

In the Eye of the Beholder: Processing Body Shape Information in Anorexic and Bulimic Patients

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Previous body image studies have suggested that dieting-disordered patients (anorexia and bulimia nervosa) differ from normal subjects in their estimation of body size and desired body shape. It was hypothesized that overconcern with body shape in these patients would be reflected in their visual analyses of specific parts of their bodies. This hypothesis was investigated using a system that combines an infrared light source, video camera, dedicated microprocessor, and computer to monitor eye-gaze direction at 50 times per second. Fifteen dieting-disordered patients and 10 control subjects were examined in this way while simultaneously being shown a picture of themselves on a TV screen. Preliminary results suggest that the patients tend to focus on those parts of their body with which they are dissatisfied, while normal subjects scan their whole body shape. Objective assessment of areas of specific bodily concern among dieting-disordered patients, as well as the examination of voluntary and involuntary processing of self-referential stimuli, is offered by the use of such technology.

Over the past 25 years, there has been considerable interest in the way in which patients with eating and dieting disorders assess their own body shape.

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Garner and Garfinkel (1981) suggested that sensory, cognitive, and affective components are reflected in responses to body image appraisal. The proliferation of measurement techniques and the various methodologies employed in the assessment of body shape perception including the task instructions given to the subjects have contributed to the inconsistent findings reported in the literature (Touyz, Beumont, Collins, Philips, & Thompson, 1984a; Bowden, Touyz, Rodriguez, Hensley, & Beumont, 1989; Slade, 1985). A factorial study by Thomas (1987) demonstrated that different measurement techniques tap divergent aspects of this phenomenon.

Despite disparate reports in this area, one consistent finding that does seem to emerge in the literature is the importance of body shape dissatisfaction in the dieting-disordered population (Touyz, Beumont, Collins, McCabe, & Jupp, 1984b; Touyz, Beumont, Collins, & Cowie, 1985). This is considered to be a robust change associated with both the measurement of personality factors (Garner, Olmsted, & Polivy, 1983) and in the prediction of clinical outcome (Freeman, Thomas, Solyom, & Hunter, 1984). Bruch (1962) proposed that complete recovery from anorexia nervosa depended on the correction of body shape disturbance. Freeman et al. (1984) provided empirical support for this observation in finding that body shape dissatisfaction at the conclusion of successful treatment for bulimia nervosa was the best predictor of relapse at intervals of 6 months, and 1, and 5 years.

Given that the patients' perception of their body shape disturbance may be an important variable in determining the long-term outcome in anorexia and bulimia nervosa, objective measurement of the phenomenon has much to recommend it. The present paper reports an exploratory study using a computerized infrared measurement of eye movement to examine how patients with anorexia and bulimia nervosa visually process a picture of their own body shape compared to normal age- and sex-matched controls.

METHOD

Subjects

Fifteen consecutive, female, dieting-disordered inpatients volunteered to participate in the study. All met DSM-III-R criteria for anorexia (14) or bulimia nervosa (1). They ranged in age from 15 to 38 years. Control subjects ($n = 10$) were volunteer female hospital staff (5) and adolescent school girls (5) who disavowed any history of eating disorders or other psychopathology (Table 1).

Eye-Gaze Measurement

The eye-gaze monitor consists of a low-level infrared light source and video camera coupled to a built-in microprocessor (Fig. 1). The infrared beam illuminates the eye, and reflections from the cornea and retina are identified. This information is analyzed by the microprocessor. The relative positions of the two reflections are a measure of eye-gaze direction. These directions, which

Table 1. Subject characteristics, body image variables and distribution of gaze for eating-disordered and normal subjects.

	Patients (<i>n</i> = 15)		Controls (<i>n</i> = 10)	
	Mean	(SD)	Mean	(SD)
Age	21.9	(7.2)	25.7	(8.1)
Body mass index	16.5	(2.8)	19.8	(3.1)
Body dissatisfaction	40.7	(23.7)	17.6	(29.6)
Satisfaction ratings				
Face	54.3	(16.4)	65.9	(8.6)
Chest	35.9	(17.9)	62.7	(5.1)
Abdomen	14.6	(14.1)	52.7	(13.4)
Legs	15.3	(14.6)	50.9	(12.0)
Percentage Gaze				
Face	7.3	(8.9)	22.7	(3.7)
Chest	21.5	(9.3)	25.2	(3.5)
Abdomen	29.7	(9.4)	26.8	(8.6)
Legs	29.3	(12.2)	22.0	(9.2)
Evaluative gaze index	22.5	(12.0)	57.9	(6.8)

have a precision better than 1 degree of arc, are reported to a host computer at a rate of 50 times a second. The host computer is responsible for the synchronization of data collection with image presentation and for the storage of the data for later analysis.

Prior to the data collection trial, the eye-gaze system was calibrated to ensure that gaze was tracked accurately and to familiarize the subject with the device. The experimental trial began as follows: The subject was presented with a static image of her actual body shape, photographed against a light background with a Polaroid camera, and wore a form-fitting body leotard. This photograph was presented on the computer screen for a fixed period of 10 s. The subject was simply told to "look at the picture of yourself in the monitor."

Visual Analogue Scales

At the conclusion of the eye-gaze measurement, each subject was asked to rate her satisfaction with different parts of her body on four visual analogue scales, that is, one visual analogue scale for each body part (face, chest, abdomen, and legs).

In order to examine the relationship between gaze and dissatisfaction, we derived a score for each subject that combined her evaluative rating with the proportion of time spent looking at each body part. The evaluations were made on a 100-point scale with a neutral valuation equal to 50. To derive a single score reflecting the tendency to look at favorably or unfavorably evaluated body parts, this figure was multiplied by the fraction of time the subjects looked at that body area. This figure was summed across the four body areas to provide an evaluative gaze index with a theoretical range of 0 to 100.



Figure 1. Computerized infrared eye movement monitor. Resolution 50 Hz and 0.75 degrees of arc. Image generation and storage by a host microcomputer.

RESULTS

Table 1 presents data from both groups on the dissatisfaction and evaluative ratings for body parts. Dieting-disordered patients expressed significantly less body image satisfaction as measured on the rating scales. These results are consistent with previous findings that eating disorder subjects are more dissatisfied with their perceived body shape than are controls.

Eye-Gaze Data

Qualitative inspection of the data showed that controls had a relatively even distribution of gaze over the four body parts, whereas the dieting-disordered patients were less likely to look at their faces than control subjects. Patients tended to focus their attention on their abdomen and legs.

There was a difference in pattern of distribution of gaze and satisfaction in the two groups of subjects. For controls there was a similar proportion of time spent looking at and satisfaction with each body region. A different relationship was found among dieting-disordered patients. Patients tended to be most dissatisfied with their abdomen and legs and more satisfied with their chest

and face. This relationship was reflected in their gaze in that they tended to focus on that part of the body with which they were most dissatisfied. The weighted average of the satisfaction ratings of the four body areas viz the evaluative gaze index was significantly different ($t = -8.79$, $df = 25$, $p < 0.01$) between the two groups (Table 1).

DISCUSSION

Although preliminary in nature, the present results tend to confirm and possibly extend previous findings about the processing of body shape information by patients with anorexia and bulimia nervosa. This study employs an objective and innovative technology that allows the assessment of visual scanning as it is happening. The experimental condition deliberately allowed only a relatively short time frame (10 s) (Touyz et al., 1984b) when processing information concerning body shape in an attempt to obtain the patient's initial evaluation. For the 10-s presentation, patients do not have much opportunity to "fine tune" their response to the image.

An inverse relationship between satisfaction with a body area and the time spent looking at that region was evident in the patients but not in the control subjects. To dwell selectively on those parts with which one is most dissatisfied may well reflect the so-called "morbid preoccupation" with body shape so often described in the clinical literature on eating disorders. If confirmed, then this measure, applied in a standardized manner, may allow for an objective assessment of body shape dissatisfaction. If it proves to be a robust measure, then its ultimate utility may be as an adjunct in helping to objectively determine whether there has been any change in the patients dissatisfaction in their body shape following treatment.

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