Taste Responsiveness in Anorexia Nervosa

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Preferences for sugar/fat mixtures were examined in 12 anorectic females and in 14 normal-weight volunteer controls. The subjects, recruited at an eating-disorders clinic in Paris, were tested after an overnight fast and 2 hours after lunch. Anorectic patients disliked the taste of foods rich in fat more than did controls. Perceptions and preferences for sweet taste did not differ between anorectic females and controls. After lunch, taste preference ratings were equally reduced in both groups, suggesting that satiety aversion to sucrose is present even in anorexia nervosa.

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Anorexia nervosa is characterised by avoidance of most calorie-rich foods (Russell, 1967; Beumont & Chambers, 1981; Van Binsburgen *et al*, 1988). Anorectic patients often limit their intakes to vegetables and fruit, and avoid meats, milk products, sweets and other desserts (Russell, 1967; Beumont & Chambers, 1981).

Explanations of food avoidance in anorexia nervosa have invoked the concept of 'carbohydrate phobia' (Crisp, 1967). However, more recent clinical (Beumont & Chambers, 1981; Drewnowski *et al*, 1987) and cognitive studies (Drewnowski *et al*, 1988) have suggested that anorectic women chiefly reject those foods that are rich in fat. Fat aversion rather than carbohydrate phobia seems to determine the pattern of food avoidance in anorexia nervosa (Drewnowski, 1989).

One of the characteristics of anorexia nervosa is reduced pleasure in eating (Drewnowski, 1989). Although no deficiencies in taste have been observed, studies with anorectic patients have shown a low hedonic responsiveness to taste and an aversion to the oral sensation of fat (Drewnowski *et al*, 1987; Sunday & Halmi, 1990). In a series of sensory studies with sweetened dairy products, anorectic patients liked intensely sweet stimuli but showed a strong dislike for stimuli that were rich in fat (Drewnowski *et al*, 1987).

Taste-preference profiles for sweet solutions are thought to be a sensitive index of nutritional status (Cabanac *et al*, 1971). In one study, underweight subjects failed to show the expected drop in preference ratings for sweet taste after ingesting glucose (Cabanac *et al*, 1971). In another study, anorectic women continued to find sucrose solutions acceptable, even after a 400 kcal meal (Garfinkel, 1974). In other studies, satiety aversion to sucrose (or 'negative alliesthesia') disappeared after sustained dieting and weight loss (Cabanac *et al*, 1971). If taste preferences are an accurate index of body weight 'set point', anorectic women should find sucrose solutions acceptable even after a meal.

Method

The subjects were 12 young women with a clinical diagnosis of DSM-III-R anorexia nervosa (restrictor) who were in-patients at the eating disorders clinic, Clinique des Maladies Mentales et de l'Encephale, Hôpital Ste Anne, Paris. All patients were amenorrhoeic, and the mean duration of anorexia nervosa was 8.9 years (range 1–22 years). The treatment programme included nutritional rehabilitation, behavioural and cognitive therapy, and nutritional counselling. Informed consent was obtained from each subject.

Fourteen normal-weight volunteer controls were recruited from medical students and nursing staff at the Hôpital Ste Anne. The two groups were comparable in age (mean 26.8 years) and height (mean 1.64 m). Anorectic women weighed a mean of 37.6 kg, while control women weighed a mean of 56.3 kg. Mean body mass indices (BMI) were 14.0 and 20.7 respectively.

Taste stimuli included three different types of dessert-type soft white cheese ('fromage blanc') containing 0 g, 3 g, and 7 g of fat per 100 g, and thickened heavy cream ('creme fraiche') containing 30 g of fat per 100 g (Drewnowski *et al*, 1987). The stimuli were sweetened with sucrose at 1%, 5%, 10%, 20% and 40% (weight / weight) to produce 20 sensory stimuli in a 4×5 factorial design.

Taste samples were presented at 5 °C in 30 ml plastic cups and in a random order. Subjects used a spoon, and kept the sample in the mouth for as long as needed to make judgements of sensory intensity and hedonic preference. The subjects then expectorated the sample and rinsed their mouths with tap water. The samples were rated along nine-point category scales as described previously (Drewnowski *et al*, 1987).

All subjects were tested at 11.00 a.m., and again at 2.30 p.m., two hours after lunch (at 12.00 p.m.), composed of appetiser or soup, main dish of meat or fish with vegetables, cheese, fruit or dessert, with water. Individual intakes at lunch were evaluated by a dietitian. Mean (s.d.) caloric intake was 666 (197) kcal for anorectic women and 816 (350) kcal for normal-weight controls.

Results

As shown in Fig. 1, anorectic women disliked taste stimuli that were rich in fat. The group by fat interaction was

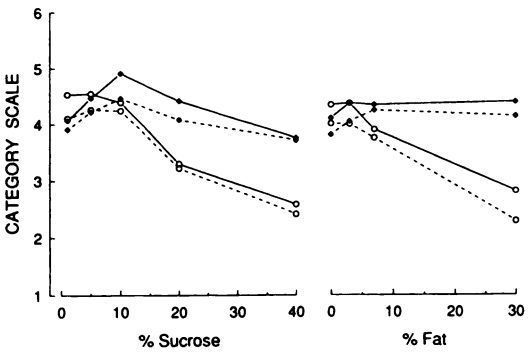

Fig. 1 Mean hedonic preference ratings as a function of stimulus sucrose (left panel) and fat content (right panel) (○, anorectics; ◆, controls; ——, after fasting; -----, after lunch).

significant ($F=5.86$, d.f. = 3,72, $P<0.01$). Anorectic women liked intensely sweet stimuli less than did controls, but not significantly so ($F=2.49$, d.f. = 4,96, NS). Thus, anorectic women disliked fat, but did not differ in their sweetness preferences from normal-weight controls. The anorectic women preferred stimuli containing a mean of 7.6% sucrose and only 3.5% fat. In contrast, normal-weight controls preferred stimuli containing a mean of 10.9% sucrose and 10.1% fat.

The effect of satiety on taste-preference profiles was only marginal ($F=4.21$, d.f. = 1,24, $0.10>P>0.05$). Both anorectic women and normal-weight controls showed a slight decline in taste preferences following a meal. No group by meal interaction was observed, suggesting that both anorectic patients and normal controls showed a comparable satiety response to feeding.

Anorectic patients and normal-weight controls did not differ in their perception of sweetness, and satiety status (fasted or fed) had no effect on sweetness ratings for either group. As in previous studies, sweetness intensity ratings rose with increasing sucrose levels. The main effects of sucrose ($F=277.66$, d.f. = 4,96, $P<0.01$), and fat ($F=5.70$, d.f. = 3,72, $P<0.01$), were both significant, in agreement with previous results (Drewnowski *et al*, 1987).

Anorectic patients rated the stimuli as higher in fat than did controls ($F=6.17$, d.f. = 1,24, $P<0.05$). Ratings of fattiness rose with increasing fat content. Analysis of variance showed significant main effects of fat ($F=47.49$, d.f. = 3,72, $P<0.01$) and sugar ($F=12.95$, d.f. = 4,96, $P<0.01$), as well as a fat by sugar interaction ($F=2.91$, d.f. = 12,288, $P<0.01$).

Discussion

Fat aversion rather than carbohydrate phobia appears to be the chief factor guiding food selection in anorexia nervosa (Drewnowski, 1989). Anorectic patients strongly disliked sensory stimuli that were rich in fat. A similar aversion to fat has been observed among eating-disorder patients in the US (Drewnowski *et al*, 1987; Sunday & Halmi, 1990), and among diet-conscious young ballet dancers in France. However, American patients also preferred intensely sweet stimuli, which the present subjects did not. On the contrary, the present response profiles showed a non-significant reduction in preference for those stimuli that were intensely sweet.

The marked taste aversion to fat-rich foods is a characteristic that is shared by both the French and the American patients. However, the seeming difference in preferences for sweet foods between patient groups deserves further comment. While the American patients were a mixed group of anorectic restrictors and anorectics with bulimia (Drewnowski *et al*, 1987), the present sample was composed of anorectic restrictors only. Previous studies have shown that anorectic restrictors are more likely than bulimics to profess a dislike for high-calorie foods that are rich in fat, sugar, or both (Drewnowski *et al*, 1988).

Another explanation draws on differences in diet-related attitudes between France and the US. At the present time, excess fat rather than sugar consumption is viewed as the chief problem in the American diet. Current dietary recommendations published by expert panels and the Federal Government emphasise lowering fat consumption, while encouraging the consumption of complex carbohydrates, starches and grains. Reducing sugar consumption, once a key item of nutritional advice, is no longer a priority. Widespread use of intense sweeteners in diet soft drinks and other low-calorie foods has helped to minimise the connection between calories and sweet taste for many young dieters in the US. In contrast, French anorectics still view sugar a key source of calories, to be avoided.

Thus 'carbohydrate phobia', observed by psychiatrists in the 1970s, may have been a cultural rather than a clinical phenomenon. At that time, carbohydrates were viewed as uniquely fattening, while particular scorn was reserved for refined sugar. The most popular weight-loss diets of the time contained little or no carbohydrate but were composed of protein and as much as 72% fat. The rehabilitation of carbohydrates has been reflected in the changed composition of weight-loss diets, which now contain up to 60% of calories from carbohydrates, 20% protein, and 20% fat. In switching their focus from carbohydrate to fat, anorectic women may be simply following a common social trend.

Taste in anorexia nervosa appeared normal. Anorectics and controls rated sweetness intensity similarly, in agreement with previous results (Drewnowski, 1989; Sunday & Halmi, 1990). In contrast, anorectic patients appeared sensitised to the fat content of foods and rated sugar/fat mixtures as higher in fat

than did normal controls. These data replicate earlier results obtained using similar sensory stimuli with a group of young French dancers.

There was no support for the hypothesis that elevated hedonic responses for calorie-dense foods are shown by individuals below their optimum body weight (Cabanac *et al*, 1971). Anorectic patients rated the sugar/fat mixtures as less pleasant than did controls, and disliked those that were sweetest and richest in fat. There was no evidence for the notion that emaciated anorectic patients fail to show satiety aversion to sucrose. Anorectic patients are arguably further below their optimum body weight than are controls, and should therefore respond differently to manipulations of caloric repletion. They did not. Both anorectics and controls showed a comparable reduction in taste-preference profiles following a meal, arguing against the notion of a selective satiety deficit in anorexia nervosa.

The present findings have important clinical implications for the diagnosis and treatment of eating disorders. Most clinical approaches are still focused on the supposed avoidance of carbohydrates by the anorectic patient. The initial assessment of the anorectic patient is geared towards determining whether the patient is avoiding any specific food groups, such as complex carbohydrates. The avoidance of sweets and carbohydrates is included in both the Eating Attitudes Test and the Eating Disorders Inventory. Behavioural therapy in bulimia nervosa is directed at preventing the vomiting of high-carbohydrate foods, and bulimic patients are instructed to avoid high-carbohydrate foods and other foods that may cause binge-eating. In contrast, the present study shows that anorectic restrictor patients dislike the oral sensation of fat and are likely to avoid all fat-rich foods. Fat rather than carbohydrate is the nutrient of major interest in the aetiology and treatment of eating disorders.

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Blood-Letting in Bulimia Nervosa

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Three cases of blood-letting in association with bulimia nervosa are reported. This association has not previously been described.

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There is a recognised association between various types of self-mutilation (e.g. cutting and burning) and eating disorders (Favazza *et al*, 1989). However, there does not appear to be any reference in the literature to deliberate blood-letting by venepuncture or insertion of intravenous cannulae either as an alternative method of self-mutilation or in association with eating disorders. We report three such cases.