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Emotional Stroop Effects: Eating Disorders and Obesity

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Emotional Stroop Effects: Eating Disorders and Obesity

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the requirements for the degree of
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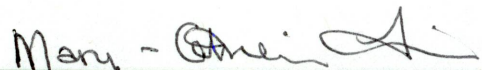
Each person whose signature appears below certifies that this dissertation in his/her opinion is adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.



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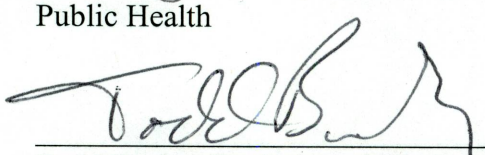

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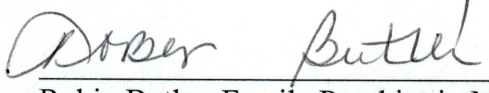

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ABSTRACT

Emotional Stroop Effects: Eating Disorders and Obesity

by

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This study addresses the effects of emotional valence on selective processing of body-shape related words in young women who suffer from anorexia, bulimia, or obesity, and non-clinical controls. Research in the area of emotional Stroop interference has indicated that persons with eating disorders, particularly anorectics, show elevated latencies in naming colors of words related to food or body-shape, in contrast to either neutral words, or to non-clinical control groups. One intriguing issue regarding the emotional Stroop interference among various clinical populations relates to the question of whether the interference is due to the emotionality of the relevant words or to their valence. In addition, limited studies have been done on bulimia and obesity, and emotional Stroop interference. Overall, the Stroop task demonstrated utility in measuring emotional interference in persons with and without eating disorders. This study found that words with positive valence, regardless of Stroop word category, were processed relatively quickly by all participants. The control group demonstrated the shortest response latency, as compared to the eating disorder group, who took significantly longer to respond. This effect was shown regardless of valence or category of the words. Additionally, this study lends support to the Body Shape Questionnaire as a measure of eating disorder severity, and emphasizes the importance of including body image in the

evaluation and treatment of eating disorders. The various levels of eating disorder concerns among the obese participants support the psychologically heterogeneous nature of the obese population. It is hoped that this study prompts further examination into the subgroups within the obese population with regards to the cognitive processing of emotional data in relation to body image disturbance. Furthermore, the study may sharpen the understanding of the cognitive schema of eating disorders and, through further research, their susceptibility to treatment. In addition, the findings can prompt the development of a practical and independent measure for the severity of eating disorders, recovery, and for identification of specific concerns, particularly related to body image, among individuals who are afflicted by these life threatening diseases.

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INTRODUCTION

Difficulties associated with eating behavior, existing on a broad continuum from basic overeating to psychopathologically disordered eating, is a growing area of concern within the medical and mental health communities (Rivas-Vazquez, Rice, & Kalman, 2003). Anorexia nervosa and bulimia nervosa are the two most widely recognized eating disorders. In addition, patients presenting with atypical eating disorders are typically classified as having an eating disorder not otherwise specified (American Psychiatric Association, 2000). The most prominent type within this category is binge eating disorder. Although obesity is not classified as an eating disorder, several dysfunctional eating behaviors and cognitions call for this potentially life-threatening condition to be investigated parallel to eating disorders.

Among all psychological disorders, eating disorders have been associated with one of the highest risks of premature death resulting from either medical complications or suicide (Keel, Dorer, Eddy, Franko, Charatan, & Herzog, 2003). Overall, 15–20% of patients with eating disorders may die as a result of the disorder, and 25% of those who survive, remain chronically ill (i.e., maintaining a low body weight, chronic fluctuations in weight). Several medical complications result from eating disordered behaviors.

In anorexia, medical complications occur as a result of low caloric intake and subsequent malnutrition, and the consequences extend to nearly all organ systems. Osteoporosis, amenorrhea, hypothermia, hypotension, and gastrointestinal issues are some of the various physical complications that may arise as an attempt by the body to shut down "nonessential systems" (Sobel, 2004). Medical consequences of bulimia stem

from physical and chemical changes that result from binging and purging. Tears in the esophageal stomach juncture may develop due to the force of regurgitation of acid against this area (Sobel, 2004). Erosion of dental enamel, arrhythmias, and reduced serotonin are also complications associated with bulimia.

Halmi (2000) reports that approximately 40% of individuals with eating disorders eventually recover, while others may attain functionality yet continue to exhibit mild disordered eating behaviors.

Impaired self-image, compromised physical health, and psychosocial dysfunction may persist into adulthood for those having "recovered" from an active eating disorder during adolescence (Striegel-Moore, Seeley, & Lewinsohn, 2003). Additionally, individuals with eating disorders are at risk for substance abuse, depression, and anxiety disorders, and remain at risk for relapse after recovery (Johnson, Cohen, Kasen, & Brook, 2002). Current treatments have not significantly altered the course of obesity and eating disorders, underscoring the complexity of these conditions and the need for further research to improve detection and treatment of eating disorders. Assessing body image as part of a comprehensive evaluation may lead to further specification in diagnosis and intervention. In addition, indirect methods of assessing body schema may serve as practical and independent measures for the severity of eating disorders and recovery, and the identification of specific concerns in individuals afflicted by these life-threatening disorders.

Body Image

Body image has been defined as the internal representation of one's outer appearance (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999). One's unique internal view affects cognitive, emotional, and behavioral aspects of an individual. Body image concerns can adversely affect psychological well-being and quality of life. This section of the review of the literature will focus on the clinical issues that arise from body image disturbances, or a negative view of one's outer appearance; and more specifically as related to persons with anorexia nervosa, bulimia nervosa, or obesity.

Conceptualizations

Early in the 20th century, researchers were interested in the neurological basis of body image. For instance, Head (1926; as cited in Pruzinsky & Cash, 2002) offered an account of body schema; the cognitive processes related to a schema which serves as a reference point for organizing new information about one's appearance. Pruzinsky and Cash (2002) note that historically, psychological variables were not considered; rather, body schema was hypothesized to be a neural mechanism whereby changes in movement and posture were centrally coordinated.

Psychodynamic Perspectives

Schilder (1950) proposed a biopsychosocial approach to self-awareness of body image, noting that both conscious and unconscious processes contributed to the total image of one's body. He cited contributions of emotions, attitudes, wishes, and social

relationships on body image. During this time, projective methodologies were the primary tool for investigating body image through psychodynamic perspectives.

More recently, Krueger (2002) defined body image as the dynamically and developmentally evolving mental representation of what Freud labeled the body ego, or the body self. He noted that the body is the reality, through which we experience life. The body self and image, on the other hand, are ideas which are created by and live within the imagination. Body image, he posited, is a cumulative set of images and meanings about the body, its parts, and its functions. It is an integral component of self-image and the basis of self-representation.

It follows from a psychodynamic approach that attachment is the foundation for the development of body image. The attunement of the caregiver with the infant's body through sensory-motor modalities forms the foundation for the psychological self and evolving body image, according to this perspective (Krueger, 2002). This is accomplished through the infant's discovery of body boundaries and internal states as separate from caregivers. Krueger notes that a body image is a conceptual composite of all sensory modalities, combined with later mental representations of the others' reactions to one's appearance. One's body image is a developmental process that transforms gradually with maturation around an intact psychological self; however, this process may become abrupt, symptomatic, and prominent in cases where pathology becomes apparent.

Cognitive-Behavioral Approaches

Shontz (1990) argued that the shift from neurological to psychodynamic perspectives had removed "body" from body image research. He posited that the

psychodynamic view of body image was a "projection screen for emotional learning and experience" which eliminated the "image" from body image by operationally defining it as perceiving ambiguous stimuli such as inkblots. Shontz (1969) called for the investigation of a multifaceted "body experience" through the use of diverse theoretic methods and frameworks, such as field theory, Gestalt psychology, and cognitive theory.

From a current cognitive-behavioral perspective, Cash (2002) explains the developmental influences on body image to include socialization regarding the meaning of physical appearance and one's body-centered experiences during childhood. He notes that these experiences occur in the context of one's social, cognitive, emotional, and physical development as person-environment interactions. Body image development is affected by cultural and media-based messages, parental role modeling, and social relationships. Cash also notes that positive self-esteem may serve to facilitate development of a positive evaluation of one's body; whereas poor self-concept may increase one's body image vulnerability.

Cash cites two basic attitudinal components of body image: investment and evaluation. He states that the cognitive-behavioral importance persons place on their appearance denotes investment. Evaluation refers to the positive-to-negative judgments of and beliefs about one's appearance (e.g., body satisfaction, dissatisfaction). Cash and Szymanski (1995) demonstrated that body image evaluations are related to the degree of discrepancy between self-perceived physical characteristics and personally valued appearance ideals.

Markus (1977) defined self-schemas as "cognitive generalizations about the self, derived from past experience, that organize and guide the processing of self-related

information contained in an individual's social experience" (p. 64). According to cognitive-behavioral theory, schematic content is comprised of implicit attitudes, assumptions, beliefs, and rules which influence one's thoughts, emotions, and behaviors. Hence, body image schemas reflect one's core beliefs about the significance and influence of appearance in life, to include appearance as essential to one's sense of self.

Contextual events or situational cues activate schema-driven processing of information about, and self-evaluations of, one's appearance. Internal dialogues among individuals with problematic body image schemas become habitual, flawed, and dysphoric. Cash (2002) describes coping mechanisms, which include well-developed cognitive strategies or behaviors, used to accommodate to environmental events that trigger distressing body image thoughts and emotions. These include body concealment behaviors, appearance correcting rituals, and other compensatory strategies that serve to maintain body image beliefs through negative reinforcement. He found that these maneuvers facilitate temporary avoidance, reduction, or regulation of body image discomfort.

Sociocultural Perspectives

Body image disturbances are often attributed to sociocultural pressures to be thin and from physical divergence from the current cultural thin-ideal. Pressure to be thin comes from an array of sources, including media, families, and peers (Levine & Smolak, 1996). The results may include an internalization of the cultural ideal of thinness, elevated investment in appearance, and a generalized belief that attainment of thinness will result in many social and interpersonal benefits (e.g., greater personal acceptance,

enhanced career success). Because this ideal is virtually biologically impossible for most individuals, the internalization of cultural ideals along with external pressures to be thin, are thought to promote body dissatisfaction. In addition, elevated internalization of the thin-ideal is thought to foster information-processing biases that result in body image distortions (Williamson, Stewart, White, & York-Crowe, 2002).

Gender differences. "Normative discontent" has been used to describe the insidious negative feelings that girls and women experience towards their bodies (Rodin, Silberstein, & Striegel-Moore, 1985), regardless of weight status. Striegel-Moore and Franko (2002) note that, regardless of age, females are far more likely to experience body image concerns than males. In addition, eating disorders are in excess of 10 times more prevalent in females than in males (Striegel-Moore, 1997). As girls enter puberty, body image concerns become more common, and by adolescence, a preoccupation with weight and body dissatisfaction becomes more normative. It is not uncommon for girls who report feeling fat and wanting to lose weight to be within normal weight range. This body dissatisfaction remains fairly stable and continues throughout the lifespan for many women.

Ethnic differences. The incidence of obesity is higher among minorities than the incidence for Caucasians, with African-American women having extremely high rates of obesity (Klesges, DeBon, & Meyers, 1996). Compared to Caucasian women, African-American women endorse a body ideal that is slightly heavier, are less likely to report body dissatisfaction and dieting to lose weight, and report less social pressure to be thin (Rucker & Cash, 1992). Studies have shown that African-American females have higher self-esteem than Caucasian females, and that self-esteem may not be as dependent on

body image as it is for Caucasian women (Celio, Zabinski, & Wilfley, 2002). Striegel-Moore and her colleagues (2000) found that increased body dissatisfaction exists for both African-American and Caucasian girls between the ages of 11 and 16. African-American girls, however, have less dissatisfaction than Caucasian girls, and that this dissatisfaction increases more sharply over time in Caucasian girls.

Some Asian cultures have traditionally viewed obesity as a sign of beauty, health, and prosperity; however, the industrialization of these cultures has lead to a desire to be thinner in some Asian countries (i.e., Japan, China). Asian-American women have also demonstrated this desire, but they have been shown to engage in less dieting behaviors and have a lower incidence of eating disorders than Caucasian women (Mintz & Kashubeck, 1999). The collectivistic culture in this ethnic group has been proposed to affect one's body image through the pressure to maintain a perfect physical appearance that does not bring shame onto the community (Hall, 1995).

In the Hispanic culture, strong family identification may provide a buffer from the narrowly defined physical ideal presented in the media. Further, Hahn-Smith and Smith (2001) found greater maternal identification to be associated with better self-esteem and body image in both Hispanic and Caucasian girls. The traditional values promoted by this culture include female submissiveness, self-sacrifice, and restraint which often translate into higher levels of eating disturbances and body dissatisfaction.

A Feminist approach. McKinley (2002) maintains that women's body dissatisfaction stems from a cultural context in which the female body is associated with deviance (i.e., medicalization of ordinary functions such as menstruation and menopause) and encouraged to be evaluated (i.e., media objectification of female body). Rather than

focus on individual pathology, feminist theory views body image disturbance as a systematic social problem. Cash, Winstead, and Janda (1986) found that only 7% of women expressed little concern over their physical appearance. This sparked an interest in investigating the distinction between subjective body size dysphoria in normal versus clinical populations. McKinley proposes that the internalization of social constructions of women's bodies forms an "objectified body consciousness" (OBC).

A component of OBC is body surveillance, or watching oneself as if one were an observer. Fredrickson and Roberts (1997) argue that routine monitoring of the body influences women's psychological experience, deepening shame and anxiety while diminishing awareness of internal bodily states. Higher body surveillance (i.e., appearance is most important) has been found to be related to lower body satisfaction, more eating problems, and lower levels of self-acceptance.

The internalization of cultural body standards is another element of OBC, which refers to the connection between conforming to society's standards with one's sense of self-worth. McKinley (2002) notes that women may feel a sense of empowerment as they approximate these standards, but more often shame when they can not. Body shame is thus related to degree of endorsement of cultural body standards. Additionally, body shame has been found to correlate with higher body surveillance, lower body satisfaction, more eating problems, and reduced psychological well-being.

The final component of OBC is the assurance that cultural body standards can be achieved with adequate effort; namely, appearance control beliefs. A sense of competence may be temporarily obtained in gaining control over one's body in the attempt to work towards often unattainable standards. McKinley (2002) has found that

these beliefs are related to higher frequencies of restricted eating and more eating problems. She notes that control beliefs are correlated with higher psychological well-being, which may indicate that these beliefs may serve to help women feel good about themselves while reinforcing problematic eating behaviors.

Body Image and Anorexia Nervosa

Anorexia nervosa is a life-threatening disease with a prevalence of 1% - 3% among adolescent and young adult females. The disease is classified as an eating disorder and characterized by a refusal to maintain normal body weight, an intense fear of becoming fat even when the person is under weight, a disturbance in body-image, and an absence of at least three consecutive menstrual cycles due to under-eating. There are two subtypes: the Restricting Type, which requires the absence of binge-eating/purging behaviors, and the Binge-Eating/Purging Type, which specifies the presence of these behaviors.

Bruch (1962), who offered the first systematic account of the role of body image disturbance in the phenomenology of eating disorders, argued that distorted body size perception was a necessary factor in the development of anorexia nervosa, and posited that it was the most important pathognomonic feature of the disorder. Without addressing body image, Bruch reported that an improvement in anorexic symptomatology may only be temporary. In fact, body image has been found to be a predictor of relapse in anorexic patients, with the majority of these patients continuing to obsess over body weight and shape, even after weight restoration.

Slade and Russel (1973) examined size perceptions in persons with anorexia nervosa, finding that, despite their emaciated state, patients with anorexia nervosa overestimated their physical proportions when compared to controls. This study generated a wealth of research in the mid-1970s, which lead to the inclusion of body image criterion for the diagnosis of anorexia nervosa in the *Diagnostic and Statistical Manual of Mental Disorders-III* (DSM-III; American Psychiatric Association, 1980). The current definition of anorexia nervosa contains two criteria that denote body image disturbance (DSM-IV-TR; American Psychiatric Association, 2000): 1) "an intense fear of gaining weight or becoming fat, even though underweight" and 2) "disturbance in the way in which one's body weight or shape is experienced, undue influence of body weight or shape on self-evaluation, or denial of the seriousness of the current low body weight" (p. 589).

According to findings from Cash and Deagle's meta-analysis (1997), the average eating-disordered patient distorts her size to a greater extent than approximately 73% of controls. However, body size distortion does not appear to be stable nor pathognomonic among eating disordered patients. Among anorexic patients, size misperception has been shown to predict higher levels of psychopathology, including external loss of control, low ego strength, higher levels of depression, anxiety, and poor clinical outcomes (Garner, 2002). Body size misperception in this population can be triggered by viewing thin images of women in the media, negative mood states, and perceived overeating, and is thus unstable.

Various explanations have been proposed to account for the observed size overestimation in patients with anorexia (Smeets, Ingleby, Hoek, & Panhuysen, 1999).

Pure visual misperception contends that the patient retrieves a fatter image of herself through visual memory, and her size estimations reflect this image. Another explanation attributes size estimation to the reconstruction of visual representations based on particular thoughts and feelings; thus, the distortion of the visual body image is a function of memory rather than perception. Another notion is that smaller bodies may be more prone to overestimation regardless of level of eating pathology simply because it is more difficult to estimate the size of smaller objects than larger ones. From an information processing approach, body size estimation errors may be due to a cognitive judgment rather than a perceptual error.

From a cognitive-evaluative perspective, body dissatisfaction indicates dysfunctional beliefs about weight and shape. These beliefs become associated with the positive and negative reinforcement contingencies related to success or failure at weight controlling behaviors (Cash, 2002). Once weight loss is achieved, the process is maintained by "starvation symptoms," which include attitudinal, emotional, and physiological aspects that tend to encourage weight control behavior to persist (Garner, 2002).

There have been more studies of body size estimation than body dissatisfaction in this area (Cash & Deagle, 1997); although body dissatisfaction has been shown to be the most common precipitating factor in anorexia nervosa. Interestingly, at the worst stage of this disorder many patients are satisfied and proud of their emaciated body shape. Body dissatisfaction appears to be a Western phenomenon, as cases of anorexia in China and India do not include the fear of becoming fat.

Body image has been shown not to improve until the last stages of recovery, and may be at its worst during the stages of weight gain. Cognitive-behavioral approaches to treatment, combined with family therapy and interpersonal relationship themes, have demonstrated efficacy in improving body image (Cash & Strachan, 2002). This treatment aims at cognitive restructuring of the meaning of thinness and weight control, while acknowledging the adaptive functions eating disordered symptoms serve. Developing a more positive body image includes avoiding certain self-defeating activities (e.g., compulsive exercise, weighing) and replacing them with various body image enhancing practices (e.g., yoga, massage) that accentuate the body as a source of pleasure.

Body Image and Bulimia Nervosa

Body image disturbance, which includes internalization of culturally prescribed body image ideal, body image distortion, and body dissatisfaction, is one of the most significant risk factors in the development and maintenance of bulimia nervosa (Stice, 2002). Bulimia nervosa has a prevalence of 1% - 3% among adolescent and young adult females, and is characterized by binge-eating and inappropriate compensatory methods to prevent weight gain. Unlike the binge eating/purging type of anorexia nervosa, individuals with bulimia nervosa are able to maintain minimally normal body weight (American Psychiatric Association, 2000).

The sole body image criterion related to body image for the *DSM-IV-TR* definition of the eating disorder bulimia nervosa, focuses on the effects of disturbance on one's self-concept, requiring that "self-evaluation is unduly influenced by body shape

and weight" (pp. 594, American Psychiatric Association, 2000). This may be attributed to the prominence of the denial of low body weight among anorexic patients and to the early findings of size misperception in anorexia nervosa. In an extensive meta-analysis, Cash and Deagle (1997) found that anorexic and bulimic samples did not differ in body size estimation levels; however, bulimics had higher levels of subjective body image disturbance than anorexics.

Various explanations have been proposed to account for the link between body image disturbances and increased risk of bulimia (Stice, 2002). A widely accepted mechanism is that body image dissatisfaction and distortion lead to increased dieting with the belief that this is an effective method of weight control. However, dieting may result in bulimic pathology, such as binge eating to offset the effects of caloric restriction. Additionally, dieting requires a shift from attending to physiological cues of hunger to cognitive control over eating behaviors. This shift may increase vulnerability to overeating when these cognitive processes are affectively disrupted.

Another pathway to bulimia nervosa has been proposed to progress from negative affect related to body image dissatisfaction and distortion, especially for females in Western culture where appearance has a central evaluative component. Negative affect is thought to increase the risk of binge eating to provide comfort and distraction from undesirable emotions. Compensatory behaviors may also be used, such as vomiting, to reduce anxiety about weight subsequent to overeating, or to serve as an emotional catharsis (Stice, 2002).

Current cognitive-behavioral therapy techniques for bulimia nervosa focus on the reduction of value placed on shape and weight in terms of self-worth (Cash & Strachan,

2002). Additionally, this treatment modality aims to help individuals become aware of the rigid set of rules that govern their behaviors (Fairburn, 1985). Stice (2002) suggests directly targeting body image dissatisfaction and distortions, along with addressing the thin-ideal internalization, to improve treatment outcomes.

Body Image and Obesity

Obesity has reached epidemic proportions in the United States and other Westernized countries, and it appears to be showing no signs of attenuation. In the past ten years, the percentage of U.S. adults who are overweight has risen from 45% to 58%, while the percentage of adults classified as obese has risen from 12% to 21% (Mokdad, Ford, Bowman, Dietz, Vinicor, Bales, et al., 2003). The urgent concern regarding these figures is due to the increased risk these individuals face for developing life-compromising conditions, such as coronary heart disease, hypertension, stroke, and Type 2 diabetes (Aronne, 2001).

Over thirty years ago, Stunkard and Burt (1967) began examining body image dissatisfaction in obese adults. These authors noted that obese adults with childhood onset demonstrated severe adult levels of body image disturbance; whereas obese adults with adult onset displayed a much lower level of disturbance. Stunkard and Mendelson (1967) presented findings demonstrating body dissatisfaction as an important aspect of the distress associated with obesity; however, there has been a paucity of research in this area until recently.

During the 1970s and 1980s, the majority of body image research regarded size perception as being the most important element in eating disorders and obesity. For

example, in the area of obesity research, the idea that subjective dissatisfaction with appearance was an expected correlate of overweight; thus, it followed that if patients lost weight, their body satisfaction would improve. Rosen, Orosan, and Reiter (1995) have found that although weight loss may not be associated with changes in body image, improvements in body image satisfaction may occur in the absence of weight loss.

The assumption that obese persons must have poor body image reflects the cultural stigma against obese individuals (Schwartz & Brownell, 2002). Research indicates a more complex picture. Obesity has been linked to body image dissatisfaction; however, the obese population is psychologically heterogeneous (Friedman & Brownell, 1995). Obesity is not classified as an eating disorder, although binge-eating disorder is a diagnostic category in need of further research in the *DSM-IV-TR* (American Psychiatric Association, 2000) of which individuals are usually overweight or obese.

Current criteria for a diagnosis of binge eating disorder do not include consideration of body image distortion, but focus solely on eating behavior and feelings about binge eating. This distinct subgroup of the obese population experiences higher levels of psychological distress than those who do not binge eat. Wilfley, Schwartz, Spurrell, and Fairburn (2000) found that patients with binge eating disorder had similar levels of shape and weight disturbances as patients with anorexia nervosa and bulimia nervosa.

Phul and Brownell (2001) posit that the stigma against obese persons makes it the last acceptable forms of discrimination. Obesity is seen as a "voluntary" condition that results from an inability to control one's urges. Many obese persons internalize this blame. One study found a significant relationship between amount of stigmatization

experienced and severity of negative body image (Myers & Rosen, 1999). In a sample of women with binge eating disorder, Jackson, Grilo, & Masheb (2000) found childhood teasing to be highly correlated with poor self-esteem and depression.

Frequent dieting and weight cycling is prevalent among obese persons. Individuals who endorse a subjective view of themselves as a weight cycler (i.e., "yo-yo dieting") are more likely to have lower self-esteem, be dissatisfied with their bodies, and lower levels of life satisfaction. The number of pounds actually lost and regained has not been associated with degree of psychological distress (Friedman, Schwartz, & Brownell, 1998).

Information Processing and Eating Disorders

As previously stated, neurophysiological (body perception) and cognitive-affective components (body dissatisfaction) together constitute body image (Fassino, Piero, Daga, Leombruni, Mortara, & Rovera, 2002). This dissertation focuses on body image dysfunction from the cognitive-affective viewpoint as an important psychopathological element of eating disorders. Studies have shown that patients with eating disorders display evidence of abnormal cognitive style and information processing, which is another primary area of interest of this dissertation.

For instance, individuals with bulimia were found to be significantly quicker on a test of impulsiveness than patients with restricting type of anorexia (Matching Familiar Figures Test; Kaye, Bastiani, & Moss, 1995). Research in the area of cognitive bias such as studies using the modified Stroop (e.g., Green, Corr, & de Silva, 1999) and the dot/visual probe (e.g., Rieger, Schotte, Touyz, & Beumont, 1998) paradigms

demonstrates that anorectics demonstrated greater bias for food words; whereas bulimics tended to show bias toward weight and shape related words. Studies of memory bias indicate that patients with eating disorders display differential memory for material related to their disorder (Hermans, Pieters, & Eelen, 1998).

Cognitive Schema: An Introduction

As mentioned previously, cognitive theory contends that previous experiences shape the way in which individuals organize and interpret current life occurrences. Individuals develop schemas for processing and integrating new information based on early life events; these schemas are necessary to learning and normal functioning. Schemas are composed of organizing principles that become automatic, operating beyond the awareness of the individual. Automatic processing is essential to normal functioning; however, problems can arise when cognitive processing becomes overly rigid. In such cases, thoughts can promote unrealistic expectations and result in erroneous interpretation of experiences (Beck, 1976). Prior to a more focused discussion on the relationship between body image schema and eating disorders, the next section offers some background on the effects of emotion on information processing.

Information Processing and Emotion

Damasio (1994) explains that innate emotional reactions, such as fear (e.g., in response to potentially "threatening" stimuli), primarily involve the circuitry of the limbic system (i.e., amygdala and anterior cingulate). From a developmental perspective, these primary emotions are followed by the development of a collection of secondary

emotions, which occur once an individual begins experiencing feelings and forming systematic connections between categories of objects and situations with primary emotions. In infancy, Damasio posits, structures in the limbic system are insufficient to support the process of secondary emotions; thus, the network must be broadened, requiring activation of the prefrontal and of somatosensory cortices. Within the first year of life, the frontal region is involved in important integrative functions related to affect and cognitive behaviors (Fox, 1991). Muller (1985) notes that internal models regarding external world and internal identity are generated by the prefrontal area of the brain, a statement that follows from earlier research regarding connections between mind and body.

Somatic Marker Hypothesis

Damasio (1994) proposed a theory of emotion called the somatic marker hypothesis. He explains that somatic markers are a particular instance of feelings generated from secondary emotions. Through the individual's learning history, emotions and feelings have been associated with predicted future outcomes of certain circumstances. Occasionally, somatic markers can operate without coming to consciousness. Somatic markers are acquired through experience, under the influence of an internal preference system and under the control of an external environment, which include people and events with which the individual must interact, as well as social and ethical conventions by which the individual is shaped.

Prior to Damasio's idea of somatic markers, Freud believed that current situations could derive emotional power from symbolic associations with previous experiences.

This idea is reflected in the area of attachment theory (see Ainsworth, Blehar, Waters, & Wall, 1978), which suggests that fundamental emotional reactions early in life (i.e., attachment with primary caregiver) form the basis of subsequent emotions. Thus, emotions can arise from the reinstatement of prior emotional meaning, such that a current situation "primes" a similar previous emotional event (Clore & Ortony, 2000). Accessing any portion of a structurally complex representation, or schema, even when unaware of the process, can trigger a multitude of events that make up emotional states.

In neurocognitive terms, an emotional network in the brain is activated when a stimulus input matches one or more of the elements stored in the network units as a result of previous emotional experiences (Lang, 1995). Through the phenomenon known as spreading activation (see Collins & Loftus, 1975), excitation of one unit leads to activation of adjacent units; hence, the greater the number of initial units stimulated, the greater the likelihood that the entire network will become engaged. This spreading activation leads to efferent output in the form of visceral, behavioral, and facial expressions (i.e., the experience of emotions).

The Role of Emotion in Information Processing

An "important consequence of the pervasiveness of emotions is that virtually every image, actually perceived or recalled, is accompanied by some reaction from the apparatus of emotion" (Damasio, 1999, p.58). Burley (1998) argues that cognition and feeling are inseparable, occurring mutually. When an emotion occurs, neurons located in the hypothalamus, basal forebrain, and brain stem release neurotransmitters which temporarily alter the typical functioning of several neural circuits. Further, Damasio

(1999) asserts, that the increase or decrease of release of transmitters lead to the sensing of a quickening or slowing down of the mind processes, along with the sense of pleasantness or unpleasantness that encompasses mental experience.

Oatley and Johnson-Laird (1987) suggest that the role of emotion is to instantaneously signal the pursuit of desired outcomes or the avoidance of undesired outcomes. Emotions elicit changes in information-processing modes to deal with a potentially new situation that may require action to be taken. In one mode, top-down emotional appraisals operate on the basis of perceptual similarity. This serves the function of behavioral preparedness, and is thus relatively fast but error prone (Clore & Ortony, 2000). Immediate cognitive appraisals that yield information about the relationship of the environmental stimulus to the individual, result in the generation of central states in the brain responsible for an emotional expression (LeDoux, 1989).

However, individuals continuously appraise situations for indications of personal relevance by creating interpretations of data from the perceived world. Clore and Ortony (2000) note that this bottom-up type of emotional process operates at a rule-based level which is not always conscious or explicit. It serves the function of behavioral flexibility, and is thus relatively slow but more reliable than the top-down route to emotional appraisal.

Clore and Ortony (2000) propose that events and their outcomes are evaluated in relation to an individual's goals, standards, and attitudes. These categories of value structures give rise to perceptions of 'goodness' and 'badness', which lead to a variety of affective responses. According to this perspective, appraisals lead directly to emotions and beliefs as alternate ways of representing the meaning of a situation. In this regard,

emotions are not cognitive events; rather they are "meta-representational," or a non-cognitive form of an appraisal. Greenberg, Rice, and Elliott (1993) posit that emotions emerge from "appraisals of match/mismatch between situations and needs, goals or concerns" (p. 67).

Emotional Valence

Emotional stimuli are said to attract disproportionately more processing resources due to the activation of specific knowledge structures representing personal threats (Mogg, Mathews, & Weinman, 1989). Motivational systems of the brain can prime an emotional network by increasing the probability that one of its stored representations will be activated (Lang et al. 1992). For instance, both animals and humans who are primed to be in a negative emotional state (i.e., through fear conditioning or viewing aversive pictures) react much more strongly to a startling stimulus than when in a neutral or positive emotional state. This effect can be enhanced when more arousing or emotionally intense stimuli are used as primes.

Mathews and Mackintosh (1998) found that threatening stimuli can be detected pre-attentively, causing interference in information processing, even when the nature of the stimulus cannot be reported. Research findings demonstrate that such detection initiates processes leading to attentional localization prior to any detailed analysis of the threat content or meaning. Bradley, Greenwald, Petry, and Lang (1992) hypothesized that the "activation of emotional responses to arousing stimuli may interfere with deployment of other behaviors necessary for encoding peripheral detail" (p. 388).

Informational explanations assume that individuals use affective states as signals about their current situation or about their judgment. This approach argues that experiencing negative affect indicates a threat to the attainment of a desired goal and that the situation calls for systematic and attentive processing. On the other hand, positive affect signals a safe situation, and that general knowledge constructs are a sufficient basis for judgment (Bless, 2000). Although these approaches postulate different mechanisms (i.e., capacity, motivation, and information), they all specify that the valence (i.e., the subjective positivity or negativity associated with the emotion) of the affective state is responsible for the effects of emotions on cognitive processing.

Body Image Schema and Eating Disorders

Thompson, Heinberg, Altabe, and Tantleff-Dunn (1999) explain the current cognitive model of body image schema is defined as an organization of information about one's physical self. It can take on an overall negative or positive valence, such that every time an individual activates the schema in response to external events, she experiences generally pleasing or displeasing emotions. The body image schema is not physically separate from other areas of cognition; rather, other large cognitive structures, such as the self, can become dominated by appearance-related qualities.

Thompson et al. (1999) discusses interconnections between factual knowledge (e.g., the word "cake") and self-rated meanings (e.g., "fat-girl food") being created by, what these authors term the "mental encyclopedia." They posit that the presence of a large negative body image schema affects normal output, storage, and retrieval processes of the mental encyclopedia. Such an effect could be useful, as the body image schema

speeds up the processing of relevant information. On the other hand, the effect could be inhibitory as mental resources are deteriorated by the emotional consequences of the schema-relevant information.

Social information-processing biases develop to support and confirm established beliefs about the body and self. Thus, an individual who thinks negatively about her body assumes that others judge her harshly along the same dimensions and interpret others' behaviors on the basis of that belief. In the case of severe body image disturbance, body-related themes dominate one's cognition, which is supported by accompanied emotional experiences. This pattern likely exists in individuals with eating disorders.

The Stroop Paradigm

The Stroop paradigm attempts to address the domain of emotional interference on attention. In the original task (Stroop, 1935), the participant must name the color of ink in which names of colors are printed, while attempting to ignore the meaning of the word. For example, a word such as BLUE may appear in red ink and the participant is required to name it as "red." Stroop, as well as most subsequent investigators (see MacLeod, 1991), found that participants take longer to name the actual color of a color-word when the meaning is antagonistic to the ink in which the word is printed. Alternatively, when words with no association to colors are printed in colored ink, there is little or almost no effect on the task.

Many investigators have found that words of particular salience to certain groups of participants cause more color-naming interference for these participants than for a

control group. This phenomenon is called emotional Stroop interference (Williams, Mathews, & MacLeod, 1996; Williams & Nulty, 1986). The emotional Stroop effect has been widely researched in various psychopathologies, including depression, anxiety, specific phobias, panic disorders, and post traumatic stress disorders (see Williams, Mathews, & MacLeod, 1996). The effect follows the cognitive model for emotional disorders (Williams, Watts, MacLeod, & Mathews, 1988), and has been attributed to "construct accessibility" (Gotlib & McCann, 1984; Williams & Nulty, 1986), "activation of danger schemata" (Mathews & MacLeod, 1985), and to the "emotional salience" of words (Watts, McKenna, Sharrock & Trezise, 1986).

These findings suggest that the emotional Stroop paradigm taps an information processing bias toward these issues that stems from a deeply rooted schema (see Markus, Hamill, & Sentis, 1987; Vitousek & Hollon, 1990). A proposed cause of the "Stroop Effect" is that the emotional content of the word attracts attentional resources and thereby delays color naming (Williams, et al., 1996). However, in this area of research, the opposite effect has also been demonstrated, with avoidance of the emotional content of the word (Ruiter & Brosschot, 1994).

Stroop and Eating Disorders

While the majority of investigators in the area of emotional Stroop task have focused on anxiety and mood disorders, some investigators have pursued this issue among individuals with anorexia nervosa and other eating disorders (Ben-Tovim & Walker, 1991; Cooper & Fairburn, 1992; Jones-Chester, Monsell, & Cooper, 1998; Long, Hinton & Gillespie, 1994). Methodological limitations have been cited in some of these

studies (see Green, Corr, & de Silva, 1999); however, these investigators have reported elevated latencies among anorectics for color-naming of words related to weight, body-shape and food, in contrast to neutral words, control groups, or both. These findings suggest that the emotional Stroop paradigm taps an information processing bias toward these issues that stems from a deeply rooted schema, as discussed previously (Markus, Hamill, & Sentis, 1987; Vitousek & Hollon, 1990).

One concern of theoretical and practical importance in the area of emotional Stroop relates to the influence of treatment on this phenomenon. A reduced interference after treatment would suggest the importance of cognitive processing in both the development of emotional disorders and in the recovery process. Furthermore, this reduction may indicate that the effect is due to a modification of a deeply rooted schema, which emerged from the interactions among cognitions and emotions of the individual. In a practical sense, such a reduction in the interference may also be used as an independent objective measure of the severity of the disorder, or the extent of recovery.

Indeed, studies that have focused on this issue have indicated a reduction of emotional Stroop interference following therapy in conditions of depression (Segal & Gemar, 1997), anxiety (Mathews, Mogg, Kentish & Eysenck, 1995), and various phobias (Lavy, Hout, & Arntz, 1993). Fewer studies have been reported regarding eating disorders, and have cited more contradicting results. Lovell, Williams, and Hill (1997) reported that, compared to controls, recovered anorectics continued to be distracted by body shape-related words, suggesting an enduring cognitive bias among women who have recovered from anorexia. In contrast, Green, Wakeling, Elliman, and Rogers (1998)

reported a reduction in color-naming impairment while in treatment, as a function of weight gain and reduction of anorexic symptomatology.

The discrepant findings among these studies may be due to methodological diversity, differences in the therapeutic approaches, or to variations in the participants' psychopathologies. Another possible explanation relates to the differences in the nature of body-concern words used in the studies. Upon inspection, the words used by Lovell et al. (1997) indicate that some of the body shape words were actually food-related (i.e., "fattening" and "calories"), or body parts (i.e., "stomach," "thighs," and "hips"). Furthermore, only four words were strictly related to body shape ("chubby", "plump", "fatty," and "slim") and the words "slim" has a positive emotional valence. In contrast, Green et al. (1998) used only negative body shape words in their research.

Green et al. interestingly found that although recovered anorectics showed substantially higher scores on the Eating Disorder Inventory-2 (EDI-2) than control participants, the recovered anorectics demonstrated no relative interference in body-shape words following treatment. In other words, while the recovered anorectics showed higher level of psychopathology than controls, based on the EDI-2, this pathology was not apparent in the Stroop interference of body-shape words. In the discussion of their results, Green et al. add a caveat regarding a possible artifactual process that can account for their results; the susceptibility of the Stroop effect to priming and post-attentional summation effects in block presentation, namely, presenting words from similar semantic category in one block (see Green et al., 1999; McKenna, 1986; Warren, 1972).

Statement of the Problem

With eating disorders having one of the highest risks of premature death resulting from either medical complications or suicide, among all psychological disorders (Keel, et al., 2003), and obesity resulting in health complications, morbidity, and mortality, as well, the need for clear diagnostic impressions and effective treatment is vital. Assessing body image as part of a comprehensive evaluation may lead to further specification in diagnosis and intervention; especially in light of the persisting psychosocial deficits and impaired self-image into adulthood for those having "recovered" from an active eating disorder during adolescence (Striegel-Moore, et al., 2003). Indirect methods of assessing body schema, such as the modified Stroop task, may serve as a practical and independent measure for the severity of eating disorders and level of recovery.

The first goal of this study was to examine the emotional Stroop interference of positive, neutral, and negative body and food words among persons with eating disorders to non-clinical controls. Additionally, the emotional valence was to be investigated in terms of the severity of eating disorder symptomatology, as measured by the Eating Disorder Inventory-3 (EDI-3, Garner, 2004). Further, this study set out to explore these concepts with regard to the effect of body image, as measured by the Body Shape Questionnaire (BSQ, Cooper, Taylor, Cooper, & Fairburn, 1987), on information processing, as measured by the emotional Stroop test, among individuals with anorexia, bulimia, and obesity.

It is the intent of this study that it will contribute to a better understanding of the role of cognitive processing of emotional data. Furthermore, it is hoped that the study

may expand our knowledge of the cognitive schema of eating disorders and, through further research, their susceptibility to treatment. In addition, the findings can prompt the development of a practical and independent measure for the severity of eating disorders and recovery, and for identification of specific concerns, particularly related to body image, among individuals who are afflicted by these life threatening disorders. Finally, as this is the first study which investigates obesity with the emotional Stroop task, it is hoped that this study will encourage further exploration.

Hypotheses

1) There will be differences between the ratings of target words among participant categories, but not between ratings of control words. Specifically:
    a. No differences will exist across participant categories for ratings of pleasantness of food control words.
    b. No differences will exist across participant categories for ratings of pleasantness of body control words.
    c. No differences will exist across participant categories for ratings of arousal of food control words.
    d. No differences will exist across participant categories for ratings of arousal of body control words.
    e. No differences will exist across participant categories for ratings of dominance of food control words.

f. No differences will exist across participant categories for ratings of dominance of body control words.

g. Differences will exist across participant categories for ratings of pleasantness of food target words.

h. Differences will exist across participant categories for ratings of pleasantness of body target words.

i. Differences will exist across participant categories for ratings of arousal of food target words.

j. Differences will exist across participant categories for ratings of arousal of body target words.

k. Differences will exist across participant categories for ratings of dominance of food target words.

l. Differences will exist across participant categories for ratings of dominance of body target words.

2) The emotional Stroop interference (as measured by the difference in response time between the target words and the control words) will significantly differ among participant categories and Stroop valence (positive, neutral, negative).

a. Color-naming latencies among Stroop valences for food words will differ based on participant categories:

i. Participants with eating disorders will have longer response latencies than those without eating disorders.

b. Color-naming latencies among Stroop valences for body words will differ based on participant categories:

i. Participants with eating disorders will have longer response latencies than those without eating disorders.

3) A positive correlation will be found between eating disorder-related scores and color-naming response times.
   a. BSQ total scores will increase as color-naming response time increases.
   b. EDI-3 scale scores will increase as color-naming response time increases.
4) A positive correlation will be found between BSQ total scores and EDI-3 scale scores for each of the participant categories:
   a. BSQ total scores will increase as EDI-3 scale scores increase for participants with anorexia nervosa.
   b. BSQ total scores will increase as EDI-3 scale scores increase for participants with bulimia nervosa.
   c. BSQ total scores will increase as EDI-3 scale scores increase for obese participants.
   d. BSQ total scores will increase as EDI-3 scale scores increase for control participants.

Study Aims

The study aims to examine the following:

1) The effect of emotional valence on words related to persons with clinical levels of eating disorders and non-clinical controls.
2) The differences and similarities among individuals with obesity, anorexia, and bulimia in regards to body image and information processing.

3) The first information regarding the effect of emotionally valanced words in persons who are obese.

METHOD

Participants

Clinical participants (i.e., diagnosed with anorexia nervosa or bulimia nervosa) were recruited through referrals from the Eating Disorders Program at the Behavioral Medicine Center in Loma Linda, California, and through referrals from physician, therapist, and dietician members of the 'Eating Disorder Professionals of Idaho' group in Boise, Idaho. Flyers (Appendix A) at various locations throughout the Loma Linda University and Boise State University campuses attracted non-clinical controls (i.e., BMI within normal limits and absence of eating disorder symptomatology) and obese participants (i.e., BMI $\geq$ 30). Thirty-nine percent of the total participants completed the study in Boise, and 61% participated in Loma Linda. No males were included in this study, and the participants needed to be able to read and speak English.

Power analysis indicated that a sample size of 20 participants in each group would have been sufficient, given the anticipated analyses, to achieve a power of .80 at an alpha level of .05. Unfortunately, this sample size was not achieved despite efforts from the researchers to recruit and schedule participants. The sample sizes are as follows for each of the following categories: anorexia nervosa (N=4), bulimia nervosa (N=11), obesity (N=6), and non-clinical controls (N=15). There were a total of nine subjects who failed to show up for their appointments (8 with BN, 1 with AN).

The study sample consisted of 36 females between the ages of 16 and 33 years, with a mean age of 24 (*SD* = 3.97). The participants' ethnic background was 58% Caucasian, 17% Hispanic, 3% Asian-American, and 22% who were unspecified. Over

half (56%) of the participants labeled themselves as Christian (the two most predominant groups; 17% specified Catholic, 11% specified Seventh Day Adventist), 22% considered themselves non-Christian, and 22% were unspecified.

Measures

Body Mass Index (BMI)

BMI is an index of body mass which relates to the nutritional state of the subject. The BMI is obtained non-invasively, and is defined as the weight in kilograms divided by the square of the height in meters. Previous research (e.g., Robinson & Killen, 2001) recommends the use of BMI as an outcome measure, on the bases of accessibility, reliability, measurement validity, and clinical validity. BMI has demonstrated clinical validity in its associations with blood pressure and hypertension (Robinson & Killen), and Type-2 diabetes (Pinhas-Hamiel, Dolan, Daniels, Standiford, Khoury, & Zeitler, 1996). A BMI equal to or greater than the 85th percentile, or a BMI of 25 or greater, often is used to define overweight, while the 95th percentile, or a BMI of 30, defines obesity. Female subjects with a BMI between 18.7 and 23.8 are considered to be within normal limits for weight (Mitchell, 1997).

Body Shape Questionnaire (BSQ)

The BSQ (Cooper, Taylor, Cooper, & Fairburn, 1987) is a 34-item questionnaire which shows the perception of body image and is a useful measure of weight and shape

concern. For each item, there are six possible answers (from 1 (never) to 6 (always). Based on a study conducted by Cooper and Taylor (1988), the total scores were classified into four categories: not worried about body shape <81, slightly worried = 81-110, moderately worried = 111-140, or extremely worried >140. The BSQ demonstrated good test-retest reliability and concurrent validity with other measures of body image (Rosen, Jones, Ramirez, & Waxman, 1996).

Eating Disorder Inventory-3 (EDI-3)

The EDI-3 (Garner, 2004) is a self-rating inventory with 91 items that assess attitudinal and behavioral aspects pertinent to anorexia and bulimia. The EDI-3 yields twelve primary scales, three of which are specific to eating disorders (Drive for Thinness (DT), Bulimia (B), Body Dissatisfaction (BD), and the remaining nine are general psychological scales relevant to eating disorders (Low Self-Esteem (LSE), Personal Alienation (PA), Interpersonal Insecurity (II), Interpersonal Alienation (IA), Interoceptive Deficits (ID), Emotional Dysregulation (ED), Perfectionism (P), Asceticism (A), and Maturity Fears (MF). Six composites are also produced: Eating Disorder Risk (EDRC), Ineffectiveness (IC), Interpersonal Problems (IP), Affective Problems (AP), Overcontrol (OC), and General Psychological Maladjustment (GPMC). This is a widely used measure, with both clinical and research applications. It has demonstrated excellent reliability and validity (see Garner, 2004).

The Emotional Stroop Test

The Stroop paradigm attempts to address the domain of emotional interference on attention. In the original task (Stroop, 1935), the participant must name the color of ink in which names of colors are printed, while attempting to ignore the meaning of the word. For example, a word such as BLUE may appear in red ink and the participant is required to name it as "red." Stroop, as well as most subsequent investigators (see MacLeod, 1991), found that participants take longer to name the actual color of a color word when the meaning is antagonistic to the ink in which the word is printed. Alternately, when words with no association to colors are printed in colored ink, there is little or almost no effect on the task.

Many investigators have found that words of particular salience to certain groups of participants cause more color-naming interference for these participants than for a control group. This phenomenon is called emotional Stroop interference (Williams, Mathews, & MacLeod, 1996; Williams & Nulty, 1986). The emotional Stroop effect has been widely researched in various psychopathologies, including depression, anxiety, and post traumatic stress disorders (see Williams, Mathews, & MacLeod, 1996).

For this study, the stimuli included words related to the following categories: Positive body words (e.g., "thin"), neutral body words (e.g., "waist"), negative body words (e.g., "fat"), positive food (e.g., "cake"), neutral food (e.g., "hunger") and negative food (e.g., "vomit"). The words were based on a previous study of hospitalized anorexic patients in Israel (Cohen, 2000), in which the relevancy of the words for anorexia, their emotional valence, and their intensity were explored. As the words in Cohen's study were written in Hebrew, the current study serves as a pilot for the use of the English

words among eating disorder groups, obese persons, and non-clinical controls. These word groups were contrasted with six control word groups (non-food, non-body-shape), matched for number of letters and occurrence. Each of the above-referenced words appeared in each of the following colors: red, blue, green, and black. The words appeared in random order.

Procedure

As previously described, clinical participants were recruited through referrals from the eating disorders programs. Flyers posted at university campuses attracted non-clinical controls and obese participants. Participation involved a single testing session which lasted approximately 90 minutes. All data collection was conducted by a trained female experimenter. After providing information, answering questions and obtaining informed consent (Appendices B and C), the participant was invited into a quiet room, either at the Psychophysiology of Emotion and Human Cognition Lab in the Department of Psychology at Loma Linda University, or at Warm Springs Counseling Center in Boise, Idaho. Participants received specific instructions regarding the task which was presented via computer. The participant then received 25 practice trials followed by the blocks of experimental trials. The computer program recorded the participants' response latencies automatically.

The Emotional Stroop Task was administered by computer using the E-Prime software platform (Schneider, Eschman, & Zuccolotto, 2002). In this Stroop task, each trial began with a fixation mark, an '*', presented in yellow font on a gray background at the center of the computer screen for 1 second. Following the fixation mark, a word

stimulus appeared in one of the following colors of font: red, blue, green, black. The word remained on the screen until the participant responded or for 1.5 seconds (which ever comes first). The participant's task was to press a button on a response box in the corresponding color to which the word was presented. The words (Appendix D) were drawn from the following seven categories: positive body, neutral body, negative body, positive food, neutral food, negative food, and control words (i.e., neutral non-food, non-body). The words were presented in blocks of 30 trials with each block including words drawn from a single category. A total of seventeen total blocks were presented in random order.

Immediately following the Stroop task, participants were asked to rate their reactions to each word that they were presented on a 9-point Likert-type scale, with 5 being neutral. This was also administered by computer using the E-Prime software platform (Schneider, Eschman, & Zuccolotto, 2002). The first rating was one of pleasantness or happiness (9 = completely happy, pleased, satisfied, or hopeful; 1 = completely unhappy, annoyed, unsatisfied, melancholic, despaired, or bored). The second rating was on a dimension from calm to excited (9 = stimulated, excited, frenzied, jittery, wide-awake, aroused; 1 = completely relaxed, calm, sluggish, dull, sleepy, unaroused). The third rating was the dimension of controlled versus in-control (9 = completely controlling, influential, in control, important, dominant, autonomous; 1 = completely controlled, influenced, cared-for, awed, submissive, guided).

A demographic questionnaire (Appendix E) was also completed by each participant, with the exception of the Loma Linda clinical participants, to provide general information (i.e., age, ethnicity), as well as specific information relevant to eating

behaviors and states (i.e., current level of hunger, dieting status). Each participant's body mass index (BMI) was obtained either from the medical record or, if the record is unavailable, at the end of the session by weighing the participant and calculating BMI on site. The Body Shape Questionnaire (BSQ; Appendix F) was administered, with the exception of Loma Linda clinical participants, as a measure of body image concerns. The Eating Disorder Inventory-3 (EDI-3) was completed, which was used to support the diagnosis of the participants, and to gather more specific psychological information. At the conclusion of the testing session, the participants were given a $20 gift-card (Boise participants), or $20 cash (Loma Linda clinical participants).

RESULTS

The raw scores from the BSQ, and the T-scores from the EDI-3 were entered into SPSS. Regarding the Stroop task, mean response times, in milliseconds (ms), for correct trials were calculated within stimulus category for each participant. The participants' ratings of each word were entered into SPSS as an average across eating disorder group for each of the three categories (i.e., pleasantness, arousal, control). The data was screened and the parametric assumptions were evaluated.

Boxplots were inspected to assess univariate outliers. One case was excluded from the analyses for a number of reasons. This participant was from the BMC at Loma Linda University, and was diagnosed with bulimia nervosa; however, her BMI was 44, thus meeting inclusion criteria for the obese category. Further, she was 33 years of age, which was beyond the upper age limit for this study.

Histograms were examined to assess univariate normality, which was approximated. Multivariate normality was examined by inspecting bivariate scatterplots, which revealed moderate violations of multivariate linearity, normality, and homoscedasticity.

Thirty-nine percent of the total participants completed the study in Boise, and 61% participated in Loma Linda (Table 1). For the bulimic group, mean BMI and age of participants did not differ significantly based on study location (Boise BMI: $M = 22.47$, Loma Linda BMI: $M = 20.33$; $t = 1.04$, $df = 7$, $p = .33$; Boise age: $M = 24.33$, Loma Linda BMI: $M = 20.57$; $t = 1.25$, $df = 8$, $p = .25$).

Table 1

Descriptive Statistics for BMI and Age by Study Location and Participant Category

Participant Category	Boise, Idaho	Loma Linda, California
	M (SD)	*M (SD)*
Control *(N)*	*N*=1	*N*=14
BMI	24.9	22.23 (2.40)
Age	30	24.5 (2.31)
Anorexic *(N)*	*N*=4	
BMI	17.9 (1.54)	*N*=0
Age	25 (4.32)	
Bulimic *(N)*	*N*=3	*N*=7
BMI	22.47 (3.27)	20.33 (2.73)
Age	24.33 (4.04)	20.57 (4.47)
Obese *(N)*	*N*=6	
BMI	33.27 (3.73)	*N*=0
Age	22 (2.97)	

Upon examination of the missing data, 22% of the participants (N=8) did not complete the demographic forms or the BSQ. These were all clinical participants from the BMC in Loma Linda. As a result of a program change, these measures were inadvertently removed from the intake packet that had been previously completed by all patients at time of entry into the program. Additionally, two participants (6%) from the BMC did not complete the EDI-3. The Stroop was successfully completed and recorded for 86% of the participants, with 14% of the data unable to be retrieved due to experimenter error.

Participants rated each word on a 9-point scale in terms of pleasantness, arousal, and dominance. Analysis of variance (ANOVA) was conducted for each of the twelve categories of ratings (e. g., pleasantness ratings of food control words, pleasantness

ratings of food critical words, dominance ratings of body control words, dominance ratings of body critical words). A bar graph visually demonstrates the differences in ratings by participant group for each of the valence categories.

Hypothesis 1a proposed that differences will not exist across participant categories for ratings of pleasantness of food control words. This hypothesis was supported, in that there was not a main effect of participant group (F (3, 36) = 0.15, p = .93), or an interaction effect of participant group x Stroop valence (F (6, 36) = 0.33, p = .92). However, there was a main effect demonstrated for Stroop valence category (F (2, 36) = 10.95, p = .001), with a moderate effect size (partial η^2 = .38). Thus, pleasantness ratings for food control words differ among Stroop word valences (i.e., positive, neutral, negative), with the negative words receiving the least pleasant ratings.

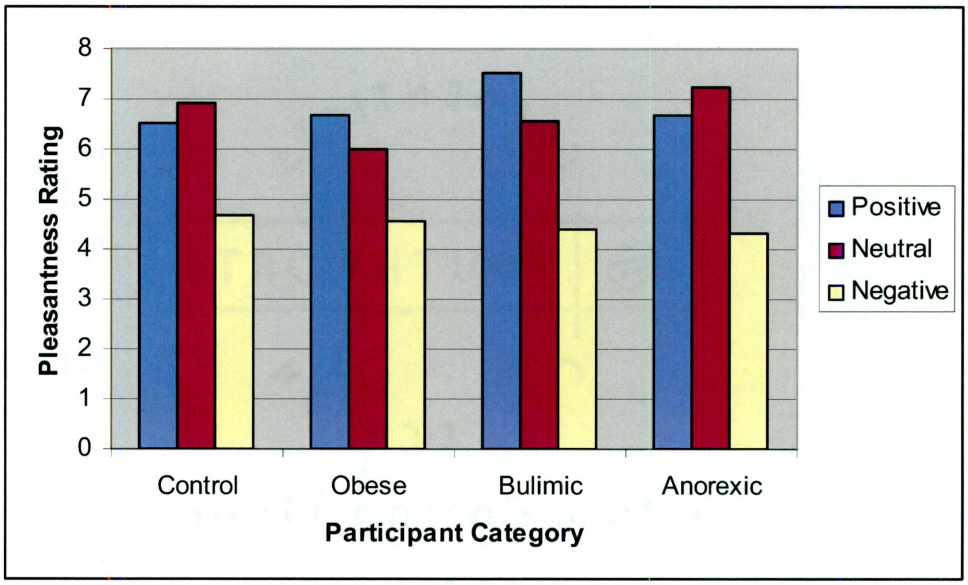

Figure 1. Mean Pleasantness Ratings for Control Food Words Across Stroop Word Valences and Participant Categories

Hypothesis 1b stated that differences will not exist across participant categories for ratings of pleasantness of body control words. This hypothesis was supported; there were no significant differences across participant groups or valence categories for body control words in terms of pleasantness. Although not statistically significant, the negative valenced words were rated lowest across participant groups.

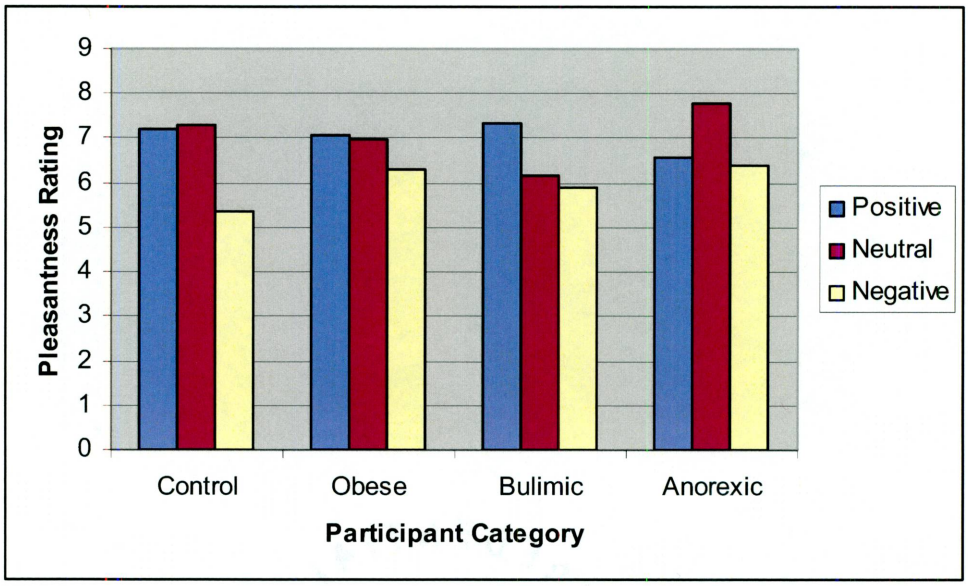

Figure 2. Mean Pleasantness Ratings for Control Body Words Across Stroop Word Valences and Participant Categories

Hypothesis 1c stated that differences will not exist across participant categories for ratings of arousal of food control words. This hypothesis was supported; there were no significant differences across participant groups or valence categories for food control words in terms of arousal. The trend for the negative valenced food words appeared to be that they were rated highest in terms of arousal for all groups except for the obese group. Another trend can be seen for the positive valenced food words, which were rated lowest in terms of arousal for all groups except for the bulimic group.

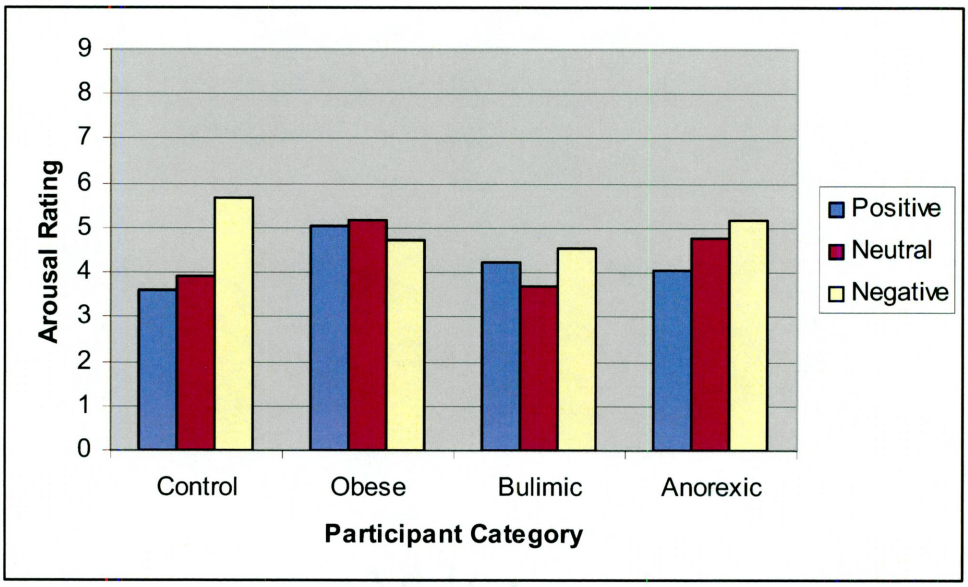

Figure 3. Mean Arousal Ratings for Control Food Words Across Stroop Word Valences and Participant Categories

Hypothesis 1d proposed that differences will not exist across participant categories for ratings of arousal of body control words. This hypothesis was supported, in that there was not a main effect of participant group (F (3, 35) = 2.22, p = .10), or an interaction effect of participant group x Stroop valence (F (6, 35) = 0.70, p = .65). However, there was a main effect demonstrated for Stroop valence category (F (2, 35) = 7.16, p = .002), with a small effect size (partial η^2 = .29). Thus, arousal ratings for body control words differ among Stroop word valences (i.e., positive, neutral, negative), with the positive words receiving the lowest arousal ratings.

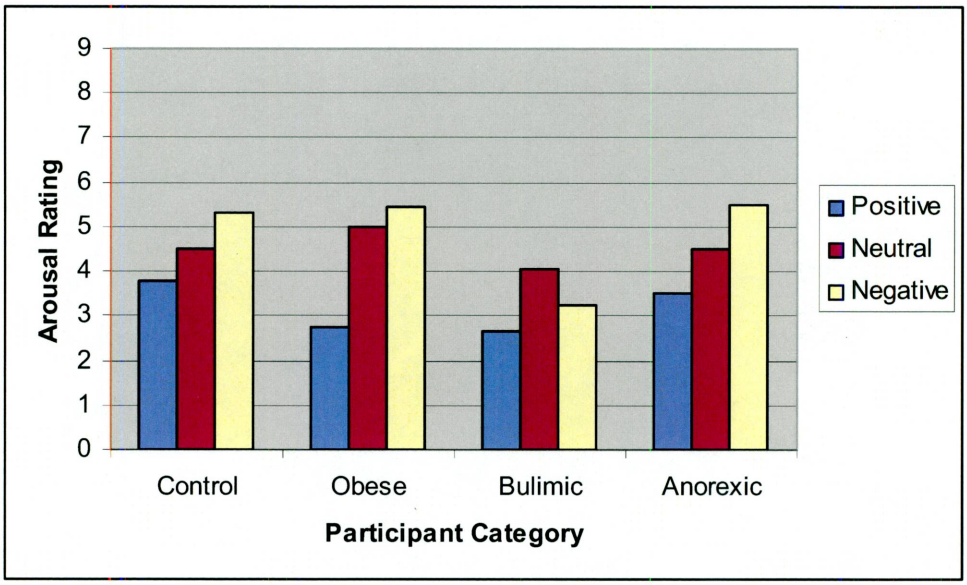

Figure 4. Mean Arousal Ratings for Control Body Words Across Stroop Word Valences and Participant Categories

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Hypothesis 1e stated that differences will not exist across participant categories for ratings of dominance of food control words. This hypothesis was supported; there were no significant differences across participant groups or valence categories for food control words in terms of dominance. This differs from the other food control words in that there is not a consistent lower pattern for the negative words.

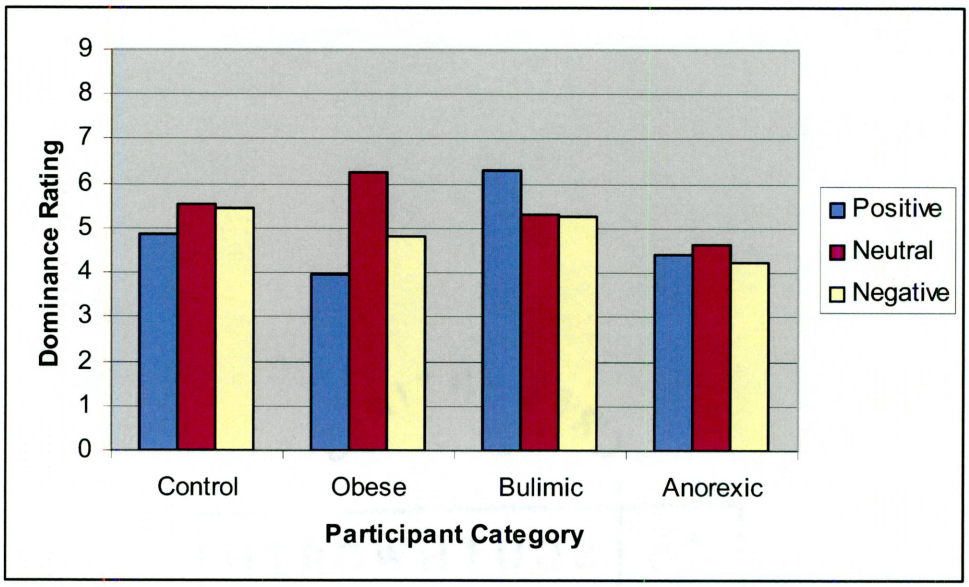

Figure 5. Mean Dominance Ratings for Control Food Words Across Stroop Word Valences and Participant Categories

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Hypothesis 1f stated that differences will not exist across participant categories for ratings of dominance of body control words. This hypothesis was supported; there were no significant differences across participant groups or valence categories for body control words in terms of dominance. Interestingly, the obese group rated the positive valenced body words the lowest, and the anorexic group rated the negative valenced body words the lowest.

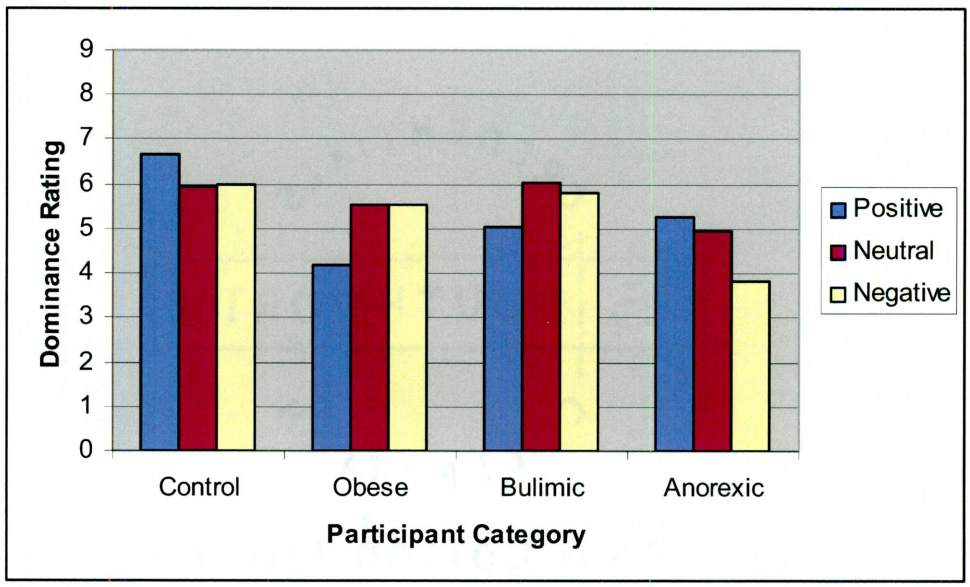

Figure 6. Mean Dominance Ratings for Control Body Words Across Stroop Word Valences and Participant Categories

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Hypothesis 1g proposed that differences would exist across participant categories for ratings of pleasantness of food target words. This hypothesis was supported. There was a main effect of participant group (F (3, 36) = 5.54, p = .003) with a small effect size (partial η^2 = .32). There was a main effect demonstrated for Stroop valence category (F (2, 36) = 34.40, p = .001), with a moderately large effect size (partial η^2 = .67). Thus, pleasantness ratings for food target words differ among Stroop word valences (i.e., positive, neutral, negative), and among participant groups. Additionally, there was an interaction effect of participant group x Stroop valence (F (6, 36) = 2.48, p = .041) with a small effect size (partial η^2 = .29). For the bulimic group, the neutral words were rated lower in terms of pleasantness than the negative valenced food words; however, for the rest of the groups, the positive valenced food words were rated as most pleasant,

followed by the neutral valenced food words, and then by the negative valenced words, which were rated least pleasant.

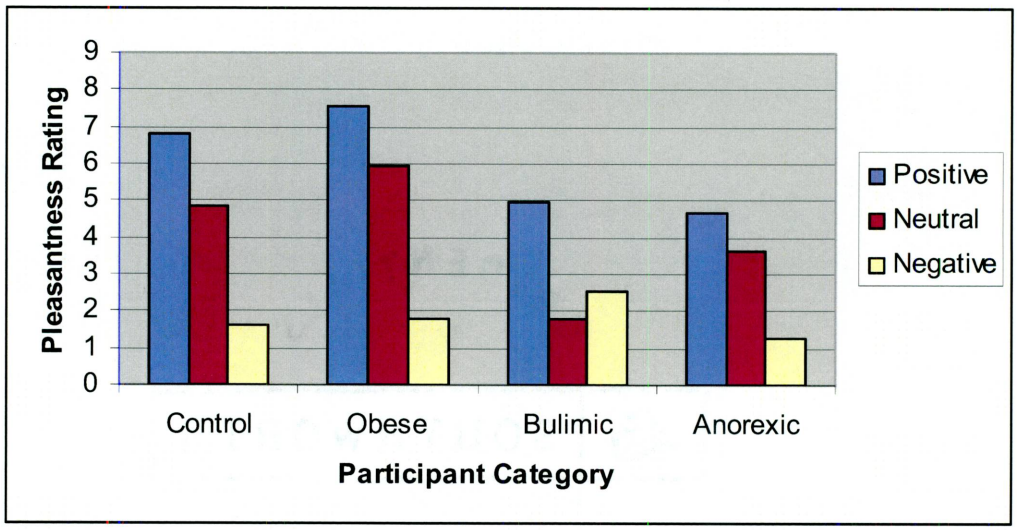

Figure 7. Mean Pleasantness Ratings for Target Food Words Across Stroop Word Valences and Participant Categories

Hypothesis 1h stated that differences would exist across participant categories for ratings of pleasantness of body target words. This hypothesis was supported. There was a main effect of participant group (F (3, 36) = 7.325, p = .001) with a small effect size (partial η^2 = .38). There was a main effect demonstrated for Stroop valence category (F (2, 36) = 68.00, p = .001), with a large effect size (partial η^2 = .80). Thus, pleasantness ratings for body target words differ among Stroop word valences (i.e., positive, neutral, negative), and among participant groups. Additionally, there was an interaction effect of participant group x Stroop valence (F (6, 36) = 12.78, p = .001) with a moderately large

effect size (partial η^2 = .68). Across participant groups, positive valenced words were given the highest pleasantness rating, followed by the neutral valenced body words, and then by the negative valenced words, which were rated least pleasant. The anorexic group rated the positive body words the most pleasant and the negative body words the least pleasant among participant categories.

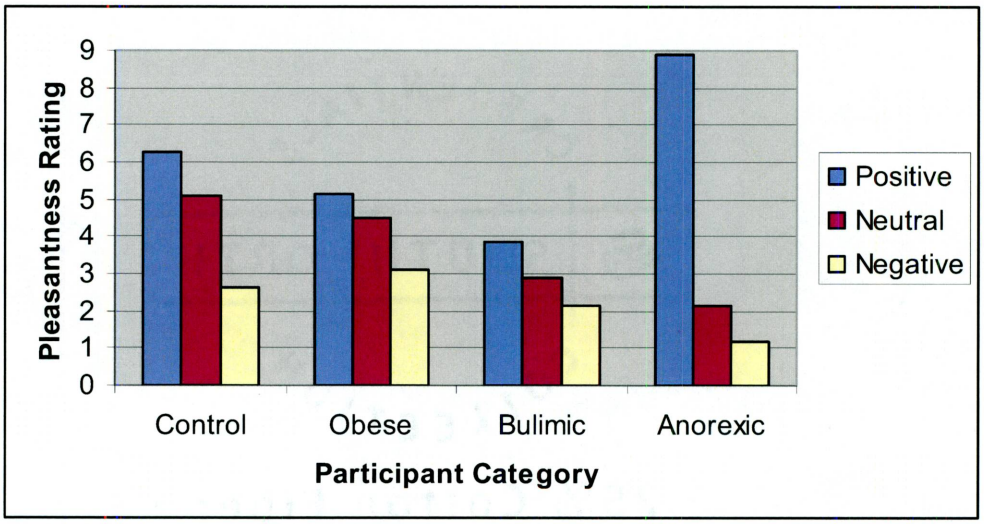

Figure 8. Mean Pleasantness Ratings for Target Body Words Across Stroop Word Valences and Participant Categories

Hypothesis 1i proposed that differences would exist across participant categories for ratings of arousal of food target words. This hypothesis was not supported. There were no significant differences among participant groups (F (3, 36) = .50, p = .68), or

among Stroop valence categories (F (2, 36) = .04, p = .97). No interaction effect was demonstrated.

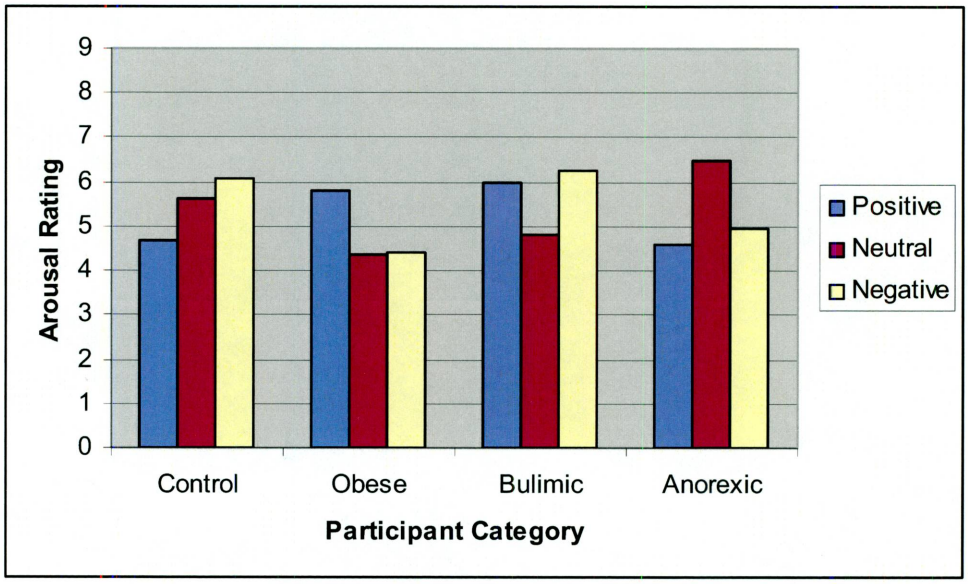

Figure 9. Mean Arousal Ratings for Target Food Words Across Stroop Word Valences and Participant Categories

Hypothesis 1j proposed that differences would exist across participant categories for ratings of arousal of body target words. This hypothesis was not supported. No interaction effect was demonstrated (F (6, 36) = .2.27, p = .06; partial η^2 = .27). There was a main effect for Stroop valence categories (F (2, 36) = 3.23, p = .05) with a small effect size (partial η^2 = .15), and a main effect for participant groups (F (2, 36) = 5.48, p = .003) with a small effect size (partial η^2 = .31).

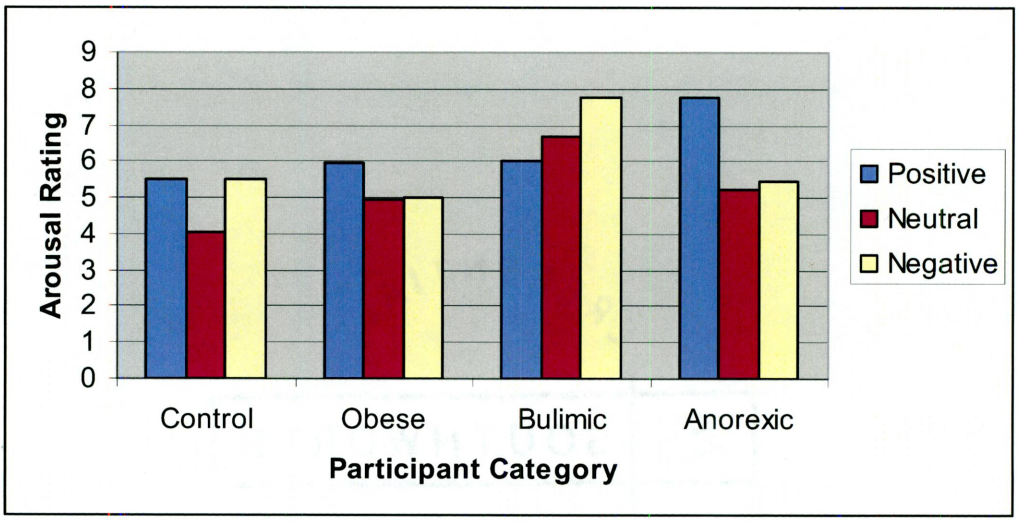

Figure 10. Mean Arousal Ratings for Target Body Words Across Stroop Word Valences and Participant Categories

Hypothesis 1k proposed that differences would exist across participant categories for ratings of dominance of food target words. This hypothesis was not supported; however, there was a main effect of participant group (F (3, 36) = 3.05, p = .041) with a small effect size (partial η^2 = .20). Thus, dominance ratings for food target words differ among participant groups; specifically, the obese group had the highest overall mean dominance ratings, and the anorexic group had the lowest overall mean dominance ratings.

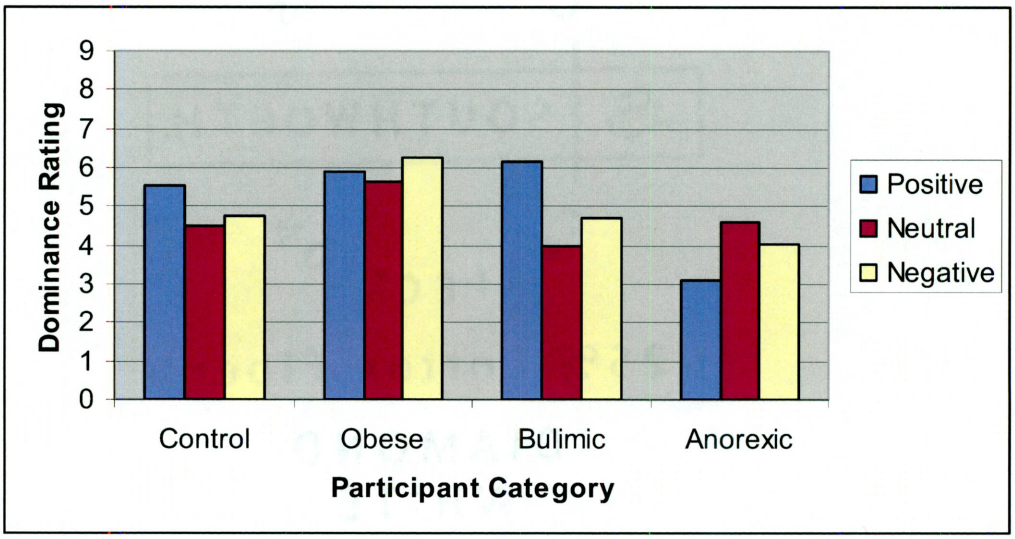

Figure 11. Mean Dominance Ratings for Target Food Words Across Stroop Word Valences and Participant Categories

Hypothesis 11 proposed that differences would exist across participant categories for ratings of dominance of body target words. This hypothesis was not supported. There were no significant differences among participant groups (F (3, 36) = 2.44, p = .08), or among Stroop valence categories (F (2, 36) = .05, p = .95). No interaction effect was demonstrated.

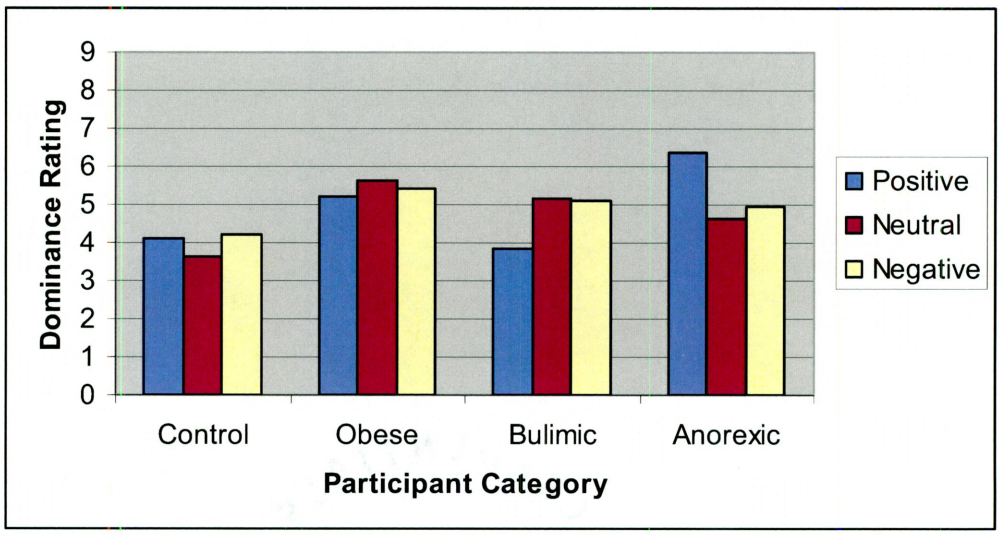

Figure 12. Mean Dominance Ratings for Target Body Words Across Stroop Word Valences and Participant Categories

Table 2 displays the descriptive statistics for the mean response times for combinations of Stroop categories and valences for each of the participant categories for the target words. Interestingly, regardless of valance or word category, the control group's response times were quicker than the obese group, followed by the bulimic group, which were faster than the anorexic group. The one exception to this was that the bulimic group had a shorter response time than the obese group for negative body words.

Table 3 shows the descriptive statistics for the mean response times for combinations of Stroop categories and valences for each of the participant categories for the control words. The same trend was demonstrated here, as seen in the target words; however, for the positive body words, bulimics responded quicker than the obese group.

Table 2

Target Words: Mean Response Times for Participant Categories by Combinations of Stroop Categories and Valences

	Body Words			Food Words		
Participant Category *(N)*	Positive *M (SD)*	Neutral *M (SD)*	Negative *M (SD)*	Positive *M (SD)*	Neutral *M (SD)*	Negative *M (SD)*
Control (15)	679.62 (117.09)	705.12 (139.36)	743.52 (143.88)	720.30 (168.62)	752.67 (135.96)	709.57 (126.30)
Obese (6)	765.38 (110.16)	732.63 (146.16)	772.61 (136.20)	817.72 (139.77)	777.60 (161.36)	787.78 (130.18)
Anorexic (3)	942.00 (183.49)	1260.83 (500.64)	842.63 (94.48)	938.97 (113.61)	1083.12 (304.56)	1211.90 (442.89)
Bulimic (6)	784.65 (158.36)	850.03 (216.94)	754.51 (110.97)	833.97 (214.69)	897.31 (285.70)	836.78 (186.59)

Note. Response times are measured in milliseconds (ms).

Table 3

Control Words: Mean Response Times for Participant Categories by Combinations of Stroop Categories and Valences

	Control Body Words			Control Food Words		
Participant Category *(N)*	Positive *M (SD)*	Neutral *M (SD)*	Negative *M (SD)*	Positive *M (SD)*	Neutral *M (SD)*	Negative *M (SD)*
Control (15)	702.94 (132.76)	725.72 (165.18)	700.40 (130.49)	734.56 (160.64)	731.90 (159.32)	725.73 (142.27)
Obese (6)	737.31 (107.69)	742.97 (130.60)	736.08 (136.21)	799.89 (166.44)	767.17 (185.15)	735.75 (143.58)
Anorexic (3)	969.01 (249.20)	1003.09 (189.02)	904.12 (119.60)	1014.02 (142.65)	1076.42 (307.39)	1077.79 (333.18)
Bulimic (6)	718.74 (79.38)	779.64 (176.03)	786.34 (183.55)	833.83 (199.80)	788.68 (114.46)	796.62 (152.38)

Note. Response times are measured in milliseconds (ms).

Hypothesis 2 stated that the emotional Stroop interference will significantly differ among participant categories and Stroop valences. To examine this hypothesis, repeated measures analyses of variance (ANOVA) were conducted using interference scores (calculated by subtracting the target word response times from the control word response times for each words valance/category). Table 4 displays the descriptive statistics for the mean interferences for combinations of Stroop categories and valences for each of the participant groups.

Table 4

Mean Stroop Interference for Combinations of Stroop Categories and Valences by Participant Groups

	Food Words			Body Words		
Participant Category *(N)*	Positive *M (SD)*	Neutral *M (SD)*	Negative *M (SD)*	Positive *M (SD)*	Neutral *M (SD)*	Negative *M (SD)*
Control (15)	14.25 (81.31)	-20.78 (107.23)	16.15 (83.04)	23.32 (69.15)	20.59 (57.81)	-43.12 (69.10)
Obese (6)	-17.83 (53.63)	-10.43 (40.91)	-52.02 (36.90)	-28.07 (15.41)	10.34 (46.39)	-36.53 (39.19)
Bulimia (7)	7.94 (103.98)	-93.63 (222.03)	-18.99 (65.21)	-61.71 (87.12)	-61.20 (79.92)	26.83 (81.49)
Anorexia (2)	84.39 (41.83)	-8.24 (67.27)	-105.20 (4.87)	58.76 (50.93)	-383.62 (337.36)	93.83 (211.75)

Note. Interference times are measured in milliseconds (ms); Negative amounts indicate that target words received a longer response time than control words.

Color-naming latencies among Stroop valences for food words were proposed to differ based on participant categories with participants with eating disorders demonstrating longer response latencies than those without eating disorders. Thus for Hypothesis 2a, Mauchly's test of Sphericity was first examined, which determined that the homogeneity of variance assumption was not violated (p=.002) for the interferences for the food words.

This analysis revealed that there were no significant differences between Stroop interferences among participant categories (F (3, 26) = .74, p = .54). Additionally, no significant differences among Stroop valences were found between interference scores (F (2, 52) = 2.33, p = .11). No interaction effect was revealed through this analysis. Figure 13 displays the mean interference scores for participant groups within each Stroop word valences category. The obese group demonstrated a longer response latency for the target words than the control words regardless of valence. The anorexic and bulimic groups both responded quicker to the control words than the target words in the neutral and negative valenced word categories, but took longer to respond to positive valenced control words than positive valenced target words.

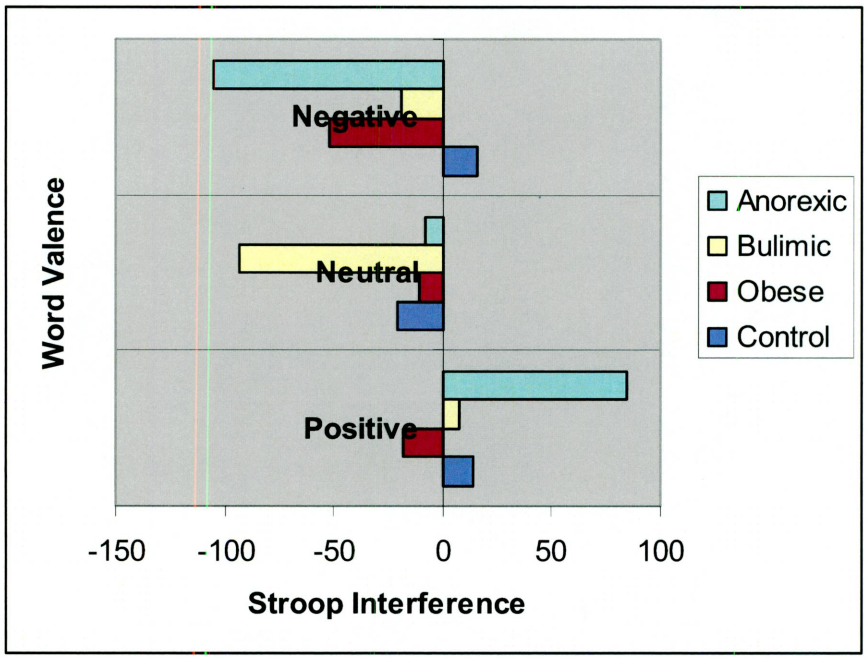

Figure 13. Mean Interference for Participant Groups Within Stroop Food Word Valence Categories

Note. Interference times are measured in milliseconds (ms); Negative amounts indicate that target words received a longer response time than control words.

Hypothesis 2b stated that color-naming latencies among Stroop valences for body words will differ based on participant categories with participants with eating disorders demonstrating longer response latencies than participants without eating disorders. Mauchly's test of Sphericity was first examined, which determined that the homogeneity of variance assumption was violated (p=.12) for the interferences for the body words.

This analysis revealed that there were no significant differences between Stroop interferences among participant categories (F (3, 26) = 2.55, p = .08) with a small effect size (partial η^2 = .23). There was a main effect of Stroop valence category for interference scores (F (2, 52) = 10.58, p = .001), with a small effect size (partial η^2 = .29). Thus, ignoring all other variables, the interference scores significantly differed across Stroop valence categories. Additionally, an interaction effect for Stroop valence x participant group was revealed through this analysis (F (6, 52) = 8.96, p = .001), with a moderate effect size (partial η^2 = .51).

Figure 14 displays the mean interference scores for participant groups within each Stroop word valences category. The anorexia group demonstrated a longer response latency for the neutral valenced target body words than the negative or positive valenced control body words. The bulimic group responded quicker to the target words than the control words in the negative valenced word category, but took longer to respond to positive and neutral valenced control words than positive and neutral valenced target words.

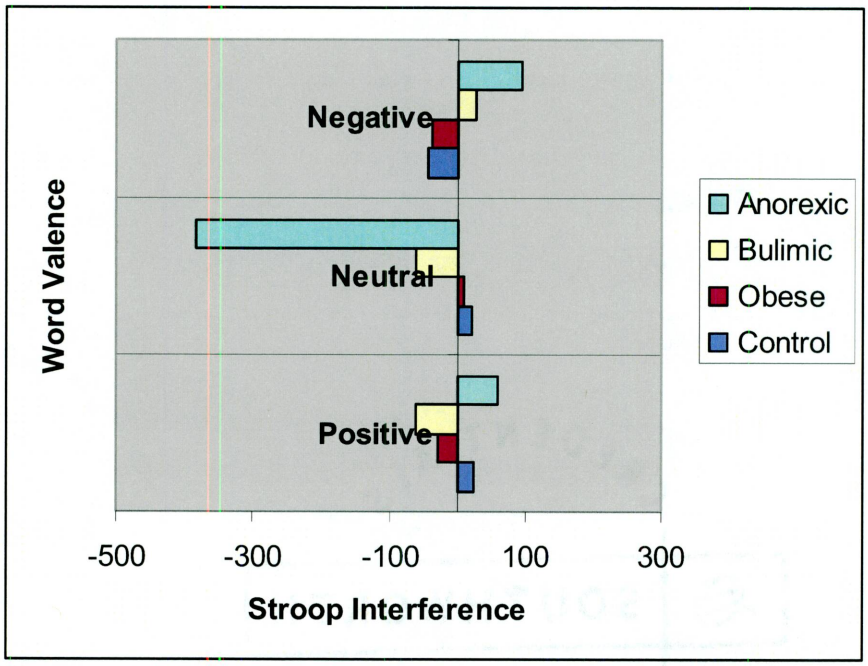

Figure 14. Mean Interference for Participant Groups Within Stroop Body Word Valence Categories

Note. Interference times are measured in milliseconds (ms); Negative amounts indicate that target words received a longer response time than control words.

Hypothesis 3a states that BSQ total scores will increase as color-naming response time increases across word/valence categories. Table 4 demonstrates that the data did not support this hypothesis for all word/valence categories. Color-naming latencies for neutral body words had a significant correlation with BSQ total scores ($r = .52$, $p = .01$). The remainder of the word/valence categories had a positive, but non-significant relationship with BSQ total scores.

Table 5

Correlations and Descriptive Statistics for Hypothesis 3a

Variable	BSQ Total	*N* *M (SD)*
BSQ Total	—	28 94.32 (34.49)
Positive Food Words	.27	30 784.39 (176.82)
Negative Food Words	.48	30 800.89 (228.57)
Neutral Food Words	.26	30 819.63 (212.13)
Positive Body Words	.37	30 744.02 (148.30)
Negative Body Words	.15	30 761.45 (129.67)
Neutral Body Words	.52**	30 795.18 (257.91)

Note. *** Correlation is significant at the 0.01 level.

Hypothesis 3b stated that EDI-3 scale scores will increase as color-naming response time increases across word/valence categories. Table 6 demonstrates that the data supported this hypothesis in some instances. Response time for negative body words and positive food words, did not have a significant relationship with any scale of the EDI-3. The Bulimia scale (B) on the EDI-3 showed a positive relationship with the

neutral valenced body words (Body words: $r = .46$, $p = .01$). The neutral valenced body words had several strong significant correlations with EDI-3 scales. The Perfectionism, Maturity Fears, Body Dissatisfaction, Interpersonal Alienation, and Overcontrol scales were not significantly correlated with any of the word/valence categories.

Table 6

Hypothesis 3b: Correlations between EDI-3 Scale Scores and Color-naming Response Times for Word/Valence Categories

Variable	Positive Food Words	Negative Food Words	Neutral Food Words	Positive Body Words	Negative Body Words	Neutral Body Words
DT	.42	.42	.46	.37	.22	.52**
B	.15	.43	.20	.24	-.01	.46**
BD	.43	.37	.38	.42	.45	.45
LSE	.28	.51**	.41	.37	.15	.53**
PA	.47	.66**	.58**	.60**	.33	.68**
II	.34	.54**	.44	.47	.17	.55**
IA	.37	.42	.44	.42	.33	.37
ID	.32	.51**	.46	.42	.10	.58**
ED	.35	.59**	.51**	.47**	.24	.70**
P	-.07	.21	.24	.15	-.03	.08
A	.14	.44	.24	.26	-.03	.49**
MF	-.02	.26	.01	.07	-.12	.32
EDRC	.41	.49**	.38	.40	.26	.57**
IC	.39	.60**	.51**	.50**	.25	.62**
IPC	.39	.52**	.47	.48**	.26	.50**
APC	.35	.57	.51	.46	.18	.67**
OC	.05	.39	.29	.25	-.04	.35
GPMC	.33	.59**	.47	.48	.19	.61**

Note. ** Correlation is significant at the 0.01 level.

Hypothesis 4 (a-d) stated that a positive correlation would be found between BSQ total scores and EDI-3 scale scores for each of the participant categories. Table 7 shows that this was not supported in most cases; however, there were a few noteworthy correlations. For example, in the bulimic group, the General Psychological Maladjustment Composite (GPMC) shows a significant relationship with the total BSQ scores ($r = 1.00$, $p = .002$), and the anorexic group approaches significance ($r = .98$, $p = .02$). The GPMC consists of the summed *T* scores for all nine of the psychological scales, and is a general measure of psychological adjustment. The mean GPMC *T* scores for the anorexic and the bulimic groups fell into the clinical range ($M = 44.33$, $SD = 14.74$, and $M = 49.00$, $SD = 6.98$, respectively), and the mean BSQ total scores indicate that these two groups are "moderately worried" about their body shape (anorexic: $M = 132$, $SD = 25$, and bulimic: $M = 121$, $SD = 50$).

In addition, the Bulimia Scale (B), which primarily assesses the tendency to think about and engage in binge eating, was significantly related to BSQ scores for the control group ($r = .66$, $p = .008$), and approached significance in the bulimic group ($r = 1.00$, $p = .02$). The mean B *T* scores for the bulimic and control groups are as follows: $M = 46$, $SD = 17.78$ (within the clinical range), and $M = 41$, $SD = 3.92$ (within the non-clinical range), respectively. As mentioned previously, the bulimic group's BSQ score indicated "moderate worry" about their body shape; the control group's mean evidences they are "not worried" about their body shape ($M = 74$, $SD = 22$).

The Eating Disorder Risk Composite (EDRC) was also positively correlated with BSQ total scores for the control group ($r = .6$, $p = .01$). The EDRC is a global measure of eating and weight concerns, and is composed of the summed *T* scores on the Drive for

Thinness (DT), Bulimia (B), and Body Dissatisfaction (BD) scales. The mean EDRC *T* scores for control group fell into the non-clinical range ($M = 30$, $SD = 6.77$).

The Asceticism scale (A) positively correlated with BSQ total scores for the control group ($r = .77$, $p = .001$). This EDI-3 scale assesses the tendency to seek virtue through the pursuit of spiritual ideals, such as self-denial, self-restraint, and self-discipline. This scale was not significantly correlated with any of the other participant groups' BSQ total scale.

Table 7

Hypothesis 4: Correlations between EDI-3 Scale Scores and BSQ Total Scores by Participant Category

	Anorexia Nervosa $N = 4$	Bulimia Nervosa $N = 3$	Obese $N = 6$	Control $N = 15$
EDI-3 Scales	BSQ Total $M = 132$ ($SD = 25$)	BSQ Total $M = 121$ ($SD = 50$)	BSQ Total $M = 108$ ($SD = 26$)	BSQ Total $M = 74$ ($SD = 22$)
DT	.82 ($p = .18$)	.72 ($p = .50$)	.82 ($p = .04$)	.40 ($p = .15$)
B	.70 ($p = .30$)	1.00 ($p = .02$)	.63 ($p = .18$)	.66** ($p = .008$)
BD	-.77 ($p = .22$)	.59 ($p = .60$)	.87 ($p = .03$)	.71 ($p = .003$)
LSE	.43 ($p = .57$)	.98 ($p = .13$)	.47 ($p = .35$)	.43 ($p = .12$)
PA	.88 ($p = .12$)	.94 ($p = .22$)	.59 ($p = .22$)	.49 ($p = .06$)
II	.56 ($p = .44$)	.99 ($p = .10$)	-.59 ($p = .22$)	-.19 ($p = .51$)
IA	-.84 ($p = .16$)	.65 ($p = .55$)	.01 ($p = .98$)	.33 ($p = .24$)
ID	.74 ($p = .26$)	.99 ($p = .10$)	.21 ($p = .69$)	.50 ($p = .06$)
ED	.78 ($p = .22$)	1.00 ($p = .06$)	.54 ($p = .27$)	-.03 ($p = .92$)
P	-.45 ($p = .55$)	.54 ($p = .64$)	-.09 ($p = .86$)	-.28 ($p = .31$)
A	.91 ($p = .09$)	.99 ($p = .08$)	.49 ($p = .33$)	.77** ($p = .001$)
MF	.90 ($p = .10$)	.98 ($p = .13$)	.69 ($p = .13$)	.15 ($p = .60$)
EDRC	.53 ($p = .47$)	.83 ($p = .38$)	.87 ($p = .03$)	.63** ($p = .01$)
IC	.68 ($p = .32$)	1.00 ($p = .04$)	.55 ($p = .26$)	.56 ($p = .03$)
IPC	.13 ($p = .87$)	.86 ($p = .34$)	-.32 ($p = .54$)	.08 ($p = .77$)
APC	.86 ($p = .14$)	.99 ($p = .10$)	.50 ($p = .31$)	.40 ($p = .14$)
OC	.44 ($p = .56$)	.87 ($p = .34$)	.12 ($p = .82$)	.07 ($p = .80$)
GPMC	.98 ($p = .02$)	1.00** ($p = .002$)	.37 ($p = .47$)	.39 ($p = .15$)

Note. ** Correlation is significant at the 0.01 level.

SUPPLEMENTAL ANALYSES

In addition to the hypotheses addressed in this study, several other aspects of the Stroop latencies, EDI-3, and BSQ were investigated. As previously discussed, participants rated each word on a 9-point scale in terms of pleasantness, arousal, and dominance. Line graphs (Appendix G) demonstrate fairly neutral responses from control group participants, with the exception of positive and negative food words in terms of pleasantness. Participants from the anorexia group rated positive body words high across rating categories. They rated negative food words extremely low in terms of pleasantness, and positive food words were rated lower than other participant groups across rating categories. Obese participants demonstrated similar rating scores to controls; however, the obese group had higher dominance scores, and lower arousal scores.

The Stroop color-naming latencies were examined in relation to the participants' own ratings of the words. For each word valence/category (i.e., positive body, neutral body, negative body, positive food, neutral food, negative food), mean rating scores and response times were transformed into *z*-scores. Correlations were investigated, and visually represented through scatterplots (Appendix H). There were no significant correlations revealed among Stroop color-naming latencies and word ratings within each participant group, according to word valence/categories.

The findings from further investigation into the mean differences in Stroop word categories between valenced words and matched control words are presented in Appendix I, which displays the results of paired *t*-tests for each variable. There were no

significant differences between the mean valenced words and the control words. In fact, the matched pairs were all highly correlated.

To further examine the relationships among the eating disorder measures used in this study, correlations were performed (Appendix J). There was no relationship found for the BSQ total score and BMI. BSQ total scores also correlated with all scales of the EDI-3, with the exception of the Perfectionism scale.

DISCUSSION

This study proposed to contribute to the understanding of the role of cognitive processing of emotional data in persons afflicted with eating disorders and obesity. As such this study investigated the Stroop interference of body- and food-words in participants diagnosed with eating disorders (anorexic/bulimic), as compared to obese and non-clinical control participants. The stimuli included words related to the following categories: Positive body words (e.g., "thin"), neutral body words (e.g., "waist"), negative body words (e.g., "fat"), positive food (e.g., "cake"), neutral food (e.g., "hunger") and negative food (e.g., "vomit"). The words were based on a previous study of hospitalized anorexic patients in Israel (Cohen, 2000), in which the relevancy of the words for anorexia, their emotional valence, and their intensity were explored. These word groups were contrasted with six control word groups (non-food, non-body-shape), matched for number of letters and occurrence. The valances of the words were also examined by group status. Additionally, utilizing standardized measures, the impact of body image, and of eating disorder severity, on information processing was also assessed.

Hypothesis 1 proposed that there would be differences between the ratings of target words among participant categories across valence categories, but not between ratings of control words. In examining the control words, as predicted, differences were not found overall; although, there were some interesting findings. For the target words, it was proposed that there would be differences between the ratings of target words among participant categories across valence categories. As noted below this was variable depending on the words rated.

The hypothesis was supported in terms of pleasantness ratings; there were differences found among participant groups and across Stroop valence categories. For instance, the bulimic group rated the neutral target food words lower in terms of pleasantness than the negative valenced target food words. This is interesting because the negative food words were all purging words (i.e., vomit, laxative, diarrhea, throw-up) and the neutral food words were eating words (i.e., eating, hunger, munchies, craving), indicating that feelings of hunger are less pleasant for the bulimic group than purging words. The rest of the groups, however, rated the positive valenced target food words as most pleasant, followed by the neutral valenced food words, and then by the negative valenced words, which were rated least pleasant. This is what would be expected for the groups without eating disorders; the high sugar/high fat food words as most pleasant, followed by the eating words, and the purging words as least pleasant. Interestingly, this trend also occurred for the anorexic group. In terms of pleasantness ratings of food control words, there were differences among Stroop word valences (i.e., positive, neutral, negative), with the negative words receiving the least pleasant ratings, which may have been due to the word "shout" being included in this group which could carry a negative valance.

In terms of arousal ratings, the control food words demonstrated a trend in which negative valenced control food words were rated highest in terms of arousal for all groups except for the obese group. Another trend can be seen for the positive valenced control food words, which were rated lowest in terms of arousal for all groups except for the bulimic group. Regarding the arousal ratings of the target food words, no significant differences were found among participant groups or among Stroop valence categories.

The obese group had the highest overall mean dominance ratings for the target food words, and the anorexic group had the lowest overall mean dominance ratings. Contrary to popular belief, this may suggest that obese individuals may feel more dominant, and anorexic individuals may feel the least in control regarding food. This feeling of weakness over food may be explained by anorexics' intense fear of becoming fat and of losing control over how much food they eat, along with their constant state of starvation. On the other hand, obese individuals may feel more in control in regards to food due to their ability to feel satiated over sporadic intervals throughout the day without fear of becoming fat.

Regarding the pleasantness of target body words, positive valenced words were given the highest pleasantness rating, followed by the neutral valenced body words, and then by the negative valenced words, which were rated least pleasant. This pattern occurred across all participant groups. The anorexic group rated the positive body words (i.e., thin, slender, slim, skinny) the most pleasant and the negative body words (i.e., heavy, fat, bloated, plump) the least pleasant among participant categories. This is what would be expected for this population, given their quest for thinness.

For the target body words, there were no differences between the arousal ratings among participant groups across valence categories; however, differences were found when examining the ratings among participant groups and across Stroop valence categories in isolation. Interestingly, negative body words received the highest arousal ratings from the bulimic group, and positive body words received the highest ratings from the anorexic group. Thus, the negative body words reflected a heavier weight status (i.e., heavy, fat, bloated, plump), and the positive body words described a thinner body

type (i.e., thin, slender, slim, skinny). These ratings suggest a difference in what may maintain the disorders of bulimia and anorexia, with bulimics having greater feelings of arousal towards overweight (or greater fear of being fat), and anorexics possessing greater feelings of arousal towards underweight (or greater desire to be thin). This finding points to an important distinction between these two groups.

The body control words were rated differently across Stroop valence categories. For instance, positive control body words (i.e., warm, breathe, card, candle) received the lowest arousal ratings. Again, these findings demonstrate that although the control words appeared to be neutral in valence, they triggered various levels of feelings of arousal among the groups. This finding points to the importance of individual factors affecting the ratings of seemingly neutral words.

In terms of dominance ratings of target words, there were no differences between ratings for target body words, either across participant groups or among Stroop valence categories. This was also found for the dominance ratings for control words; however, a trend did appear for the obese and anorexic groups. The obese group rated the positive valenced control body words (i.e., warm, breathe, card, candle) as triggering the least amount of dominance, and the anorexic group rated the negative valenced control body words (i.e., ready, cat, mailbox, album) as triggering the least amount of dominance.

Overall, the control words were expected to be rated as more neutral than the target words in terms of dominance, pleasantness, and arousal, which was shown to be fairly accurate; however, the heterogeneity of ratings within and across groups allude to the complexity of eating disorders and obesity. On the whole, pleasantness and

dominance appeared to more related to food than body, and arousal was heightened with body and food.

These findings indicate that there may have been some methodological error in distinguishing between words in terms of valence. This problem has appeared in several studies, evidencing the difficulty with predetermining the nature of body- and food-concern words. For example, the words used by Lovell, Williams, & Hill (1997) have been suggested to show some of the body shape words were actually food-related or body parts. Similarly, the words used in this study may have not been exclusive in terms of valence. Further, no significant differences were found between valenced words and control words. In fact, the matched pairs were all highly correlated.

Interestingly, regardless of valance or word category, the control group's response times were quicker than the obese group, followed by the bulimic group, which were faster than the anorexic group. This supports studies that have found evidence of abnormal information processing in patients with anorexia (Fassino, Piero, Daga, Leombruni, Mortara, & Rovera, 2002). For example, in a recent study Fowler, Blackwell, Jaffa, Palmer, and colleagues (2006) found delays in rapid visual information processing in a group of in-patient anorexic patients compared to non-clinical controls. The literature does not indicate that persons with bulimia exhibit information processing difficulties.

In the current study, it was discovered that the bulimic group had a shorter response time than the obese group for negative target body words (i.e., heavy, fat, bloated, plump). Thus, although the bulimic group may have fears of becoming

overweight, the stigma that many obese persons suffer may have triggered an emotional response to words denoting overweight for the obese group.

Many investigators have found that words of particular salience to certain groups of participants cause more color-naming interference for these participants than for a control group. One intriguing issue regarding the emotional Stroop interference among various populations relates to the question of whether the interference is due to the emotionality of the relevant words (as rated by the participants), or to their negative valence (McKenna & Sherra, 1995). In order to investigate this issue further, the Stroop color-naming latencies were examined in relation to the participants' own ratings of the words. This was proposed to provide additional information as to the accuracy of the experimental words and categories chosen by the experimenters.

Through exploratory analyses, it was discovered that participants from the anorexia group rated positive body words high across rating categories. They rated negative food words extremely low in terms of pleasantness, and positive food words were rated lower than other participant groups across rating categories. Obese participants demonstrated similar rating scores to controls; although, the obese group had higher dominance scores, and lower arousal scores. However, no significant correlations were revealed among Stroop color-naming latencies and word ratings within each participant group, according to word valence/categories.

The mean response times for combinations of Stroop categories and valences for each of the participant groups were additionally examined for the control words. The same trend was demonstrated here, as seen in the target words; however, for the positive body words (i.e., warm, breathe, card, candle), bulimics responded quicker than the obese

group. This finding is another example of the possibility of words holding particular relevance for some groups, and not others, which was not predicted apriori in this study.

Hypothesis 2 proposed that the emotional Stroop interference will significantly differ among participant categories and Stroop valences. For instance, color-naming latencies among Stroop valences for food words were proposed to differ based on participant categories with participants with eating disorders demonstrating longer response latencies than those without eating disorders. No significant differences between interference scores for food words were found among participant categories, or among Stroop valences. This is surprising given the difference in pleasantness ratings among the groups for food words. This finding suggests that the Stroop effect may not be driven by personal salience of the words, or that these words hold such personal meaning to each disordered patient that there is nothing systematic; hence eliminating any statistically significant findings. Again, this provides support for the complexity of eating disorders and obesity.

A trend was observed in which the obese group demonstrated a longer response latency for the target food words than the control food words regardless of valence. The anorexic and bulimic groups both responded quicker to the control food words than to the target words in the neutral and negative valenced word categories. This finding suggests that the Stroop effect was able to be demonstrated for the eating disorder and obese groups with the food words that were used in this study, especially ones that fell into the neutral or negative valence categories.

Hypothesis 2b stated that color-naming latencies among Stroop valences for body words will differ based on participant categories with participants with eating disorders

demonstrating longer response latencies than participants without eating disorders. There were no significant differences between Stroop interferences among participant categories; however, the interference scores for the body words significantly differed across Stroop valence categories depending on participant groups. Specifically, the anorexia group demonstrated a longer response latency for the neutral valenced target body words (i.e., thighs, figure, hips, waist) than the negative or positive valenced control body words. This was somewhat expected, given the predicted emotional valence of the target words versus the control words; particularly, that there was emotional interference for the anorexic group when viewing body part words, as opposed to non-body part words.

The impact of body image on information processing was also addressed in this study. It was proposed in Hypothesis 3a that color-naming latencies will elevate in relation to body-shape disturbance. Color-naming latencies increased in response to neutral body words (i.e., thighs, figure, hips, waist) in relation to more severe body image problems. The remainder of the word/valence categories had a positive, but non-significant relationship with body shape disturbance. This suggests that this Stroop task may be related to body image; specifically, the more severe the disturbance in body shape the longer the response latency across groups.

The effect of eating disorder symptomatology and severity was also investigated in terms of color-naming latencies in Hypothesis 3b. Color naming latencies for neutral valenced body words (i.e., thighs, figure, hips, waist) increased as bulimic tendencies increased. The neutral valenced body words were related to several scales on the EDI-3. This provides more support that the neutral valenced words used in this study likely

elicited emotional interference. Thus, bulimic tendencies increase with greater emotional interpretation of body parts across eating disorder, obese, and control categories.

Perfectionism, often related to the cognitive maintenance of eating disorders (Garner, 2004), displayed no relationship with any of the word/valence categories. This may be due in part to the sampling procedure used in this study. Several control participants were recruited through universities, and students may have higher levels of perfectionism in general. Perfectionism has long been associated with a range of disordered eating behaviors in women (Forbush, Heatherton, & Keel, 2007). However, in a review of previous research, Franco-Paredes, Mancilla-Díaz, and Vázquez-Arévalo (2005) reveal that the idea that anorexic and bulimic individuals display higher levels of perfectionism than non-disordered control individuals is not supported when using the perfectionism scale of the EDI. Thus, the current findings may reflect measurement error; however, this area warrants further investigation.

The relationship between body shape disturbance (BSQ) and eating disorder symptomatology (EDI-3) was investigated in Hypothesis 4. Higher levels of body image disturbance and eating disorder severity corresponded to diagnostic groups; for example, participants in the anorexic and the bulimic groups fell into the clinical range for psychological adjustment, and were moderately worried about their body shape. Overall, these findings lend support to the BSQ, which is a measure of body shape disturbance, as a strong associated factor to eating disorder severity. Additionally, this provides support for the importance of including body image in the evaluation and treatment of eating disorders.

The tendency to think about and engage in binge eating was significantly related to levels of body shape dissatisfaction for bulimic and control groups. As expected, bulimic participants had clinical levels of binge eating tendencies, and indicated they were moderately worried about their body shape. For control participants, their level of binge eating tendencies was non-clinical, and they reported minimal worries about their body shape. It is not surprising that the anorexic group's level of body dissatisfaction did not correlate with the Bulimia scale, because despite their worry about body shape, this anorexic sample may represent the restrictive type of anorexia, instead of the binge/purge type. Likewise, the obese sample in this study likely does not represent the binge eating disorder subgroup of the obese population. Thus, because body shape dissatisfaction appears to be associated with binge eating tendencies in persons with bulimia, body image should be addressed as part a comprehensive treatment program for bulimia. Additionally, the use of the BSQ may provide useful information regarding treatment efficacy and recovery.

Higher levels of eating and weight concerns, as measured by the EDRC, were significantly related to higher levels of body shape disturbance for the control group. Both the obese and control groups rated their eating and weight concerns in the non-clinical range across measures, with the obese group noting slight worry, and the control group noting no worry. Although obesity has been linked to body image dissatisfaction in some studies, this finding supports the psychologically heterogeneous nature of the obese population (Friedman & Brownell, 1995).

Limitations

It is important to note several methodological inadequacies in the design of the current study. The difficulty in recruiting participants resulted in a sample size, thus limiting statistical power of the analyses.

Further, the treatment program changes which occurred in the Behavioral Medical Center in Loma Linda, California resulted in missing data, thus impacting the results. Additionally, the participants with eating disorders from Boise, Idaho, were referred through their outpatient physicians, counselors, or dieticians; thus access to medical records was not provided, and diagnostic categories were based on patient report. Also, the locations of this study were a religious institution (Loma Linda), and a primarily Caucasian population (Boise). Thus, the uniqueness of this sample may have impacted the results and reduced the generalizability of the results. Another concern is that this study did not control for the effects of medication on information processing. This potential confound may have impacted the Stroop results, especially not knowing the effects of medication on the cognitive processes for those patients with eating disorders on medication.

Various threats to validity reduced the reliability of the findings, as well as the generalizability of the results, such as using a correlational design, and using self-report measures. Also, as mentioned previously, the word valences and word categories may not have been orthogonal, impacting the findings of this study. Further, the words used

in this study were based on a previous study that used Hebrew words (Cohen, 2000). In retrospect, a pilot study testing the English words would have been advantageous. Within group heterogeneity also likely impacted the effect of the words utilized.

Implications

Despite a small sample size, this study provides information regarding the effect of eating disorder symptoms, including body image, on information processing. The Stroop task demonstrated some utility in measuring emotional interference in persons with and without eating disorders. Relatively longer response latencies among participants with eating disorders suggest attentional difficulties among persons with anorexia or bulimia. Words with positive valence, regardless of Stroop word category, were processed relatively quickly by participants with eating disorders and those without, implying less emotional interference for words of positive valence.

The findings suggest that the modified Stroop task may be related to level of body image disturbance, as well as eating disorder severity. Additionally, this study demonstrates the BSQ as a measure of eating disorder severity. Further, the importance of including body image in the evaluation and treatment of eating disorders was emphasized. Lastly, the low levels of body image disturbance and various levels of eating disorder concerns among the obese participants support the psychologically heterogeneous nature of the obese population. This additionally points to the complexity of studying this diverse population. This is the first study examining information processing with the modified Stroop task in the obese population, which should encourage further research of this kind.

Future Research

A wide variety of research has demonstrated that emotional interference effects can be assessed through the modified Stroop task. This study found differences in emotional interference among the participant categories, although the differences were not systematic. Thus future studies using the Stroop to examine information processing among individuals with eating disorders should attempt to match the word lists for various potential confounds. Additionally, the data suggests that the neutral words were indeed evocative words. Body words and neutral words may be related to sexuality in some way for these populations; thus, it would be interesting to have the participants rate the words on a scale anchored by "sexual" and "non-sexual."

In terms of the study design, a separate participant group of persons with the diagnosis of binge eating disorder (Eating Disorder, NOS) would contribute to the understanding of this complex disorder. Additionally, making sure the obese individuals do not meet criteria for this diagnosis would be helpful in differentiating among individuals within this diverse group. It would be of clinical interest to examine the length of time with eating disorder, length of time in treatment, and length of time in recovery in relation to information processing. Also, comparing Stroop color naming latencies in terms of individuals in inpatient versus outpatient treatment centers would provide valuable information into the process of modifying the body schema.

The findings of the study will hopefully contribute to a better understanding of the role of cognitive processing of emotional data. Furthermore, the study may enrich our understanding of the cognitive schema of eating disorders and, through further research, their susceptibility to treatment. In addition, the findings may illuminate the

importance of the need for the development of a practical measure for the severity of eating disorders, its recovery, and for identification of specific concerns, particularly related to body image, among individuals who are afflicted by these life threatening diseases. Additionally, it is hoped that this study prompts further examination into the subgroups within the obese population with regards to the cognitive processing of emotional data in relation to body image disturbance.

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APPENDIX A

Recruitment Flyer

WANTED: Females

for Eating Disorder Research

(This study is being conducted as part of Doctoral student research)

- **This study examines how persons with eating disorders or weight concerns process information.**
- **We need all females (underweight, overweight, obese; with or without eating disorders).**
- **You must be between 16 and 30 years old to participate.**
- ***No treatment will be given as a part of this study.***
- **If you agree to participate, you will be asked to:**
  - **Complete a few questionnaires**
  - **Perform a computer task**
  - **Have your BMI (body mass index) calculated**
- **Participation lasts about 60-90 minutes.**
- **You will receive a $20 gift-card as a "Thank you" for your participation.**
- ***All information is confidential.***

Your help is greatly appreciated. Thank you!

For more information or to schedule an appointment, please contact:

Kristy: 343-7797

research4ed@yahoo.com

APPENDIX B

Consent Form

LOMA LINDA UNIVERSITY

Paul Haerich, Ph.D
Professor
(909) 558 8707
phaerich@psych.llu.edu

Department of Psychology
School of Science & Technology
Loma Linda University
Loma Linda, CA 92350

Eating Disorders and the Stroop Task

INFORMED CONSENT: Eating Disorder Group, Color-Naming Only

Purpose

You are invited to participate in this research study because you have been diagnosed with an eating disorder (anorexia or bulimia). The purpose of this study is to evaluate how persons with eating disorders or weight concerns view themselves, and how their brains process information relevant to these concerns. We anticipate that the results will be useful in the development of more specific and more effective treatments for persons with eating disorders as well as the creation of tools for measuring the effects of treatment. We will also use this information from this study to talk to or train other professionals who may want to work with persons with eating disorders or weight concerns.

Procedure

With your consent, you will be performing a computer-operated color-naming task called the Stroop Task. In this task you will be asked to respond as quickly and as accurately as possible by naming, out loud, the color each word is presented in when it appears on the computer screen. An audio-recorder will be taping your voice. After the Stroop Task, you will be asked to complete some pencil and paper questionnaires on which you will answer questions about yourself, and rate how you feel about certain words. The total time for your participation in this study will be about 45 – 60 minutes.

Risks

There is no increased risk associated with participation in this study beyond that which occurs in everyday life. Therefore, the committee that reviews human studies (Institutional Review Board) has determined that participating in this study exposes you to minimal risk.

We want you to be aware that the types of questions you will be asked are personal and can make some people feel a little uncomfortable. You may skip these items. You may stop at any time or not answer questions that you find too personal. All of the information you provide on the questionnaires will remain confidential.

Benefits

This is a basic research study. Therefore you will not directly benefit from your participation. Our goal is that the results will be used in the future to improve treatment and the measurement of the outcome of treatment for persons with eating disorders or weight concerns.

Additional Costs

There is no cost to you for participating in this study.

Confidentiality

All information from this study about you will be kept strictly confidential, and any report of the study will not personally identify you. None of the information you disclose may be revealed to anyone outside the research investigators. The only exceptions are when disclosure is required or permitted by law. Those situations typically involve substantial risk of physical harm to oneself or to others.

Impartial Third Party Contact

If you wish to contact an impartial third party not associated with this study regarding any complaint you may have about the study, you may contact the Office of Patient Relations, Loma Linda University Medical Center, Loma Linda, CA 92354, (909) 558-4647, for information and assistance.

Loma Linda University
Adventist Health Sciences Center
Institutional Review Board
Approved 4/13/06 Void after 4/12/2007
33040 Chair R L Rigsby MD

Participants' Rights

You are free to withdraw from the study at any time. Participation is completely voluntary and will not affect your current or future medical care or your relationship with Loma Linda University Medical Center or the Behavioral Medicine Center.

If you have any questions regarding this study, we will be happy to answer them.

Consent Statement

I have read the contents of the consent form. My questions have been answered to my satisfaction. I hereby consent to participation in this study. Signing this consent document does not waive my rights nor does it release the investigators or institution from their responsibilities. I may call Dr. Paul Haerich at (909) 558 4770 or Dr. Kiti Freier at (909) 558 8725 if I have any additional questions or concerns. I have been given a copy of this consent form.

_____ _____

Participant Signature Date

_____ _____

Parent or Guardian Signature Date
(for participants under 18 years of age)

I have review this consent document with the person(s) signing above. An opportunity has been provided to ask any questions regarding this document and the research described in it.

_____ _____

Investigator Date

Loma Linda University
Adventist Health Sciences Center
Institutional Review Board
Approved 4/13/06 **Void after** 4/16/2007
33060 **Chair** R L Rigsby M.D.

_____

Loma Linda University

Paul Haerich, Ph.D
Professor
(909) 558 8707
phaerich@psych.llu.edu

Department of Psychology
School of Science & Technology
Loma Linda University
Loma Linda, CA 92350

Eating Disorders and the Stroop Task

INFORMED CONSENT: Comparison Group, Color-Naming Only

Purpose

You are invited to participate in this research study as a comparison participant who has not been diagnosed with an eating disorder (that is, anorexia or bulimia). The purpose of this study is to evaluate how persons with eating disorders or weight concerns view themselves, and how their brains process information relevant to these concerns. We anticipate that the results will be useful in the development of more specific and more effective treatments for persons with eating disorders as well as the creation of tools for measuring the effects of treatment. We will also use this information from this study to talk to or train other professionals who may want to work with persons with eating disorders or weight concerns.

Procedure

With your consent, you will be performing a computer-operated color-naming task called the Stroop Task. In this task you will be asked to respond as quickly and as accurately as possible by naming, out loud, the color each word is presented in when it appears on the computer screen. An audio-recorder will be taping your voice. After the Stroop Task, you will be asked to complete some pencil and paper questionnaires on which you will answer questions about yourself, and rate how you feel about certain words. The total time for your participation in this study will be about 45 – 60 minutes.

Risks

There is no increased risk associated with participation in this study beyond that which occurs in everyday life. Therefore, the committee that reviews human studies (Institutional Review Board) has determined that participating in this study exposes you to minimal risk.

We want you to be aware that the types of questions you will be asked are personal and can make some people feel a little uncomfortable. You may skip these items. You may stop at any time or not answer questions that you find too personal. All of the information you provide on the questionnaires will remain confidential.

Benefits

This is a basic research study. Therefore you will not directly benefit from your participation. Our goal is that the results will be used in the future to improve treatment and the measurement of the outcome of treatment for persons with eating disorders or weight concerns.

Additional Costs

There is no cost to you for participating in this study.

Confidentiality

All information from this study about you will be kept strictly confidential, and any report of the study will not personally identify you. None of the information you disclose may be revealed to anyone outside the research investigators. The only exceptions are when disclosure is required or permitted by law. Those situations typically involve substantial risk of physical harm to oneself or to others.

Impartial Third Party Contact

If you wish to contact an impartial third party not associated with this study regarding any complaint you may have about the study, you may contact the Office of Patient Relations, Loma Linda University Medical Center, Loma Linda, CA 92354, (909) 558-4647, for information and assistance.

_____

Loma Linda University
Adventist Health Sciences Center
Institutional Review Board
Approved 4/13/06 **Void after** 4/16/2007
33060 **Chair** R L Rig...

Participants' Rights

You are free to withdraw from the study at any time. Participation is completely voluntary and will not affect your current or future medical care or your relationship with Loma Linda University Medical Center or the Behavioral Medicine Center.

If you have any questions regarding this study, we will be happy to answer them.

Consent Statement

I have read the contents of the consent form. My questions have been answered to my satisfaction. I hereby consent to participation in this study. Signing this consent document does not waive my rights nor does it release the investigators or institution from their responsibilities. I may call Dr. Paul Haerich at (909) 558 4770 or Dr. Kiti Freier at (909) 558 8725 if I have any additional questions or concerns. I have been given a copy of this consent form.

_____ _____

Participant Signature Date

_____ _____

Parent or Guardian Signature Date
(for participants under 18 years of age)

I have review this consent document with the person(s) signing above. An opportunity has been provided to ask any questions regarding this document and the research described in it.

_____ _____

Investigator Date

Loma Linda University
Adventist Health Sciences Center
Institutional Review Board
Approved 4/13/06 **Void after** 4/12/2007
33060 **Chair** R L Rigsby

_____

APPENDIX C

Authorization for Use of Private Health Information

INSTITUTIONAL REVIEW BOARD
Authorization for Use of
Protected Health Information (PHI)
Per 45 CFR §164.508(b)
OFFICE OF SPONSORED RESEARCH

Loma Linda University • 11188 Anderson Street •
Loma Linda, CA 92350
(909) 558-4531 (voice) / (909) 558-0131 (fax)

OSR#55060

TITLE OF STUDY: Stroop Task and Eating Disorders

PRINCIPAL INVESTIGATOR: Paul Haerich, Ph.D.

Others who will use, collect, or share PHI: Jeff Mar, MD, Kiti Freier PhD, Kristy Kuehfuss, MA, Kate Truitt, BA, Jessie Stevens, BA

This form authorizes the collection and use of protected health information about you, the participant, by the individuals listed above. The study named above may be performed only by using personal information relating to your health. National and international data protection regulations give you the right to control the use of your medical information. Therefore, by signing this form, you specifically authorize your medical information to be used or shared as described below.

Protected Health Information ("PHI") means individually identifiable health information, as defined by HIPAA, that is created or received by us and that relates to the study listed above. For the purposes of this study the specific health information we will collect from you will be limited to information in your medical charts regarding your current diagnosis and symptomology, including BMI, as well responses to questionnaires that will be administered during the study. The purposes of our use and disclosure of this health information are described in the Purpose section of this Consent & Authorization Form.

We will protect your privacy in the following ways:

1. **Your name or other protected information will not be used. Instead, all identifying information will be coded.**
2. **Only the individuals listed above will be able to access your information.**
3. **All information will be kept in a locked safety box under the primary investigator's care.**

The persons who are authorized to use and/or disclose your health information are the investigators who are listed on page one of this Research Consent Form and the Loma Linda University Institutional Review Board. This authorization will expire at the completion of this research study and we will no longer keep protected health information that we collect from you.

The main reason for sharing this information is to be able to conduct the study as described earlier in the consent form. In addition, it is shared to ensure that the study meets legal, institutional, and accreditation standards. Information may also be shared to report adverse events or situations that may help prevent placing other individuals at risk.

All reasonable efforts will be used to protect the confidentiality of your PHI which may be shared with others to support this study, to carry out their responsibilities, to conduct public health reporting and to comply with the law as applicable. Those who receive the PHI may share with others if they are required by law, and they may share it with others who may not need to follow the federal privacy rule.

While this study is still in progress, you may not be given access to any medical information about you that is related to this study. After the study is completed and the results have been analyzed, you will be permitted access to any medical information collected about you for this study.

You have the right to revoke this authorization and can withdraw your permission for us to use your information for this research by sending a written request to the Principal Investigator listed on page one of this form. If you do send a letter to the Principal Investigator, the use and disclosure of your protected health information will stop as of the date he/she receives your request. However, the Principal Investigator is allowed to use information collected before the date of the letter or collected in good faith before your letter arrives. Revoking this authorization will not affect your health care or your relationship with your health care facility affiliated with this study. To withdraw your permission, please contact the Principal Investigator or study personnel, Paul Haerich, PhD, at 909-558-8707.

You may refuse to sign this authorization. Refusing to sign will not affect the present or future care you receive at this institution and will not cause any penalty or loss of benefits to which you are entitled. However, if you do not sign this authorization form, you will not be able to take part in the study for which you are being considered. You will receive a copy of this signed and dated authorization prior to your participation in this study.

.....

I agree that my personal health information may be used for the study purposes described in this form.

_____	_____
Signature of Participant	**Date**
_____	_____
Signature of Investigator Obtaining Authorization	**Date**
_____	_____
Signature of Parent of Legal Guardian if Participant is a Minor	**Date**

APPENDIX D

Stroop Words

Positive Body-Shape	**Control (non-food, non-body-shape)**
SLIM	WARM
SLENDER	BREATHE
THIN	CARD
SKINNY	CANDLE
Neutral Body-Shape	
THIGHS	WREATH
FIGURE	ADMIRE
HIPS	BOOK
WAIST	CHAIR
Negative Body-Shape	
HEAVY	READY
FAT	CAT
BLOATED	MAILBOX
PLUMP	ALBUM
Positive Food	
SWEETS	DRAFTS
ICE-CREAM	DAY-DREAM
CAKE	TREE
CHIPS	BUNNY
Neutral Food	
EATING	FLOWER
HUNGER	ANTLER
MUNCHIES	TRAINEES
CRAVING	AMUSING
Negative Food	
VOMIT	SHOUT
LAXATIVE	FRAGMENT
DIARRHIA	CHANNELS
THROW-UP	START-UP

APPENDIX E

Demographic Form

(Demographic Form)

Thank you for providing the following information.

GENERAL INFORMATION

1) Your age: _____

2) Please indicate your cultural or ethnic identity: _____

3) Please indicate your religious affiliation: _____

4) How long has it been since you last ate? _____

5) How hungry are you right now? *(Circle one)*

Not at all hungry A little hungry Extremely hungry

6) Are you currently dieting? *(Circle one)*

Yes No

7) How much do you exercise per week? _____

8) Have you ever been diagnosed with an eating disorder? *(Circle one)*

Yes No

APPENDIX F

Body Shape Questionnaire

BSQ-34

We should like to know how you have been feeling about your appearance over the **PAST FOUR WEEKS**. Please read each question and circle the appropriate number to the right. Please answer all the questions.

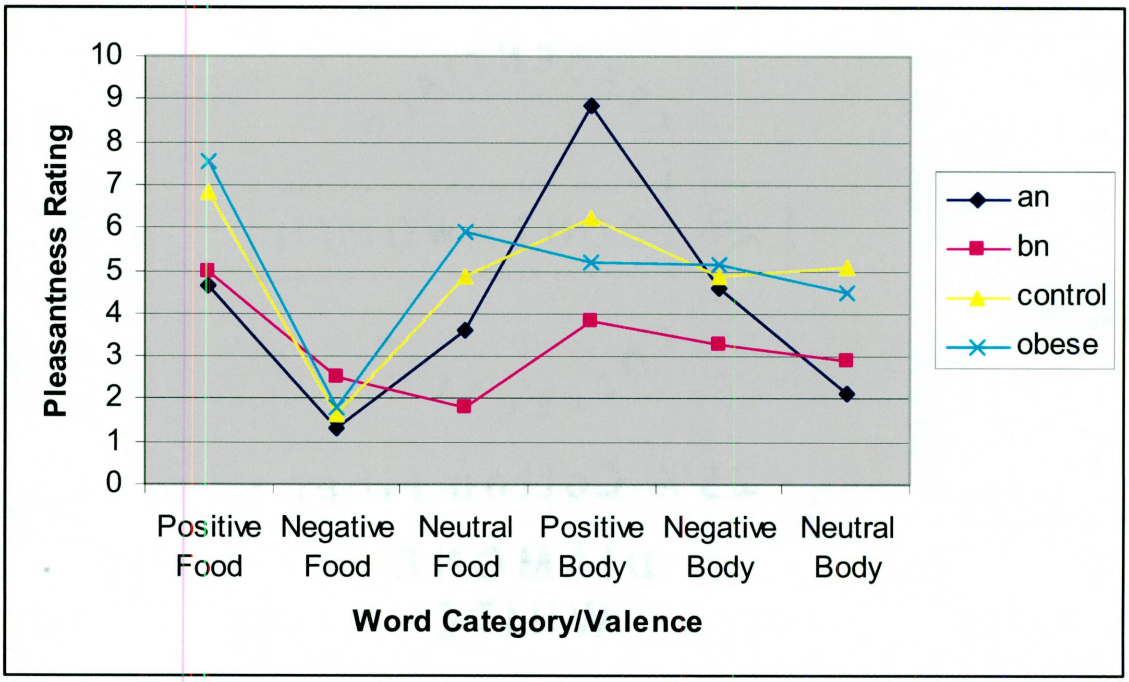
OVER THE PAST FOUR WEEKS:

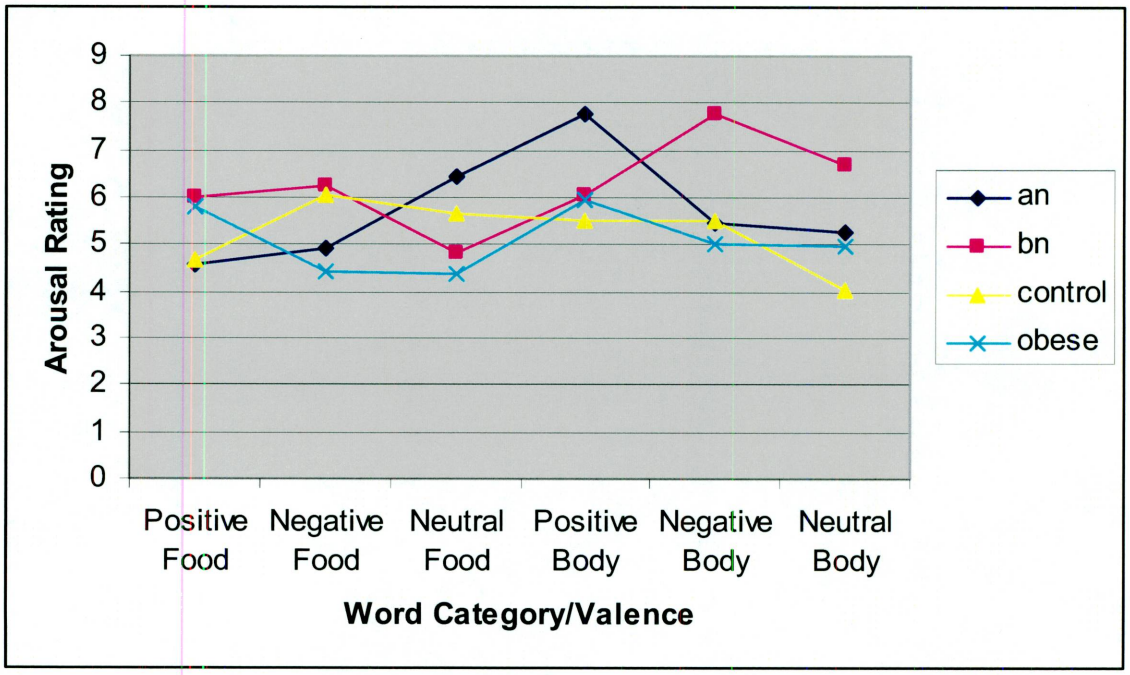
	Never	Rarely	Sometimes	Often	Very often	Always
1. Has feeling bored made you brood about your shape?	1	2	3	4	5	6
2. Have you been so worried about your shape that you have been feeling you ought to diet?	1	2	3	4	5	6
3. Have you thought that your thighs, hips or bottom are too large for the rest of you?	1	2	3	4	5	6
4. Have you been afraid that you might become fat (or fatter)?	1	2	3	4	5	6
5. Have you worried about your flesh being not firm enough?	1	2	3	4	5	6
6. Has feeling full (e.g. after eating a large meal) made you feel fat?	1	2	3	4	5	6
7. Have you felt so bad about your shape that you have cried?	1	2	3	4	5	6
8. Have you avoided running because your flesh might wobble?	1	2	3	4	5	6
9. Has being with thin women made you feel self-conscious about your shape?	1	2	3	4	5	6
10. Have you worried about your thighs spreading out when sitting down?	1	2	3	4	5	6
11. Has eating even a small amount of food made you feel fat?	1	2	3	4	5	6
12. Have you noticed the shape of other women and felt that your own shape compared unfavourably?	1	2	3	4	5	6
13. Has thinking about your shape interfered with your ability to concentrate (e.g. while watching television, reading, listening to conversations)?	1	2	3	4	5	6
14. Has being naked, such as when taking a bath, made you feel fat?	1	2	3	4	5	6
15. Have you avoided wearing clothes which make you particularly aware of the shape of your body?	1	2	3	4	5	6
16. Have you imagined cutting off fleshy areas of your body?	1	2	3	4	5	6

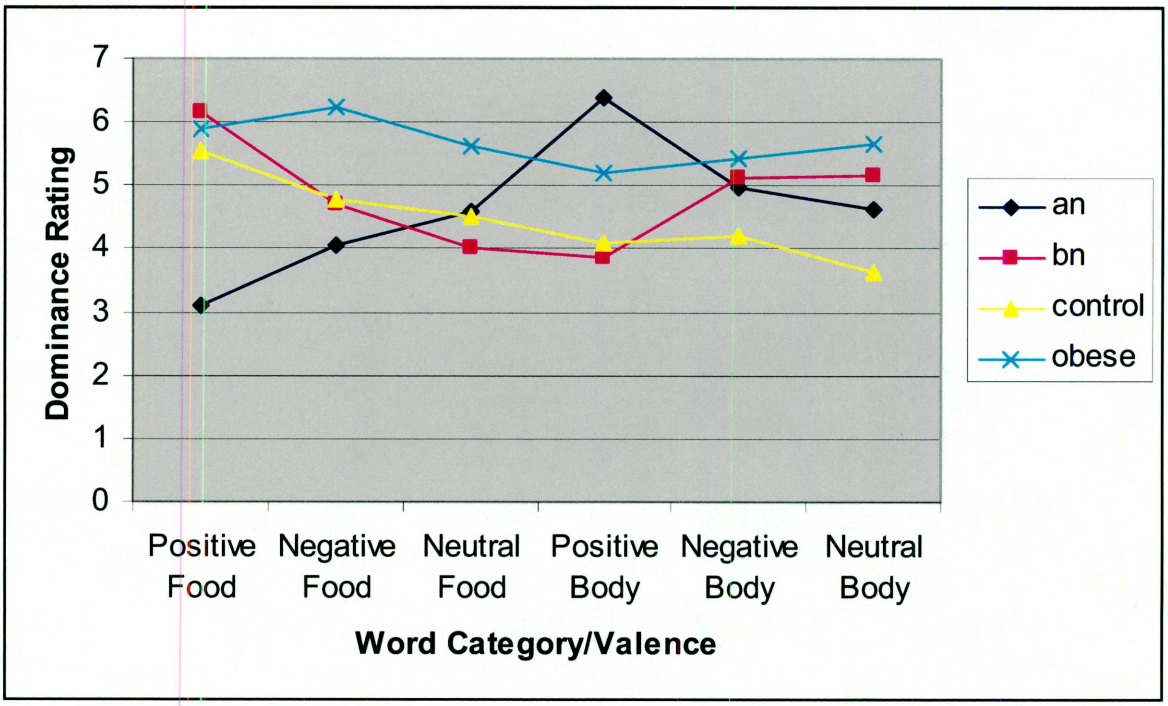
	Never	Rarely	Sometimes	Often	Very often	Always
17. Has eating sweets, cakes, or other high calorie food made you feel fat?	1	2	3	4	5	6
18. Have you not gone out to social occasions (e.g. parties) because you have felt bad about your shape?	1	2	3	4	5	6
19. Have you felt excessively large and rounded?	1	2	3	4	5	6
20. Have you felt ashamed of your body?	1	2	3	4	5	6
21. Has worry about your shape made you diet?	1	2	3	4	5	6
22. Have you felt happiest about your shape when your stomach has been empty (e.g. in the morning)?	1	2	3	4	5	6
23. Have you thought that you are in the shape you are because you lack self-control?	1	2	3	4	5	6
24. Have you worried about other people seeing rolls of fat around your waist or stomach?	1	2	3	4	5	6
25. Have you felt that it is not fair that other women are thinner than you?.	1	2	3	4	5	6
26. Have you vomited in order to feel thinner?	1	2	3	4	5	6
27. When in company have your worried about taking up too much room (e.g. sitting on a sofa, or a bus seat)?	1	2	3	4	5	6
28. Have you worried about your flesh being dimply?	1	2	3	4	5	6
29. Has seeing your reflection (e.g. in a mirror or shop window) made you feel bad about your shape?	1	2	3	4	5	6
30. Have you pinched areas of your body to see how much fat there is?	1	2	3	4	5	6
31. Have you avoided situations where people could see your body (e.g. communal changing rooms or swimming baths)?	1	2	3	4	5	6
32. Have you taken laxatives in order to feel thinner?	1	2	3	4	5	6
33. Have you been particularly self-conscious about your shape when in the company of other people?	1	2	3	4	5	6
34. Has worry about your shape made you feel you ought to exercise?	1	2	3	4	5	6

APPENDIX G

Supplemental Analyses: Line Graphs of Participants' Word Ratings

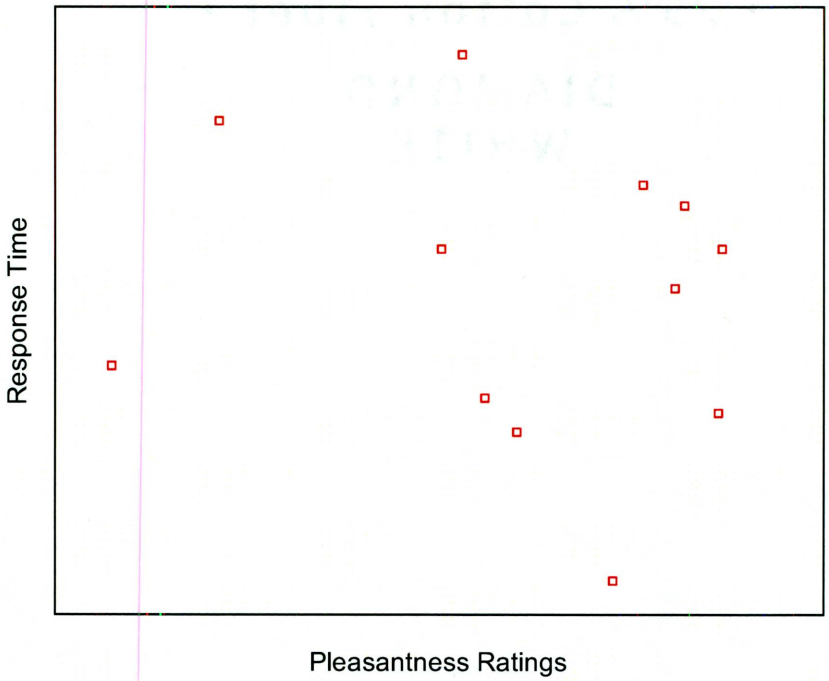

Pleasantness Rating
10
9
8
7
6
5
4
3
2
1
0
Positive Food
Negative Food
Neutral Food
Positive Body
Negative Body
Neutral Body
Word Category/Valence
an
bn
control
obese


Arousal Rating
9
8
7
6
5
4
3
2
1
0
Positive Food
Negative Food
Neutral Food
Positive Body
Negative Body
Neutral Body
Word Category/Valence
an
bn
control
obese

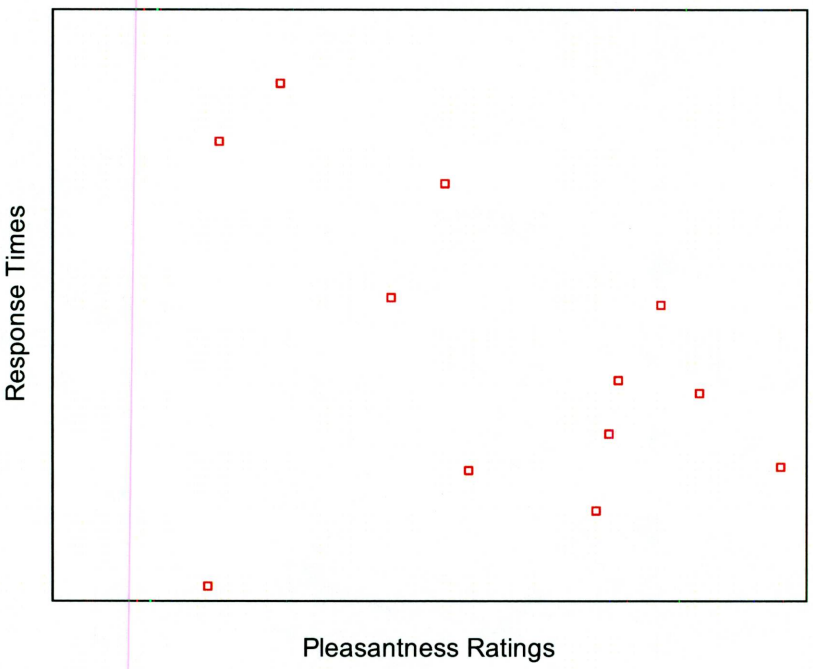

Dominance Rating
7
6
5
4
3
2
1
0
Positive Food
Negative Food
Neutral Food
Positive Body
Negative Body
Neutral Body
Word Category/Valence
an
bn
control
obese

APPENDIX H

Supplemental Analysis: Scatterplots

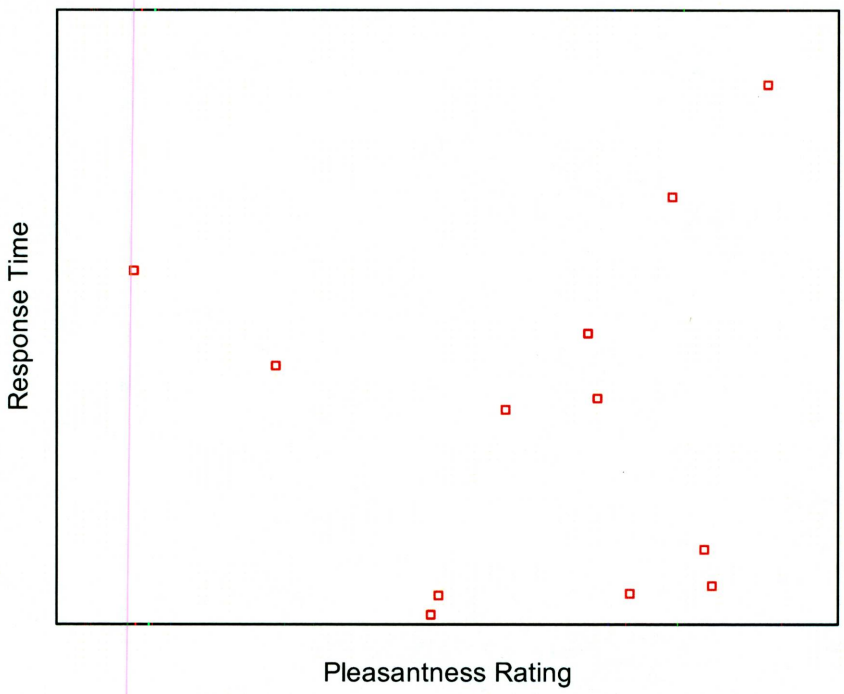


Scatterplot for Control Group: Mean Word Ratings of Pleasantness in Relation to Mean Response Times, Across Word Category/Valence (r = -.15, p =.64).

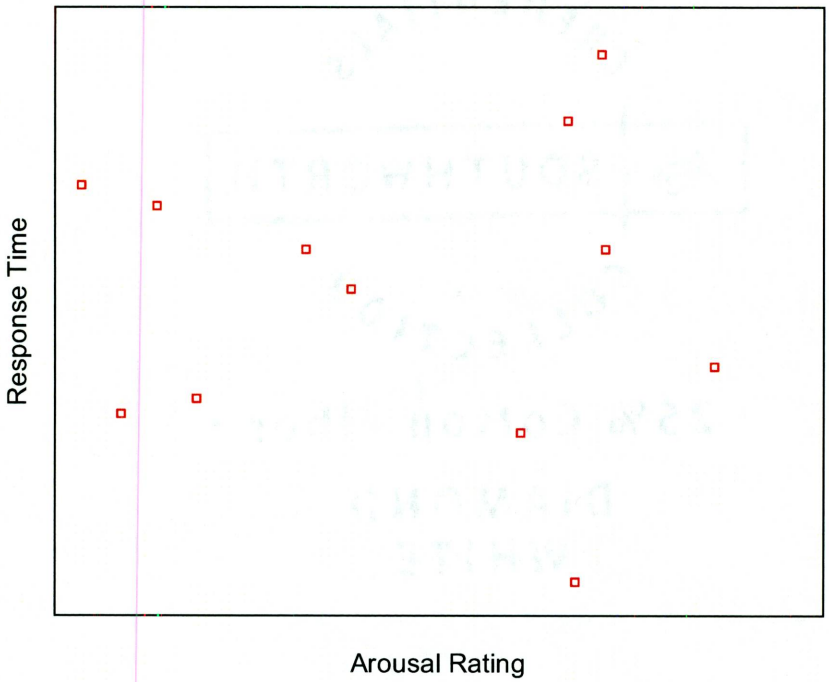


Scatterplot for Anorexia Group: Mean Word Ratings of Pleasantness in Relation to Mean Response Times, Across Word Category/Valence (r = -.37, p =.24).

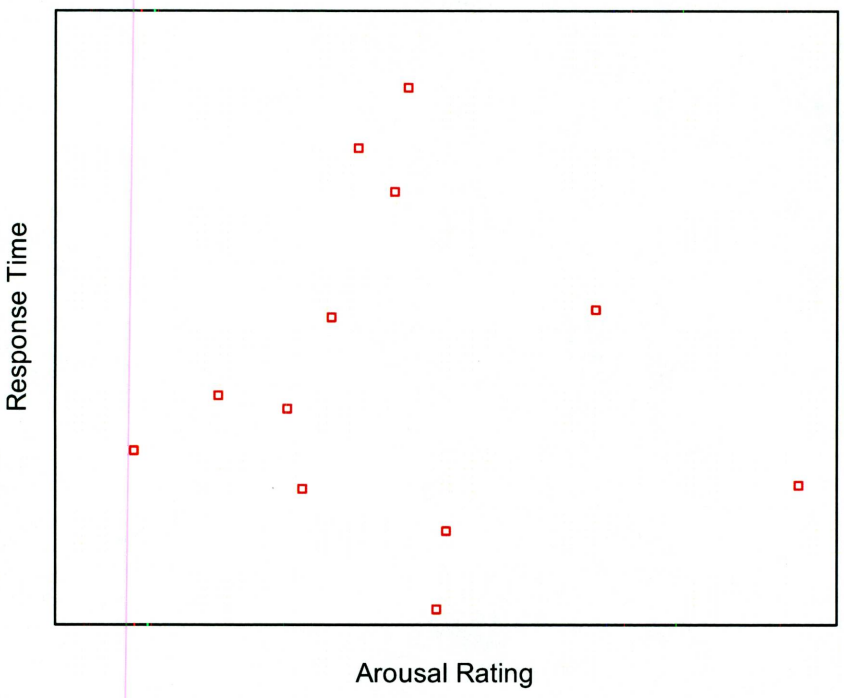
Scatterplot for Bulimia Group: Mean Word Ratings of Pleasantness in Relation to Mean Response Times, Across Word Category/Valence (r = -.40, p =.19).



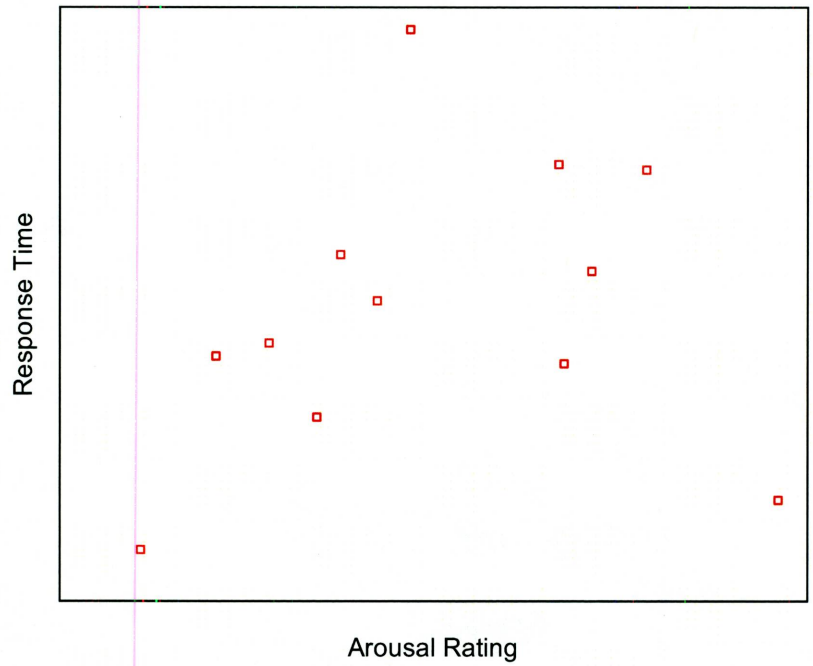
Scatterplot for Obese Group: Mean Word Ratings of Pleasantness in Relation to Mean Response Times, Across Word Category/Valence (r = .03, p =.93).



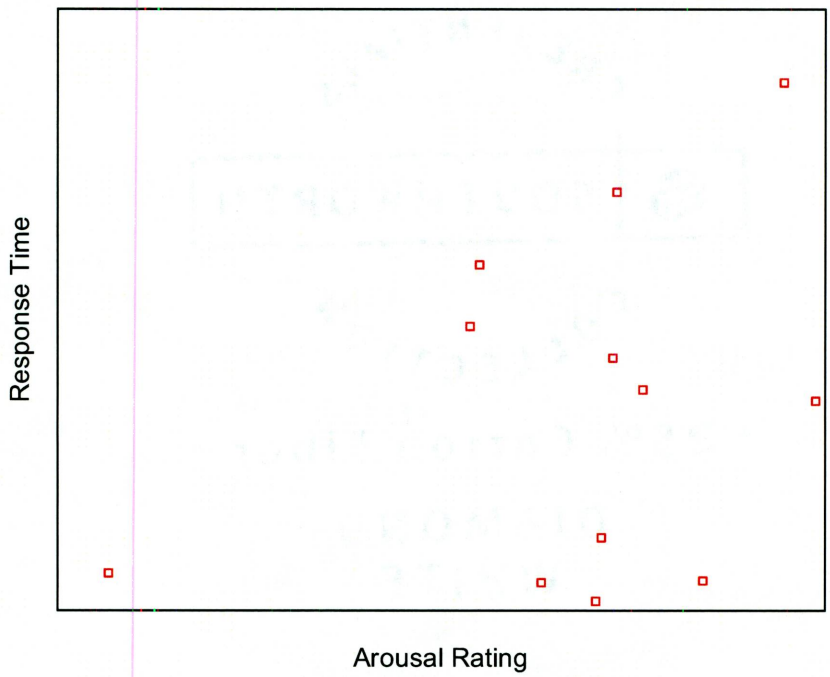
Scatterplot for Control Group: Mean Word Ratings of Arousal in Relation to Mean Response Times, Across Word Category/Valence (r = -.03, p =.94).



Scatterplot for Anorexia Group: Mean Word Ratings of Arousal in Relation to Mean Response Times, Across Word Category/Valence (r = -.06, p =.85).

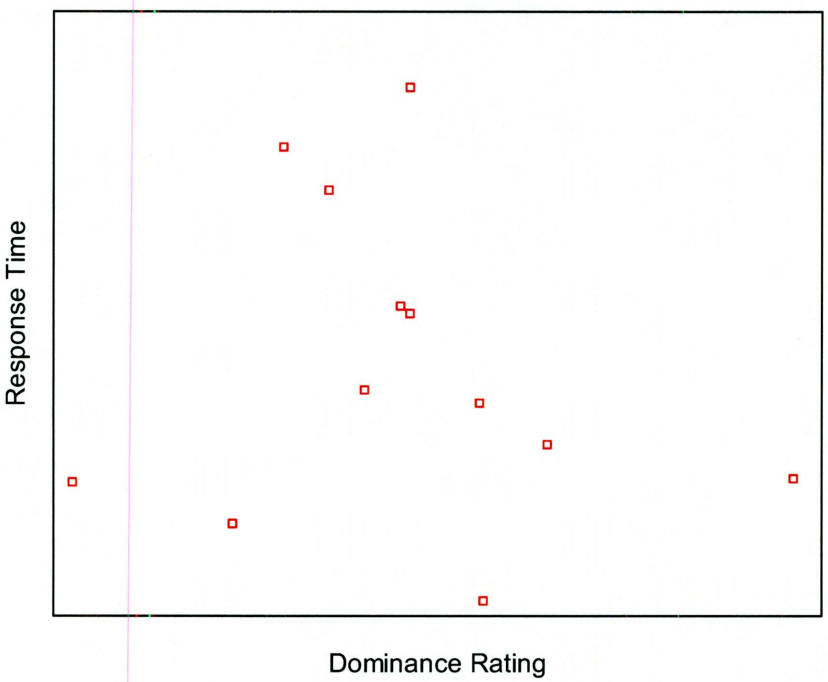


Scatterplot for Bulimia Group: Mean Word Ratings of Arousal in Relation to Mean Response Times, Across Word Category/Valence ($r = .22$, $p = .50$).

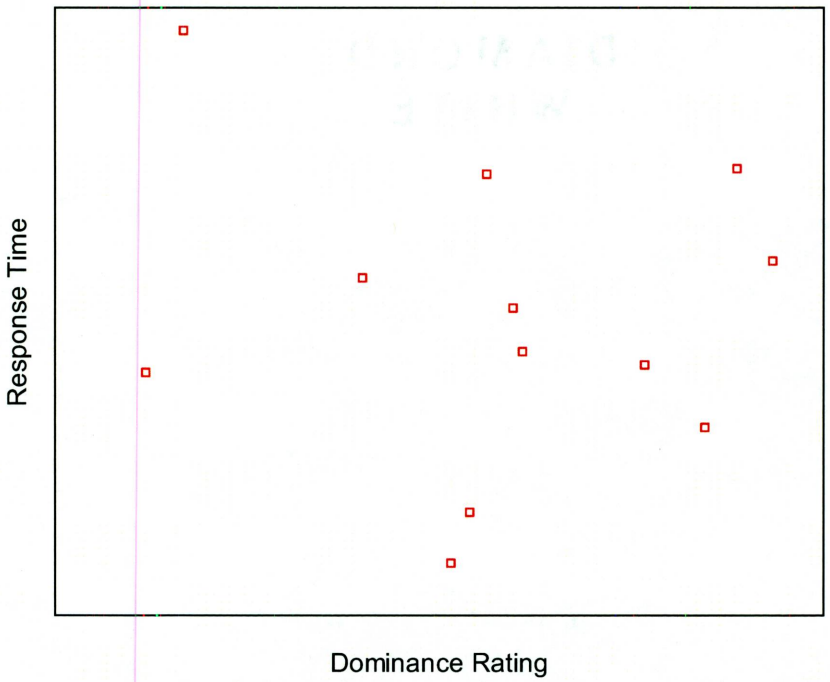


Scatterplot for Obese Group: Mean Word Ratings of Arousal in Relation to Mean Response Times, Across Word Category/Valence ($r = .33$, $p = .30$).

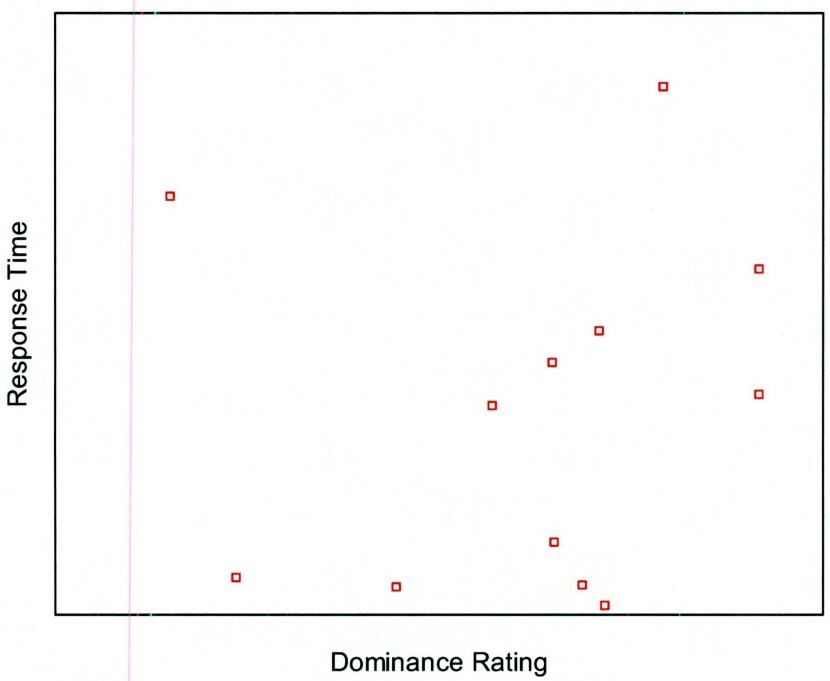
Scatterplot for Control Group: Mean Word Ratings of Dominance in Relation to Mean Response Times, Across Word Category/Valence (r = -.05, p =.89).



Scatterplot for Anorexia Group: Mean Word Ratings of Dominance in Relation to Mean Response Times, Across Word Category/Valence (r = -.15, p =.63).



Scatterplot for Bulimia Group: Mean Word Ratings of Dominance in Relation to Mean Response Times, Across Word Category/Valence (r = -.12, p =.71).



Scatterplot for Obese Group: Mean Word Ratings of Dominance in Relation to Mean Response Times, Across Word Category/Valence (r = .15, p =.63).

APPENDIX I

Mean Differences in Response Latencies from Control Words to Valenced Words

Mean Differences in Response Latencies from Control Words to Valenced Words

Variable	Valenced Words *M (SD)*	Control Words *M (SD)*	t_{corr}	*df*	*p*
Positive Food Words	784.39 (176.82)	795.42 (180.80)	.75	29	.461
Negative Food Words	800.89 (228.57)	787.12 (208.05)	-.99	29	.330
Positive Body Words	744.02 (148.30)	739.58 (148.69)	-.33	29	.748
Negative Body Words	761.45 (129.67)	745.10 (149.10)	-1.05	29	.301
Neutral Food Words	819.63 (212.13)	784.76 (193.01)	-1.45	29	.157
Neutral Body Words	795.69 (257.91)	767.69 (175.27)	-1.13	29	.268

APPENDIX J

Correlation Matrix for Eating Disorder Measures

Correlations for Eating Disorder Measures

Variable	BSQ Total Score
BSQ Total Score	----
DT	.79**
B	.75**
BD	.70**
LSE	.78**
PA	.83**
II	.56**
IA	.59**
ID	.73**
ED	.68**
P	.02
A	.82**
MF	.69**
EDRC	.82**
IC	.83**
IPC	.62**
APC	.75**
OC	.53**
GPMC	.82**

Note. ** Correlation is significant at the 0.01 level.