CLINICAL RESEARCH

Abnormal perception of food size in anorexia nervosa

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Abstract

The hypothesis that patients with anorexia nervosa exaggerate the perceived size of food was tested. Video recordings of five items of food and four neutral objects of a similar size were made such that the size of each object increased steadily from half to twice its normal size. Each of the nine objects was placed on a ledge inside a dummy television screen next to the video screen, the food items alternating with the neutral objects, and 20 female patients with anorexia nervosa and 20 female controls matched for age were asked to adjust the size of the video recording to that of the real object. Although there was no overall difference in perceptual accuracy between patients and controls, both groups perceived the food items as being bigger than the neutral objects, the patients exaggerating the size of the food significantly more than the controls.

These results imply that patients with anorexia might start eating more easily when admitted if their food were presented as small portions on large plates.

Introduction

Patients with anorexia are obsessed with food and often eat in bizarre ways.¹ It is therefore surprising that in the many studies on anorexia nervosa only minimal attention has been paid to food, the object of such patients' obsession, and little attempt made to explain why patients with anorexia eat in an unusual manner. We presume that the common assumption is that these patients are simply afraid of food. Another possibility, however, is that, as these patients misperceive their own body image^{2,3} and claim to feel fat despite being manifestly thin, they may also be misperceiving the size, and possibly other qualities, of their food.

Some studies have dealt with people's differing perceptions of food size. In a study in which five dessert foods were used as stimuli and subjects were asked to adjust a picture to a size as close as possible to the food Beams found that the desserts that the subjects preferred tended to be adjusted to a bigger size than those that they disliked.⁴ He consequently proposed that a subject's liking for or disliking of a particular food might alter his or her perception of its physical size. Tajfel agreed that a more valued object would tend to be thought of as bigger than objects of neutral value.⁵ The few other studies on the concepts of value and need in relation to the perception of various objects were reviewed by Bruner and Goodman, who agreed that the greater the value of an object to a subject, or the greater the subject's need for the object, the greater the object's size would be perceived by the subject.⁶

Our clinical impression of the possibility of misperception of food size by patients with anorexia is thus supported by the importance of the effect of value and need on perception. We here investigate the hypothesis that patients with anorexia nervosa misperceive—in the direction of exaggeration—the size of items of food.

Subjects and methods

This weight disorder unit provides a specialist service for treating anorexia nervosa. Twenty female patients with anorexia who were receiving treatment and whose illness had been diagnosed according to the criteria of the American Psychiatric Association⁷ were compared with 20 female control subjects matched for age who were medically fit and denied having or having had an eating disorder. The patients were at varying stages in their treatment, but all were considered by their therapists to be still showing obviously anorectic attitudes to their weight at the time of the study.

Figure 1 shows how the experimental equipment was set up. Video recordings were made of five high energy foods (a cream bun, a 200 g chocolate bar, a 200 g chocolate biscuit, a 300 g meat pie, and a 300 g bar of sausage meat) and four neutral objects of a similar size (a notebook, a small jewellery box, a hand slide viewer, and a tennis ball). These films were all made such that the object was initially shown on the screen at half its normal size; the size was then increased steadily over one minute to twice normal. Calibration was by means of a ratio scale from 1 to 60 that was displayed digitally in the lower right of the screen and covered with a tab during the experiment. Videotapes were available with three different sequences of presentation, all of which alternated the food with the neutral objects. Each subject was randomly allocated to one of the three presentation sequences.

Having given informed consent, each subject was familiarised with the experimental set up (fig 1) and her weight and height recorded. Subjects then sat equidistant from the two screens at a fixed distance of 1.5 metres. In the

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first experiment the five foods and four neutral objects were alternately placed on a ledge in the middle of the dummy television screen to the right of the real screen. Each subject could consequently directly compare the size of the real object with the object's image showing on the screen. The films of the object were started and the subjects were asked to manipulate the size of the object on the video screen with a remote control unit held in the hand until each image was in their opinion as close as possible to the size of each real object. The experimenter lifted the tab on the video screen and recorded the number when the subject was satisfied with the result.

Experimental set up showing television (left), dummy television screen with ledge for objects (right), and position of subject.

The second experiment was performed identically except that the real object was simply placed on the ledge in the dummy television screen for 10 seconds and then removed. Subjects were asked to adjust the video image to the correct size from what they remembered.

The third experiment was a simple pen and paper exercise. Each of the nine objects was shown to the subject, who was asked to gauge its width by reproducing this on a straight line drawn on an otherwise blank piece of paper.

Results

The 20 patients with anorexia had a mean age of 22.4 (SD 8.0) years (range 13-40) and the 20 controls a mean age of 22.0 (6.6) years (range 13-35). The mean height for both groups was 1.62 m (for patients SD=0.07, range=1.45-1.79; for controls SD=0.09, range=1.49-1.70). The mean weight of the patients was 45.7 (7.4) kg (range 31-57) and for the controls 57.6 (5.1) kg (range 46-64). The weights of the two groups were significantly different (unpaired *t* test; $t=5.92$, $p<0.001$).

As there were no noticeable violations of normality or homogeneity of variance in the distribution of estimates we chose parametric statistics for the analyses. Owing to technical difficulties only four neutral objects were presented, instead of five to match the number of items of food, so mean percentage estimates of real size were used in all statistical calculations rather than actual measurements.

Table I shows the estimates of the sizes of the nine objects by patients and controls in the three experiments. Table II shows the analyses of variance for the three experiments.

TABLE I—Estimates of sizes of food and neutral objects by patients with anorexia and controls. Values are mean percentages of real size (SD)

	Experiment 1		Experiment 2		Experiment 3	
	Food items	Neutral objects	Food items	Neutral objects	Food items	Neutral objects
Patients with anorexia	112 (19)	90 (18)	119 (25)	92 (17)	107 (20)	100 (11.4)
Controls	102 (13)	97 (14)	106 (14)	100 (12)	95 (8)	100 (8)

TABLE II—Analyses of variance for experiments 1, 2, and 3. Values are *F* values ($df=1,38$)

Experiment	Patients and controls	Food and neutral objects	Interaction
1	0.08	44.92*	16.19*
2	0.17	60.95*	24.63*
3	2.76	0.45	14.24*

* $p<0.0001$.

No difference was found between the two groups in their ability to measure size overall. Both groups did, however, noticeably exaggerate the size of the foods, the patients with anorexia doing so to a significantly greater extent than the controls; the patients perceived the foods as 12% bigger overall than the controls in each experiment. We found no significant relations with Pearson's product moment correlation coefficient, which suggested that body weight (the main physical difference between the patients and controls) was not an important factor in explaining differences in overestimating food size.

Discussion

That both the patients and the controls exaggerated the size of the foods compared with the neutral objects is further evidence for a link between value, need, and perceptual size as the foods might generally be expected to be considered more valuable. The patients exaggerated the size of food to a greater extent than the controls. We cannot be certain why but suspect that it is largely a psychological phenomenon rather than related to organic factors such as malnutrition. Our finding has implications for treatment of eating disorders: when patients with anorexia are given behavioural therapy as inpatients they might start eating more easily if their food were presented as small frequent meals on larger than normal plates. Tracing the links between estimates of the size of food and clinically relevant behaviour will, however, require a systematic approach, and this forms part of our longer term research plans. Our findings suggest that even patients with anorexia who are close to their ideal weight have an abnormal perception of food, although studies of the stability of perception of "food image" over time are clearly indicated. A lack of resolution of this misperception might predict future relapse of anorexia nervosa.

Research into perception and its relation with affect is methodologically challenging. We gained similar results with the simple pencil and paper test as with the more complex experiments, so simple tests may be all that are needed to measure food image. Another important methodological issue is the need to control for a subject's degree of hunger. Measuring the intensity of hunger is difficult, but hunger should ideally be accounted for in future studies.

Our results indicate that further work into perception of food image is warranted. Such studies would ideally be of more homogenous groups of patients at similar stages in their illness. The clinical implications of our findings may well extend beyond eating disorders and prove to be important in medical conditions such as diabetes and cardiac diseases in which diet is important.

We thank Professor R S Kalucy for helpful advice, and the other members of the unit for their help.

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(Accepted 2 March 1988)