Journal of Psychosomatic Research, Vol. 32, Nos 4/5, pp. 439–444, 1988.
Printed in Great Britain.

0022-3999/88 $3.00 + .00

PRESSURE SENSITIVITY IN BULIMIC WOMEN: A CONTRIBUTION TO RESEARCH IN BODY IMAGE DISTORTION

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(*Received* 1 *March* 1988; *accepted in revised form* 17 *May* 1988)

Abstract—The present study is a first step towards specifying perceptual peculiarities rather than visual ones that may contribute to a distorted body boundary experience in women meeting DSM III criteria for a diagnosis of bulimia. Fourteen bulimic women and 14 women without bulimia but closely matched in age, height and weight participated in the study. Pressure sensitivity was measured by means of the von Frey method under three conditions: (1) at the tip of the right index finger, (2) at the lower abdomen, (3) at the lower abdomen again, but with financial reward promised for high performance. Data confirmed the hypothesis that at both sites pressure sensitivity thresholds would be significantly higher for the bulimic group than for the comparison group. It is possible that deficits in pressure sensitivity are related to overestimation of the width of the respective body parts.

INTRODUCTION

DISTORTIONS in body awareness have not been included in the DSM-III criteria for a diagnosis of bulimia, yet clinical reports often emphasize the presence of a body image disturbance in bulimics. While the term 'body image' has been broadly applied, its specific meaning remains obscure. The different levels at which it may function range from sensory phenomena to personality features [1]. Some recent studies that used objective measurements of visual self-perception corroborate the casual clinical observation of a body image disturbance [2–5].

According to these studies, bulimics overestimate their body widths relative to controls. Little is known, however, about other than visual aspects of the body awareness of bulimic patients even though distortions in the visual body image may be related to deficits in various sensory modalities [6–8]. Powers *et al.*, for example, discuss the potential relevance of tactile perception impact on the estimation of body width [8]. Moreover, there is a growing body of evidence that the tactile system plays an important role in the development of an internal body image and that it influences the organization of neuronal structures which serve other sensory systems including visual perception [9, 10].

From information gathered during clinical interviews with bulimic women, it appeared that these women tend to experience the layers of tissue between bones and skin as being wider than they actually are. A relative loss in pressure sensitivity may contribute to such distorted perception of body boundaries. Therefore, in a preliminary study [11] we examined the absolute pressure sensitivity thresholds of women with bulimia nervosa at two body sites (finger tip and abdomen), using the von Frey technique (see below). The thresholds were found to be significantly

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higher in the sample with bulimia nervosa than in the control group. As reflected in an abdomen/finger index, the bulimic women's relative deficit in tactile sensitivity was significantly more pronounced in the abdominal area (a body region that bulimic women typically experience as being too fat) than at the finger tip (a part of the body which they generally do not experience in that way). The patient sample included in the study described, however, did not meet the DSM-III criteria for bulimia, e.g. some of the women were severely overweight, and they did not correspond with a strict operationalization of Russell's [12] set of criteria for a diagnosis of bulimia nervosa.

The aim of the present study was to examine whether a deficit in pressure sensitivity is also found in a sample of women who meet the DSM-III criteria for the diagnosis of bulimia. In addition, the current study attempted to test whether possible deficits in pressure sensitivity would be reversed under conditions of reward.

METHOD

Subjects

Patients. Fourteen women with a DSM-III diagnosis of bulimia participated in the study. They were solicited by advertisements in the local press and by notices in the waiting rooms of local primary care physicians. The women ranged in age from 21 to 33 yr with a mean age of 25 yr. Deviation from ideal weight (relative to age and height; Minnesota Life Insurance Company) varied from 0 to +18% with a mean of +8.2%. All of the patients experienced binges at least once per week, and 12 of them practised self-induced vomiting. Duration of bulimia ranged from three to 19 yr (mean = 8 yr).

Controls. 14 women with no indication of an eating disorder were recruited with the help of the bulimic patients who asked their acquaintances, friends or relatives to participate in the project. This procedure was chosen in order to recruit a control sample of a socioeconomic status similar to that of the target group. Control women were matched pairwise with the bulimics with respect to age, height and weight.

Procedure

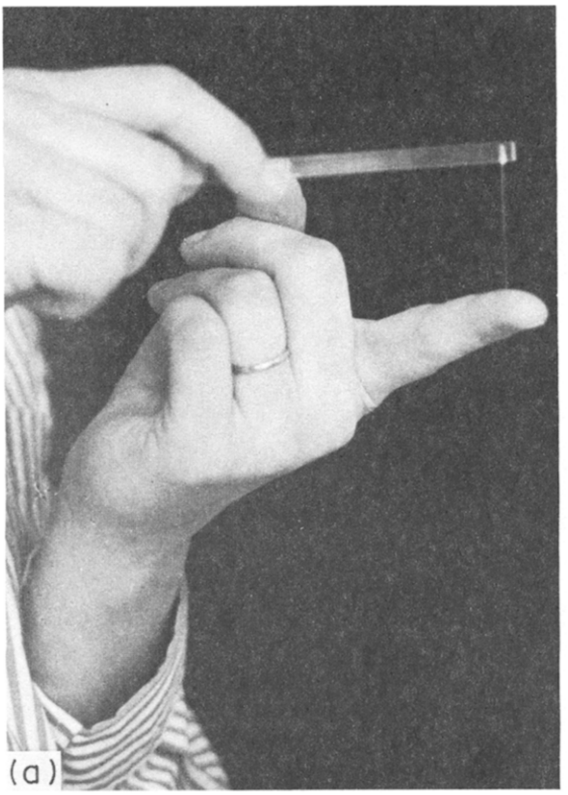
All subjects completed an Eating Disorders Questionnaire that screened for eating disorders (DSM-III) and asked for additional descriptive information in the case of bulimia (e.g. age at onset of the disorder; type and frequency of measures taken to counteract weight-gain; frequency and extent of weight changes over the last 12 months; occurrence of a rapid weight loss of more than 25%).

When a case of bulimia was identified or a woman with no signs of an eating disorder reported weight relative to age and height that matched those of a previously diagnosed bulimic patient, an appointment was scheduled for the experimental study. Friends or relatives participating in the study were scheduled right after each other in order to prevent premature exchange of information about the experiment. All subjects were asked not to use alcohol the night before participation and not to smoke or eat for two hours prior to the appointment.

At the beginning of the session, subjects were asked to estimate their present ability at that moment to concentrate on an eight-point rating scale.

The von Frey technique was chosen as a valid and reliable standard procedure to determine pressure sensitivity [13]. Equipment consists of a set of monofilaments of different strengths mounted in plastic handles. The hairs are pressed perpendicularly against the skin surface. Force is exerted until the filament buckles, then it is removed (see Fig. 1). The question is whether or not the subject detects the stimulus administered. A set of 12 hairs was used for the present study. The hairs were calibrated with an electronic balance to provide the following weights of the hair on the skin surface at the instant of buckling: 0.03; 0.05; 0.1; 0.2; 0.35; 0.5; 0.7; 0.8; 1.0; 1.2; 1.25; 1.3mg.

Absolute thresholds are commonly defined as 'that low stimulus quantity that arouses a response 50% of the time' [14]. The up–down or staircase method [15, 16] is the method of choice when absolute thresholds are to be determined in a short time period. In this method ascending and descending runs alternate. The first ascending run starts with a predetermined number of presentations of a stimulus well below the threshold. After a number of step increments, the subject will eventually detect two consecutive stimuli at least half of the time. At this point, the experimenter initiates a descending series of trials, starting at two steps above the ending point of the ascending run. Again, each stimulus is



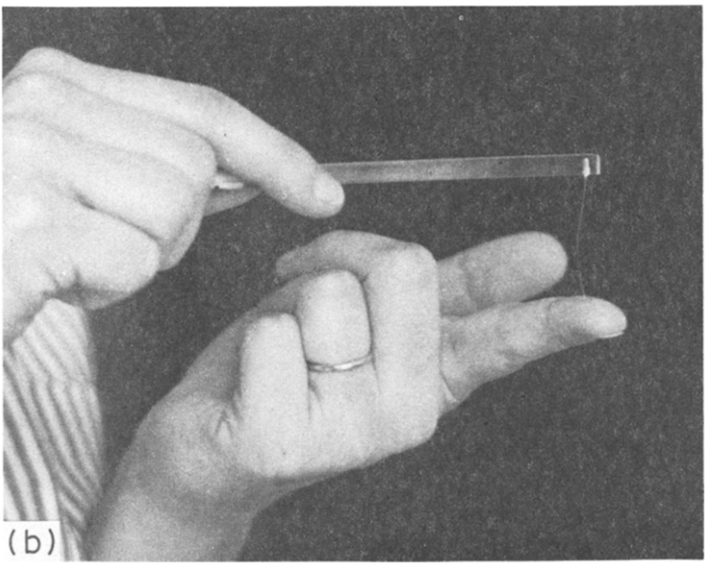


FIG. 1.—The von-Frey technique applied to the finger tip.

presented a predetermined number of times. After a few step decrements, the subject will respond to less than 50% of the trials in two consecutive runs. At this point, the direction of the stimulus is again reversed, starting with a stimulus intensity at two steps below the ending point of the descending run, etc. A plateau is usually quickly reached. The mean of the values where the response changes is calculated separately for ascending and descending runs; the average of these two values is the absolute threshold.

During the experiment, subjects were seated in a comfortable reclining chair. A blindfold was used to prevent them from detecting the stimuli on the basis of visual perception. Pressure sensitivity was tested under three conditions. First it was measured at the finger tip. Secondly, it was measured at the lower abdomen. Thirdly, thresholds at the lower abdomen were again assessed, but this time under a condition of reward. The beginning and the end of each trial series was indicated by an acoustic signal. The subjects' task was to count how many stimuli they had detected during a trial and to tell the number as soon as a tone had signalled the end of the trial. The number of stimulus presentations per trial varied from four to six. Subjects were promised up to three DM, the amount of money supposedly depending on the accuracy of their detection of the stimuli delivered. In order to prevent subjects from just telling higher numbers of stimulations than they had actually perceived, they were warned that in each case of a false positive,0.20 DM would be subtracted from their financial reward. The experimenters were kept blind to the purpose of the study and the subjects' diagnosis.

Absolute individual pressure sensitivity thresholds were calculated for each of the testing conditions. Since raw scores were positively skewed, a logarithmic transformation [17] was applied.

Additionally, an abdomen/finger index (AFI = threshold abdomen/threshold finger tip) was calculated to determine the relation of pressure sensitivity in these body parts.

RESULTS

A 3 × 2 ANOVA for dependent samples showed a highly significant effect for the factor Group (see Table I) but not for the factor Body Part or for the interaction between Group and Body Part.

No significant between group differences were found for the abdomen/finger index ($t = 0.13$; $p < 0.5$).

For neither group were the absolute individual thresholds at the lower abdomen significantly correlated with the thresholds at the finger tip. Yet, within both groups, pressure sensitivity thresholds obtained at the lower abdomen under the no reward condition were positively correlated with the respective thresholds measured under the condition of reward ($r = 0.86$ for bulimics and 0.74 for controls; $p < 0.001$ each).

TABLE I.—ANALYSIS OF VARIANCE OF ABSOLUTE INDIVIDUAL PRESSURE SENSITIVITY THRESHOLDS

			Factor Group	
			bulimics	controls
Factor Body Part (condition)	Finger tip	$\bar{x}$	4.97	4.37
		s	0.58	0.43
	Abdomen	$\bar{x}$	5.15	4.65
		s	0.79	0.54
	Abdomen/ reward	$\bar{x}$	5.18	4.74
		s	0.65	0.52
			F	p
	Factor Group		20.38	< 0.0001
	Factor Body Part		2.41	=0.098
	Group x Body Part		0.16	= 0.85

Subjects' self-ratings of their present ability to concentrate did not differ significantly between groups ($\bar{x} = 5.5$, $s = 1.4$ for bulimics; $\bar{x} = 5.1$; $s = 1.3$ for controls).

T-test for dependent samples showed that pressure sensitivity was significantly lower in the bulimic group than in the control group. This was true for both finger tip ($t = 2.78, p = 0.008$) and abdomen (nonreward: $t = 2.16, p = 0.02$; reward: $t = 2.18, p = 0.02$).

DISCUSSION

The present study may be viewed as a first attempt towards specifying perceptual peculiarities other than visual distortions that may contribute to a disturbed body boundary experience in bulimic women. As deficits in tactile sensitivity may underlie a person's experience of parts of the body being wider than they actually are, we decided to focus on pressure sensitivity. Data showed that absolute individual pressure sensitivity thresholds as measured at two body parts, namely the finger tip and the lower abdomen, were higher in a group of women meeting DSM-III criteria for bulimia than in a group of women with no indication of an eating disorder. This finding corroborates the results reported by Henke *et al.* [11] for a more heterogeneous group of women with bulimic symptoms. It suggests that deficits in tactile sensitivity are in fact common in bulimia. Our data indicate that these deficits are not a mere matter of concentration. Self-ratings of the ability to concentrate did not differ significantly between bulimic and non-bulimic women. Moreover, the deficits in pressure sensitivity are not compensated when incentives are promised for high performance in the detection of tactile stimuli. Thus, the perceptual deficits are probably not primarily due to a lack of motivation.

In clinical reports it is often noted that bulimic women view their abdomen and their hips as being unrealistically wide while no mention is made of other body parts, such as fingers, or toes. This information led us to assume that in bulimics the abdomen is typically subject to body image distortion whereas the fingers are not. Thus, we expected that the bulimic women's deficit in pressure sensitivity would be more pronounced at the abdomen than at the finger tip. This was not, however, the case. In contrast to the findings of Henke *et al.* and contrary to our expectation, the abdomen/finger index did not differ significantly between bulimic and non-bulimic women. Thus, one or both of the above assumptions are not tenable. To further explore these issues, future investigations of pressure sensitivity in bulimics should include self-ratings of the extent to which the body parts under study are experienced as being too wide. Data from the present study indicate that the bulimic women's pressure sensitivity thresholds at the finger tip and at the lower abdomen are not significantly correlated. Some of the women show deficits in sensitivity to touch on the finger, others on the stomach. It will be of interest to investigate systematically whether these deficits correspond with the experience of distorted body boundaries in the respective body parts which has not been done before. Moreover, the relationship between deficits in pressure sensitivity and visual distortions of the body image in the corresponding body parts should be investigated.

No statements can of course be made on the basis of our findings with respect to causality. It may be possible that deficits in pressures sensitivity reflect neurological

disturbance secondary to the metabolic changes produced by a self-induced vomiting.

A further question is whether our findings are representative. It is possible that, although all of our bulimia women met DSM-III criteria, the recruitment of the target sample by advertising led to a non-representative selection. Subsequent studies, therefore, should test whether our findings can be replicated in a series of consecutive clinic patients.

Another interesting question is whether the deficits in pressure sensitivity that can be found in bulimic women is specific to bulimia or whether it is found in other populations as well, particularly in samples sharing other personality characteristics (e.g. anxiety) or disturbed electrolyte state with bulimics.

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