $r = .38, p = .02$
- *fat effect* correlated with state anxiety, $r = .31, p = .046$
- *thin effect* correlated with EDI, $r = .48, p = .004$
- *thin effect* correlated with body dissatisfaction, $r = .49, p = .004$
- *thin effect* correlated with interoceptive awareness, $r = .37, p = .02$
- *thin effect* correlated with perfectionism, $r = .42, p = .01$
- *thin effect* correlated with state anxiety, $r = .45, p = .01$
• **thin effect** correlated with trait anxiety, \( r = .35, p = .03 \).

All control group participants

• **body effect** correlated with EDI, \( r = .28, p = .02 \)
• **body effect** correlated with body dissatisfaction, \( r = .30, p = .01 \)
• **body effect** correlated with ineffectiveness, \( r = .26, p = .02 \)
• **thin effect** correlated with EDI, \( r = .36, p = .003 \)
• **thin effect** correlated with body dissatisfaction, \( r = .36, p = .003 \)
• **thin effect** correlated with ineffectiveness, \( r = .29, p = .01 \)
• **thin effect** correlated with maturity fears, \( r = .24, p = .03 \)
• **thin effect** correlated with perfectionism, \( r = .23, p = .04 \)
• BMI was not related to Stroop response times, but was significantly related to participants scores on the EDI, \( r = .28, p = .001 \) (i.e., as BMI increased, so did eating disorder symptoms).