Rank Perception and Self-Evaluation in Eating Disorders

Valentina Cardi, PhD1*
Rosalia Di Matteo, PhD2
Paul Gilbert, PhD., FBPsS, OBE3
Janet Treasure, PhD. FRCP, FRCPsych, OBE1

ABSTRACT
Objectives: Heightened sensitivity to social comparison and negative self-evaluation have been implicated in the development and maintenance of eating disorders (EDs). This study used behavioral tasks, as well as self-report measures, to examine processing of social rank-related cues and implicit self-concept in participants with EDs.

Method: Fifty healthy participants (HCs), 46 people with an ED, and 22 people recovered from an ED (REC) undertook an attentional bias task using social rank-related cues and an implicit self-evaluation task. In addition, they completed self-report measures of social comparison, submissive behavior, and shame.

Results: People with EDs showed vigilance toward social rank-related stimuli and lower implicit positive self-evaluation than HCs. Self-report data confirmed the behavioral findings and showed that people with EDs had higher levels of unfavorable social comparison, submissive behaviors, and external and internal shame than HCs. People who had recovered from an ED showed an intermediate profile between the two groups.

Discussion: People with EDs have heightened sensitivity to social rank-related cues and impaired self-evaluation at an automatic level of processing. Some of these biases remain in people who have recovered. Interventions which aim to remediate social threat sensitivity and negative bias about self and others might be of benefit in EDs. © 2014 Wiley Periodicals, Inc.

Keywords: eating disorders; attention; implicit self-esteem; social rank; shame

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Introduction

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Eating disorders (EDs) are primarily characterized by problems with eating, weight, and shape, but social difficulties have also been identified. Childhood negative self-evaluation, loneliness, shyness, and feelings of inferiority have been implicated in the onset of the illness.1–4 Experiences of negative social evaluation, such as teasing and bullying,5 and “fat talk”6 are often reported and linked to the precipitation of shape and weight concerns, through the internalization of sanctioned cultural standards of acceptance (e.g. thin ideal)7,8 and heightened tendency to social comparison.9,10 Once developed, ED symptoms reinforce interpersonal problems, such as isolation11 and loneliness.12 A systematic review and meta-analysis of social processing in Anorexia Nervosa (AN)13 found high levels of social inferiority (e.g. unfavorable social comparison, submissive behaviors, beliefs that others judge them negatively; effect size = 1.21) and negative self-evaluation (i.e. low self-esteem; effect size = 1.59) in AN patients compared to healthy controls. Most of this evidence has been gathered from self-report measures, and only a few studies have measured automatic processing of self-relevant and social stimuli in EDs.

Experimental studies on social processing in EDs show that people with AN have a negatively biased perception of social stimuli, with attentional interference for angry faces14 and an attentional bias toward critical faces;15 blame focused on other people, rather than situational variables in frustrating social situations;16 and failure to identify intimacy.17 Some of the difficulties are also present in...
recovered patients, including sensitivity to rejection,\textsuperscript{15} feelings of inferiority to others,\textsuperscript{18} and perception of low social rank.\textsuperscript{19,20} This suggests that there might be both state and trait difficulties in social processing which underpin the typical psychopathology of EDs. The importance of social factors as causal and maintenance factors in EDs have been described in several explanatory models.\textsuperscript{21–23}

The need to maintain a positive image of the social self is a fundamental human trait. Part of this includes vigilance to threats that might affect self-esteem, social status and self-worth.\textsuperscript{24} Social-evaluative threat occurs when a valued aspect of self-identity is, or is feared to be, negatively judged by others.\textsuperscript{25} It has been shown to be among the most salient stressors to the human neuroendocrine system\textsuperscript{25} and to elicit stronger neural reactions among anxious adults than physical threat stimuli.\textsuperscript{26} Loneliness and social exclusion heighten the sensitivity to social threats and increase depressive symptomatology.\textsuperscript{27} This can set up a vicious circle of poor interpersonal functioning.

Recent studies found evidence of a correspondence between the attentional response to threat cues and neural circuits involved in threat perception, such as the anterior cingulate cortex, amygdala, and the dorsolateral prefrontal cortex. The use of multidimensional measures to investigate abnormalities in primary behavioral functions (e.g. threat and reward systems) across mental disorders follows the principles advocated by the Research Domain Criteria initiative of the National Institute of Mental Health (2009). The RDoC project encourages the building of evidence to classify psychological disorders in terms of observable behaviors and brain functions (http://www.nimh.nih.gov/research-priorities/rdoc/nimh-research-domain-criteria-rdoc.shtml). The use of this interpretative framework and multidimensional measures might represent a step toward understanding the circuits involved in EDs.

The aim of this article is to investigate automatic processing of social and self-related cues in currently ill ED patients, a sample of recovered participants, and healthy controls. To our knowledge, this is the first study using self-reports as well as behavioral measures of cognitive functioning to investigate rank perception in EDs. Behavioral tasks allow us to assess implicit, automatic evaluation of social stimuli and can be an ecologically valid measure of real-life functioning. Also, they are less sensitive to social desirability and self-presentation concerns, and can tap into different mental processes than those activated in completing self-reports.

**Hypotheses.** Based on the literature described above it was hypothesised that people with EDs would show:

- Heightened vigilance to rank-related stimuli;
- Lower implicit positive self-evaluation;
- Higher levels of external shame (i.e. belief that more powerful others look down on the self), unfavorable social comparison, submissive behaviors, and internal shame (i.e. shame related to the self) than healthy controls (HCs); on self-report measures.

Also, it was hypothesised that:

- There would be correlations between the behavioral and self report measures;
- Social and self-related difficulties would be also present in people who had recovered from an ED;
- Attentional bias to social rank and implicit self-evaluation would predict eating disorders and mood symptoms.

**Method**

**Participants**

Participants were recruited from the Institute of Psychiatry Eating Disorders Unit’s volunteer database, through advertisements placed on the BEAT (Beating Eating Disorders) website and through a circular email sent out to the staff and students at King’s College London. Inclusion criteria consisted of: women between 16 and 65 years old, fluent in English, with normal visual acuity and no motor impairment. A tailored version of SCID-I (only the overview, screening and EDs modules, and open questions on past or present history of anxiety and mood disorders), which is a standardized interview for diagnostic assessment of DSM-IV disorders,\textsuperscript{28} was administered to screen for past or current mental health disorder in HCs and to confirm the diagnosis of EDs. The recovered group (REC) consisted of participants with a past ED, who had a body mass index (BMI; kg/m) of at least 18.5, reported no binge eating, purging, or fasting in the prior 3 months, and scored within 1 SD of age-matched community norms\textsuperscript{29} on each of the EDE-Q subscales.\textsuperscript{30,31} Ethical approval was obtained from the Psychiatry, Nursing and Midwifery Research Ethics Sub-Committee, King’s College London. All participants provided written informed consent in order to take part in the study.

**Measures**

A demographic questionnaire including questions on: ethnicity, medication, visual impairment, neurological
condition, employment status, current occupation, years of education, eating disorders duration, highest/current/lowest BMI, marital status, number of children, household sharing, diagnosis of psychiatric conditions in the family, and comorbidity was completed by all participants (Table 1). Participants also completed the following standardized measures.

**Eating Disorder Examination Questionnaire (EDE-Q).** This questionnaire is a 36-item self-report version of the original interview. The EDE-Q is composed of four subscales: weight concern, shape concern, eating concern, dietary restraint, and a global score (a composite mean score of the 4 subscales). Scores ranging from 0 to 6 on a Likert scale correspond to high concurrent and criterion validity. The Cronbach's $\alpha$ for the sample tested in this study was 0.95.

**Depression Anxiety Stress Scales (DASS).** The DASS is a 21-item three-scale self-report measure of depression, anxiety, and stress. Higher scores are related to higher levels of depression, anxiety, and stress. The scale has been validated and found to possess good reliability, with Cronbach's $\alpha$ to be 0.94 for depression, 0.87 for anxiety, and 0.91 for stress. The overall Cronbach's $\alpha$ for the sample tested in this study was 0.95.

**The Personal Feelings Questionnaire (PFQ-2).** This is a self-report measure of shame and guilt proneness in which participants rate how often they have experienced each of 16 feelings over the last few days on a 5-point scale ranging from never to continuously or almost continuously. Higher scores indicate higher levels of shame and guilt proneness. The validation study showed that the PFQ-2 has good internal reliability. The Cronbach's $\alpha$ for the sample tested in this study was 0.90. Only the items related to shame proneness were considered in this study.

**The Other as Shamer Scale (OAS).** This 18-item self-report questionnaire measures the perception of negative judgments by more powerful others on the self using a 5-point Likert scale. The scale showed a good reliability in the validation study, with a Cronbach's $\alpha$ of 0.92. The Cronbach's $\alpha$ for the sample tested in this study was 0.95. Higher scores indicate higher levels of shame.

**The Social Comparison Scale (SCS).** This self-report questionnaire uses a semantic differential methodology to measure social comparison. There are 11 items measuring a respondent's global social comparison of themselves in relation to others on a series of bipolar constructs rated 1 to 10. Low scores indicate feelings of inferiority and low rank self-perceptions. The validation study showed that this scale has good reliability, with Cronbach's $\alpha$ of between 0.88 and 0.96 with clinical population and between 0.90 and 0.91 with student population. The Cronbach's $\alpha$ for the sample tested in this study was 0.94.

**The Submissive Behavior Scale (SBS).** This self-report measures behavioral frequency of 16 examples of submissive behavior on a 5-point Likert scale. The validation study of this scale showed that it has a Cronbach's $\alpha$ of 0.82 and 4-month test–retest reliability. The Cronbach's $\alpha$ for the sample tested in this study was 0.92.

**Visual Probe Detection Task.** This is a visual probe detection task originally developed by Posner et al. and it assesses attentional bias. The participant's task is to respond to a probe stimulus that is initially hidden from view behind one of two stimuli. A fast reaction time (RT) suggests that attention has been directed to the stimulus that obscured the probe.

The stimuli consist of eight grey-scale pictures of faces of different people (male and female) providing neutral and dominant poses and neutral and submissive poses. The facial pose is of direct eye gaze and upward head tilt to express dominance and averted eye gaze and a downward head orientation to communicate submission. Previous studies showed that these facial poses effectively communicate social dominance and submission. In the dot-probe task each neutral picture is matched with a dominant or submissive pose of the same person. The task consists of 16 practice and 64 experimental trials (16 dominant-neutral pairs and 16 submissive-neutral pairs, repeated twice, once with the emotional face on the right and once on the left) presented in random order for each participant.

Following a fixation point (500 ms), a picture pair appears for 500 ms, followed by a probe (two dots either arranged vertically or horizontally) replacing the picture on either the left or the right of the screen. The probe remains on the screen until the participant makes a response by pressing the appropriate labelled key on the keyboard. Participants are instructed to indicate, as quickly and accurately as possible, which probe appears on the screen after the presentation of the picture pair. The task was programmed using E-Prime psychology software (Psychology Software Tools, Inc., Pittsburgh, PA).

**Implicit Association Test.** The purpose of this procedure is to measure the strength of automatic associations between concepts. Association between concepts that share a response key is inferred to be stronger the faster the subject performs the task. Two subversions of the task were used:
TABLE 1. Sociodemographic and clinical variables

<table>
<thead>
<tr>
<th></th>
<th>EDs (N = 46)</th>
<th>REC (N = 22)</th>
<th>HCs (N = 50)</th>
<th>Test Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>27.3 (10.2)</td>
<td>29.5 (8.4)</td>
<td>25.3 (7.4)</td>
<td>$F_{[2,115]} = 1.8$, $p =$ NS</td>
</tr>
<tr>
<td>Years of education</td>
<td>15.8 (3.4)</td>
<td>16.4 (5.0)</td>
<td>16.7 (3.0)</td>
<td>$F_{[2,115]} = 7$, $p =$ NS</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>19.0 (4.0)</td>
<td>21.8 (2.3)</td>
<td>21.7 (1.9)</td>
<td>$F_{[2,115]} = 11.6$, $p &lt; .001$. ED vs. REC: $p =$ .001. REC vs. HC: $p =$ NS. ED vs. REC + HC: $t_{[116]} = -4.8$, $p &lt; .001$</td>
</tr>
<tr>
<td>Length of illness (yrs)</td>
<td>10.5 (9.5)</td>
<td>8.0 (6.2)</td>
<td>N/A</td>
<td>$t = 1.1$, $p =$ NS</td>
</tr>
<tr>
<td>Psychiatric medication (yes/no)</td>
<td>45.7%</td>
<td>22.7%</td>
<td>N/A</td>
<td>$\chi^2(1) = 3.3$, $p =$ .06</td>
</tr>
<tr>
<td>No. previous admissions</td>
<td>37%</td>
<td>27.3%</td>
<td>N/A</td>
<td>$\chi^2(1) = 0.6$, $p =$ NS</td>
</tr>
<tr>
<td>Psychiatric disorder other than ED diagnosed (yes/no)</td>
<td>43.5%</td>
<td>27.3%</td>
<td>N/A</td>
<td>$\chi^2(1) = 1.6$, $p =$ NS</td>
</tr>
<tr>
<td>Without a partner (single/divorced vs. in a relationship)</td>
<td>80.4%</td>
<td>68.2%</td>
<td>38%</td>
<td>$\chi^2(2) = 18.7$, $p &lt; .001$</td>
</tr>
<tr>
<td>EDE-Q restriction</td>
<td>3.8 (1.5)</td>
<td>1.9 (5.9)</td>
<td>0.7 (0.8)</td>
<td>$F_{[2,115]} = 14.9$, $p &lt; .001$. ED vs. REC: $p =$ .003. ED vs. HC: $p &lt; .001$. REC vs. HC: $p =$ NS. ED vs. REC + HC: $t_{[116]} = 5.1$, $p &lt; .0001$</td>
</tr>
<tr>
<td>EDE-Q eating concern</td>
<td>4.0 (3.9)</td>
<td>1.0 (1.2)</td>
<td>0.2 (0.3)</td>
<td>$F_{[2,115]} = 27.5$, $p &lt; .001$. ED vs. REC: $p &lt; .001$. ED vs. HC: $p &lt; .001$. REC vs. HC: $p =$ NS. ED vs. REC + HC: $t_{[116]} = 7.3$, $p &lt; .0001$</td>
</tr>
<tr>
<td>EDE-Q weight concern</td>
<td>3.8 (1.4)</td>
<td>1.9 (3.1)</td>
<td>0.8 (0.7)</td>
<td>$F_{[2,115]} = 39.5$, $p &lt; .001$. ED vs. REC: $p &lt; .001$. ED vs. HC: $p &lt; .001$. REC vs. HC: $p =$ .04</td>
</tr>
<tr>
<td>EDE-Q shape concern</td>
<td>4.5 (1.3)</td>
<td>1.8 (1.7)</td>
<td>1.2 (1.0)</td>
<td>$F_{[2,115]} = 84.0$, $p &lt; .001$. ED vs. REC: $p &lt; .001$. ED vs. HC: $p &lt; .001$. REC vs. HC: $p =$ .05</td>
</tr>
<tr>
<td>EDE-Q total</td>
<td>4.0 (1.5)</td>
<td>1.7 (2.6)</td>
<td>0.8 (0.6)</td>
<td>$F_{[2,115]} = 56.1$, $p &lt; .001$. ED vs. REC: $p &lt; .001$. ED vs. HC: $p &lt; .001$. REC vs. HC: $p =$ NS. ED vs. REC + HC: $t_{[116]} = 12.7$, $p &lt; .0001$</td>
</tr>
<tr>
<td>DASS stress</td>
<td>18.0 (8.7)</td>
<td>10.9 (7.1)</td>
<td>6.4 (5.4)</td>
<td>$F_{[2,115]} = 32.0$, $p &lt; .001$. ED vs. REC: $p =$ .001. ED vs. HC: $p &lt; .001$. REC vs. HC: $p =$ .05</td>
</tr>
<tr>
<td>DASS depression</td>
<td>21.5 (12.9)</td>
<td>4.8 (6.0)</td>
<td>3.9 (4.5)</td>
<td>$F_{[2,115]} = 52.0$, $p &lt; .001$. ED vs. REC: $p &lt; .001$. ED vs. HC: $p &lt; .001$. REC vs. HC: $p =$ NS. ED vs. REC + HC: $t_{[116]} = 10.2$, $p &lt; .0001$</td>
</tr>
<tr>
<td>DASS anxiety</td>
<td>13.0 (10.3)</td>
<td>5.6 (5.9)</td>
<td>3.3 (3.3)</td>
<td>$F_{[2,115]} = 23.1$, $p &lt; .001$. ED vs. REC: $p &lt; .001$. ED vs. HC: $p &lt; .001$. REC vs. HC: $p =$ NS. ED vs. REC + HC: $t_{[116]} = 6.7$, $p &lt; .0001$</td>
</tr>
</tbody>
</table>

Sociodemographic and clinical variables compared between groups, expressed as mean [standard deviation], and percentage. One-way ANOVAs and $\chi^2$ calculated. EDs, eating disorders; REC, recovered participants; HCs, healthy controls; NS, nonsignificant.

- The self-esteem IAT included “me”/“other” words, and positive and negative personality words from Anderson;43
- The self-compassion IAT included “me”/“other” words, and positive and negative words from Cooper and Cowen44 “lack of warmth” dimension and from
Each IAT consists of seven blocks of categorization trials, with 20 trials for practice blocks and 40 trials for data collection blocks. Each stimulus is displayed until the correct response is given. The next stimulus item follows at 150 ms intertrial interval.42

The IAT involves five steps. In each step, the subject press a left or right key to rapidly categorize each of a series of stimuli that are presented in the middle of a computer screen. Instructions for the categorization task vary for the five steps.

- **Step 1 (block 1, 20 trials):** participants practice a target concept discrimination by categorizing items into “me” and “other” categories;
- **Step 2 (block 2, 20 trials):** participants practice an attribute discrimination by categorizing items into positive and negative categories;
- **Step 3 (block 3, 20 trials and block 4, 40 trials):** participants categorize items into two combined categories, each including the target and attribute concept that were assigned to the same key in the preceding two steps (self + positive for left key; other + negative for right key);
- **Step 4 (block 5, 20 trials):** practice that reverses key assignments for the target or the concept;
- **Step 5 (block 6, 20 trials and 7, 40 trials):** like the third, but it uses the just-switched key assignments (e.g. self + negative; other + positive).

**Analyses**

Statistical analyses were calculated using SPSS version 20.0. One-way ANOVAs were used to compare the questionnaires scores (PFQ, OAS, SBS, SCS), and the attentional bias to rank and implicit self-evaluation scores (self-esteem and self-compassion combined due to construct similarities and a correlation of $r = .3$, $p = .003$) between the three groups of participants (EDs, REC, HCs).

The attentional bias scores were calculated following the analytical plan of MacLeod and Mathews.46 An attentional bias score to social rank was calculated combining the attentional responses to dominant and submissive faces. The RTs for the trials when the probe replaced the emotional picture (dominant or submissive face; valid trials) were subtracted from the RTs for the trials when the probe replaced the neutral picture (invalid trials; attentional bias score = invalid trials − valid trials). Data from trials with errors were discarded. To remove outliers, reaction times that were less than 100 ms or more than three standard deviations above each subject’s mean were excluded.47

IAT scores were computed according to the widely used algorithm ($D$ measure) proposed by Greenwald and colleagues.48 Reaction times above 10,000 ms were discarded and participants for whom more than 10% of trials had latency less than 300 ms were deleted (one participant in the ED group). Data for analyses were obtained by subtracting mean reaction times of block 6 from block 3; and block 7 from block 4. The means of these two effects were divided by their pooled standard deviation based on all responses in blocks 3, 4, 6, and 7. The IAT effect for implicit self-esteem was computed by subtracting the mean latency for the “me + positive” block from that for the “me + negative” block (step 5 – step 3). Similarly, the IAT effect for implicit self-compassion was computed by subtracting the mean latency for the “me + self-compassion block from that for the “me + self-criticism” block (step 5 – step 3). Positive IAT effects indicate relatively fast responses when “me” shared the response key with “positive” (self-esteem/self-compassion). The scores for implicit self-esteem and self-compassion were combined into an “implicit self-evaluation score.”

Correlations were calculated on the total sample (currently ill, recovered, and healthy controls combined) between self-report measures of internal shame, external shame, submissive behaviors, and social comparison, and attentional bias to rank and implicit self-evaluation. Two regression models were calculated to examine the relationship between attentional bias to rank and implicit self-evaluation and the severity of ED and mood symptoms.

All effect sizes (ESs) were calculated using Cohen’s $d$.49

**Procedure**

This study was carried out in a single 90-min session. The SCID-I was administered at the beginning of the session, followed by the questionnaires and the computerised tasks. At the end of the session, height and weight measures were obtained by the experimenter in order to calculate the BMI (kg/m$^2$).

**Results**

**Sociodemographic and Clinical Variables**

One hundred and twenty-three female participants were initially included. Two HCs and three recovered participants were excluded from the study because they did not meet the inclusion criteria. The final sample ($N = 118$) consisted of 50 HCs, 46 individuals with a current ED, and 22 people with a lifetime history of EDs and recovered. Of those with an ED, 29 had Anorexia Nervosa (AN: 20...
with restrictive subtype and 9 with binge/purge subtype), and 17 individuals had Bulimia Nervosa (BN). Of those recovered from an ED, 13 people had AN in the past and 9 had BN. The sociodemographic variables are illustrated in Table 1. Ethnicity, age, and education were similar between the groups. People with a lifetime eating disorder (both currently ill and recovered) were less likely to have a partner.

As expected, people with current illness scored higher on all the clinical measures. The recovered group had scores on some domains (Weight Concern subscale of the EDE-Q and Stress subscale of the DASS) that remained higher than HCs, albeit lower than those who were acutely ill. Table 1 shows the clinical variables for the ED, REC, and HC groups.

**Attentional Bias to Social Rank**

There was an overall difference between groups in the attentional response to social-rank facial stimuli \( F_{(2, 108)} = 4.4; p = .01 \); Games-Howell post hoc tests: EDs vs. HCs \( p = .02 \), ES = 0.6; EDs vs. REC \( p = .98 \); REC vs. HCs \( p = .09 \), ES = 0.6). People currently ill and recovered showed increased vigilance toward rank-related stimuli (EDs: mean = 11.1, SD = 31.1; REC: Mean = 9.9, SD = 26.7), whereas HCs showed attentional disengagement from these stimuli, and vigilance toward neutral faces [HCs: mean = -4.7, SD = 22.6; ED + REC vs. HCs: \( F_{(1, 110)} = 5.6, p = .02 \); ED vs. REC + HCs: \( F_{(1, 110)} = 2.9, p = .09 \)].

**Implicit Self-Evaluation**

There was an overall difference between groups on the implicit self-evaluation scores \( F_{(2, 112)} = 4.9; p = .009 \); Games-Howell post hoc tests: EDs vs. HCs \( p = .009 \), ES = 0.64; EDs vs. REC \( p = .2 \), ES = 0.42; REC vs. HCs \( p = .8 \), ES = 0.2). People with EDs had significantly lower scores than HCs. People who recovered from an ED did not differ significantly from the ED and HC groups, and showed an intermediate profile [EDs: \( D \) score mean = 0.26, SD = .25; REC: \( D \) score mean = 0.36, SD = 0.21; HCs: \( D \) score mean = .4, SD = 0.18; \( p = .009 \), ES = 0.6; EDs + REC vs. HCs: \( t_{(113)} = -2.6, p = .01 \); ED vs. REC + HCs: \( t_{(113)} = -3.1, p = .002 \)].

**Self-Report Measures**

Table 2 shows the results of the groups on self-report measures. Overall, the three groups differed significantly on all self-report measures. Currently ill people reported significantly higher levels of internal and external shame, submissive behaviors, and unfavorable social comparison than HCs (large effect sizes). Recovered people had less extreme scores than the currently ill group (large effect sizes). They reported similar levels of internal shame and unfavorable social comparison than HCs, but significantly higher external shame and submissive behaviors (medium/large effect sizes).

**Correlations Between Implicit and Explicit Measures of Self and Others Processing**

The attentional bias to social rank significantly correlated with unfavorable social comparison (SCS: \( r = -.18, p = .05 \)). Implicit self-evaluation significantly correlated with levels of submissive
behaviors ($r = -0.18$, $p = 0.04$), unfavorable social comparison ($r = -0.2$, $p = 0.01$), and external shame ($r = -0.24$, $p = 0.008$).

**Regression Models**

Two regression models were calculated across the three samples of participants, with attentional bias to rank and implicit self-evaluation as independent variables, and severity of ED symptoms (EDE-Q total score) and mood symptoms (DASS total scores) as outcome variables. The first model showed that self-evaluation ($\beta = -0.2$, $t = -2.0$, $p = 0.05$), but not attentional bias to rank ($\beta = 0.07$, $t = 0.76$, $p = 0.44$) significantly predicted eating disorders symptoms.

In contrast, the second model showed that the attentional bias to rank ($\beta = 0.2$, $t = 2.3$, $p = 0.02$), but not negative self-evaluation ($\beta = -0.17$, $t = -1.86$, $p = 0.06$), significantly predicted the severity of mood symptoms. However, when the Group variable was entered as a predictor too, the contribution of attentional bias to social rank and negative self-evaluation did not remain significant (attentional bias to rank: $\beta = 0.1$, $t = 1.5$, $p = 0.1$; negative self-evaluation: $\beta = 0.005$, $t = 0.07$, $p = 0.9$).

**Discussion**

The aim of this article was to investigate perception of social stimuli and implicit self-evaluation in ED patients, participants recovered from the illness, and healthy controls, using self-reports as well as behavioral tasks. The results provided support for the hypotheses that people with EDs have biased processing of social stimuli (i.e. heightened vigilance to social rank cues), and experience lower levels of implicit positive self-evaluation than healthy controls. Findings from the self-report measures also showed higher levels of submissive behaviors, negative expectations about others’ beliefs on the self (external shame), unfavorable social comparison, and internalized shame in currently ill patients than healthy controls.

People who had recovered from the illness had an intermediate profile between the ED and healthy control groups. They showed similarities with the currently ill group, in that they had increased vigilance toward rank-related stimuli, and higher negative expectations about others’ beliefs on the self and submissive behaviors than HCs. However, they also showed similarities with the healthy group, in that they had similar levels of implicit self-evaluation, internal shame, and social comparison.

Correlations between the behavioral and self-report measures were found across groups. Finally, the attentional bias toward social rank-related cues was associated with the severity of mood symptoms, whereas implicit self-evaluation was associated with the severity of ED symptoms across the entire sample.

Our study provides evidence for a greater tendency of people with EDs to perceive social stimuli...
according to power relationships and to experience poorer self-evaluation than healthy controls. The behavioral tasks showed the automaticity of these processes. These findings add evidence to support the key importance of social rank issues and negative self-evaluation in EDs. In prospective studies, for example, perception of low social rank was found to be associated with the increase of anorexic symptoms and low self-compassion with poor response to nutritional rehabilitation.

These data are in line with the predictions of socio-cultural models of the illness (e.g. Refs. 7 and 8) and suggest that negative self concept and a tendency to engage in social comparison might be putative explanatory factors for the internalization of social pressures. Frequent engagement in social comparisons has generally been implicated in the development of body dissatisfaction and disordered eating (e.g. Refs. 9 and 10) and correlational findings in at risk subjects support this relation (for review, see Ref. 53). Early experiences of bullying, teasing and “fat talk” are relevant in EDs, and could influence the vulnerability to manipulate body, weight, and shape to remediate negative self- and social evaluation. This might be particularly true for those with a predisposition to experience heightened sensitivity to the threat of exclusion, rejection, and submissiveness.

People who recovered from the illness showed comparable levels of self-evaluation than healthy controls (i.e. implicit self-evaluation, internal shame, and social comparison), but still had rank-related issues (i.e. heightened vigilance to rank-related stimuli, higher levels of external shame and submissive behaviors). These findings are in line with previous data showing issues with social rank, but not internal shame after recovery from an ED.

To conclude, following the RDOC framework, the results of this study suggest potential abnormalities in primary behavioral functions (e.g. threat and reward systems) in EDs. These abnormalities are relevant for the development of prevention, relapse prevention, and treatment programs.

Limitations

This study has several limitations. The cross-sectional design means that the factors investigated can only be considered to be correlates rather than causal variables. The limited sample size of ED subgroups and recovered participants meant that the power of the study to examine these differences was reduced. Finally, examining the role of adverse social experiences and other biological and neural biomarkers in future studies may be of help to clarify the social phenotype of the disorder.

Clinical Implications

Interventions targeting threat sensitivity and negative self-evaluation might be of benefit in EDs. Attentional bias modification trainings have been developed and successfully applied to anxiety disorders to reduce sensitivity to threat. A series of studies has shown the potential to retrain attention toward compassionate images of others and away from rejecting stimuli in people with low self-esteem. These paradigms could be used to reduce oversensitivity to power issues within social relationships in EDs and increase attention to compassionate images of others.

The use of implicit measures could also complement the investigation of risk factors and inform treatment development. A series of studies show that the behavioral response to social cues (e.g. selective attention to threat) is associated with biological and neuropsychological changes and reflect a history of learning which predisposes to the development of psychopathology. Furthermore, it has been suggested that performance changes on a social cognitive task might be useful to define prognosis and response to treatment.

Discussion

The results from this study provide evidence for social difficulties and impaired self-evaluation in EDs. It is suggested that targeting self-concept deficits, sensitivity to social threat, and the development of positive bonding could be of benefit to the treatment of EDs.

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