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CLINICAL AND PERSONALITY CORRELATES OF BODY SIZE OVERESTIMATION  
IN ANOREXIA NERVOSA AND BULIMIA NERVOSA

by

Cheryl Dawne Thomas

B.A. (Hons), Simon Fraser University, 1981

THESIS SUBMITTED IN PARTIAL FULFILLMENT OF  
THE REQUIREMENTS FOR THE DEGREE OF  
MASTER OF ARTS  
in the Department  
of  
Psychology



Cheryl Dawne Thomas 1983

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## ABSTRACT

In the current study, perceived actual body size and ideal body size were assessed in (1) seventeen restricting anorexics, (2) twenty-three bulimic patients with histories of anorexia nervosa, (3) twenty-four bulimic patients who had never been anorexic, (4) eighteen phobic controls, and (5) thirty-three normal controls. Measures of body size dissatisfaction were derived by calculating the discrepancies between subjects' self-estimates of actual and ideal size. Subjects completed a variety of clinical and personality inventories, and provided data on their food regulation habits and their weight and menstrual histories. Univariate, factor analytic and multiple regression procedures were used to examine the pattern of relationships among these variables in the total sample ( $N=115$ ) and within each group. Results of the analysis of body size measures indicate that size overestimation measures may reflect an important aspect of body image in bulimia, but may not be adequate measures of underlying body image distortions in individuals for whom food restriction, rather than habitual bingeing and vomiting, is the preferred mode of weight control. Factor analytic and multiple regression results show that a dimensional approach to studying the relationships between body size overestimation and clinical and personality characteristics provides a clearer and more meaningful picture of the associations among these variables than the typically reported correlations between individual variables. The current findings

also highlight the value of the body size dissatisfaction measure as an index of body image disturbance, and illustrate the theoretical and clinical relevance of distinguishing between bulimic patients on the basis of previous anorexic history.

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## A. Introduction

Body image has been of general clinical interest for many years. The concept of body image as a phenomenon which may be inconsistent with one's anatomical appearance evolved from reports of phantom-limb experiences by patients with limb amputations (Head, 1920). Schilder (1935) described body image as "the picture of our own body which we form in our mind, that is to say, the way in which our body appears to ourselves" (p. 37). Others have conceptualized body image as a neural representation which determines bodily experiences (Head, 1920), the mental image that an individual has of the physical appearance of his body (Traub & Orbach, 1964), and as a broad psychological construct involving the individual's thoughts, feelings and attitudes toward his body (Secord & Jourard, 1953; Fisher & Cleveland, 1958). More recently, Askevold (1975) has observed that "the body image is part of our relationship with our surroundings or life space as well as with our inner somatic self. It is a gestalt concept and its composition prey to great confusion . . ." (p. 71).

The lack of a well-formulated theoretical context in which the body image concept can be meaningfully located has been problematic for researchers interested in anorexia nervosa and bulimia nervosa, disorders in which body image distortions are thought to be pathognomic. Disturbed body image in these groups

has generally been inferred from clinical observation and from empirical evidence that anorexic patients overestimate their body size relative to controls. Techniques for assessing body image are somewhat crude and it is not clear that the various available measures are reflecting the same aspects of underlying body image disturbance. Clinical and personality variables which may mediate body image disturbances in eating disorders are only partially understood, and the role of distorted body image in the etiology, maintenance and treatment of eating disorders remains a topic for continued speculation and investigation.

### Clinical Characteristics of Patients with Anorexia and Bulimia Nervosa

#### Anorexia Nervosa

Anorexia nervosa is characterized by profound physical, behavioral and emotional changes in individuals who deliberately starve themselves in what has been described as the "relentless pursuit" of thinness (Bruch, 1973). In anorexia nervosa, weight loss of 25% or more of body weight is achieved primarily through severe restriction of food intake. An intense fear of becoming obese, which persists despite increasing weight loss, is characteristic. Monotonous and eccentric diets, food hiding or hoarding, obsessive preoccupation with thoughts of food and cooking, and strenuous exercise regimes are common (Bruch, 1962;

Crisp, 1965; Rowland, 1970; Garfinkel, 1974). Self-induced vomiting, laxative abuse and bouts of uncontrolled "binge-eating" have been estimated to occur in about 50% of anorexic patients. (Fairburn, 1982). DSM-III criteria for anorexia nervosa are presented in Table 1.

Anorexia nervosa occurs primarily in adolescent and young adult females; male incidence is estimated at only 5% of cases (Bemis, 1978). Age at onset may range from prepuberty to the early 30s although onset is most common in early to late adolescence. A recent study found a bimodal distribution of age onset with peaks at 14 1/2 and 18 years (Halmi, Casper, Eckert, Goldberg & Davis, 1979).

Within the past 20 years, there has been a dramatic rise in the number of reported cases and the true annual incidence has been estimated at 1.6 per 100,000 population (Kendell, Hall, Hailey & Babigian, 1973). Crisp, Palmer and Kalucy (1976) estimated that there was one severe case of anorexia nervosa for every 200 girls over the age of 12 in England.

#### Bulimia Nervosa

Variously labeled bulimarexia (Boskind-Lodahl, 1976), bulimia nervosa (Russell, 1979) or bulimia (DSM-III; American Psychiatric Association, 1980), this disorder involves a grossly disturbed eating pattern in which bouts of uncontrolled and excessive eating (binges), are followed by compensatory



Table 1

DSM-III Criteria for Anorexia Nervosa

---

- A. Intense fear of becoming obese, which does not diminish as weight loss progresses.
  - B. Disturbances of body image, e.g. claiming to "feel fat" even when emaciated.
  - C. Weight loss of at least 25% of original body weight or, if under 18 years of age, weight loss from original body weight plus projected weight gain expected from growth charts may be combined to make the 25%.
  - D. Refusal to maintain body weight over a minimal normal weight for age and height.
  - E. No known physical illness that would account for the disorder.
-

self-induced vomiting or the use of large quantities of laxatives and other purgatives. As with anorexia nervosa, patients with this disorder have a morbid fear of becoming obese and experience the loss of control over their eating habits as profoundly shameful and distressing.

The body weight of bulimic individuals tends to lie within the normal range although some patients experience large fluctuations in weight or achieve weights considerably below the norm for age and height. However, the weight loss is rarely as severe as that achieved by patients with anorexia nervosa.

Fairburn (1982) has suggested that the term "bulimia nervosa" is the most satisfactory label for this disorder because "it conveys the link with anorexia nervosa and emphasizes the central role of binge-eating" (p. 631). Russell's (1979) criteria for the diagnosis of bulimia nervosa are presented in Table 2.

In his original study, Russell (1979) found that 17 of the 30 bulimia nervosa patients in his sample had definite prior histories of anorexia nervosa. Another seven patients had experienced a cryptic form of anorexia, including food restriction, weight loss and amenorrhea, prior to the onset of bingeing and self-induced vomiting. The possibility that clinically relevant differences exist between those patients with bulimia nervosa who have no prior histories of anorexia nervosa and those who do, has never been directly addressed.

Table 2

Diagnostic Criteria for Bulimia Nervosa (Russell, 1979)

---

1. The patients suffer from powerful and intractable urges to eat.
  2. They seek to avoid the fattening effects of food by inducing vomiting or abusing purgatives or both.
  3. They have a morbid fear of becoming fat.
-

Bulimia nervosa has generally been viewed as a relatively uncommon disorder and has not been extensively studied until very recently. There has been a marked upsurge in the numbers of reported cases in the past five years (Fairburn & Cooper, 1982), possibly as a consequence of increased publicity about the disorder. Fairburn and Cooper (1982) estimate that the prevalence of bulimia nervosa is currently in the region of 2% of young adult females.

#### Personality Characteristics of Anorexics and Bulimics

The salience of personality factors in anorexia has recently been noted by Halmi (1982). She observes that patients meeting DSM-III criteria for anorexia nervosa will frequently qualify for Axis II diagnoses of borderline, compulsive, histrionic, schizoid or atypical personality disorders. Russell (1979) has also remarked on this issue in his discussion of bulimia nervosa noting "the inextricable merging of personality traits with the symptoms and disturbances caused by the illness" (p. 441).

A number of recent studies have examined personality and other psychological factors in anorexia nervosa and bulimia. Smart, Beumont and George (1976), and Beumont (1977) found that anorexia nervosa patients displayed a high degree of neuroticism and marked obsessionality. These results have been recently confirmed in studies reported by Solyom, Freeman and Miles

(1982), and Solyom, Thomas, Freeman and Miles (1983).

Cantwell, Sturzenberger, Burroughs, Salkin and Green (1977) found a strong relationship between anorexia nervosa and depression in a sample of 33 patients who met stringent diagnostic criteria for the disorder. Similarly, Eckert, Goldberg, Halmi, Casper and Davis (1982) found that hospitalized anorexics ( $n=105$ ) who were assessed periodically for depressive symptoms were, on the whole, mildly to moderately depressed. Furthermore, the greater the degree of depression, the more likely anorexic patients were to deny the severity of their illness and to exhibit binge-eating, self-induced vomiting and body image disturbances.

In a study reported by Casper, Eckert, Halmi, Goldberg and Davis (1980), anorexic patients who experienced bulimic episodes ( $n=49$ ) were found to be less introverted but to have greater anxiety, depression, guilt and interpersonal sensitivity than anorexic patients who did not ( $n=56$ ).

More recently, Strober (1983) identified three sub-groups of anorexics according to their MMPI profiles. The Type I group, which constituted 38% of the total sample ( $N=65$ ), had MMPI profiles characterized by a peak on Hypomania and depressed scores on Social Introversion and Psychopathic Deviance. This profile suggests heightened energy and productivity, a strong need for interpersonal approval and a high degree of impulse control. As Strober notes, it bears a close resemblance to the traditional stereotype of the "anorectic personality" in which

qualities such as excessive conformance and regimentation, self-doubt, interpersonal anxieties and social inhibitions have historically been regarded as central. The MMPI profiles of the Type 2 anorexics who made up 28% of the total sample in Strobers's study, suggested a more neurotic personality structure with high levels of anxiety, self-doubt and social inhibition.

Fifteen percent of Strober's sample were classified as Type 3. This group had MMPI profiles reflecting serious personality disturbance including a low tolerance for frustration, heightened dependency needs, self indulgence, chronic dysphoria and limited planning and resourcefulness. Individuals with the Type 3 profile were more likely to have somatic preoccupations, problems with substance abuse and poor impulse control. As well, Type 3 patients demonstrated greater denial of illness, fear of fat, binge-eating and purgative use, and had more ominous prognoses than did Type 1 or Type 2 patients.

The Type 3 anorexics of Strober's study are notable in that Pyle, Mitchell and Elke (1981) found MMPI profiles in their sample ( $n=34$ ) of non-anorexic bulimic women to reflect similar symptoms of anxiety, depression, alienation and vulnerability to impulsive behavior.

## Body Image Disturbances in Anorexia and Bulimia Nervosa

Body image disturbances in anorexia nervosa were first described by Lasegue in 1873: "The patient when told that she cannot live upon an amount of food that would not support a young infant replies that it furnishes sufficient nourishment for her adding that she is neither changed nor thinner" (p. 93). However, it was Hilda Bruch (1962) who first advanced the idea that body image played a central role in anorexia nervosa, and she has written extensively and authoritatively on the subject (1962; 1970; 1973; 1977).

Bruch has differentiated three areas of psychological disturbance in anorexia nervosa which appear to occur on a perceptual/conceptual level (1962; 1970; 1973). According to Bruch, disturbances in body image involve an inability on the part of the anorexic patient to identify her appearance as abnormal. This misperception may reach "delusional proportions" with the emaciated patient appearing totally unconcerned about her extreme thinness, and stubbornly defending her body size as "just right" or even "too fat". In addition to the body image disturbance, Bruch describes disturbances in the perception of affective and visceral sensations, and an "overwhelming sense of ineffectiveness". Bruch believes that the subjective experience of personal ineffectiveness underlies the body image and perceptual disturbances. She writes that anorexic patients "experience themselves as not being in control of their

behavior, needs and impulses, as not owning their own bodies, as not having a center of gravity within themselves. Instead, they feel under the influence and direction of external forces. They act as if their body and behavior were the product of other people's influences and actions (Bruch, 1973, p. 55)." In Bruch's view, the correction of body image distortion is critical to recovery from anorexia nervosa.

### Theoretical Explanations of Body Image Disturbances

Theoretical perspectives on body image disturbances in anorexia and bulimia have not been well developed. However, a number of formulations concerning the mechanisms which underly distorted body size perception exist in the literature.

Bruch (1962; 1973; 1977) has suggested that disturbances in body image are related to "hunger awareness", a concept which includes body sensations and cognitive disturbances. She believes that early interactional patterns in which others are unresponsive to the child's need for independence are responsible for faulty hunger awareness. According to Bruch (1977), anorexics are developmentally arrested at the Piagetian concrete operational stage and therefore rely excessively on the process of accommodation. There is some indirect support for this view; Halmi, Goldberg and Cunningham (1977) reported that adolescent females become more accurate in their body size estimates as they grow older.



Crisp (1965; 1977) maintains that anorexia nervosa occurs in vulnerable adolescents as a response to the expectations, demands and conflicts of adulthood, including sexual maturity. Amenorrhea, a commonly associated feature of anorexia nervosa, is thought to be a symptom of the regression to a premenarchal perception of body image which protects the anorexic from frightening changes in sexual identity, thinking and feeling (Koff, Rierdan, & Silverstone, 1978).

Another theoretical formulation suggested by Crisp and Kalucy (1974) is that overestimation of body size reflects an adaptive failure. In this view, the tendency of the anorexic to perceive herself as "fatter" than she is occurs because of the rapid weight loss; the anorexic patient simply fails to adapt her perceptions to the recent change in her shape.

Alternatively, Slade (1977) proposes that overestimation of body size can be attributed to an "abnormal sensitivity" to body shape. Slade found that 40 pregnant women who were tested when four months pregnant overestimated their body size as compared to normal controls. Sixteen of these women were retested when they were eight months pregnant; all showed a reduction in the tendency to overestimate.

Other investigators have suggested that body size overestimation is related to denial of illness in anorexia nervosa (Casper et al., 1979; Goldberg et al., 1977). However, Garfinkel et al. (1980) have argued convincingly that denial is not likely to operate as a mediator since overestimation

tendencies persist long after the initial phases of treatment.

Although many of the above formulations have some merit, none are able to satisfactorily explain why body size overestimation does not occur in all anorexic individuals and occurs in individuals without eating disorders (Casper et al., 1979), why overestimation tendencies persist long after the recovery of normal weight in many anorexic patients (Garfinkel, Moldofsky & Garner, 1981) and why such disturbances are so resistant to modification (Garfinkel et al., 1978).

More recently, a general theoretical framework consistent with Bruch's (1973) insistence on the central importance of an "overwhelming sense of ineffectiveness" in mediating body image disturbances, has been proposed by Garner and Garfinkel (1982). These authors argue that satisfaction with body image may be subsumed under more general feelings of self-satisfaction or self-esteem. Thus, "If an individual views the non-physical aspects of herself negatively, and if she also equates low self-worth with 'fatness', she may 'see' herself as larger than her actual size" (Garner & Garfinkel, 1982, p. 278).

Alternatively, Freeman et al. (1983) have observed that the tendency among patients with anorexia nervosa or bulimia nervosa to overestimate body size appears to be complexly related to a sense of competence or effectiveness and to a cultural stereotype which they have labeled "thin is competent". For these patients, it seems that a sense of self-worth and personal effectiveness is objectified in a thin body shape. "Thinness"

becomes an index by which self-worth is evaluated.

For patients with bulimia nervosa, it appears that adherence to controlled eating patterns is also necessary for self-esteem and that the frequent experience of "incompetence" in the form of bingeing may produce inflated body size perception. Johnson, Stuckey, Lewis and Schwartz (1982) reported that bulimics most frequently describe their feelings during a binge using adjectives such as disgusted, helpless, guilty and panicky. Following a binge, feelings of "fatness", tiredness, depression, guilt and shame are common. Subsequent purging behavior may help to restore a sense of control and adequacy in these patients.

#### Empirical Investigations of Body Image

Empirical studies of body image disturbance have primarily involved the assessment of size overestimation in patients with anorexia nervosa. Overestimation tendencies in non-anorexic bulimic patients have been assessed in only one study to date (Freeman et al., 1983).

Two types of techniques have been used to assess body size overestimation. The first type involves estimations of the widths of specific body parts. The second involves the judgement of overall body size. Disturbed "body image" has typically been inferred from overestimations of specific body region widths or overall body size.

## Body Region Size Estimations

Movable Caliper Technique. This technique is based on an analog procedure described by Reitman and Cleveland (1964). The apparatus consists of two movable indicators on a horizontal plane. Subjects are required to adjust the movable indicators to estimate the width or depth of the body at specific points. Comparison with actual size yields a measure of distortion.

The technique was originally employed in an anorexic sample by Slade and Russell (1973), who found that anorexic patients ( $n=14$ ) overestimated their body widths at specific points (face, chest, waist, hips) relative to normal controls. Although this finding has been confirmed by Crisp and Kalucy (1974), Fries (1977) and Pierloot and Houben (1978), other studies have found no between-group differences with respect to self-estimation assessed using technique. Button, Fransella and Slade (1977) replicated Slade and Russell's study with carefully matched controls and found no difference in the tendency to overestimate. Employing larger samples, Garner, Garfinkel, Stancer and Moldofsky (1976) and Casper, Halmi, Goldberg et al. (1979) found self-overestimation of body regions to be as marked in controls as in anorexics.

Using this technique, body size overestimation has been found in schizophrenic (Fries, 1977), thin, neurotic (Garner et al., 1976), obese (Fries, 1977; Garner et al., 1976) and pregnant women (Slade, 1977). These findings have Casper et al.

(1979) to conclude that "overestimation cannot be considered unique to anorexia nervosa" (p. 64).

Despite the apparent inability of the movable caliper technique to differentiate regularly between groups, within anorexic samples overestimation has been found to relate to poor prognosis and psychopathology.

Image Marking Method. This technique, which is similar to the movable caliper technique, was developed by Askevold (1975). The procedure requires that the subject stand in front of a large, blank sheet of paper mounted on the wall. With a pencil held in each hand, the subject is instructed to use the pencils to mark the places which correspond to the width of her shoulders, chest, hips etc. Somewhat equivocal results have been obtained using this procedure.

Wingate and Christie (1977) and Pierloot and Houben (1978) found that the technique successfully differentiated between anorexic patients and controls, with anorexics showing a greater tendency to overestimate their body size. Strober et al. (1979) however, found that anorexic patients and age-matched psychiatric in-patient controls overestimated body size to a very similar degree when tested on admission, and again six months later.

## Overall Size Judgements

Distorting Photograph Technique. Glucksman and Hirsch (1969) introduced this method which involves estimations of actual size using the subject's own photographic image which is projected onto a screen. The image can be adjusted along a horizontal axis to look anywhere from 20% "thinner" to 20% "fatter" than actual size. Garner et al. (1976) first employed this technique in the study of body size perceptions of anorexic ( $n=18$ ) and obese ( $n=16$ ) subjects. There were marked tendencies to overestimate in approximately 50% of the combined anorexic/obese sample. In following up these patients, Garfinkel, Moldofsky and Garner (1977) found overestimation to be strongly predictive of poor prognosis. Additionally, in the anorexic patients, overestimation was associated with interoceptive disturbances as assessed by a test for aversion to sucrose tastes (Garfinkel, Moldofsky, Garner, Stancer & Coscina, 1978). Garfinkel et al. (1978) also found that body size estimations in the anorexic group were not affected by cues such as looking at themselves in a mirror, or the number of calories consumed prior to self-estimates.

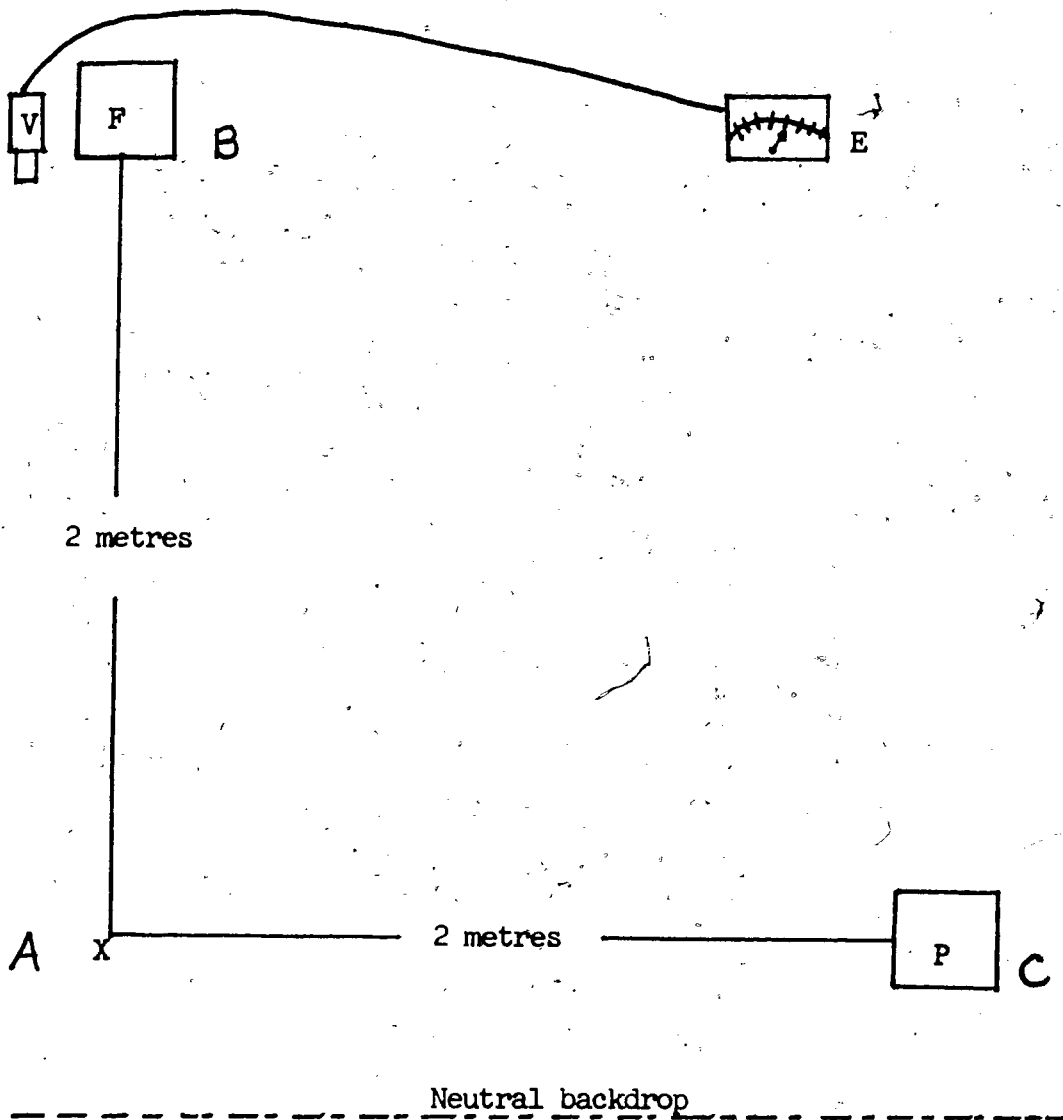
Body size estimation using this method has been found to be a fairly stable phenomenon in test-retests spaced one week (Garfinkel et al., 1978) and one year apart (Garfinkel, Moldofsky & Garner, 1979), regardless of any weight gain.

The work of Garner and Gaffinkel and their co-workers with the distorting photograph technique provides strong indications that marked body size overestimation is associated with severity of psychopathology on a variety of indices, as well as being a poor prognostic sign. Although this group of researchers has provided some of the most robust data on body image distortion using the distorting photograph technique, they are the only group of researchers to have employed it. Technical difficulties and the expense of the apparatus have made it less attractive to investigators than other available techniques.

Video Camera Technique. In 1976, Allebeck, Hallberg and Espmark reported a new technique for assessing body image distortions which employed a specially modified video monitor. Images on the monitor could be electronically adjusted to make the individual look thinner or fatter. While this procedure offers a number of advantages over the distorting photograph technique, the procedure has never been used to test body image perception in eating-disordered samples.

Recently, a modification of the Allebeck et al. procedure, was introduced by Freeman, Thomas, Solyom et al. (1983; in press). The procedure assesses body size perception using a modified video TV camera which permits a continuous horizontal distortion ranging from .80 to 1.40 times actual size. A schematic illustration of the procedure is presented in Figure

1.



Legend

- V . . . . . video camera
- F . . . . . frontal monitor
- P . . . . . profile monitor
- E . . . . . experimenter and control box
- X . . . . . subject

Figure 1. Schematic layout of the video camera apparatus for assessing body size perception.



The subject stands at the apex of an isosceles triangle at point A. At points B and C are two black and white video monitors, and at point B is the modified TV camera. The arrangement is such that the subject sees a full-length frontal view of herself in the monitor at point B and sees a full-length profile view of herself when she turns to face the monitor at point C. The subject stands against a neutral backdrop to eliminate all visual cues; thus only the subject's image appears on the monitor screen. The experimenter uses a control box connected to the camera to vary the image on the monitor throughout the range from thin to fat. The subject is requested to say "Stop" when the image on the screen is, in her view, an accurate representation of how her body really appears. The amount of distortion is read off a meter attached to the camera and recorded by the experimenter.

The method of limits is used such that on the first and third frontal trials and the first and third profile trials, the image begins at the thin end and is gradually increased. On the second and fourth frontal trials and the second and fourth profile trials, the image begins at the fat end and is gradually decreased. Subjects thus give four ratings on each monitor. Following Slade and Russell (1973), each trial estimate of size is expressed as a ratio:  $(\text{perceived size}/\text{real size}) \times 100$ . Scores of 100 represent accurate size estimation, while scores above or below 100 represent overestimation and underestimation, respectively. The average scores over the four frontal, and four

profile trials are recorded as the subject's frontal and profile estimates, respectively.

Using this procedure to assess body size overestimation, Freeman et al. (1983) have reported preliminary data which are consistent with previous research findings. These authors found that normals ( $n=15$ ) and psychiatric controls ( $n=9$ ) were quite accurate in estimating their body size, while anorexics ( $n=19$ ), and most particularly, bulimics ( $n=27$ ), overestimated their body size. The most powerful effect occurred with respect to ideal body size. While there was a tendency for all subjects to want to be thinner than they actually were, bulimics exhibited a dramatic tendency in this direction. Approximately half of the bulimic subjects wished to be thinner than the limits of the apparatus would permit. Contrary to expectations and the findings of Crisp and Kalucy (1974), who reported body size overestimation to be greater after ingestion of a high carbohydrate meal, Freeman et al. found that a high carbohydrate meal had no effect on body size estimation in any of the groups.

The preliminary data suggest that the video camera technique is at least as useful in the measurement of body size as any of the other currently available techniques. It allows for both frontal and profile size estimates to be made, and is relatively inexpensive, easy to acquire and simple to operate. The technique has demonstrated good internal consistency ( $r=.62$ ), and test-retest reliability over 7 to 22 day intervals ( $r=.90$  for frontal estimates;  $r=.86$  for profile estimates).

These coefficients compare favorably to those reported by Garner et al. (1977) for the distorting photograph technique.

### Clinical and Personality Correlates of Body Size Overestimation

Slade and Russell (1973) found overestimation in their anorexic sample to be negatively correlated with in-hospital weight gain. Moreover, weight loss after discharge was related to in-hospital overestimation of body size. Similarly, Button et al. (1977) found that overestimation of size in anorexia nervosa was associated with more severe pathology (i.e., self-induced vomiting), and early relapse.

Using the distorting photograph technique, Garfinkel, Moldofsky and Garner (1980) tested a large series of patients who met diagnostic criteria for anorexia nervosa and then divided the sample into two groups; marked overestimators ( $n=38$ ), who overestimated body size by 10% or greater, and underestimators/moderate overestimators ( $n=87$ ), whose estimates were less than 10% above actual size. They found overestimation of body size to be associated with more pronounced anorexic symptoms, greater externality on a locus of control measure, greater depression, greater anxiety, and greater physical anhedonia. Subjects who overestimated their actual size also preferred to be significantly smaller than they were, and demonstrated less satisfaction on an attitudinal measure of body satisfaction.

Degree of neuroticism, and external locus of control (the extent to which one perceives life events as outside of personal control) have been shown to relate to body size overestimation in anorexics (Pierloot and Houben, 1978; Garner et al., 1976) but these relationships do not hold for obese, "thin" normal, or normal controls (Garner et al., 1976). Overestimation tendencies in anorexic patients have also been related to ego strength as measured by the Ego-strength scale of the MMPI (Wingate & Christie, 1978) and to self-report measures of self-esteem (Garner et al., 1980). Degree of depression has also been shown to influence the extent of body size overestimation (Eckert et al., 1982).

Hood, Moore and Garner (1982), using externality on a modified version of Rotter's (1966) Internal-External Locus of Control Scale as a measure of "ineffectiveness" (Bruch, 1962), found that anorexic patients with high (external) scores ( $n=36$ ) were significantly more likely to be depressed and neurotic, to binge-eat, to self-induce vomiting, to abuse purgatives, to use more alcohol and to have a thinner ideal body image than anorexic patients with low (internal) scores ( $n=43$ ).

### Overview of the Current Study

The data on which the following study was based were gathered as part of a larger investigation funded by grants from the British Columbia Health Care Research Foundation to Dr.

Leslie Solyom of the Department of Psychiatry at Shaughnessy Hospital, and Dr. Richard Freeman of the Department of Psychology at Simon Fraser University. The investigation was approved by the ethics committees of the University of British Columbia, Shaughnessy Hospital and Simon Fraser University prior to its initiation. The study was carried out by this author, under the supervision of Drs. Solyom and Freeman.

The purpose of the investigation was to address the following questions:

1. Do anorexics and bulimics differ from each other and from control subjects with respect to body size estimation?
2. Is body size estimation affected by eating a meal?
3. Does body size estimation in anorexic patients change as a function of the course of the disorder?
4. To what psychological variables is body size estimation related?

The data concerning the effect of eating a meal on body size estimation have already been analyzed and reported on a subset of the sample (Freeman et al., 1983). These data will be subjected to more comprehensive analyses and reported elsewhere.

Empirical reports of the correlations between bulimic-like behavior and increased personality pathology and body size distortions in patients with anorexia nervosa, suggested that these associations would be even more pronounced in non-anorexic bulimic patients for whom bingeing and vomiting are central, rather than associated features of illness. Additionally, in the

context of theoretical formulations which link feelings of self-worth, effectiveness, and competence to the attainment of a "thin" body shape in anorexia nervosa, Russell's (1979) description of the large proportion of previously-anorexic cases in his sample of bulimia nervosa patients suggested that bulimic patients who had previously achieved but were unable to maintain a very thin body shape, might overestimate their body size to a greater extent than patients with anorexia nervosa or bulimics who had never achieved such extreme weight loss or subscribed to severe food restriction habits.

In the current study, the following hypotheses were tested:

1. Anorexic and bulimic subjects were expected to overestimate their body sizes relative to psychiatric and normal controls. Bulimic subjects, particularly those with previous anorexic histories, were expected to demonstrate greater overestimation tendencies than anorexic subjects.

2. It was expected that all subjects, regardless of group membership would wish to be thinner than their perceived actual size, that the discrepancies between perceived actual and ideal body size would be greater in the eating disorder groups than in the control groups, and that bulimic subjects, especially previously-anorexic bulimics, would demonstrate the largest discrepancies in this regard.

3. Clinical characteristics including longer duration of illness, lower body weight, more frequent bingeing, self-induced vomiting and purgative abuse, and more distorted attitudes

towards food and weight, were expected to be related to greater body size distortions.

4. Greater body size distortion with respect to overestimation of body size, and the discrepancy between actual size and ideal body size, was expected to be associated with more pronounced depressive symptomatology, heightened feelings of personal ineffectiveness as measured by degree of externality on a locus of control measure, greater disposition to guilt, and elevated scores on the MMPI.

Following univariate analysis of the data, factor analysis of clinical and personality variables was planned as a means of reducing the number of predictors to be used in subsequent regressions on body size estimates, and to determine whether the clinical and personality variables would cluster together in ways which could be meaningfully related to body size overestimation in anorexic and bulimic patients.

## B. Method

### Subjects

#### Eating Disorder Patients

Ninety-three female patients with symptoms of anorexia nervosa or bulimia nervosa were referrals to the psychiatric outpatient service of Dr. Leslie Solyom of the Department of Psychiatry at Shaughnessy Hospital in 1981<sup>1</sup>. At the close of a one-hour intake interview and history conducted by Dr. Solyom, each patient was informed that the study was taking place, and asked to participate. Eighty-seven of these patients were

<sup>1</sup>In comparison with anorexic and bulimic referral patterns reported by other investigators, cases referred to Dr. Solyom at Shaughnessy Hospital are more likely to be "chronic" than "newly-identified" and are more likely to be bulimic than anorexic. Over the two-year period from January 1981 to January 1983, the number of referrals in which binge-eating, self-induced vomiting and/or laxative abuse were the predominant features exceeded the number of cases in which food restriction was the central feature in a ratio of 2.5 to 1. Other investigators are only now beginning to report an increase in the number of referrals for bulimia (e.g., Fairburn, 1982). While it is difficult to account for the referral pattern at Shaughnessy Hospital, it has provided an opportunity to study body size overestimation and other important variables in a larger sample of bulimic patients than has been readily available in other research facilities. In the wake of reports that researchers and clinicians in other geographic areas are beginning to notice similar referral patterns, I believe that the results of the current study will prove to be more widely generalizable than was initially supposed.



amenable to hearing further details about the study from the experimenter. Each of these was contacted by telephone by the experimenter within one week of their initial interview with Dr. Solyom. The experimenter explained that the study was designed to assess body image perception in individuals with eating disorders, described the procedure, and arranged testing appointments with the 80 patients who agreed to participate. Of these, seven failed to appear for scheduled testing. Four who did come for testing did not complete the body size measures and another five who completed testing were omitted from analyses because they did not meet diagnostic criteria for either anorexia nervosa or bulimia nervosa. The 64 remaining subjects were assigned to one of three groups as follows:

Restricters. Seventeen patients were included in this group. Of these, 14 met modified DSM-III criteria for anorexia nervosa<sup>2</sup>. The other three patients in this group had met modified DSM-III criteria for anorexia nervosa within the previous three months and were still, on average, 15% below standard weight for age and height<sup>3</sup>. No patient in the

<sup>2</sup>DSM-III criteria for anorexia nervosa were unaltered, except that the weight loss criterion of 25% of original body weight was reduced to 20% in recognition of the fact that earlier identification and intervention currently preclude such extreme weight loss in many cases. Moreover, as Bemis (1978) notes: "Although the figure of 25% loss of original weight is often accepted as a minimum criterion . . . precise demarcation of a specific amount of weight loss for diagnostic purposes is clearly impossible because of the varying ages, heights, and premorbid weights of patients" (p. 594)."

<sup>3</sup>Standard weight for age and height is based on actuarial tables provided by the Metropolitan Life Insurance Company (1959).

restrictor group met Russell's (1979) criteria for bulimia nervosa. The patients in this group ranged in age from 13 to 32 years with a mean age of 22.8 ( $SD=5.4$  years). Their average weight, expressed as a percentage of standard weight for age and height, was 73.9% ( $SD=9.6\%$ ) and they had been ill for an average of 60.4 months. For the most part, patients in this group achieved and maintained their low weights through severe caloric restriction; they did not habitually succumb to impulsive eating binges or resort to food evacuation methods such as vomiting or laxative abuse. All but four of the patients in this group were amenorrheic\* at the time of testing. Of the four who were not amenorrheic at testing, three had been amenorrheic at some previous point in their illness.

Previously-anorexic bulimics. The 23 patients in this group all met Russell's (1979) criteria for bulimia nervosa. These patients had been bulimic for an average of 41.1 months ( $SD=26.2$ ). Although none of these patients met modified DSM-III criteria for anorexia nervosa at the time of testing, there was conclusive evidence of previous anorexia nervosa in their clinical histories. Each of these patients had experienced an initial period of successful caloric restriction and extreme weight loss ( $M=20.0$  months,  $SD=24.8$ ) which was followed by a break into increasingly frequent eating binges, and increasing reliance on self-induced vomiting and/or laxative use as a means

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\*For the purposes of this study, an individual was considered to be amenorrheic if she had not had a menstrual period for six consecutive months.

of preventing weight gain. The patients in this group ranged in age from 16 to 32 with a mean age of 22.5 ( $SD=4.4$  years). Their average weight, expressed as a percentage of standard weight, was 99.1% ( $SD=15.8\%$ ), and they had been ill with some form of eating disorder for an average of 64.8 months. At the time of testing patients in this group were, on average, consuming 3988 calories per binge ( $SD=1572$ ), bingeing 32.3 times per month ( $SD=18.0$ ), vomiting 32.7 times per month ( $SD=27.1$ ), and using 9.9 laxatives ( $SD=20.0$ ), 5.1 times per month ( $SD=8.0$ ). Only three of the 23 patients in this group were amenorrheic at the time of testing. Another five described "very irregular" menstrual cycles. However, of the 20 patients who were not amenorrheic at testing, 13 had been amenorrheic at an earlier point in their illness.

Never-anorexic bulimics. The 24 patients in this group all met Russell's (1979) criteria for bulimia nervosa. None of these patients however, had previously met modified DSM-III criteria for anorexia nervosa although in eight cases, the onset of binge-eating had followed a clearly demarcated period of strict dieting ( $M=8.1$  months,  $SD=4.1$ ). They ranged in age from 19 to 32 years with a mean age of 24.6 ( $SD=4.9$  years). Their average weight, expressed as a percentage of standard weight, was 107.3% ( $SD=13.6\%$ ) and they had been bulimic for an average of 68.1 months. At the time of testing, the patients in this group were consuming 4931 calories per binge ( $SD=1706$ ), bingeing 24.2 times per month ( $SD=13.4$ ), vomiting 28.0 times per month ( $SD=23.1$ ),

and using 1.8 laxatives ( $SD=6.3$ ), 4.5 times per month ( $SD=10.2$ ). Three patients in this group were amenorrheic at the time of testing and another four reported "very irregular" menstrual cycles. Of the 21 patients who were not amenorrheic at testing, 10 had been so previously in their illness.

### Phobic Controls

Subjects in the phobic patient control group were female patients who were either in treatment with Dr. Solyom in June and July of 1981, or who were referred to his service during a four-month period from January through April, 1982. Patients were screened by Dr. Solyom on the following criteria: (1) age between 13 and 32 years, (2) weight within 10% of standard normal weight, (3) no history of anorexia nervosa, bulimia nervosa, or obesity (weight greater than 15% above standard normal weight), and (4) free of psychotic or organic symptomatology and clinical depression.

Each patient who met the above criteria was asked to participate in the study by Dr. Solyom. Those who were agreeable were contacted by telephone by the experimenter who described the study as an investigation of body image perception in anorexia nervosa, explained that control subjects were needed, and described the procedure. The patient's participation was requested and payment of \$10.00 was offered on completion of the initial one-hour testing session. Another \$5.00 was offered for

the completion and return of an additional three questionnaires.

Twenty-one phobic patient controls were obtained in this manner and completed testing. Of these 21, three were omitted from the analysis because they did not meet the weight criterion. Thus the final phobic control group was composed of 18 patients, all of whom met standard diagnostic criteria for anxiety-related disorders; nine were agoraphobic, seven had specific phobias and two were socially phobic. These patients ranged in age from 19 to 32 years with a mean age of 26.6 ( $SD=3.7$  years). Their average weight, expressed as a percentage of standard weight, was 97.0% ( $SD=6.1\%$ ) and their mean duration of illness was 134.0 months.

#### Normal Controls

Female undergraduates at Simon Fraser University were solicited to serve as normal controls. In order to participate in the study, these subjects were required to meet the following criteria: (1) under 33 years of age, (2) weight within 10% of standard normal weight, (3) no history of anorexia nervosa, bulimia or obesity and (4) no current psychiatric problems for which treatment had been sought. Each subject was screened on these criteria by the experimenter prior to testing.

Outlines describing the study and offering payment of \$10.00 for the initial one-hour testing session were posted in the Department of Psychology. An additional \$5.00 was offered

for completion of three additional questionnaires. Identical information was also distributed to a number of undergraduate psychology tutorials.

Normal controls were solicited and tested from January through March, 1981, and again in January and February of 1982. Eighteen of the 35 normal controls who completed testing, participated in the study in partial fulfillment of the requirements of a 300-level psychology course. Two of the subjects who completed testing were subsequently omitted from the analysis because they did not meet the weight criterion. Thus, the normal control group was composed of 33 subjects who ranged in age from 18 to 29 years with a mean age of 21.6 years ( $SD=3.4$  years). Their average weight, expressed as a percentage of standard weight, was 100.3% ( $SD=6.1\%$ ).

Additional clinical and demographic data describing the eating disorder patients and control subjects is presented in Table 3.

## Measures

### Body Size Estimates

Frontal and profile estimates of actual and ideal body size were obtained using the video camera technique introduced by Freeman et al. (1983; in press). The technique has been described in detail on pages 18 through 22 of this paper. Body

Table 3

## Clinical and Demographic Characteristics of Eating Disorder and Control Subjects

Variable	Normal Controls (n=33)	Phobic Controls (n=18)	Restricters <sup>c</sup> (n=17)	Never-AN <sup>d</sup> Bulimics (n=24)	Prev-AN <sup>e</sup> Bulimics (n=23)	Test	p
Age	M SD 21.6 3.1	26.6 <sup>ae</sup> 3.7	22.8 5.4	24.6 4.9	22.5 4.4	F(4,110) =4.79	.0013
Height (metres)	M SD 1.67 .07	1.65 .06	1.62 .06	1.67 .06	1.65 .08	F(4,110) =1.35	.2555
Current Wt. (kgs.)	M SD 57.4 6.2	55.4 6.2	40.2 <sup>abde</sup> 5.5	61.4 8.3	55.3 8.8	F(4,110) =23.96	.0000
Lowest Wt.	M SD 52.3 <sup>e</sup> 4.9	50.4 <sup>e</sup> 5.5	36.3 <sup>abde</sup> 4.4	52.6 <sup>e</sup> 5.9	43.9 6.7	F(4,110) =31.84	.0000
Menarche (age)	M SD 13.2 1.6	12.6 1.6	12.8 1.5	13.2 1.3	13.3 1.6	F(4,110) =0.75	.5602
Amenorrhea	Yes Irregular No 2 (6.1%) 0 31(93.9)	1 (5.6) 2(11.1) 15(83.3)	13(76.5) 0 4(23.5)	3(12.5) 4(16.7) 17(70.8)	3(13.0) 5(21.7) 15(65.2)	$\chi^2(8)$ =52.85	.0000
Age Onset	M SD 15.4 5.5	15.4 5.5	17.7 3.8	18.8 3.9	16.7 2.9	F(3,78) =2.46	.0688
Duration Ill (months)	M SD 134.0 <sup>cde</sup> 79.2	134.0 <sup>cde</sup> 79.2	60.4 47.6	68.1 60.0	64.8 41.4	F(3,78) =24.58	.0000

Note: Letter superscripts denote differences between group means which are significant at or beyond the .05 level after the Bonferroni adjustment for the multiple comparison of all pairs of means.

size dissatisfaction measures were derived by calculating the discrepancy between actual and ideal size estimates (frontal actual - frontal ideal; profile actual - profile ideal).

### Self-Report Measures

1. Self-rated frequency of bingeing, vomiting, and laxative use. This is a simple three-item measure which was developed for use in the current study. Subjects are asked to rate the frequency with which they binge (defined as consumption of at least 2000 calories at one sitting), self-induce vomiting, and use laxatives on a six-point scale from 0 (never) to 5 (more than once a day). Intermediate points on the scale are described as 1-once or twice a year, 2-once a month, 3-once or twice a week, and 4-once a day.

2. Slade Anorexic Behavior Scale (ABS; Slade, 1973). This self-report scale was developed to rate the presence or absence of 22 distinctively anorectic behaviors in three major categories; Resistance to Eating (8 items), Food Disposal (8 items), and Overactivity (6 items). Items are scored 0 if not present, 1 if present. Category scores are obtained by summing item scores in each category. A total score is computed by summing the three category scores.

3. Eating Attitudes Test (EAT; Garner & Garfinkel, 1979). This is a 40-item self-report scale that measures a broad range of behaviors and attitudes observed in anorexia nervosa. The



instrument is intended as a screening questionnaire to detect anorexia nervosa cases although its use in this regard, in the absence of other information, has recently been questioned (Williams, Hand & Tarnopolsky, 1982). Garner and Garfinkel (1979) reported that the EAT successfully differentiated anorexia nervosa patients from normal and obese subjects, and the instrument has been employed by Garner and Garfinkel (1980) and by Button and Whitehouse (1981) in various student populations.

A number of questions regarding weight and menarchal history (i.e., What was your highest past weight?, How long ago was that?, At what age did you begin menstruating?) were appended to the EAT to simplify administration and data collection.

4. Beck Depression Inventory (BDI; Beck, Ward, Mendelsohn et al, 1961). The BDI is a clinically derived self-report measure of depressive symptoms. The inventory contains 21 symptom categories sampling affective, cognitive, motivational and somatic symptoms of depression. Individual category scores are summed to yield a total score. The inventory has been extensively employed in a wide variety of clinical and research settings and its validity has been established in both clinical (Beck et al., 1961; Metcalfe & Goldman, 1965) and university (Bumberry, Oliver & McClure, 1978) populations. Hood, Moore & Garner have observed that several of the symptom categories measured by the BDI relate to attitudes commonly observed in

anorexia nervosa (i.e., sense of failure, negative body image, guilt, ineffectiveness).

5. Internal-External Control Scale (I-E Scale; Rotter, 1966). This forced-choice scale assesses an individual's beliefs about the extent to which one has personal control over the course of one's life. On each of the 23 items (an additional six items are included as fillers), the individual is required to choose between two alternatives which reflect either internal or external control. Items are scored in the direction of externality and summed to yield a total score. The higher the score, the less the individual is convinced of his ability to personally influence or control life events. The I-E Scale has demonstrated good reliability and validity, and has been extensively used in a wide variety of clinical and research settings. Several investigators have reported positive correlations between externality and body size overestimation in anorexia nervosa (Pierloot & Houben, 1978; Garner et al., 1976).

6. Mosher Forced Choice Guilt Inventory (FCGI; Mosher, 1968). This 78-item forced-choice inventory for females was developed from a sentence completion measure of guilt (Mosher Incomplete Sentences Test; Mosher, 1961). The inventory assesses three aspects of guilt; Moral Conscience (17 items), Hostility Guilt (22 items) and Sex Guilt (39 items), which are viewed as measuring the personality disposition of guilt rather than guilt feelings. Weighted scores for the items on each scale are summed to yield the scale score. The three measures of guilt have been

found to be unrelated to measures of social desirability (Mosher, 1968).

7. Minnesota Multiphasic Personality Inventory (MMPI; Hathaway & Meehl, 1951). In addition to the 13 standard clinical scales of the MMPI, subjects were assessed on the Ego-strength scale (Barron, 1953), which measures adaptability and personal resourcefulness. Only raw scores are available for this scale since it has not yet been put in a standard score form which would be comparable to the profile scores of other MMPI scales. Wingate and Christie (1978) found ego-strength, as assessed on this scale, to be negatively related to overestimation of body size in a sample of patients with anorexia nervosa.

#### Procedure

Testing of restricters, bulimics, and phobic control patients took place in the Department of Psychiatry at Shaughnessy Hospital. Normal controls were tested in the Department of Psychology at Simon Fraser University. The testing environment at each location was arranged to maximize uniformity across settings. Subjects were tested individually by a female experimenter. Practical considerations (i.e., location of testing, nature of pathology) made it impossible for the experimenter to remain blind to the group membership of subjects.

Subjects were required to fast for 12 hours prior to testing. All subjects were aware that they would be given breakfast as part of the experimental procedure. Efforts were made to contact each subject the day prior to testing to remind them to fast. As a further check, immediately prior to testing, subjects were asked if they had broken the fast. Although a number of subjects admitted to minor infractions (i.e., a cup of coffee in the morning), none were judged serious enough to bias testing. One bulimic patient who arrived late for her appointment because she had been "bingeing" was rescheduled for testing on another day.

Informed, written consent was obtained from each subject upon arrival for testing. Each subject then completed a number of self-report inventories including the BDI, ABS, and EAT. On completion of these measures, the subject was given a robe and a two-piece bathing suit in her size, and shown to an adjoining room to change.

When the subject had changed, the body size testing procedure was explained by the experimenter as follows:

"If you'll come over here and stand by me, I'll explain what we're going to do. I want you to stand on this spot and face the video monitor in front of you. You can see a full frontal (or profile) view of yourself. I'm going to change the picture of you on the screen to make you look fatter or thinner. Each time I do this, I want you to say 'Stop' when you think it's an accurate picture of how big you are."

The procedure was completed as previously described, and the subjects responses recorded by the experimenter. After the four frontal and four profile trials had been completed, the

subject was shown to another room for a standard breakfast which consisted of orange juice, cereal and milk, a bran muffin with butter, fruit yoghurt, coffee or tea, cream and sugar. The meal, which totalled 755 calories and included 75 grams of carbohydrate, was layed out attractively on a colorful placemat. Each subject was requested to "Eat as much as you can, everything if possible." The experimenter sat with the subject during the meal making conversation on topics unrelated to the experiment. Subjects were permitted to smoke during the meal if they so desired. The experimenter recorded the approximate number of calories consumed after the subject had completed testing and left.

After the meal, the subject was shown back into the testing room to complete the body size measures. The post-meal instructions and procedure were identical to those described for the pre-meal measures. The procedure was then repeated for a third time with instructions to the subject to "Say stop when the picture on the monitor is your ideal size, the size you'd really like to be."

Finally, the subject's height and weight were measured and recorded, and she was free to change into her own clothes. Prior to leaving, each subject was given general feedback about her performance and confidentiality assurances were repeated. Each control subject was paid \$10.00 and given the additional test package containing the MMPI, the I-E Scale, and the Mosher FCGI. They were promised, and paid, an additional \$5.00 for completion

and return of the three inventories within two weeks. Eating disorder subjects routinely completed these three tests as part of their intake assessments.

### Data Analysis

All data analysis was carried out using BMDP Statistical Software programs (University of California Press, 1981).

#### Effect of the Meal on Post-Meal Body Size Measures

Although the effect of eating a meal on body size overestimation was not of primary concern in the current study, because subjects had consumed varying amounts of food prior to ideal body size estimates and because ideal size was a critical dependent variable in the present study, a number of theoretical and statistical questions needed to be addressed before proceeding with the analyses. One-way analysis of variance, using number of calories consumed as the single covariate, was performed for each of the post-meal actual and ideal body size estimates. The results of this analysis are presented in Table A-1 of Appendix A. There were few discernible differences between the unadjusted group means, and the means adjusted for number of calories consumed. Although possible statistical corrections were reviewed, it appeared that all available statistical methods of correcting the post-meal body size

estimates for the number of calories consumed would have the very undesirable effect of markedly reducing, or eliminating, within group variance. As an alternate solution, it was decided to use the pre-meal estimates of actual size plus the post-meal estimates of actual and ideal size as dependent variables. In effect, this meant that twice as many analyses as would otherwise have been required were conducted. Although this was not a perfect solution in an experimental or statistical sense, I do not believe that the substantive results of the study are much affected by the "caloric contamination" of the post-meal ideal size estimates. Indeed, I am inclined to argue that estimates of ideal body size are unlikely to be affected by eating a meal. This assumption could be tested by examining differences between ideal estimates made before and after a meal in a small group of subjects. Unfortunately, time constraints precluded any test of this assumption prior to analysis.

#### Treatment of Missing Data

Data collected during the experimental testing session was complete for all subjects. Missing data was problematic only with respect to the three personality questionnaires which were completed outside of the testing session; the MMPI, the I-E Scale, and the Mosher FCGI.

Across the total sample ( $N=115$ ), 27.5% of subjects failed to complete the MMPI, 21.7% did not complete the I-E Scale, and

25.0% failed to return the Mosher FCGI. The percentage of missing data by group for each of these measures is presented below.

PERCENTAGE OF MISSING DATA BY GROUP

	Normal Controls (n=33)	Phobic Controls (n=18)	Restricters (n=17)	Never-AN Bulimics (n=24)	Prev-AN Bulimics (n=23)
MMPI	31.3	44.4	0.0	29.2	33.3
I-E	27.3	38.9	5.9	16.7	25.0
FCGI	33.3	44.4	10.6	21.7	17.4

Phobic and normal control subjects were least likely to have completed the three measures. In contrast, a high percentage of the restricters had completed all three inventories. The above pattern of missing data is most likely attributable to differences in the willingness of subjects in the different groups to disclose the kind of information which personality measures demand when there is no direct personal benefit involved in doing so.

Univariate analyses were conducted using only available data on these measures. However, estimation of missing data was necessary prior to multivariate analyses which require complete data matrices. Therefore, estimates of missing values were generated using all available data and employing the maximum likelihood method.



Given the above group differences in the percentage of missing data, the assumption of random "missingness" was not tenable. Where data is not missing at random, the method of maximum likelihood, which uses linear convergence, is preferred over regular regression procedures which tend to produce unstable regression coefficients and overestimate error variance under such circumstances.

## C. Results

### Demographic and Clinical Characteristics of Subjects

These results are presented in Table 3.

Phobic control subjects were, on average, significantly older than subjects in the normal control ( $p < .01$ ) and previously-anorexic bulimic ( $p < .05$ ) groups. The restricters weighed significantly less at testing than subjects in all of the other groups ( $p < .001$ ) and had achieved significantly lower past-lowest weights than the previously-anorexic bulimics ( $p < .01$ ), as well as the controls and never-anorexic bulimic patients ( $p < .001$ ). The lowest past weights attained by the previously-anorexic bulimics were also significantly below those ever achieved by subjects in the control and never-anorexic bulimic groups ( $p < .001$ ). Restricters and bulimics did not differ from phobic controls with respect to age at onset of illness, but the phobic controls had been ill significantly longer than the eating disorder patients ( $p < .001$ ).

## Body Size Measures

### Internal Consistency

A check on the internal consistency of the body size measures was performed by computing the Pearson product-moment correlations between frontal and profile estimates for each group, and for the total sample ( $N=115$ ). These results are presented in Table A-2 of Appendix A. Within groups, the correlations between the pre-meal frontal and actual estimates ranged from .56 in the normal control group to .86 in the previously-anorexic bulimic group. Correlations in the phobic control, restricter, and never-anorexic bulimic groups were .82, .59 and .66, respectively. The correlation between the pre-meal frontal and profile estimates in the total sample was .73. Similar results were obtained for the post-meal actual and ideal frontal and profile estimates. These correlation coefficients compare favorably to the internal consistency coefficient of .62 reported by Freeman et al. (in press) for a smaller sample of mixed eating disorder, phobic and normal subjects.

### Estimates of Actual Size.

Results of the analysis of pre-meal and post-meal actual size estimates are presented in Table 4.

Table 4

## Group Comparisons for Perceived-Actual Body Size Measures

Variable	Normal Controls <sup>a</sup> (n=33)	Phobic Controls <sup>b</sup> (n=18)	Restricters <sup>c</sup> (n=17)	Never-ANd Bulimics <sup>d</sup> (n=24)	Prev-ANe Bulimics <sup>e</sup> (n=23)	F	P
Pre-meal							
Frontal	M 102.9 <sup>1</sup>	100.8	106.4	104.4	108.6 <sup>ab</sup>	3.72	.0071
	SD 3.9	6.1	8.6	8.7	8.9		
Profile	M 101.5	101.1	103.8	106.2	109.2 <sup>ab</sup>	3.54	.0093
	SD 4.2	5.1	10.8	10.9	11.3		
Post-meal							
Frontal	M 102.1	98.8	104.4	104.8	107.4 <sup>b</sup>	4.12	.0038
	SD 3.1	4.6	7.5	9.6	10.0		
Profile	M 101.8	99.3	102.1	103.7	109.6 <sup>ab</sup>	4.02	.0044
	SD 4.8	4.4	11.0	10.0	12.8		

Note: Letter superscripts denote differences between group means which are significant at or beyond the .05 level after the Bonferroni adjustment for the multiple comparison of all pairs of means.

<sup>1</sup>Scores of 100 represent accurate estimation whereas scores above or below 100 represent overestimation or underestimation respectively.

On the pre-meal frontal and profile measures, all groups overestimated their body size to varying degrees. The most pronounced overestimation tendencies were observed in the previously-anorexic bulimic group. These patients overestimated their actual body size to a significantly greater extent than the normal and phobic controls on both the frontal and profile measures ( $p < .05$ ). There were no other significant differences between group means. These findings hold even when the Bonferroni adjustment of the significance level is disregarded.

A similar pattern of results was observed for the post-meal estimates of actual size. All groups, except the phobic controls, overestimated their body size to varying degrees. Again, the most marked overestimation of body size was observed in the previously-anorexic bulimic group, who overestimated to a significantly greater degree than the phobic control group on the frontal measure ( $p < .01$ ), and to a significantly greater extent than both control groups on the profile measure ( $p < .05$ ). If the Bonferroni adjustment of the significance level is ignored, the difference between the previously-anorexic bulimics and normal controls on the post-meal frontal measure is significant beyond the .05 level. However, none of the other differences between group means are significant even when the less conservative p-value is adopted.

It must be emphasized that the observed differences between group means are more representative of relative than absolute overestimation tendencies on the part of previously-anorexic

bulimics. A percentage breakdown of subjects' pre-meal frontal and profile estimates into three categories; underestimators or accurate estimators (scores of 100 or less), moderate overestimators (scores greater than 100 but less than 110), and marked overestimators (scores greater than or equal to 110), is presented in Table 5. More than 50% of the subjects in every group overestimated their frontal and profile body sizes to some extent. In the previously-anorexic bulimic group, there were simply fewer underestimators and a greater combined number of moderate and marked overestimators relative to the other groups.

#### Estimates of Ideal Size

Results of the matched-pair t-tests for differences between actual and ideal size estimates are presented in Table 6.

Subjects in all of the groups preferred to be thinner than their perceived actual size. These results were statistically significant across all comparisons for the total sample, the two bulimic groups and the two control groups ( $p < .0001$ ). For the restricters however, only the comparison between the pre-meal frontal and ideal frontal estimates revealed a statistically significant difference ( $p < .05$ ). Notably, 47% of the patients in the combined bulimic groups had ideal body sizes which were thinner than could be assessed given the limits of the apparatus.

Table 5

Percentages of Underestimators, Moderate Overestimators and Marked Overestimators

	Normal Controls (n=33)	Phobic Controls (n=18)	Restricters (n=17)	Never-AN Bulimics (n=24)	Prev-AN Bulimics (n=23)
Pre-Meal					
Frontal					
Accurate/Under	21.1	44.4	29.4	29.2	13.0
Moderate Over	73.7	44.4	36.3	50.0	56.6
Marked Over	6.1	11.2	35.3	20.8	30.4
Profile					
Accurate/Under	39.4	33.3	35.3	25.0	17.4
Moderate Over	51.5	66.7	52.9	50.0	43.5
Marked Over	9.1	0.0	11.8	25.0	39.1

Table 6

Matched-Pair Comparisons of Actual and Ideal Size Estimates

		Pre-meal Frontal - Ideal Frontal	Pre-meal Profile - Ideal Profile	Post-meal Frontal - Ideal Frontal	Post-meal Profile - Ideal Profile
Total Sample ( <u>df</u> =114)	t p	12.45 .0000	12.29 .0000	11.27 .0000	10.98 .0000
Normal Controls ( <u>df</u> =32)	t p	9.92 .0000	10.59 .0000	9.35 .0000	9.87 .0000
Phobic Controls ( <u>df</u> =17)	t p	5.55 .0000	5.75 .0000	5.99 .0000	6.29 .0000
Restricters ( <u>df</u> =16)	t p	2.23 .048	2.07 .0549	1.52 .0549	1.81 .0945
N-AN Bulimics ( <u>df</u> =23)	t p	7.63 .0000	8.06 .0000	7.87 .0000	8.32 .0000
Pr-AN Bulimics ( <u>df</u> =22)	t p	8.06 .0000	7.83 .0000	7.13 .0000	6.93 .0000



## Measures of Body Size Dissatisfaction

As previously described, the body size dissatisfaction measures are derived by calculating the discrepancy between estimates of actual and ideal size. The results of the analysis of body size dissatisfaction measures are reported in Table 7.

All groups were dissatisfied with their perceived body size to varying degrees, with the two bulimic groups reporting the greatest dissatisfaction. The previously-anorexic bulimics were significantly more dissatisfied with their perceived size than the restricters, the phobic controls and the normal controls ( $p < .05$ ).

If the Bonferroni adjustment of the significance level is disregarded, an identical pattern of differences is observed with respect to the never-anorexic bulimics. With the more stringent Bonferroni limits on significance however, the differences between the never-anorexic bulimics and the control groups do not achieve statistical significance for two of the four body size dissatisfaction measures. No other significant group differences on body dissatisfaction measures were observed.

Table 7

Group Comparisons for Body Size Dissatisfaction Measures

Variable	Normal Controls <sup>a</sup> (n=33)	Phobic Controls <sup>b</sup> (n=18)	Restricters <sup>c</sup> (n=17)	Never-AN <sup>d</sup> Bulimics (n=24)	Prev-AN <sup>e</sup> Bulimics (n=23)	F	p
Pre-meal							
Frontal	M 8.5	9.7	6.2	17.3 <sup>ac</sup>	20.8 <sup>abc</sup>	9.64	.0000
	SD 4.9	7.4	11.4	11.1	12.4		
Profile	M 9.1	10.1	6.4	19.2 <sup>abc</sup>	23.0 <sup>abc</sup>	10.64	.0000
	SD 4.9	7.4	12.7	11.7	14.1		
Post-meal							
Frontal	M 7.7	7.7	4.2	17.7 <sup>abc</sup>	19.7 <sup>abc</sup>	11.45	.0000
	SD 4.7	5.4	11.4	11.0	13.3		
Profile	M 9.4	8.2	4.7	16.5 <sup>c</sup>	23.4 <sup>abc</sup>	10.06	.0000
	SD 5.6	7.1	13.8	10.9	15.7		

Note: Letter superscripts denote differences between group means which are significant at or beyond the .05 level after the Bonferroni adjustment for the multiple comparison of all pairs of means.

<sup>1</sup>(Pre-meal frontal estimate - ideal frontal estimate).

## Correlates of Body Size Overestimation and Size Dissatisfaction

The number of variables used in the current study precludes presentation of the correlations between clinical and personality variables with all of the body size measures. In this section, Pearson product-moment correlation coefficients are reported only for the post-meal frontal measures; estimates of actual and ideal size, and the body dissatisfaction measure derived by subtracting the ideal frontal estimates from post-meal estimates of actual size. Only those correlations which are significant at or beyond the .05 level (two-tailed t-test) are reported. Probability levels are therefore not listed in the text. Although all of the correlation coefficients are significant, many of them are small and account for little variance. These correlations are reported because they are interesting when considered in conjunction with the results of the subsequent factor analysis.

### Clinical Correlates

Estimates of actual size. Across the total sample ( $N=115$ ), overestimation of actual body size was positively related to higher scores on the EAT (.41), to higher self-rated frequencies of vomiting (.40), laxative use (.24) and bingeing (.34), and to higher ABS Resistance to Eating (.38), Food Disposal (.27) and total (.34) scores. Younger subjects tended to overestimate body

size to a greater extent than older subjects (-.25) in the total sample.

In the restricter group ( $n=17$ ), overestimation of size was related to more recent attainment of very low body weight (-.48). For the previously-anorexic bulimics ( $n=23$ ), greater overestimation of actual size was associated with higher EAT (.59), ABS Resistance to Eating (.59) and ABS total (.48) scores, and with higher lowest-past weight (.56). In this group, actual size overestimation was also correlated with briefer duration of illness (-.45).

The ABS Resistance to Eating and total scores were positively correlated with bigger actual size estimates in the phobic control ( $n=18$ ) group (.54 and .56, respectively).

There were no significant correlations between any of these variables and actual size estimates in the never-anorexic ( $n=24$ ) or the normal control ( $n=33$ ) groups.

Estimates of ideal size. In the total sample, thinner ideal body size was related to higher current (-.46) and past highest (-.37) weight, to higher self-rated frequencies of vomiting (-.45), laxative use (-.29) and bingeing (-.49), and to higher scores on the EAT (-.30) and ABS Food Disposal scale (-.33).

Thinner ideal size was associated with higher scores on the ABS Food Disposal scale (-.48) in the restricter group, and with higher current weight (-.45) and higher self-rated frequency of bingeing (-.51) in the never-anorexic bulimic group. For the previously-anorexic bulimics, thinner ideal body size was

related to younger age (.49), more recent attainment of highest-ever weight (.56), briefer duration of illness (.68), and with higher current weight (-.62), higher past weight (-.48), and higher ABS total scores (-.46).

In the normal control group, thinner ideal size was correlated with higher EAT(-.35), ABS Overactivity (-.55), and ABS total (-.49) scores, with higher self-rated frequency of bingeing (-.37), and with more recent attainment of lowest-ever weight (-.37). For the phobic controls, higher current weight (-.60) and higher past weight (-.54) were related to endorsement of thinner body size.

Body size dissatisfaction. Greater body size dissatisfaction in the sample as a whole, was related to higher current (.33) and higher past (.34) weights, to higher self-rated frequencies of vomiting (.54), laxative use (.36) and bingeing (.53), and to higher scores on the EAT (.47), and the ABS Resistance to Eating (.31), Food Disposal (.43) and total (.33) scores.

For the restricters, body size dissatisfaction was positively correlated with higher scores on the ABS Food Disposal Scale (.50). There were no significant correlates of body size dissatisfaction in the never-anorexic bulimic group. In the previously-anorexic bulimic group, greater body size dissatisfaction was related to higher current (.48) and higher past weight (.56), to higher self-rated frequency of laxative use (.44) and to higher EAT (.57), ABS Resistance to Eating

(.58) and ABS total (.57) scores. Additionally, younger age (-.50), more recent attainment of highest-ever weight (-.46) and briefer duration of illness (-.61) were associated with more pronounced body size dissatisfaction for previously anorexic bulimics.

Among the normal controls, increased body size dissatisfaction was positively related to higher ABS Overactivity (.43) and total (.42) scores. In the phobic control group, higher current weight (.54), higher past weight (.63) and higher scores on the ABS Resistance to Eating scale (.62) were associated with greater body size dissatisfaction.

#### Personality Correlates

Actual size estimates. In the total sample, higher scores on all of the standard MMPI scales, with the exception of the Lie, K, Masculinity-femininity and Hypomania scales, were positively correlated with body size overestimation ( $r_s > .30$ ). Overestimation was negatively correlated with the MMPI Ego-strength score (-.36), and related to higher scores on the BDI (.40) and the Mosher PCGI Moral Conscience (.28) and Sex-Guilt (.30) scales.

In the restricting group, only the MMPI Psychasthenia scale score related to overestimation of body size (.48). For the never-anorexic bulimics, greater overestimation of body size was associated with lower scores on the MMPI Hypomania scale (-.42),

but no other significant correlations were observed. Increased externality as assessed on the I-E Scale (.43) was correlated with increased overestimation of actual size in the previously-anorexic bulimic group.

Overestimation tendencies in the normal control group were associated with higher scores on the MMPI K (.46), Moshier FCGI Hostility Guilt (.44) and Sex Guilt (.37) scales, and with lower scores on the MMPI Psychopathic Deviate (-.38) and Hypomania (-.50) scales. In contrast, for the phobic controls larger actual size estimates were correlated with higher scores on the MMPI Psychopathic Deviate (.46) and Paranoia (.55) scales.

Ideal size estimates. Thinner ideal body size estimates in the total sample, were related to higher scores on the MMPI F (-.46), Hypochondriasis (-.28), Hysterical Conversion (-.21), Psychopathic Deviate (-.33), and Schizophrenia (-.20) scales, to lower scores on the MMPI K scale (.27), and to higher scores on the BDI (-.31) and the I-E Scale (-.34).

In the restricter group, higher scores on the MMPI Hypochondriasis (-.54) and Psychopathic Deviate (-.47) scales were significantly related to endorsement of thinner ideal body size. For the never-anorexic bulimics, thinner ideal size estimates were similarly associated with higher scores on MMPI Hypochondriasis (-.47), and with higher scores on the MMPI Hysterical Conversion (-.46) scale. There were no significant correlates of ideal body size in the previously-anorexic bulimic group.

In the normal control group, thinner ideal size was significantly associated only with higher scores on the MMPI Psychopathic Deviate scale (-.38), whereas in the phobic control group, greater internality as assessed on the I-E Scale (-.56), and higher MMPI Masculinity-femininity scores were correlated with smaller ideal size estimates.

Body size dissatisfaction. With the exception of the K scale, which was negatively correlated with size dissatisfaction (-.25), and the Lie, Psychopathic Deviate, Paranoia and Hypomania scales, which were unrelated to this measure, all the standard MMPI scales were positively associated with greater body size dissatisfaction ( $r_s > .20$ ) in the sample as a whole. Increased dissatisfaction with body size in the total sample was also related to lower scores on the MMPI Ego-strength scale (-.28) and to higher scores on the BDI (.40), the I-E Scale (.35), and the Moral Conscience (.26) and Sex Guilt (.23) scales of the Moshier FCGI.

In the restricter group, increased body size dissatisfaction was associated with higher scores on the MMPI Hypochondriasis (.60), Hysterical Conversion (.48) and Psychopathic Deviate (.51) scales. No significant correlates of body size dissatisfaction were observed in either of the two bulimic groups.

For the normal controls, only the Moshier FCGI Sex Guilt scale was related to increased dissatisfaction with body size (.36). Higher scores on the BDI (.59), and MMPI



Masculinity-femininity (.58) and Paranoia (.62) scales were associated with greater body size dissatisfaction in the phobic control group.

### Factor Analysis

A principal component analysis of clinical and personality data was performed as a means of reducing the number of variables to be used as predictors of body size estimates in subsequent multiple regressions, and to determine whether the relationships among these variables could be separated along meaningful dimensions. Only the data on phobic control and eating disorder subjects ( $n=82$ ) were used in the analysis. Normal controls ( $n=33$ ) were omitted due to their proportional underrepresentation in the total sample.

Ten factors with eigenvalues greater than 1.0 were extracted. Of these, the first three had eigenvalues greater than 3.0 while the eigenvalues for factors four through ten were all less than 2.0. Therefore, only the first three factors, which accounted for 51% of the total variance, were retained for rotation to a varimax solution. The rotated three-factor solution is presented in Table 8.

On the first factor, the Beck Depression Inventory and nine of the 13 clinical scales of the MMPI had loadings in excess of +.60. More moderate positive loadings were observed for the Eating Attitudes Test, self-rated frequency of bingeing, the

Table 8

Principal Components of Clinical and Personality Data in the  
Combined Eating and Phobic Disorder Sample

Variable	Factor 1	Factor 2	Factor 3	$h^2$
Age	-.07	.25	-.70	.56
Current weight	.03	.86	.06	.74
Highest past weight	.08	.77	.07	.60
Months <sup>a</sup> since highest weight	.12	-.09	-.44	.22
Lowest past weight	-.17	.77	.02	.62
Months since lowest weight	.08	.06	-.34	.13
Age at onset of illness	-.06	.01	.25	.07
Duration of illness	-.02	.19	-.81	.70
Age at menarche	-.03	.06	.12	.02
Eating Attitudes Test	.55	-.03	.54	.60
SR frequency of vomiting	.38	.37	.53	.57
SR frequency of laxative use	.11	.12	.42	.20
SR frequency of bingeing	.50	.44	.43	.63
ABS Resistance to eating	.50	-.39	.52	.67
ABS Food disposal	.45	-.01	.63	.60
ABS Overactivity	.32	-.42	.44	.48
I-E Scale	.14	.40	.13	.20
Beck Depression Inventory	.83	.02	.21	.74
MMPI Lie Scale	-.25	-.10	.08	.08
F Scale	.61	.55	.04	.68
K Scale	-.42	-.47	-.01	.40
Hypochondriasis	.72	.02	.09	.52
Depression	.84	-.20	-.11	.76
Conversion hysteria	.72	-.00	.02	.51
Psychopathic deviate	.73	.26	-.08	.61
Masc.-femininity	-.23	.25	.46	.33
Paranoia	.76	.06	.01	.58
Psychasthenia	.91	.11	-.01	.84
Schizophrenia	.88	.18	.06	.80
Hypomania	.25	.29	.46	.35
Social Introversion	.80	-.17	-.15	.69
Ego strength	-.85	.15	-.07	.75
Mosher FCGI Moral conscience	.68	-.30	.30	.64
Mosher FCGI Hostility-Guilt	.47	-.39	-.13	.39
Mosher FCGI Sex-Guilt	.30	-.55	.31	.49
Variance explained	9.34	4.31	4.11	
Cumulative proportion of total variance	.28	.41	.51	

Resistance to Eating and Food Disposal subscales of the ABS, and the Moral Conscience and Hostility Guilt scales of the Mosher FCGI. The MMPI Ego-strength and K scales were negatively related to Factor 1, with loadings of  $-.85$  and  $-.42$  respectively. Weight- and age-related variables bore no relationship to the first factor, which appeared to be describing a dimension of generalized psychopathology. Factor 1 was therefore labeled "Clinical Pathology".

The second factor was more difficult to name. Weight-related variables including current weight, highest past weight, and lowest past weight had high positive loadings on this factor. Self-rated frequency of bingeing, the I-E and MMPI F scale had more moderate positive loadings while the ABS Overactivity, the MMPI K and the FCGI Sex Guilt scales were negatively related to the second factor. Age-related variables and variables reflecting general clinical pathology did not tend to load on Factor 2.

At first glance, this factor looked as if it were reflecting pure bulimic pathology. Surprisingly however, neither the Eating Attitudes Test or the ABS Food Disposal scale were related to Factor 2. On more careful examination, the second factor appeared to be describing a habitual eating pattern which was characterized by poor self-control and associated with relatively high body weight, but not associated with guilt, excessive exercise, laxative abuse, or generally distorted attitudes towards food, weight or body size. Factor 2 was

therefore labeled "Habitual Overeating".

Factor 3 was labeled "Acute Eating Disturbance". Age-related variables including current age, duration of illness, and length of time since highest past weight had moderate to high negative loadings on this factor. Additionally, all of the eating pathology variables had moderate to high positive loadings on the third factor, as did the MMPI Hypomania and Masculinity-femininity scales. Neither weight-related or general clinical pathology variables were strongly associated with this factor.

#### Group Comparisons on Factors

Results of the one-way analysis of variance and pair-wise comparisons of group means on the three factors are presented in Table 9.

The previously-anorexic bulimics had significantly more clinical pathology, as measured by Factor 1, than the phobic controls ( $p < .001$ ), the restricters ( $p < .01$ ), and the never-anorexic bulimics ( $p < .001$ ). The never-anorexic bulimics obtained significantly higher scores on Factor 2 (Habitual Overeating) than the phobic controls ( $p < .05$ ), the restricters ( $p < .001$ ), and the previously-anorexic bulimics ( $p < .05$ ). The phobic controls and previously-anorexic bulimics were also more tolerant of eating and weight, as assessed on Factor 2, than the restricters ( $p < .001$ ). On Factor 3 (Acute Eating Disturbance),

Table 9

Group Comparisons on Factor Scores

	Phobic Controls <sup>a</sup> (n=18)	Restricters <sup>b</sup> (n=17)	Never-AN <sup>c</sup> Bulimics (n=24)	Prev-AN <sup>d</sup> Bulimics (n=23)	F	p
Factor 1	M	-.70	-.09	-.21	.84 <sup>abc</sup>	.0000
	SD	.84	.84	.89	.77	
Factor 2	M	.14 <sup>b</sup>	-1.39	.75 <sup>abd</sup>	.14 <sup>b</sup>	.0000
	SD	.69	.56	.72	.64	
Factor 3	M	-1.00 <sup>bcd</sup>	.08	.36	.34	.0000
	SD	.73	.77	.94	.90	

Note: Letter superscripts denote differences between group means which are significant at or beyond the .01 level after the Bonferroni adjustment for the multiple comparison of all pairs of means.

all three of the eating disorder groups had significantly higher mean scores than the phobic controls ( $p < .001$ ).

This pattern of results remains the same when the Bonferroni correction of the alpha-level is disregarded except that the difference between the phobic controls and restricters on Factor 1 is significant at the .05 level.

#### Correlations of Factors with Body Size Measures

Correlations between the three factors and body size measures in the combined sample ( $n=82$ ), and by group, are presented in Tables 10 through 14.

Actual size estimates. In the sample as a whole ( $n=82$ ), higher scores on Factor 1 (Clinical Pathology) and Factor 3 (Acute Eating Disturbance) were significantly related to greater overestimation of actual size across all measures ( $p < .01$ ). Factor 2 (Habitual Overeating) was unrelated to overestimation tendencies in the combined sample.

In the restricter group, higher scores on Factor 1 were significantly correlated only with the pre-meal frontal estimate of actual size ( $p < .01$ ). Factors 2 and 3 were unrelated to actual size estimates in this group. For the previously-anorexic bulimics, only Factor 3 was positively related to increased estimation of body size. These correlations were significant at or beyond the .01 level for the pre-meal frontal and profile estimates, and for the post-meal frontal measure. The

Table 10

Correlations Between Factors and Body Size Estimates in  
the Combined Eating and Phobic Disorder Sample<sup>a</sup>

Body size estimate	Factor 1	Factor 2	Factor 3
Pre-meal frontal	.39***	.02	.32***
Pre-meal profile	.35***	.08	.34***
Post-meal frontal	.33***	.03	.37***
Post-meal profile	.35***	.04	.33***
Ideal frontal	-.27**	-.60***	.14
Ideal profile	-.29***	-.62***	-.23*
Frontal pre-meal - ideal	.46***	.41***	.31***
Profile pre-meal - ideal	.42***	.38***	.38***
Frontal post-meal - ideal	.42***	.40***	.35***
Profile post-meal - ideal	.40***	.32***	.37***

<sup>a</sup>n=82.

\*p<.05, two-tailed. \*\*p<.02, two-tailed. \*\*\*p<.01,  
two-tailed.

Table 11

Correlations Between Factors and Body Size Estimates in  
the Phobic Control<sup>a</sup> Group

Body size estimate	Factor 1	Factor 2	Factor 3
Pre-meal frontal	.41	.42	-.08
Pre-meal profile	.32	.15	-.05
Post-meal frontal	.30	.17	-.18
Post-meal profile	.30	.32	-.10
Ideal frontal	-.20	-.54**	-.02
Ideal profile	-.33	-.70***	.01
Frontal pre-meal - ideal	.46*	.70***	-.05
Profile pre-meal - ideal	.45	.58**	-.04
Frontal post-meal - ideal	.42	.61***	-.13
Profile post-meal - ideal	.42	.70***	-.17

<sup>a</sup>n=18.

\* $p < .05$ , two-tailed. \*\* $p < .02$ , two-tailed. \*\*\* $p < .01$ ,  
two-tailed.



Table 12

Correlations Between Factors and Body Size Estimates in  
the Restrictor<sup>a</sup> Group

Body size estimate	Factor 1	Factor 2	Factor 3
Pre-meal frontal	.51*	-.09	.03
Pre-meal profile	.19	-.11	.11
Post-meal frontal	.37	-.16	.19
Post-meal profile	.32	-.23	.16
Ideal frontal	-.24	-.06	-.15
Ideal profile	-.13	-.29	-.31
Frontal pre-meal - ideal	.58*	-.02	.14
Profile pre-meal - ideal	.23	.08	.27
Frontal post-meal - ideal	.44	-.06	.24
Profile post-meal - ideal	.33	-.03	.30

<sup>a</sup>n=17.

\*p<.05, two-tailed.

Table 13

Correlations Between Factors and Body Size Estimates in  
the Never-Anorexic Bulimic Group<sup>a</sup>

Body size estimate	Factor 1	Factor 2	Factor 3
Pre-meal frontal	.15	.08	.12
Pre-meal profile	.30	-.14	.10
Post-meal frontal	.13	-.13	.05
Post-meal profile	.13	-.11	.14
Ideal frontal	-.44*	-.35	.40
Ideal profile	-.32	-.24	.30
Frontal pre-meal - ideal	.34	.23	-.10
Profile pre-meal - ideal	.39	-.05	-.01
Frontal post-meal - ideal	.33	.07	-.16
Profile post-meal - ideal	.20	-.03	.03

<sup>a</sup>n=24.

\*p<.05, two-tailed.

Table 14

Correlations Between Factors and Body Size Estimates in  
the Previously-Anorexic Bulimic Group<sup>a</sup>

Body size estimate	Factor 1	Factor 2	Factor 3
Pre-meal frontal	.17	.17	.54**
Pre-meal profile	.25	.26	.60***
Post-meal frontal	.15	.29	.59***
Post-meal profile	.19	.08	.47*
Ideal frontal	-.27	-.27	-.57***
Ideal profile	-.17	-.36	-.58***
Frontal pre-meal - ideal	.26	.26	.68***
Profile pre-meal - ideal	.26	.35	.71***
Frontal post-meal - ideal	.24	.34	.71***
Profile post-meal - ideal	.21	.20	.59***

<sup>a</sup>n=23.

\*p<.05, two-tailed. \*\*p<.02, two-tailed. \*\*\*p<.01,  
two-tailed.

correlation with the post-meal profile estimate was significant only at the .05 level.

The three factors were not significantly related to any of the estimates of actual size in the never-anorexic or phobic control groups.

Ideal size estimates. In the combined sample, thinner ideal frontal and profile size was related to higher scores on Factor 1 (Clinical Pathology) and Factor 2 (Habitual Overeating) ( $p < .02$ ). Higher scores on Factor 3 (Acute Eating Disturbance) were related to endorsement of thinner ideal size only for the profile measure ( $p < .05$ ).

In the restricter group, the three factors were not significantly related to ideal body size estimates. Higher scores on Factor 1 were negatively correlated with thinner ideal frontal estimates in the never-anorexic bulimic group ( $p < .05$ ), while higher scores on Factor 3 were associated with smaller ideal body size estimates in the previously-anorexic bulimic group ( $p < .01$ ).

For the phobic controls, higher scores on Factor 2 were significantly associated with thinner ideal body size ( $p < .02$ ); Factors 1 and 3 were not related to ideal size estimates in this group.

Body size dissatisfaction. For the sample as a whole, higher scores on all three factors were unrelated to greater body size dissatisfaction across all measures ( $p < .01$ ).

In the restricter group, higher scores on Factor 1 were associated with more dissatisfaction on the pre-meal - ideal frontal measure ( $p < .05$ ). Size dissatisfaction among previously-anorexic bulimics was associated with higher scores on Factor 3 ( $p < .01$ ), but was not related to scores on Factors 1 or 2. There were no significant correlations between the factors and size dissatisfaction in the never-anorexic bulimic group.

For the phobics, increased dissatisfaction with body size was associated with higher scores on Factor 2 across all measures ( $p < .02$ ), and with higher scores on Factor 1 for the pre-meal - ideal frontal measure ( $p < .05$ ).

### Multiple Regression Analyses

Multiple regressions were performed for each body size measure for the combined eating and phobic disorder group ( $n=82$ ) and for each group separately, using scores on all three of the previously obtained factors as independent variables. No significant between-group differences were observed for any of the dependent measures with respect to either the slopes or intercepts of the fitted regression lines.

### Estimates of Actual Size

Results of the regressions of actual size estimates on the

three factors are presented in Tables 15 through 18.

When eating and phobic disorder subjects were considered as a single group, the regressions of the actual size estimates on the three factors were all significant at or beyond the .0001 level. Twenty-four percent or more of the variance in self-estimates of body size was predictable from scores on the three factors, with Factors 1 (Clinical Pathology), and 3 (Acute Eating Disturbance) contributing significantly ( $p < .002$ ) to all predictions.

In the previously-anorexic bulimic group ( $n=23$ ), the regression of the pre-meal profile size measure on the three factors was significant beyond the .02 level; only Factor 3 (Acute Eating Disturbance) contributed significantly ( $p < .01$ ) to the prediction of 26% of the variance in these estimates.

No significant results were obtained for the regressions of actual size estimates on factor scores which were conducted in the restricter ( $n=17$ ), never-anorexic bulimic ( $n=23$ ), or phobic ( $n=18$ ) samples.

#### Estimates of Ideal Size

The results of the regressions of ideal frontal and profile estimates on the three factors are reported in Tables 19 and 20, respectively.

For the combined eating disorder and phobic sample, the regressions of the ideal size measures on the three factors were

Table 15

## Results of the Regressions of the Pre-Meal Frontal Measure on the Factors

	$R^2$	$F^a$	p	Intercept	St. Reg. Coeff.	t	p
Combined Sample	.25	8.73	.0000	105.18			
Factor 1					.390	3.98	.0002
Factor 2					.020	0.20	.8422
Factor 3					.315	3.21	.0019
Phobic Controls	.37	2.72	.0846	108.05			
Factor 1					.663	2.03	.0618
Factor 2					.324	1.42	.1769
Factor 3					.505	1.59	.1334
Restricters	.31	1.97	.1680	109.95			
Factor 1					.627	2.39	.0326
Factor 2					.149	0.58	.5700
Factor 3					.185	0.77	.4560
Never-AN Bulimics	.11	0.86	.4776	101.45			
Factor 1					.325	1.34	.1956
Factor 2					.266	1.08	.2936
Factor 3					.364	1.36	.1882
Prev-AN Bulimics	.36	2.92	.0604	105.44			
Factor 1					.141	0.73	.4736
Factor 2					-.052	-0.25	.8048
Factor 3					.553	2.72	.0135

<sup>a</sup>Degrees of freedom: Combined Sample (3,78); Phobics (3,14); Restricters (3,13); Never-Anorexic Bulimics (3,20); Previously-Anorexic Bulimics (3,19).

Table 16

## Results of the Regressions of the Pre-Meal Profile Measure on the Factors

	$R^2$	$F^a$	p	Intercept	St. Reg. Coeff.	t	p
Combined Sample	.24	8.34	.0001	105.42			
Factor 1					.349	3.54	.0007
Factor 2					.080	0.81	.4214
Factor 3					.339	3.44	.0009
Phobic Controls	.18	1.02	.4121	106.51			
Factor 1					.606	1.64	.1243
Factor 2					.045	0.17	.8644
Factor 3					.409	1.13	.2766
Restricters	.06	0.30	.8237	102.44			
Factor 1					.214	0.70	.4968
Factor 2					-.053	-0.18	.8606
Factor 3					.179	0.64	.5353
Never-AN Bulimics	.15	1.16	.3513	105.87			
Factor 1					.409	1.72	.1014
Factor 2					.017	0.07	.9442
Factor 3					.273	1.04	.3102
Prev-AN Bulimics	.26	4.33	.0174	104.14			
Factor 1					.206	1.14	.2667
Factor 2					.017	0.09	.9285
Factor 3					.583	3.08	.0062

<sup>a</sup>Degrees of freedom: Combined Sample (3,78); Phobics (3,14); Restricters (3,13); Never-Anorexic Bulimics (3,20); Previously-Anorexic Bulimics (3,19).



Table 17

## Results of the Regressions of the Post-Meal Frontal Measure on the Factors

	$R^2$	$F^a$	p	Intercept	St. Reg. Coeff.	t	p
Combined Sample	.24	8.38	.0001	104.14			
Factor 1					.328	3.33	.0013
Factor 2					.029	0.30	.7687
Factor 3					.368	3.74	.0004
Phobic Controls	.10	0.50	.6867	100.67			
Factor 1					.346	0.89	.3901
Factor 2					.071	0.26	.7979
Factor 3					.100	0.26	.7948
Restricters	.23	1.32	.3116	103.96			
Factor 1					.448	1.62	.1297
Factor 2					-.029	-0.11	.9151
Factor 3					.326	1.28	.2215
Never-AN Bulimics	.03	0.22	.8784	105.68			
Factor 1					.148	0.58	.5675
Factor 2					-.081	-0.32	.7562
Factor 3					.073	0.26	.7971
Prev-AN Bulimics	.36	3.58	.0331	104.10			
Factor 1					.101	0.54	.5957
Factor 2					.071	0.36	.7255
Factor 3					.555	2.83	.0107

<sup>a</sup>Degrees of freedom: Combined Sample (3,78); Phobics (3,14); Restricters (3,13);  
Never-Anorexic Bulimics (3,20); Previously-Anorexic Bulimics (3,19).

Table 18

## Results of the Regressions of the Post-Meal Profile Measure on the Factors

	$R^2$	$F^a$	p	Intercept	St. Reg. Coeff.	t	p
Combined Sample	.24	8.01	.0001	104.06			
Factor 1					.350	3.54	.0007
Factor 2					.041	0.42	.6781
Factor 3					.333	3.37	.0012
Phobic Controls	.17	0.98	.4290	102.32			
Factor 1					.419	1.12	.2806
Factor 2					.240	0.92	.3720
Factor 3					.276	0.76	.4587
Restricters	.19	1.02	.4152	98.40			
Factor 1					.344	1.20	.2484
Factor 2					-.140	-0.50	.6238
Factor 3					.289	1.10	.2910
Never-AN Bulimics	.24	0.40	.7525	103.35			
Factor 1					.216	0.86	.3990
Factor 2					.003	0.01	.9895
Factor 3					.222	0.81	.4298
Prev-AN Bulimics	.26	2.24	.1167	105.03			
Factor 1					.176	0.88	.3906
Factor 2					-.127	-0.60	.5584
Factor 3					.506	2.40	.0269

<sup>a</sup>Degrees of freedom: Combined Sample (3,78); Phobics (3,14); Restricters (3,13); Never-Anorexic Bulimics (3,20); Previously-Anorexic Bulimics (3,19).

Table 19

## Results of the Regressions of the Ideal Frontal Measure on the Factors

	R <sup>2</sup>	F <sup>a</sup>	p	Intercept	St. Reg. Coeff.	t	p
Combined Sample	.45	21.21	.0000	90.86			
Factor 1					-.274	-3.26	.0016
Factor 2					-.596	-7.09	.0000
Factor 3					-.138	-1.64	.1048
Phobic Controls	.36	2.66	.0886	87.95			
Factor 1					-.291	-0.89	.3892
Factor 2					-.546	-2.38	.0318
Factor 3					-.388	-1.22	.2428
Restricters	.14	0.71	.5643	95.83			
Factor 1					-.390	-1.33	.2061
Factor 2					-.192	-0.67	.5151
Factor 3					-.223	-.083	.4214
Never-AN Bulimics	.36	3.70	.0288	88.51			
Factor 1					-.459	-2.22	.0384
Factor 2					-.376	-1.79	.0885
Factor 3					.053	0.24	.8169
Prev-AN Bulimics	.38	3.90	.0251	90.60			
Factor 1					-.226	-1.23	.2337
Factor 2					-.041	-0.21	.8357
Factor 3					-.542	-2.80	.0113

<sup>a</sup>Degrees of freedom: Combined Sample (3,78); Phobics (3,14); Restricters (3,13); Never-Anorexic Bulimics (3,20); Previously-Anorexic Bulimics (3,19).

Table 20

## Results of the Regressions of the Ideal Profile Measure on the Factors

	$R^2$	$F^a$	p	Intercept	St. Reg. Coeff.	t	p
Combined Sample	.52	27.73	.0000	89.81			
Factor 1					-.288	-3.65	.0005
Factor 2					-.616	-7.82	.0000
Factor 3					-.233	-2.96	.0041
Phobic Controls	.62	7.58	.0030	85.91			
Factor 1					-.484	-1.91	.0769
Factor 2					-.668	-3.78	.0020
Factor 3					-.532	-2.16	.0482
Restricters	.28	1.66	.2236	90.03			
Factor 1					-.404	-1.50	.1572
Factor 2					-.401	-1.53	.1503
Factor 3					-.349	-1.42	.1807
Never-AN Bulimics	.18	1.44	.2608	87.54			
Factor 1					-.311	-1.33	.1995
Factor 2					-.240	-1.01	.3243
Factor 3					.073	0.28	.7788
Prev-AN Bulimics	.37	3.78	.0277	88.12			
Factor 1					-.108	-0.58	.5666
Factor 2					-.160	-0.81	.4271
Factor 3					-.515	-2.65	.0158

<sup>a</sup>Degrees of freedom: Combined Sample (3,78); Phobics (3,14); Restricters (3,13);  
Never-Anorexic Bulimics (3,20); Previously-Anorexic Bulimics (3,19).

significant beyond the .0001 level. Forty-five percent of the variance in ideal frontal estimates, and 52% of the variance in ideal profile estimates was predictable from scores on the three factors. All of the factors contributed to significantly predictions of ideal size ( $p < .005$ ) except that Factor 3 (Acute Eating Disturbance) did not contribute to predictions of ideal frontal size.

In the previously-anorexic bulimic group, regressions of the ideal size estimates on the three factors were significant for the frontal and profile measures ( $p < .05$ ). However, only Factor 3 contributed to the prediction of 38% of the variance in frontal estimates, and 37% of the variance in profile estimates. For the never-anorexic bulimics, the regression was significant only for the frontal ideal measure ( $p < .05$ ); only Factor 1 (Clinical Pathology) contributed to the prediction of ideal frontal size ( $p < .05$ ).

In the phobic control group, the regression of the ideal profile measures on the three factors was significant beyond the .05 level. Factors 2 (Habitual Overeating) and 3 (Acute Eating Disturbance) contributed significantly ( $p < .05$ ) to prediction of 62% of the variance in ideal profile size.

#### Body Size Dissatisfaction Measures

Results of the regressions of body size dissatisfaction measures on the three factors are presented in Tables 21 through

24.

Considering the eating and phobic disorder subjects as a single group, the regressions of the body dissatisfaction measures on the three factors were all significant beyond the .0001 level. Scores on the three factors predicted 40% or more of the variance in body size dissatisfaction, with all three factors significantly contributing ( $p < .0005$ ) to the predictions.

In the previously-anorexic bulimic group, the regressions of the body dissatisfaction measures on the three factors were all significant beyond the .05 level; only Factor 3 (Acute Eating Disturbance) however, contributed significantly ( $p < .01$ ) to predictions of size dissatisfaction. Across the dissatisfaction measures, 55% or more of the variance in body size dissatisfaction was predictable with the exception of the post-meal - ideal profile measure where only 38% of the variance was predicted. No significant results were obtained for regressions of body size dissatisfaction measures on the factors in the never-anorexic group. In the restricter group, only the regression of the pre-meal frontal - ideal frontal measure on the factors was significant ( $p < .05$ ), with scores on Factor 1 (Clinical Pathology) alone contributing significantly ( $p < .005$ ) to the prediction of 49% of the variance.

For the phobic controls, the regressions of the body size dissatisfaction measures on the three factors were all significant beyond the .02 level. In this group, all three factor scores contributed significantly ( $p < .02$ ) to the

Table 21

Results of the Regressions of the Pre-Meal Frontal - Ideal Frontal Body  
Dissatisfaction Measure on the Factors

	$R^2$	F	p	Intercept	St. Reg. Coeff.	t	p
Combined Sample	.48	23.56	.0000	14.82			
Factor 1					.457	5.58	.0000
Factor 2					.409	4.99	.0000
Factor 3					.314	3.83	.0003
Phobic Controls	.73	12.87	.0003	20.10			
Factor 1					.735	3.47	.0038
Factor 2					.614	4.15	.0010
Factor 3					.666	3.24	.0059
Restricters	.49	4.14	.0289	14.12			
Factor 1					.779	3.44	.0043
Factor 2					.263	1.19	.2549
Factor 3					.315	1.52	.1532
Never-AN Bulimics	.23	1.97	.1511	12.94			
Factor 1					.480	2.12	.0470
Factor 2					.393	1.71	.1032
Factor 3					.257	1.03	.3156
Prev-AN Bulimics	.55	6.51	.0033	14.83			
Factor 1					.215	1.31	.2044
Factor 2					-.016	-0.09	.9263
Factor 3					.671	3.89	.0010

Table 22

Results of the Regressions of the Pre-Meal Profile - Ideal Profile Body Dissatisfaction Measure on the Factors

	$R^2$	F	p	Intercept	St. Reg. Coeff.	t	p
Combined Sample	.46	22.12	.0000	15.61			
Factor 1					.415	4.99	.0000
Factor 2					.378	4.54	.0000
Factor 3					.380	4.56	.0000
Phobic Controls	.59	6.68	.0050	20.60			
Factor 1					.747	2.84	.0132
Factor 2					.490	2.66	.0185
Factor 3					.644	2.52	.0244
Restricters	.21	1.14	.3688	12.41			
Factor 1					.417	1.48	.1619
Factor 2					.189	0.69	.5034
Factor 3					.356	1.38	.1916
Never-AN Bulimics	.18	1.49	.2486	18.33			
Factor 1					.488	2.09	.0494
Factor 2					.098	0.41	.6835
Factor 3					.230	0.90	.3814
Prev-AN Bulimics	.56	7.94	.0012	16.02			
Factor 1					.207	1.33	.1983
Factor 2					.077	0.46	.6494
Factor 3					.669	4.09	.0006



Table 23

Results of the Regressions of the Post-Meal Frontal - Ideal Frontal Body

Dissatisfaction Measure on the Factors

	$R^2$	F	p	Intercept	St. Reg. Coeff.	t	p
Combined Sample	.45	21.63	.0000	13.28	.409	4.89	.0000
Factor 1					.405	4.85	.0000
Factor 2					.350	4.18	.0001
Factor 3							
Phobic Controls	.50	4.57	.0197	12.71	.541	1.85	.0852
Factor 1					.528	2.59	.0214
Factor 2					.470	1.42	.0164
Factor 3							
Restricters	.35	2.36	.1194	8.13	.605	2.38	.0336
Factor 1					.132	0.53	.6054
Factor 2					.392	1.68	.1169
Factor 3							
Never-AN Bulimics	.12	0.91	.4548	17.17	.357	1.47	.1563
Factor 1					.117	0.48	.6382
Factor 2					.036	0.14	.8926
Factor 3							
Prev-AN Bulimics	.55	7.64	.0015	13.50	.182	1.16	.2607
Factor 1					.073	0.43	.6692
Factor 2					.673	4.07	.0007
Factor 3							

Table 24

## Results of the Regressions of the Post-Meal Profile - Ideal Profile Body

## Dissatisfaction Measure on the Factors

	$R^2$	F	p	Intercept	St. Reg. Coeff.	t	p
Combined Sample	.40	17.34	.0000	14.17			
Factor 1					.400	4.57	.0000
Factor 2					.325	3.70	.0004
Factor 3					.366	4.18	.0001
Phobic Controls	.65	8.84	.0015	16.38			
Factor 1					.606	2.51	.0050
Factor 2					.629	3.73	.0022
Factor 3					.550	2.35	.0340
Restricters	.28	1.68	.2199	8.37			
Factor 1					.490	1.82	.0911
Factor 2					.105	0.40	.6950
Factor 3					.416	1.19	.1154
Never-AN Bulimics	.06	0.41	.7456	15.69			
Factor 1					.276	1.10	.2834
Factor 2					.071	0.28	.7814
Factor 3					.169	0.61	.5479
Prev-AN Bulimics	.38	3.86	.0260	16.91			
Factor 1					.181	0.99	.3358
Factor 2					-.048	-0.24	.8095
Factor 3					.594	3.07	.0063

prediction of 49% or more of the variance in body size  
dissatisfaction.

#### D. Discussion

The results of the current study confirm the presence of overestimation tendencies in patients with anorexia nervosa. However, as Casper et al. (1979) have observed, it appears that overestimation tendencies cannot be considered unique to anorexia nervosa; the sample of restricting anorexics in the present investigation did not overestimate their body size to a significantly greater extent than normal or phobic controls.

In contrast, and as hypothesized, bulimic patients with a previous history of anorexia nervosa overestimated both their frontal and profile body size to a significantly greater extent than normal and phobic controls. Bulimic patients without previous anorexic illness also tended to overestimate more than controls, but these differences were not statistically significant.

With the notable exception of the restricters, all subjects wished to be significantly thinner than their perceived actual size and bulimic patients, regardless of prior anorexia, were significantly more dissatisfied with their perceived body size than either of the control groups or the restricting anorexics.

Clinical and personality variables which have previously been found to relate to overestimation tendencies in anorexic patients (e.g., duration of illness, frequency of bingeing, use of food evacuation methods, depression, low ego-strength,

externality) were found to cluster together along three meaningful dimensions which were highly correlated with overestimation of actual size, thinner ideal size and body size dissatisfaction in the combined phobic and eating disorder sample. However, a much less consistent pattern of results emerged when the relationships among these variables were examined within groups.

In association with the more pronounced body size distortions observed in the previously-anorexic bulimic group, the current study provides evidence that this group of patients is by far the most severely disturbed both in terms of eating attitudes and behavior and general psychological integrity. There was more overall personality disturbance among the previously anorexic bulimics than in any of the other groups. These patients seemingly engage in excessive guilty rumination, have numerous somatic concerns, tend to be socially introverted and are likely to be markedly depressed and unable to mobilize personal psychological resources on their own behalf.

Interestingly, although the bulimics with previous anorexic illness had the highest scores on the clinical pathology factor, this factor did not relate to body size overestimation or dissatisfaction in these patients. For the previously-anorexic bulimics, body size overestimation and dissatisfaction were strongly associated with the duration and severity of the eating disturbance as reflected on the Acute Eating Disturbance factor. Thus, younger age, briefer duration of illness, unstable mood,

and generally distorted attitudes and behavior with regard to food appear to be the most direct mediators and best predictors of body size distortions in bulimic patients who have previously been anorexic.

Compared to the previously-anorexic bulimics, subjects in the other two eating disorder groups demonstrated little general personality disturbance. Restricters and never-anorexic bulimics had far more disturbed eating patterns than the phobic controls as did the previously-anorexic bulimics. However, these factors were not related in any consistent fashion to overestimation or decreased body size satisfaction in the restricting or never-anorexic bulimic groups.

With respect to the restricting anorexics, the present findings support Hsu's (1982) argument that overestimation of body size cannot be considered to be pathognomic of anorexia nervosa. The restricters in this study did not differ significantly from either normal or phobic controls in their overestimation of body size or degree of body size dissatisfaction.

Although some investigators have reported that anorexic patients overestimate their body size to a significantly greater extent than controls, these results have never been reliable. In fact, the most consistent finding with respect to body size overestimation in anorexia nervosa has been the strong positive relationship between increased frequency of bingeing and self-induced vomiting, and greater size overestimation.

On the basis of clinical observation, it appears that approximately 30% of patients with anorexia nervosa begin to binge and employ food-evacuation methods at some point after the onset of anorexia. During the interphase or transition into bulimia, these patients may continue to meet criteria for anorexia nervosa. However, despite food evacuation efforts, as bingeing increases in frequency, these patients are unable to maintain the very low weight which is necessary for the diagnosis of anorexia nervosa.

In the current study, all of the patients who met diagnostic criteria for anorexia nervosa were classified as restricters because all of them relied almost exclusively on rigidly controlled food intake as the means of achieving and maintaining low body weight. In short, the present sample was a relatively homogeneous one with respect to food regulation habits. Other investigators have employed more heterogeneous samples in which varying proportions of the sample were bingeing and using laxatives or self-inducing vomiting. Higher mean values on body size measures would be expectable under such circumstances and thus more likely to result in significant differences between anorexics and controls.

Although Hsu's (1982) rejection of body size overestimation as a pathognomic factor in anorexia nervosa seems reasonable in the context of the present results, his recommendation that "body image disturbance" be deleted from diagnostic criteria for the disorder seems extreme. The restricters in the current study

did not overestimate their body size to a significant extent. Nor did they wish to be any thinner than they already were. It must be emphasized however, that their very satisfaction with an emaciated body shape suggests underlying body image disturbance in anorexic patients. While body size overestimation may not adequately reflect that aspect of body image which is distorted in anorexia nervosa, other, as yet unexplored, inferential techniques may yield entirely different results.

One alternative interpretation of the lack of overestimation tendencies in the restricting group is that these patients are more chronic than those which other investigators have studied. If Crisp and Kalucy (1974) are correct in suggesting an adaptive component to changes in body size, then anorexics who have been ill and thin longer, may overestimate their body size to a lesser extent than patients who have only recently achieved very low body weight.

With respect to clinical and personality correlates of body size overestimation in the restricting group, the relative lack of within-group variance in body size estimates may have precluded the observation of relationships which might exist in a less invariant sample.

The overall pattern of results in the present investigation points to the need for continued refinement of diagnostic categories in the area of eating disorders. Strober's (1983) delineation of three anorectic sub-types according to their MMPI profiles indicate that there is room for the definition of



specific nosological sub-types within current diagnostic categories. The present findings suggest that it may make sense to restrict the use of the term bulimia nervosa by adding the stipulation that patients must have previously met diagnostic criteria for anorexia nervosa. Those bulimic patients who have never been anorexic could be categorized using unmodified DSM-III criteria for bulimia. With respect to diagnostic criteria for anorexia nervosa, it may be fruitful to distinguish between those patients who primarily restrict food intake and those for whom bingeing and food evacuation techniques are frequent features. Additionally, more precise definition of "bingeing" and the circumstances in which it is most likely to occur would contribute to more meaningful research results.

#### Caveats

The results of this study clearly contribute to current knowledge of the relationships between clinical and personality factors and body size overestimation in patients with anorexia nervosa and bulimia nervosa.

Nevertheless, the study would have benefitted from more careful age-matching of subjects, particularly with respect to the phobic controls. Larger sample sizes, especially in the restricter group, would have permitted stronger assumptions regarding the reliability of the current findings. The relatively small number of restricters obtained for inclusion in

the present investigation reflects the pattern of referrals to the outpatient psychiatric service of Dr. Solyom at Shaughnessy Hospital over a one year period. Given the relatively large catchment population served by the Department of Psychiatry at Shaughnessy Hospital, the pattern of eating disorder referrals observed in the current investigation may be reflecting a general decrease in the incidence of anorexia nervosa and a relative increase in the incidence of bulimia. Cases referred to Dr. Solyom at Shaughnessy Hospital also tend to be more chronic than is characteristic of patient samples studied by investigators in other research facilities and this may limit the generalizability of the current findings to some extent.

As previously discussed, the major methodological flaw in the current investigation involved the "caloric contamination" of the ideal size estimates. Although the failure to assess ideal size prior to the meal was unfortunate, the similar patterns of results obtained for the pre- and post-meal estimates of actual size and the actual - ideal discrepancies lend support to the contention that ideal size estimates are relatively unaffected by the number of calories consumed.

#### Directions for Future Research

The video camera technique has been shown to be a simple, reliable and cost-effective procedure for assessing body size perception in normal and eating disorder subjects. Although some

further modifications to the apparatus are desirable (i.e., increasing the horizontal range to eliminate the floor effects observed when assessing bulimic patients), its use by investigators in other research settings is to be recommended. Standardization of body size perception assessment methods across patient samples in diverse clinical research facilities would do much to clarify current inconsistencies with respect to the overestimation tendencies of patients with different types of eating disorder.

The findings of the current study indicate that the clinical and personality factors associated with body size overestimation vary across distinguishable categories of eating disorder patients. Further elucidation of nosological subtypes, taking into account variables reflecting the history and course of the disorders as well as the gross behavioral symptoms is critical to a more complete understanding of the role of body size distortions in the pathogenesis of eating disorders.

Up to now, important differences have been obscured by the failure of many researchers to study patient groups which are homogeneous with respect to history and food regulation habits. Moreover, measures of association between individual clinical and personality variables and body size overestimation have not been successful in elucidating an unambiguous pattern of relationship among these variables. The results of the factor analysis conducted during the present investigation show that many of the clinical and personality variables which have been

found to be individually correlated with body size overestimation, cluster together along dimensions which can be more meaningfully related to body size overestimation. Most of the clinical and personality variables which were measured in the current investigation were preselected for inclusion on the basis of previous research findings in which moderate to high correlations with body size overestimation were observed for often heterogeneous samples of anorexic patients. It is not clear whether other, as yet unidentified, variables might be important or whether similar factors or similar associations with body size measures would be observed under different experimental conditions.

Of course, even if a dimensional approach proves to be effective in accounting for the relationship between diverse clinical and personality variables and body size overestimation, the validity of inferring underlying "body image disturbance" from even the most reliable evidence of size overestimation must be examined. Are we to infer that no disturbance of body image exists in patients who are severely emaciated and resistant to eating because they do not overestimate their body size? Alternatively, are we to accept the inevitability of underlying body image distortions in eating disorder patients on the evidence that they do overestimate their body size?

It is not enough for researchers to be aware that their techniques may be differentially sensitive to different aspects of body image disturbance. The role of distorted body image in

the pathogenesis of disorders such as anorexia nervosa and bulimia nervosa can only be furthered if our reliance on single inferential measures is abandoned and multi-method approaches adopted. Size overestimation techniques need to be combined with a variety of other procedures including self-report measures of body awareness and attitudes, body shape preferences, figure drawings, and assessments of proprioceptive and kinesthetic perception. The correction of distorted body image is unlikely to become feasible without a clearer conceptual understanding of what body image is and what mechanisms are responsible for its disturbance. Multi-method - multi-trait methodologies would appear to be a reasonable solution with respect to establishing the construct validity of the measures used to assess underlying body image.

**E. Appendix A**

Table A-1

## Adjusted Group Means for Post-Meal Body Size Measures After Covarying Out Calories Consumed

	Normal Controls ( $\bar{n}=33$ )	Phobic Controls ( $\bar{n}=18$ )	Restricters ( $\bar{n}=17$ )	Never-AN Bulimics ( $\bar{n}=24$ )	Prev-AN Bulimics ( $\bar{n}=23$ )	F	p
Post-Meal							
Frontal	$\bar{M}$ 102.1 (102.1) <sup>a</sup>	98.6 (98.8)	104.0 (104.4)	105.6 (104.8)	107.1 (107.4)	4.33	.0027
Profile	$\bar{M}$ 101.7 (101.8)	99.0 (99.3)	101.5 (102.1)	105.0 (103.7)	109.0 (109.6)	4.12	.0038
Ideal							
Frontal	$\bar{M}$ 94.4 (94.4)	91.2 (91.1)	101.5 (100.2)	86.4 (87.1)	88.0 (87.7)	17.33	.0000
Profile	$\bar{M}$ 92.5 (92.4)	91.2 (91.0)	97.7 (97.4)	86.4 (87.0)	86.5 (86.2)	15.67	.0000

<sup>a</sup>Group mean before adjustment for the number of calories consumed.

Table A-2

Internal Consistency of Body Size Measures

	Pre-Meal Frontal & Profile	Post-Meal Frontal & Profile	Ideal Frontal & Profile
Total Sample (n=115)	.73 <sup>a</sup>	.82	.87
Normals (n=33)	.56	.73	.79
Phobics (n=18)	.82	.48	.56
Restricters (n=17)	.59	.83	.89
Never-AN Bulimics (n=24)	.66	.87	.69
Prev-AN Bulimics (n=23)	.86	.81	.91

<sup>a</sup>Pearson product-moment correlation coefficients



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