

RESEARCH ARTICLE

Social Cognition in Eating Disorders: Encoding and Representational Processes in Binging and Purging Patients

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Abstract

Objective: The present study investigates social cognition impairments in 29 women with bingeing/purging spectrum eating disorders (ED) compared to 27 healthy controls.

Method: Measures were used to examine encoding and representational processes in relation to affect perception and affect attribution, as well as the ability to recognize mental causality in social relationships.

Results: ED patients failed to correctly encode causality in interpersonal relations, exhibited deficits in their ability to ascribe behaviour to mental states, and showed a greater tendency to attribute negative affects in interpersonal relationships. Stepwise regression analyses suggested that ED symptoms could account for deficits in the recognition of causality in interpersonal relations.

Conclusions: In addition to addressing ED symptoms, social cognition deficits should be addressed in the psychological treatment of EDs. Copyright © 2010 John Wiley & Sons, Ltd and Eating Disorders Association.

Keywords

eating disorders; social cognition; mentalization

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Introduction

Dysfunctional social cognition may play an important role in eating disorders (ED). Although this possibility is gaining increased recognition, little systematic research has been conducted. Recently, several groups have explored the possibility that deficits in social cognition found in anorexia nervosa (AN) are similar to those of patients with neurodevelopmental disorders such as Autistic Spectrum Disorders (Russell, Schmidt, Doherty, Young, & Tchanturia, 2009; Zucker, Losh, Bulik, LaBar, Piven, & Pelphrey, 2007). Zucker et al. (2007) presented a model for the investigation of social

cognition in AN (restricting type), suggesting similarities with autistic spectrum disorders. They suggested that deficits in social cognition may be central to the endophenotype of AN. Using the same research logic, we tested the hypothesis that the deficiency in social cognition in patients suffering from bulimia nervosa (BN) and bingeing/purging type anorexia nervosa (AN-B/P), focusing on recognition and awareness of emotions and on understanding cause-effect relations, may result from a global cognitive deficiency. This global deficiency may undermine their ability to correctly perceive and interpret social reality. The conceptualization used in this study combines the concepts of

mentalization and theory of mind, along with a social information-processing model, to examine the social cognition capacity of B/P patients.

Several studies have presented data suggesting that binging/purging behaviour is a more discriminative criterion of ED type than body weight. Thus, the restricting (AN-R) and binging/purging subtypes (AN-B/P and BN) are conceptualized to represent separate diagnostic categories (e.g. Vitousek & Manke, 1994; Williamson, Gleaves, & Stewart, 2005). Taxonomic studies further suggest that despite the likelihood of fluctuations among the different ED categories, AN-B/P is more akin in its personality-related attributes (e.g. affective dysregulation and mood intolerance), and patterns of comorbidity (e.g. more likely diagnosed with the dysregulated *DSM-IV* cluster B spectrum of personality disorders and mood disorders) to BN than to AN-R (Fairburn, Cooper, & Shafran, 2003; Vitousek & Manke, 1994). Based on these findings, we used the distinction between binging/purging (B/P) and restricting behaviours and focused on patients in the B/P spectrum.

Social cognition: Mentalization and the interpersonal arena in B/P patients

Social cognition is a complex skill that relates to understanding and action in interpersonal situations. According to Sergi and Green (2003) these are the cognitive processes involved in how people perceive and interpret information about themselves, others and social situations. They posit that this ability is related to the perception and interpretation of verbal and non-verbal social cues and the understanding of causality in social relationships. In recent years, much work has focused on the development of these ideas in the context of 'theory of mind' (see Tager-Flusberg (2007) for a review).

Current conceptualizations of the development of EDs, within the framework of psychodynamic theory, attachment and developmental studies, highlight the role of low reflective function (RF) and mentalization ability. The construct of RF refers to the capacity to reflect and interpret one's behaviour, as well as the behaviour of others, as caused by intentional internal mental states such as thoughts, feelings and beliefs. A major developmental factor facilitating the ability to mentalize is the caregiver's integrative mirroring of the infant's subjective experience (Fonagy, Gergely, Jurist, & Target, 2002). Adolescents for whom early experiences with others did not enable the construction of

differentiated self-other representations, experience difficulties in identifying and acknowledging internal states, in differentiating reality from fantasy, physical from psychic reality and lack the capacity to mentalize experience (Fonagy et al., 2002). Studies investigating mentalization ability in ED have suggested low levels of reflective functioning in ED patients (Fonagy et al., 1996). Impairments to the development of mentalization in ED may account for difficulties in making connections between emotional reactions and ED behaviours, as found among bulimic patients (e.g. Agras, Schneider, Arnow, Raeburn, & Telch, 1989). This global cognitive deficiency in mentalization may also undermine ED patients' ability to correctly perceive and interpret interpersonal relations. However, to our knowledge there is no research that has specifically examined mentalization ability in B/P patients.

Social cognition: Encoding and representation processes

Dodge and colleagues (Crick & Dodge, 1994; Dodge & Rabiner, 2004) present a model of social information processing and social adjustment in children, which maintains that interpersonal interactions activate a process involving simultaneous mental steps, representing different levels in social information processing. These mental steps proceed from the level of perceiving external and internal social cues to the level of responding to these cues behaviourally. The model also emphasizes that experience influences social information processing through mental schemas and representations. The present study focused on the first two levels, i.e. processes involved in selective attention to social cues and the encoding of these cues, on the one hand, and on the other hand, how these cues are interpreted and given meaning by deducing the intentions behind a given interaction. Although these processes occur in parallel, they also influence one another. While recognition and encoding affect the nature of interpretation and the representations constructed, mental representations affect encoding in a top-down process, in which previous knowledge affects the perception and organization of new information.

Social cognition among binging/purging patients

Most research in the field of social cognition among ED patients has focused on the perception of non-verbal cues, with an emphasis on the recognition of emotions

and facial expressions. Adolphs, Damasio, Tranel, Cooper, and Damasio (2000) presented a model of facial emotion recognition based on the simulation model of theory of mind, positing that we recognize other peoples' emotions by identifying with them through mentally visualizing ourselves with that facial expression. Based on this model, it can be anticipated that a deficiency in identifying and acknowledging internal emotional states could result in difficulty in understanding the emotional states of others. Studies examining the ability of patients with BN to describe their own and others' emotions support this hypothesis. BN patients show global emotion-processing deficits, expressed both in difficulties in facial emotion recognition (Kucharska-Pietura, Nikolaou, & Masiak, 2004), and in the level of representation of their own and others' emotional experiences and in the mentalization of others' emotional experiences (Bydlowski et al., 2005).

In a recent study that examined the representational processes using the social cognition and object relation scale (SCORS) developed by Westen (1991) to analyze narratives, Kernhof, Kaufhold, and Grabhorn (2008), found that ED patients had significantly lower scores on the affect-tone (AT) of relationship scale compared to controls. These data suggest that ED patients exhibit more pathological object relations in comparison to non-patients, and that they tend to perceive interpersonal interactions as malevolent and hurtful. Nonetheless, in this study no significant between-group difference was found on the understanding of social causality (USC) scale. In another study examining representations of object relations, BN patients were found to exhibit more pathological object relations involving malevolent relationships compared to AN-R patients (Piran, 1988). These findings suggest that social cognition in B/P patients may be significantly impaired.

The present study aims and hypotheses

The present study aimed to examine two fundamental levels of the ability to perceive social reality, according to the model proposed by Dodge and colleagues (Crick & Dodge, 1994; Dodge & Rabiner, 2004), namely encoding processes involved in the perception of social interactions, and the interpretation of social interactions based on representations. Encoding processes were examined using a test of facial emotion recognition and a test of the understanding of cause-effect sequences in visual stimuli. Representational

processes were examined by testing affect attribution in relationships and the ability to recognize and refer to mental causality within interpersonal relations.

Our first hypothesis was that ED patients would demonstrate lower ability to recognize affect, and would tend to attribute negative affect and malevolent interpersonal relations compared to controls. ED patients would also be less successful in correctly identifying a sequence of cause-effect relations in visual stimuli presenting relationships, and would avoid attributing causality originating from internal psychological processes to the relations described; or alternatively, they would attribute causality inappropriately, compared to controls.

Additionally, since high comorbidity rates of BN and depression have been reported (Stice, Burton, & Shaw, 2004), and deficient social cognition in ED patients might be attributed to depression (Phillips, Tiggemann, & Wade, 1997), another aim of the study was to examine the relative contribution of depression compared to ED symptomology in predicting deficient social cognition among participants. Our second hypothesis was that the presence of ED symptoms would be a better predictor of impairment in social cognition than depressive symptoms.

Method

Participants

The present study involved two samples of women between the ages of 19 and 30. A clinical sample comprised 29 patients from an adult ED inpatient department at a general hospital in Israel. All patients met the criteria for a *DSM-IV* (American Psychiatric Association, 1994) diagnosis of AN-B/P ($n=9$) or purging type BN ($n=20$) at admission, and had never been diagnosed with bipolar disorder, schizophrenic spectrum disorder, organic brain syndrome or substance use disorder. The control group comprised 27 undergraduates at the University of Haifa, who participated in the study as part of a course requirement. The students were subjected to a screening process involving a brief interview and questionnaire, and were found not to have ED symptoms.

Measures

ED and depressive symptoms

Symptoms of disordered eating were measured using the short version of the eating attitude test (EAT-26;

Garner *et al.*, 1982). Comorbid depression was assessed using the Beck depression inventory (BDI; Beck *et al.*, 1961).

Intelligence

IQ scores were estimated using participants' average scores on the block design and vocabulary subtests of the Hebrew edition of the Wechsler Adult Intelligence Scale (WAIS-III-Heb; Wechsler, 1997a). In further analyses we controlled for the influence of IQ scores by using them as a covariate in the analyses of variance.

Assessment of affect encoding processes—ability to recognize and judge affect

This test was designed specifically for the purposes of the study. Participants were presented with two faces expressing emotion, and their task was to decide whether the two faces were expressing the same or a different emotion. Stimuli were black and white photographs of faces of men and women, taken from research by Ekman and Friesen (1975). The test comprised forty trials, each with a different combination of two faces, using twenty pictures showing happy and angry faces of ten people (five women and five men). Ten pairs of pictures showed the same face exhibiting the same emotion (SS), ten pairs showed the same person with a different emotion (SD), ten pairs showed the face of a different person while the emotion was the same (DS) and ten pairs of pictures showed different people with different emotions (DD). Scores consisted of the number of correct answers. The test began with an explanation, and 20 practice trials during which participants received feedback. No feedback was given during the experimental trials. At the beginning of each trial, participants heard a 1 000 Hz tone for 100 milliseconds, followed by the appearance of a plus sign (+) at the centre of the screen for 160 milliseconds. The stimuli were then displayed at the centre of the screen until the subject responded. Every 10 trials, a screen appeared allowing the subject to take a break. To continue the task, subjects pressed the space bar on the keyboard. The same, previously randomized, order of trials was used for all participants. The task was performed on a Compaq Presario 2100 laptop computer with an Intel Celeron GHz 2.4 processor, 192 Mb of internal memory and a 14" TFT active monitor, with a Compaq Synaptics PS/2 mouse placed beside the screen. Participants were asked to respond as

quickly and as accurately as possible, with their right hand index finger on one of the two mouse buttons.

Representation processes— affect attribution in the TAT

The quality and manner of affect attribution was measured using the Affect Tone of Relationship Paradigms scale (AT) of the Social Cognition and Object Relation Scale (SCORS; Westen, 1991). The SCORS was designed to analyse participants' narratives generated using the Thematic Apperception Test (TAT; Murray, 1943). The narratives provided by each subject in response to TAT cards were analysed according to the SCORS scoring guide (Westen, 2002), and a score was assigned on a scale of 1–7 for each card, reflecting the subject's level on each subscale. The validity of the SCORS scales has been established, for example, in work by Westen, Lohr, Silk, Gold, and Kerber (1990) on adolescents diagnosed with borderline personality disorder. Two subscales from the SCORS were used: The AT scale and the Understanding of Social Causality scale (USC). The AT scale measures the affect-tone attributed to people and interpersonal relationships in the situation presented. Low scores suggest that the respondent views the social world as malevolent and other people as threatening, abusive and abandoning (e.g. 'This woman has been physically abused, and has just been beaten'). High scores suggest that the subject has a spectrum of supportive and beneficial emotional attributions, in which people are described as capable of loving and being loved, and are reliable (e.g. 'A man and woman who love one another are in conflict as to whether the man should go to war. He eventually goes, but returns safely'). Seven TAT cards were used: Cards 1, 2, 4, 6GF, 7GF, 9GF and 18GF. With the exception of card 1, these cards depict social situations. Administration of the TAT followed the procedures outlined by Murray (1943).

Perception of sequence and causation

To assess the perception of sequence and causation, the Hebrew edition of the picture arrangement subtest of the WAIS-III (Wechsler, 1997a) was used. This subtest assesses the ability to perceive appropriately social situations based on visual stimuli, and scores have been found to provide a good index of the understanding of cause–effect relations and of the ability to interpret non-verbal cues of others (e.g. Campbell &

McCord, 1996). The test comprises eleven items, each of which consists of a series of picture cards that tell a story. The cards are presented to the subject out of sequence, in a predetermined order, and the subject's task is to rearrange the pictures to create a logical story sequence, within an allotted time limit.

Representational processes—understanding and attribution of causality

The level of understanding and attribution of causality in social situations was measured using the USC of the SCORS (Westen, 1991). Low scores suggest low ability to understand causality expressed by the absence of attributions for interpersonal phenomena, or confused or highly unlikely attributions (e.g. 'This boy wanted to play the violin, and he went to the store and bought candy and didn't play the violin'). High scores suggest an understanding of the way in which complex psychological processes are involved in the formation of thoughts, emotions and actions (e.g. 'He feels very anxious, probably because it reminds him of the way his mother treated him'). The narratives provided by each subject in response to their TAT cards were analysed, and a score was assigned on a scale of 1–7 for each card (Westen, 2002).

Assessment of possible intervening variables

To control for the possible confounding effects of differences in concentration and attention, we measured attention to neutral content unrelated to weight and food using the following measures:

Picture completion subtest of the WAIS-III (Wechsler, 1997a), which assesses the ability to focus visual attention and alertness in relation to the external environment. The test consists of a series of 25 pictures representing objects, each missing an important detail, which the participant must identify. No significant between-group differences were found (B/P: $M = 10.82 \pm 2.18$; Control: $M = 10.96 \pm 2.51$; $\xi^2 = 0$).

Digit span subtest of Wechsler memory scale—revised (Wechsler, 1997b), which assesses memory for auditory series of digits not logically related and is a good indicator of attention span and distractibility. The subtest consists of digit span forward and digit span backward tests. No significant between-group differences were found (B/P: $M = 17.72 \pm 3.18$; Control: $M = 19.37 \pm 3.83$; $\xi^2 = .05$).

Trail making test (Reitan, 1958), which comprises two parts. Part A measures the ability to control attention, and Part B measures the ability to divide attention. In each part the subject is instructed to work as quickly as possible and to try not to lift their pencil from the paper. The time needed to complete each task serves as the subject's score. No significant between-group differences were found on parts A (B/P: $M = 29.93 \pm 7.8$; Control: $M = 28.39 \pm 7.12$; $\xi^2 = .01$) or B (B/P: $M = 65.48 \pm 18.65$; Control: $M = 58.88 \pm 23.62$; $\xi^2 = .02$).

Procedure

Two meetings were held with all patients hospitalized in the ward. The head of the ward, also attended the first meeting to explain the research. Patients were invited to participate in the study on a voluntary basis, with treatment unconditional on participation. After participants provided written consent, they were invited to a single session, in which all the measures were administered. Women in the control group were tested at the University of Haifa in a single session that lasted 2 hours. At the beginning of the session, participants completed the EAT-26 and the BDI, in order to identify subjects suffering from past or present disorders of ED and/or depression. None of the participants showed any such psychopathology. The TAT was scored by A.S, who was trained by the first author. A graduate student in clinical psychology who was blind to the patient's subgroup and to A.S's scoring, and who was supervised by the first author, scored 60% of the protocols independently. Using Pearson correlation coefficients, excellent inter-rater reliability was obtained for the scales in the study ($r = 0.88$ for the USC, $r = 0.95$ for the AT).

Results

Initially, χ^2 tests and ANOVA were conducted where appropriate for demographic variables, symptoms and intelligence (Table 1). There were no significant differences between groups on demographic variables. As expected significant differences were found in terms of ED and depressive symptoms, as well as estimated IQ scores, which is understandable, given that the control group was composed entirely of university students, and that ED often impairs cognitive functioning.

Before examining the study's hypotheses, we inspected possible differences between our subgroups of ED (BN and AN-B/P) on the study variables. We

Table 1 Comparison of demographic and clinical characteristics between binging/purging spectrum patients and controls

Characteristics	Binging/purging patients ^a (n = 29)	Control group (n = 27)	F	ξ^2
	M ± SD	M ± SD		
Age	23.34 ± 3.84	23.11 ± 1.18	0.09	.02
IQ estimate ^b	10.70 ± 1.52	12.9 ± 1.13	37.2**	.69
EDs (EAT-26 ^c)	44.17 ± 15	2.85 ± 1.74	202.01**	3.74
Depression (BDI ^d)	30.93 ± 11.5	2.33 ± 2.18	161.31**	2.99
	n (%)	n (%)	χ^2	r ^e
Fathers' education:				
High school education (only)	16(55.17%)	9 (33.33%)	2.75	.22
Academic education	13 (44.83%)	18 (66.66%)		
Mothers' education:				
High school education (only)	17 (58.62%)	11 (40.74%)	1.78	.18
Academic education	12 (41.38%)	16(59.26%)		
Family status:				
Single	28 (96.55%)	25 (92.59%)	3.10	.23
Married	0 (0%)	2 (7.4%)		
Divorced	1 (3.44%)	0 (0%)		

^a Anorexia nervosa—binging/purging type and bulimia nervosa. ^b Mean of vocabulary and block design subtests of the WAIS-III. ^c Garner, Olmsted, Bohr, & Garfinkel, 1982. ^d Beck, Ward, Mendelson, Mock, & Erbaugh, 1961. ^e $r(\Phi)$ were computed for χ^2 from the contingency table. ** $p < .0001$.

computed the Z-scores of each of the AN participants in the distribution of the BN participants. As can be seen in Table 2, the large majority of the scores of the AN women fell well within the distribution of the scores of the BN women, such that it made sense to pool their scores into one experimental group.

Affect recognition and attribution

Analyses of covariance (ANCOVA) was used to examine differences between groups on the affect-judgment task, and on the AT scale of the SCORS, assessing the tendency to attribute affect in social context, with estimated IQ as a covariate (Table 3). No significant group difference was found in the affect recognition task, suggesting that the two groups were equally successful in recognizing affect when the faces were presented as isolated stimuli. A

significant group difference was, however, found on the AT scale, with the clinical group showing a significantly elevated tendency to attribute negative affect compared to the control group, which tended to attribute more neutral or positive affect.

Sequence perception and understanding of causality

ANCOVA was used to examine group differences in the ability to recognize a sequence of cause-effect in stimuli depicting relationships (picture arrangement subtest), and in the understanding and attribution of causality in social situations (SCORS, USC scale), with estimated IQ as a covariate (Table 3). The clinical group had lower scores on the picture arrangement subtest compared to the control group. Furthermore, the clinical group

Table 2 Equivalence of BN and AN-B/P groups: Z-scores of each of the AN participants in the distribution of the scores of the BN women

Variable	Bulimia nervosa Mean (SD)	Anorexia nervosa Mean (SD)	Mean Z score of AN in BN distribution	Number of AN cases more than 1.5 SD from the mean of BN*
Estimated IQ	11.1(1.49)	9.96(1.25)	-0.849	1
EAT-26	45.22(14.39)	45.22(17.15)	0.11	2
BDI	30.15(11.94)	33.6 (10.70)	0.22	1
Picture arrangement	9.85 (2.25)	9.0 (1.12)	-0.38	0
Social causality (SCORS)	3.39 (0.58)	3.12 (0.31)	-0.45	0
Affect tone (SCORS)	3.26 (0.53)	3.38 (0.59)	0.23	2
Emotion recognition	38.55 (1.54)	37 (2.45)	-1.006	3**

Note. SCORS = Social Cognition and Object Relations Scale.

* No cases were farther than 1.8 from the mean. ** 2 cases more than 2 SD from the mean.

Table 3 One-way analyses of variance of study variables for the clinical and control group: Means, standard deviations and *F* values

Variable	B/P spectrum ^a (<i>n</i> = 29) <i>M</i> (<i>SD</i>)	Control group (<i>n</i> = 27) <i>M</i> (<i>SD</i>)	<i>F</i> (1, 54)	ξ^2
Recognition and affect attribution:				
Facial emotion recognition	37.55 (2.48)	37.48 (2.13)	0.5	.04
Affect-tone scale: (SCORS)	3.33 (0.54)	4.41 (0.44)	51.53**	.97
Encoding and conceptualization of causality:				
Picture arrangement subtest	9.58 (1.99)	11.7 (2.43)	4.32*	.08
Social causality scale: (SCORS)	3.31 (0.52)	3.95 (0.53)	8.49*	.16

Note. The means presented in the table are the estimate means after controlling for the covariates.

SCORS = Social Cognition and Object Relations Scale.

^aB/P—Binging/purging spectrum = AN-binging/purging type and bulimia nervosa. **p* < .05. ***p* < .0001.

showed a tendency to avoid attributing causality to the relations depicted, or alternatively attributed inaccurate causality in interpersonal relationships.

ED, depressive symptoms and IQ estimate as predictors of affect attribution and the understanding of causality

In order to examine the second hypothesis on the relative contribution of ED, depressive symptoms and differences in IQ in accounting for the differences described above, stepwise regression analyses were conducted for those measures in which we found significant differences. The dependent variables were the nature of affect attribution (SCORS, AT scale), recognition of cause and effect processes in relationships (picture arrangement subtest), and the level of attribution of causality in relationships (SCORS, USC scale). The predictive variables were EAT-26 scores, BDI scores and IQ estimate. In all regression analyses, the criterion for inclusion in the model was a significance level of 10% (Table 4).

The regression model examining predictors of affect attribution (AT) was significant ($F(2,53) = 33.94$, $p < 0.001$). Two variables passed the significance level criterion: With depressive symptoms (BDI), as the first significant variable explaining 52% of the variance. Reported ED (EAT-26), as a second predictor, raised the explained variance to 56%. The regression model for perception of sequences (picture arrangement subtest) was also significant ($F(2,53) = 7.83$, $p < 0.01$), with only reported ED symptoms (EAT-26) passing the significance criterion and explaining 18% of the variance. The regression model of the understanding of social causality (USC) was significant ($F(2,53) = 8.64$, $p < 0.001$). Two variables passed the significance criterion: ED symptoms (EAT-26) and IQ, accounting for 24% of the variance.

Discussion

The present study aimed to investigate the impairment of social cognition among women with ED in the binge/purge spectrum. We tie the reflective function and mentalization model (Fonagy et al., 2002), with a

Table 4 Standardized estimates of stepwise regressions predicting differences between clinical and control group in affect attribution, picture arrangement subtest and understanding social causality

Dependent variable	Predictors	<i>F</i> (2, 55)	SE	β	<i>R</i> ²	Adj <i>R</i> ²
Affect tone (SCORS)	Step 1—BDI questionnaire	33.94	0	−0.40*	0.52	0.54
	Step 2—EAT-26 questionnaire		0.04	−0.37*	0.04	
Encoding causality (picture arrangement)	Step 1—EAT-26 questionnaire	7.83	0.01	−0.32*	0.18	0.20
Social causality (SCORS)	Step 1—EAT-26 questionnaire	8.64	0.01	−0.31*	0.19	0.22
	Step 2—IQ		0.04	0.26**	0.05	

Note. SCORS = Social Cognition and Object Relations Scale.

p* < .05. *p* = .06.

cognitive and neuropsychological model of ToM in a developmental context (e.g. Zucker *et al.*, 2007). It was hypothesized that ED patients with binge/purge symptoms would demonstrate lower ability to recognize affect, and would tend to attribute greater negative affect and malevolent interpersonal relations compared to controls. It was also hypothesized that ED patients would be less successful in correctly identifying cause–effect relations in visual stimuli pertaining to relationships, and would either avoid attributing causality originating in internal psychological processes or would attribute causality inappropriately. As regards the first hypothesis, we did not find differences between the clinical group and controls in their ability to recognize affect presented as isolated, simple stimuli. However, this may have resulted from a methodological artefact, as our task had no time limit.

In the scant literature on emotion recognition in ED patients, the findings tend to be equivocal. Whereas Kessler, Schwarze, Filipic, Traue, and Wietersheim (2006) did not find any difference between women suffering from ED and a control group, Kucharska-Pietura *et al.* (2004) did find such difference. Kessler *et al.* (2006) suggest that emotion judgment tasks may activate different recognition mechanisms than previously believed. They note that it is possible to succeed in any emotion recognition task by scanning alone, through the operation of cognitive pattern recognition mechanisms, without applying any processes involving emotion recognition. Thus, the clinical group's success on this task in our study may not be informative about these processes, and could be understood as resulting from normal pattern recognition. In order for recognition tasks to be more sensitive to emotion recognition, it may be necessary to present complex emotional stimuli with subtle differences, and to measure response times to reflect real-life situations where emotions need to be recognized at once.

While we did not find any impairment in the recognition of emotions, there was a difference between women with and without B/P symptoms in the interpretation processes of relations. Subjects in the clinical group showed lower levels of affect attribution compared to controls, and their affect attribution was mostly negative, involving malevolence and hurt. This internalized system of object relations or working models among B/P women may suggest, as was found by Meyer and Russell (1998), that they have learned to expect others to be unavailable and insensitive to their

needs, due to problematic early relationships. We further found that BP patients were less successful than controls in correctly encoding cause–effect relations in a social context, and have a deficiency in the development of representations of social causality, showing a low ability to understand the logic and adequacy of social causality in interpersonal events. These findings suggest a developmental impairment of the capacity for mentalization of experiences.

The second hypothesis, that the presence of ED symptoms would be more predictive of deficiencies in the measures of social cognition than the existence of depressive symptoms, is supported by our results with regard to the measures of social causality, but not with the measures of affect attribution. The differences between the groups in negative affect attribution were linked mainly to self-reported depressive symptoms and to a lesser extent to ED symptoms. B/P patients showed high scores on the BDI, indicating greater presence of symptoms related to depression. This finding is in line with research demonstrating a link between bulimia and depression (e.g. Stice *et al.*, 2004). Our study further points to a connection between depression and representational processes, reflecting negative affect attribution in relationships. Thus, it can be inferred that the depressive component among ED patients may develop based on an internalization of relationships as malevolent and hurtful. In our opinion, these data suggest, in contrast to the claim of Bydlowski *et al.* (2005), that depression should be seen as an inseparable element of ED, rather than as a confounding factor. In the absence of internalization of calming, beneficial representations that could help in coping with negative moods, patients may turn to bulimic symptoms as a means to escape emotional distress.

With regard to measures of sequence and understanding of causality, while high levels of ED symptoms were a significant predictor of deficiency in the recognition of cause–effect relations, damage to the representational aspect was related primarily to the existence of an ED, but also to intelligence. The relations between intellectual capacity and the ability to understand causality is not surprising, as this ability is affected by the level of abstraction constituting an aspect of IQ (Hibbard, Hilsenroth, Hibbard, & Nash, 1995). Importantly, our data show that when we controlled for IQ, a significant difference was still found. This suggests that EDs may be linked to lower ability to draw conclusions about mental states pertaining to self and others regardless of intellectual ability.

Limitations of this research

Although our work sheds light on important aspects of social cognition in ED that have until now received little systematic attention, the results should be considered preliminary and treated with caution, due to the small samples involved. Furthermore, as we have studied only hospitalized ED patients with B/P symptoms, the results cannot be generalized to patients with less severe ED pathology. Future research should attempt to replicate our findings in larger cohorts of ambulatory patients.

Another problem concerned the emotion recognition task used in this study. In future research, the use of response time and a measure of accuracy, as well as examination of complex emotions should be employed to provide comprehensive assessment in this area. Furthermore, the control group in this study was composed entirely of undergraduate psychology students, a population which was difficult to match in terms of education and IQ in the clinical group. Nonetheless, the regression analysis suggested that IQ was related only to the representational level referring to causality, and not to other variables.

It could be claimed that the findings of this study might reflect the acute nature of the ED among our participants (e.g. Vitousek & Manke, 1994; Vitousek & Stumpf, 2005). The finding that depression accounted for most of the variance in attribution of negative affect raises the possibility that high levels of negative attribution of affect may be a state and not a trait among B/P patients. Therefore, future studies need to determine whether this social cognition deficit as well as the other deficits found in our study are enduring personality traits that may potentially predispose to ED (Vitousek & Stumpf, 2005).

Research and clinical implications

This study highlights the advantage of utilizing knowledge from different fields of psychology in order to understand psychopathology. The model of Dodge and colleagues (Crick & Dodge, 1994; Dodge & Rabiner, 2004) contributes understanding of the significance of examining processes on different levels, and suggests that deficient social cognition among women suffering from B/P symptoms may be linked more to interpretation and representational processes of affect perception and causality, than to encoding of affect. These difficulties may result from deficits in the formation of representa-

tions of the self and others, which undermine the ability to interpret interpersonal reality appropriately.

Clinically, our results suggest that the psychological treatment of EDs should address deficiencies in social cognition as well as ED symptoms. For example, treatment could focus on awareness of negative attribution style in interpersonal situations that distort the understanding of relationships. Treatment could also focus on the development of mentalization by promoting better understanding of how the mental states of others and oneself arise and influence interpersonal relations. As Bleiberg (2001) has pointed out, such treatment components may contribute to improvement in social relations, and the ability to regulate negative moods and emotional distress.

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