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Research report

How much should I eat? Estimation of meal portions in anorexia nervosa ☆

Gabriella Milos [a,*,1], Cornelia Kuenzli [a,1], Chantal Martin Soelch [b], Sonja Schumacher [a], Hanspeter Moergeli [a], Christoph Mueller-Pfeiffer [a,c,d]

[a] Department of Psychiatry and Psychotherapy, University Hospital of Zurich, Zurich, Switzerland
[b] Department of Psychology, University of Fribourg, Switzerland
[c] Center of Education and Research (COEUR), Psychiatric Services of the County of St. Gallen-North, Wil, Switzerland
[d] Department of Psychiatry, Massachusetts General Hospital, Harvard Medical School, Boston, MA, United States

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ABSTRACT

Pathological concern regarding one's weight and weight gain is a crucial feature of anorexia nervosa. Consequently, anorexia nervosa patients often claim that they are uncertain regarding the amount of food they should eat. The present study investigated whether individuals with anorexia nervosa show an altered estimation of meal portion sizes and whether this estimation is modulated by an intent-to-eat instruction (where patients are asked to imagine having to eat the presented meal), meal type and meal portion size. Twenty-four women with anorexia nervosa and 27 healthy women estimated, using a visual analogue scale, the size of six different portions of three different meals, with and without intent-to-eat instructions. Subjects with anorexia nervosa estimated the size of small and medium meal portions (but not large meal servings) as being significantly larger, compared to estimates of healthy controls. The overestimation of small meal portions by anorexia nervosa subjects was significantly greater in the intent-to-eat, compared to general, condition. These findings suggest that disturbed perceptions associated with anorexia nervosa not only include interoceptive awareness (i.e., body weight and shape), but also extend to external disorder-related objects such as meal portion size. Specific therapeutic interventions, such as training regarding meal portion evaluation, could address these difficulties.
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Introduction

Anorexia nervosa (AN) is a potentially life-threatening eating disorder (ED) that primarily affects young women. DSM-IV (American Psychiatric Association, 2000) lists four criteria for the diagnosis of an AN: (1) Refusal to maintain body weight at or above a minimally normal weight for age and height; (2) intense fear of gaining weight; (3) disturbance of one's body weight or shape; and (4) amenorrhea. Clinical observation suggests that AN patients have difficulty estimating food portion size. AN patients frequently claim that at the beginning of the illness, typically after dieting or other food intake restriction, they lost the capacity to reliably evaluate food amounts. In particular, they became unsure about their estimates regarding the size of food portions they intended to eat.

The ability to visually evaluate food amounts has received little attention in AN research. Improving restrictive eating behavior and normalizing eating habits are especially important to the treatment of AN. Improved understanding of how visual evaluation of food amounts contributes to the disorder will facilitate the development of more effective treatment strategies for AN. In a previous study, individuals with AN were found to exaggerate their estimates of the size of high-energy food objects (e.g., picture of a box of 200 g chocolate biscuits), compared to equally sized non-food objects (e.g., picture of a jewellery box), to a greater extent than healthy controls, suggesting abnormal visual perception of high-energy food objects in AN (Yellowlees, Roe, Walker, & Ben-Tovim, 1988). In contrast, estimates of the number of food objects (a plate filled with 27 candies) and non-food objects (a plate filled with 27 LEGO® bricks) did not differ between AN patients and healthy controls (Vinai et al., 2007).

The present study was designed to investigate whether estimates of meal portion sizes differ between AN patients and healthy controls. Given that individuals with AN have difficulty eating adequate portions of food, we predicted that their estimates of

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* Corresponding author.
E-mail address: gabriella.milos@usz.ch (G. Milos).
[1] These authors contributed equally to this work.

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food amounts, as depicted in pictures of real meals, would differ from estimates obtained from normal individuals. Clinical observation suggests that the salience of food changes for AN patients during actual meal situations. In accord with this observation, we examined the influence of intent-to-eat instruction (''imagine eating the presented meal'') on estimates of meal portion size. The present study also examined the potential influence of affective state on estimates of meal portions, given evidence that AN patients experience increased anxiety when viewing food pictures or high calorie drinks (Ellison et al., 1998; Friederich et al., 2006).

Methods

Subjects

The present sample included 24 females with a DSM-IV diagnosis of current AN and 27 healthy females without any current or lifetime Axis I diagnosis. Comorbity in the AN group included: major depressive disorder ($n = 9$, 37.5%), dysthymia ($n = 3$, 12.5%), depressive disorder not otherwise specified ($n = 4$, 16.7%), mood disorder due to a general medical condition ($n = 1$, 4.2%), alcohol abuse/dependence ($n = 1$, 4.2%), social phobia ($n = 4$, 16.7%), specific phobia ($n = 4$, 16.7%), obsessive–compulsive disorder ($n = 3$, 12.5%), bulimia nervosa ($n = 1$, 4.2%) and adjustment disorder ($n = 1$, 4.2%). Table 1 summarizes the sociodemographic and clinical characteristics for the two groups.

Psychometric and neuropsychological measurements

Standardized diagnostic interviews

The presence of past and current psychiatric disorders, including ED, were determined from the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I) (Wittchen, Zaudig, & Fydrich, 1997).

Standardized clinical questionnaires

The severity of depressive symptoms was assessed using the Beck Depression Inventory (BDI) (Beck & Steer, 1987; De Zwaan et al., 2008; Hautzinger, Bailer, Worall, & Keller, 1995) and eating disorder symptoms and features were assessed using the Eating Disorder Inventory (EDI) (Gartner, 1997). Trait anxiety was measured by the State-Trait Anxiety Inventory (STAI) (Laux, Glanzmann, Schaffner, & Spielberger, 1981; Spielberger, Gorsuch, & Lushene, 1970).

Standardized mood questionnaires

Because ED patients' perception of visual food cues may be influenced by current emotional state (Ellison et al., 1998;

Table 1
Sociodemographic, clinical characteristics and neuropsychological test results for anorexia nervosa patients and healthy controls.

	Anorexia nervosa ($N = 24$)		Healthy controls ($N = 27$)		t	p
	M	*SD*	*M*	*SD*		
Age	22.38	4.10	21.41	2.75	−1.00	0.322
Current BMI (kg/m^2)	15.80	2.01	21.47	2.71	8.40	0.000
Lowest BMI (kg/m^2)	13.12	1.79	20.36	2.34	12.12	0.000
Highest BMI (kg/m^2)	20.91	2.87	22.43	3.27	1.73	0.090
BDI	24.96	10.04	2.96	3.19	−10.28	0.000
STAI Trait	58.25	7.63	32.67	7.63	−11.95	0.000
EDI Total Score	187.58	32.66	64.89	27.18	−14.64	0.000
EDI Drive for Thinness	26.25	7.90	6.07	4.70	−11.23	0.000
EDI Bulimia	9.46	8.28	3.00	2.66	−3.66	0.001
EDI Body Dissatisfaction	33.29	6.56	14.48	9.25	−8.44	0.000
EDI Ineffectiveness	31.17	8.65	8.07	5.28	−11.34	0.000
EDI Perfectionism	18.58	5.33	9.00	4.57	−6.91	0.000
EDI Interpersonal Distrust	16.58	6.52	7.56	3.75	−5.96	0.000
EDI Interoceptive Awareness	29.83	7.73	7.19	5.13	−12.17	0.000
EDI Maturity Fears	22.42	7.55	9.52	3.86	−7.54	0.000
PANAS positive affect	37.61	16.29	59.70	12.44	5.48	0.000
PANAS negative affect	36.64	19.89	8.02	6.48	−6.74	0.000
Hunger	15.33	20.01	35.37	28.43	2.94	0.005
Cognitive performance						
VOSP Line Bisection Test: length deviation	6.79	6.72	5.63	5.51	−0.68	0.501
VOSP Line Bisection Test: middle deviation	2.21	1.89	2.11	1.58	−0.20	0.842
VOSP Number Location Test	9.42	1.02	9.41	0.84	−0.04	0.972
D2: correct	480.08	104.27	473.85	85.95	−0.23	0.816
D2: percentage of errors	1.57	1.11	1.16	1.09	−1.34	0.185
TMT: time A	28.62	8.33	25.00	7.36	−1.60	0.117
TMT: time B	58.19	15.70	53.19	12.23	−1.24	0.220
TMT: errors A	0.17	0.38	0.07	0.27	−0.99	0.326
TMT: errors B	0.08	0.28	0.07	0.27	−0.12	0.905
Intelligence						
Choice Vocabulary Test (verbal IQ)	102.25	9.43	101.48	10.39	−0.28	0.784
Viennese Matrices Test (non-verbal IQ)	114.38	18.58	119.89	16.74	1.12	0.270
	N	%	*N*	%	Chi^2	p
Achieved level of education					3.09	0.380
Obligatory school (9 years)	8	33.3	4	14.8		
Apprenticeship or full-time vocational school	9	37.5	10	37.0		
Higher education entrance qualification	5	20.8	10	37.0		
College or university	2	8.3	3	11.1		

BMI: Body Mass Index; BDI: Beck Depression Inventory; STAI: State-Trait Anxiety Inventory; EDI: Eating Disorder Inventory; PANAS: Positive and Negative Affective Schedule; VOSP: Visual Object and Space Perception Battery; D2: d2 Test of Attention; TMT: Trail Making Test.

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