“Eating Me Up from Inside”: A Pilot Study of Mentalization of Self and Others and Emotion Regulation Strategies among Young Women with Eating Disorders

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INTRODUCTION
This study examines the dynamics of eating disorders (EDs) in the framework of the mentalization-based model proposed by Fonagy et al. and Fonagy and Target (1, 2), in order to improve our understanding of the way in which personality factors are related to the clinical picture of EDs. Specifically, we aim to explore the relationship between the general ability of mentalization, and the specific component affective mentalization - regarding self and others, and the strategies of emotion regulation in patients with EDs compared to controls.

MENTALIZATION AND REFLECTIVE FUNCTIONING
Fonagy and colleagues (1, 3) suggested a model of mentalization that provides a formulation for the normal development of modes of experience and psychopathology. This model integrates theories of the social-cognitive concept of “theory of mind,” attachment, object-relations and self-psychology. Mentalization refers to the capacity to reflect on and interpret one’s own behavior and that of others based on intentional internal mental states, such as beliefs, thoughts and emotions. The ability to mentalize the experiences of self and others enables the individual to cope with external and internal stressors, to regulate affects and to form good interpersonal relationships (1, 3).

A major factor facilitating children’s attainment of the ability to mentalize is based on the parents’ attuned mirroring of their affective states, thus providing a secure base for the child to develop mentalization and symbolic abilities (4). In contrast, children who lack secure attach-
ment relationships are at a greater risk for remaining fixated in primitive modes for representing subjectivity.

The domain of mentalization is multifaceted, including four dimensions, each constructed of two poles (5): (a) automatic-implicit mentalization; (b) cognitive vs. affective mentalization; (c) metalization based on mental interiors vs. externally-based mentalization; and (d) mentalizing self-experience vs. mentalizing the experience of others. In this study we examine mentalizing self-experience vs. the experience of others, and the general ability of mentalization vs. affective mentalization - based on affective recognition.

In line with Choi-Kain and Gunderson’s (6) assertion that the multifaceted nature of mentalization requires the use of a multi-dimensional approach, based on related concepts, we examined the sub-construct of affective mentalization based on the related concepts of alexithymia and Theory of Mind (ToM).

Alexithymia, as conceptualized by Bagby et al. (7), refers to the subjective experience of the self. Alexithymia is a construct encompassing difficulties in identifying subjective feelings, describing feelings of the self to others, and a stimulus-bound, externally oriented cognitive style (7).

Alexithymia relates to the subjective experience of the self, whereas ToM refers to the understanding of the other. ToM refers to the ability to form representations about intentional internal mental states such as thoughts, feelings, and beliefs (8). There are cognitive aspects and affective aspects of ToM. The cognitive mechanism includes understanding of the beliefs of others, whereas the affective mechanism includes recognition of the emotions of others, and empathizing with them (5). In our study we will examine emotion recognition.

The relationships between emotional mentalizing, ToM, empathy and alexithymia were shown empirically. For example, healthy individuals with elevated alexithymia showed lower levels of empathy and performed less well in tasks of emotion recognition (9).

MENTALIZATION, ALEXITHYMIA, AFFECTIVE TOM AND EATING DISORDERS

According to the mentalization model, EDs are conceptualized as related to primitive modes of experience (10). People with EDs have failed to develop the ability to differentiate between physical and emotional states and between one’s own and others’ experiences, and to ascribe causality to self and interpersonal experiences. These deficiencies may lead to the use of bodily- and ED-related symptoms as a concrete means of represent-

ing and enacting feelings and thoughts, and a means of regulating drives and emotions (11).

Failure in the development of mentalization may lead to deficiencies in the development of emotion regulation (1), considered a major deficit in the development and maintenance of EDs (12). It has been shown that patients with EDs exhibit a less developed ability to mentalize experience and to differentiate between perspectives of self and others than non-ED individuals (13, 14). Moreover, patients with anorexia nervosa (AN) present with elevated level of alexithymia compared to patients with bulimia nervosa (BN), who present with elevated level of alexithymia than controls (15, 16). Regarding ToM, whereas some studies have found no deficits in emotion recognition (17, 18), others have found difficulties in emotion recognition among female adolescents suffering from AN (19).

AFFECT REGULATION AND EATING DISORDERS

Jurist (20, 21) suggests that the sub-construct of mentalizing affectivity is the basis of emotion regulation ability. This ability includes the recognition and expression of emotion, the process of revisiting emotions of past and present, and emotion regulation. The sub-construct of mentalizing affectivity has not been operationalized yet; in this study, we have related to two of its subcomponents - recognition and expression of emotions, with the related construct of alexithymia. We also have examined the recognition of emotions of others based on the concept of ToM.

In contrast to the theory relating the ability to regulate emotions exclusively to parent-infant relationship, other researchers suggest that it may be mainly tied to physiological or cognitive processes (22). The model presented in our study combines the two, in postulating that whereas the ability to regulate emotions may be connected to the development of mentalization, other innate physiological and cognitive maturation processes are involved as well.

Emotion regulation strategies are the processes triggered following the attending and evaluating of emotional cues, involving experiential, behavioral and physiological systems (23). A developed ability to regulate affect involves the ability to cope with distress and attenuate negative emotion as well as strengthening positive emotions (24).

The process model of emotion regulation suggests that there are two types of emotional regulation strategies: reappraisal of emotions and suppression of emotions. Cognitive reappraisal involves a cognitive change
Regarding the emotion-eliciting situation in a way that changes its emotional impact (for example by using inner speech to encourage oneself while facing stress). It occurs early and intervenes before the emotional response has been fully generated. Expressive suppression is a form of response modulation involving inhibition of ongoing emotion-expressive behavior (25). Reappraisal should successfully reduce the experiential and behavioral components of negative emotion, whereas suppression which comes relatively late in the emotion-generation process primarily modifies the behavioral aspect of the emotional response.

Gross and John (23) suggest that people using cognitive reappraisal experience and express more positive and less negative emotions and depressive symptoms; by contrast, people tending to suppress emotions experience and express less positive and more negative emotions and depressive symptoms. Swart et al. (9) further show that individuals with elevated alexithymia tend to suppress emotion and use cognitive reappraisal to a lesser extent than those with low alexithymia. Lastly, a meta-analysis about emotion regulation in several clinical groups has demonstrated significant emotion suppression in EDs, but no difference in the use of cognitive reappraisal vs. controls (26).

**AIMS AND HYPOTHESES OF THE STUDY**

First, we aimed to examine the relationship of the general ability of mentalization, as well as of the specific domain of affective mentalization about self and others, with the strategies of emotion regulation. Based on the suggestions of Fonagy and Target (2), we hypothesized that higher mentalizing abilities (high reflecting functioning [RF]), high affective ToM and low alexithymia) will be positively correlated with the cognitive reappraisal strategy, and negatively correlated with the expressive suppression strategy. We also anticipated that the correlational size of affective mentalization measures (affective ToM and alexithymia) with emotion regulation strategies will be stronger than with the general RF.

The second aim was to examine the between-group differences in mentalization abilities and emotion regulation strategies. We anticipated that the ED group would show lower RF, lower ability to identify the emotions of others (ToM), and greater alexithymia than the control group. Furthermore, the ED group would use more expressive suppression and less cognitive reappraisal than the controls.

Depression is found to be more frequent in patients with EDs vs. controls (16). In line with these findings, we aimed to explore the predictive value of mentalization, the quality of emotion regulation strategies, and depression on the severity of ED symptoms. Our third hypothesis was that comorbidity with depressive symptoms would predict greater ED symptomatology, whereas greater ability of general and affective mentalization and adequate emotion regulation strategies would serve to attenuate ED symptoms.

**METHOD**

**PARTICIPANTS**

The ED sample comprised of 25 female inpatients between the ages of 14-24 years who were hospitalized in the adolescent or adult ED inpatient departments located in a general hospital in central Israel. The ED sample is part of a study assessing mentalization in female adolescents and their parents during the years 2014-2016. It represents all cases in which both patients and parents agreed to participate in the study. All patients met the criteria for a full-blown DSM-5 diagnosis of ED (27) on admission and had never been diagnosed with a bipolar disorder, schizophrenic spectrum disorder, substance use disorder, mental retardation, organic brain syndrome or any physical disorder with the potential to affect appetite or weight (e.g., thyroid disorder or diabetes mellitus). The patients were diagnosed with either AN-restricting type (AN-R; \( n = 13 \)), AN binge/purge type (AN-B/P; \( n = 7 \)), or BN (\( n = 5 \)).

Whereas the different ED subtypes may differ in several personality characteristics (28), there are many similarities among them in other personality characteristics and in comorbid psychiatric disorders (16, 28). In addition, many patients may oscillate among the various ED diagnoses during the course of their illness (29). Therefore, in this study, we related to all patients as belonging to one group.

The control sample comprised of 22 high school and undergraduate female students who volunteered to participate in the study and of other undergraduate female students who participated as part of the requirements for completing their degree. The control participants were matched to the research group by age, marital status (all participants were single), and parents’ educational level. Controls were required to have no lifetime history of psychiatric illness, physical illness with the potential to affect appetite or weight, chronic use of medications, and any stigmata indicative of an ED.

To control for intellectual ability, we administered two subtests from the Hebrew edition of the Wechsler Adult Intelligence Scale (30, 31) as an estimate of Intelligence Quotient (IQ): block design and similarities.
**MEASURES**

**INDEPENDENT VARIABLES: MENTALIZATION**

**The Reflective Function (RF) Scale** (3). The RF scale integrates the assessment of multiple facets into a global rating for the quality of mentalizing in the context of childhood attachment relationships via narratives derived from the Adult Attachment Interview (AAI) (32). Interviews are scored on an 11-point rating scale ranging from –1 (negative RF, in which interviews are overly concrete or grossly distorting others’ mental states, e.g., “…but what makes me feel more rejected is that she breast-fed me, and she didn’t breast-feed my sister”), through ordinary RF that is common in non-clinical populations (e.g., “I think not only my mother held on to me very tightly, but I wrenched away very hard, and those two actions made it much more extreme than it might have been otherwise”), to +9 (exceptional RF, in which interviews show unusually complex, elaborate, or original reasoning about mental states of self and others).

In our study we added specific RF subscales regarding the self, mother, and father in addition to the general RF scale, according to specific questions (e.g., self: “Do you think your childhood experiences have an influence on who you are today?”). These three specific scores are designed according to the guidelines of the general RF score.

Two coders were trained by the first author, who had received training from the developers of the coding manual. One coder scored all the protocols. The two coders, who were blind to the group allocations of the participants, coded a subset of the transcripts (n = 33), yielding excellent inter-rater reliability, intraclass correlation coefficient (ICC) for general RF = .97, self RF = .90, mother’s RF = .84, and father’s RF = .88.

**TAS-20 – The Toronto Alexithymia Scale** (33). The TAS is a self-report questionnaire assessing difficulties in identifying and communicating feelings of self and a concrete/externally-oriented style of thinking. The 20 items are divided into three subscales: difficulty in identifying feelings (DIF, 7 items), difficulty in describing feelings (DDF, 5 items) and externally oriented thinking (EOT, 8 items). The reliability and factorial validity of the TAS have been established previously (33). Participants rate items on a 6-point scale ranging from Never (1) to Always (6) (Cronbach alpha of the TAS in this study = .96).

**COMORBIDITY: DEPRESSION**

**Beck Depression Inventory (BDI)** (36) is a 21-item self-report assessing the severity of depressive symptoms at the time of the evaluation. Participants rate items on a 4-point scale ranging from Rarely (1) to Often (4). (Cronbach alpha for the BDI in this study = .94)

**DEPENDENT VARIABLE: ED SYMPTOMS**

**The Eating Attitudes Test (EAT-26)** (37) is a self-reported scale assessing concerns and behaviors related to eating. Participants rate items on a 6-point scale ranging from Never (1) to Always (6) (Cronbach alpha of the EAT-26 in this study = .96).

**PROCEDURE**

All participants, and their parents or other legal guardians for minors under age 18, gave their written informed consent to participate in the study after receiving an explanation of the study’s goals and methodology. The study was approved by the Internal Review Boards (Helsinki Boards) of the Sheba Medical Center.

**Research group.** Experienced child and adolescent psychiatrists (DS, AHL, EG) established the diagnosis of ED within 14 days of admission using an adapted version of the Structured Clinical Interview for Axis I DSM-IV Disorders – Version 2.0 (SCID-I I/P, Version 2.0) (38). The degree of inter-rater reliability and complex emotion of others. We used the Hebrew version translate by Milo. Participants are presented with 36 photographs of eyes posing emotions. Participants are asked to make a forced decision between 4 words naming the emotion (1 correct and 3 distracters). The test retest reliability and validity of the RME were previously established (35).
values (according to the correlation coefficient procedure) among the three psychiatrists for the diagnosis of an ED was $r=.92$. All ED diagnoses were confirmed in clinical team meetings of the respective inpatient departments. Inclusion criteria were BMI within normal limits (18.5-25 kg/m²) (39), no cessation of menstruation since menarche, and no EDs and other reported psychopathology. Four control participants were excluded from the study.

The study measures were administered individually by two trained master’s level clinical psychology interns who were blind to patient subgroup affiliation and to the self-report results. Patients were examined only after the ED symptoms and overall medical condition were stabilized, as determined by physical examinations and relevant laboratory tests, to reduce the influence of the ED symptomatology and malnutrition on the findings of the study.

### Control group.

To screen out participants with ED symptoms or other psychopathology, the control participants reported their weight and height, and whether they had ever had an ED or any other medical or emotional morbidity. In addition, they filled out the SCOFF questionnaire for the assessment of eating disorders (40). The SCOFF is a 5-yes/no question tool, developed to screen for EDs in the general population. A total score of two and above has been found to be 100% sensitive and 87.5% specific for the presence of any ED.

### RESULTS

A comparison of the demographic characteristics of two study groups using a $t$ test is presented in Table 1. The data revealed no significant differences for age, mother’s education level, BMI, and estimated measures of IQ. Differences were found in father’s education level, so we controlled for father’s education in the statistical analyses. As expected, patients with EDs reported significantly more ED symptoms and depression compared to the non-ED control group.

A comparison of the three ED subtypes revealed no significant differences for age, verbal IQ, non-verbal IQ, mother’s education level, ED symptoms and depression (results not shown). As expected, a significant between-group difference was found for BMI, with the BN presenting with a significantly higher BMI than both the AN-R and AN-B/P groups (AN-R: $M=18.91±3.47$; AN-B/P: $M=20.48±3.82$; BN: $M=24.29±3.51$; $F_{(2,23)}=3.78$, $p<.05$). A significant between-group difference was also found for father’s education level (AN-R: $M=13.5±2.01$; AN-B/P: $M=14.82±3.06$; BN: $M=10.8±1.3$; $F_{(2,23)}=4.66$, $p<.05$). We therefore controlled for father’s education in the statistical analysis.

We therefore compared the study measures of the three ED subtypes using multivariate analyses of covariance (MANCOVAs) with father’s education level as a covariate. No significant difference emerged for mentalization abilities with the dependent variables: general RF, affective ToM (RME) and alexithymia (TAS) (Wilks’ Lambda $F_{(6,36)}=0.96$, $n.s$) as well as with the variables: self-RF, mother-RF, father-RF, RME and TAS (Wilks’ Lambda $F_{(10,32)}=0.95$, $n.s$). No significant between-group difference emerged also for emotion regulation strategies (Wilks’ Lambda $F_{(4,42)}=0.54$, $n.s$). These results and the lack of differences in the demographic and symptomatic measures between the three ED subgroups allowed us to relate to all patients as belonging to one group.

We further examined the correlation between the different measures of general mentalization (general RF, self-RF, mother-RF and father-RF), and the specific sub-components of affective mentalization - the affective ToM (RME) and alexithymia (TAS) using Pearson correlation coefficients. Elevatated general RF score was significantly correlated with elevated accurate emotion recognition (RME $r=.25$, $p<.05$), and attenuated level of alexithymia (TAS $r=-.27$, $p<.05$). Self-RF was significantly correlated with TAS ($r=-.32$, $p<.05$); father RF was significantly correlated with accurate RME ($r=.25$, $p<.05$).

### MENTALIZATION AND EMOTIONS REGULATION STRATEGIES

We examined the first research hypothesis anticipating that there will be correlations between the various aspects of mentalization and emotion regulation strategies using Pearson correlation coefficients (see Table 2). The hypothesis was supported for expressive suppression but only partially for cognitive reappraisal. Specifically, greater

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**Table 1. Demographic and Clinical Variables in Patients with EDs and Controls**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Patients with EDs (n = 25)</th>
<th>Non-ED controls (n = 22)</th>
<th>t (47)</th>
<th>Cohen’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>17.2±2.77</td>
<td>16.5±1.21</td>
<td>1.19</td>
<td>0.35</td>
</tr>
<tr>
<td>Similarity-IQ</td>
<td>10.6±2.43</td>
<td>11.6±2.84</td>
<td>1.2</td>
<td>0.35</td>
</tr>
<tr>
<td>Block design-IQ</td>
<td>10.5±3.12</td>
<td>11.1±2.32</td>
<td>1.4</td>
<td>0.41</td>
</tr>
<tr>
<td>Mother’s education</td>
<td>14.5±2.75</td>
<td>15.0±2.02</td>
<td>0.8</td>
<td>0.23</td>
</tr>
<tr>
<td>Father’s education</td>
<td>13.5±2.72</td>
<td>16.0±2.24</td>
<td>3.45**</td>
<td>1.01</td>
</tr>
<tr>
<td>Body mass index</td>
<td>20.3±3.97</td>
<td>20.7±1.92</td>
<td>0.42</td>
<td>0.12</td>
</tr>
<tr>
<td>ED symptoms (EAT-26)</td>
<td>50.8±14.73</td>
<td>96±48.81</td>
<td>12.11**</td>
<td>3.53</td>
</tr>
<tr>
<td>Depressive symptoms (BDI)</td>
<td>37.4±13.07</td>
<td>54.1±6.63</td>
<td>10.29***</td>
<td>3.00</td>
</tr>
</tbody>
</table>

**p<0.01 ***p<0.001**

BDI = Beck’s Depression Inventory

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reported alexithymia (TAS) was significantly correlated with elevated expressive suppression and with reduced cognitive reappraisal. Elevated self-RF was significantly correlated, and general RF and RME were marginally correlated with a lower tendency to suppress emotions. These data show that female adolescents suppressing their emotions show an attenuated level of general RF and specifically low level of self-RF, low level of RME and elevated level of alexithymia. Interestingly, cognitive reappraisal was only marginally correlated with elevated father-RF. Mother-RF was not related to the emotion regulation strategies.

The second part of the first hypothesis suggesting that the correlations between measures of affective mentalization (RME, TAS) and emotion regulation strategies will be stronger than the correlations with the general RF was examined using Fisher r-to-z transformation. The hypothesis was partially confirmed. Specifically, the correlation between alexithymia and cognitive reappraisal was significantly stronger than the correlation between general RF and cognitive reappraisal (Fisher’s Z=2.31, p<0.05). Nonetheless, no significant differences were detected between alexithymia X expressive suppression and general RF X expressive suppression (Fisher’s Z=0.96, n.s.). No significant differences emerged regarding the correlations between RME and expressive suppression and between general RF and expressive suppression (Fisher’s Z=0.61, n.s).

**BETWEEN-GROUP DIFFERENCES IN MENTALIZATION AND EMOTION REGULATION STRATEGIES**

To examine the second hypothesis, we conducted three between-group MANCOVAs with father’s education as a covariate. The MANCOVAs for all three groups of dependent variables: General RF, RME and TAS (Wilks’s Lambda $F_{(3,40)}=7.26, p<0.001, \eta^2=0.35$), self-RF, mother-RF, father-RF, RME and TAS (Wilks’s Lambda $F_{(5,38)}=5.71, p<0.001, \eta^2=0.43$), and expressive suppression and cognitive reappraisal (Wilks’s Lambda $F_{(2,44)}=6.07, p<0.01, \eta^2=0.22$) were significant. The univariate ANCOVAs presented in Table 3 indicate four significant between-group effects: self-RF, alexithymia, expressive suppression and cognitive reappraisal, with small to medium effect sizes. Specifically, female adolescents with EDs presented lower self-RF, elevated alexithymia, elevated use of expressive suppression and attenuated use of cognitive reappraisal compared with the controls.

**MENTALIZATION, EMOTION REGULATION STRATEGIES AND DEPRESSION AS PREDICTORS OF ED SYMPTOMS**

First, we calculated Pearson correlations of the different mentalization abilities (RF, ToM and alexithymia), and the emotion regulation strategies, with ED symptoms (see Table 4) and depression (BDI).

In the general sample, significant correlations were found between elevated ED symptoms and elevated alexithymia, low level of self-RF, attenuated use of cognitive reappraisal and elevated emotion suppression. Low general RF was marginally correlated with elevated ED symptomatology. In patients with EDs, reduced alexithymia and elevated ability of emotion recognition in others (RME) significantly correlated with attenuated ED symptoms. Interestingly, in the control group elevated RME was correlated with greater reported ED symptomatology.

Significant correlations were also revealed between BDI and self-RF ($r=-0.27, p<0.05$), TAS ($r=-0.73, p<0.001$), and depression (BDI).

**Table 2. Pearson Correlations between Mentalization Measures (General RF, Mother RF, Father RF, Self RF, RME, TAS) and Emotion Regulation Strategies (n=47)**

<table>
<thead>
<tr>
<th>Mentalization</th>
<th>Expressive suppression</th>
<th>Cognitive reappraisal</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Reflective Function (RF)</td>
<td>-0.23**</td>
<td>-0.07</td>
</tr>
<tr>
<td>Mother’s Reflective Function</td>
<td>0.01</td>
<td>-0.07</td>
</tr>
<tr>
<td>Father’s Reflective Function</td>
<td>-0.06</td>
<td>-0.23**</td>
</tr>
<tr>
<td>Self-Reflective Function</td>
<td>-0.37***</td>
<td>-0.01</td>
</tr>
<tr>
<td>ToM-Complex Emotion Recognition (RME)</td>
<td>-0.23**</td>
<td>0.0</td>
</tr>
<tr>
<td>Alexithymia (TAS)</td>
<td>0.48****</td>
<td>-0.49***</td>
</tr>
</tbody>
</table>

$^{1}p<0.06 \quad ^{2}p<0.01 \quad ^{3}p<0.001$

**Table 3. Two-Way Analyses of Variance of the Study Variables for the Two Groups**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Patients with EDs (n=25)</th>
<th>Non-patients (n=22)</th>
<th>F (1,46)</th>
<th>Eta²</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Reflective Function (RF)</td>
<td>3.88 1.88</td>
<td>4.91 1.34</td>
<td>1.02</td>
<td>.02</td>
</tr>
<tr>
<td>Mother’s Reflective Function</td>
<td>3.85 1.49</td>
<td>4.45 1.50</td>
<td>0.65</td>
<td>.01</td>
</tr>
<tr>
<td>Father’s Reflective function</td>
<td>3.85 1.85</td>
<td>4.32 1.52</td>
<td>0.01</td>
<td>.00</td>
</tr>
<tr>
<td>Self-Reflective Function</td>
<td>3.92 1.7</td>
<td>5.50 1.10</td>
<td>6.05*</td>
<td>.12</td>
</tr>
<tr>
<td>ToM-Complex Emotion Recognition (RME)</td>
<td>24.04*</td>
<td>35.9</td>
<td>24.48</td>
<td>3.44</td>
</tr>
<tr>
<td>Alexithymia (TAS)</td>
<td>65.53</td>
<td>13.21</td>
<td>47.14*</td>
<td>9.42</td>
</tr>
<tr>
<td>Cognitive Reappraisal</td>
<td>3.76 1.71</td>
<td>4.84 0.8</td>
<td>9.28**</td>
<td>.17</td>
</tr>
<tr>
<td>Expressive Suppression</td>
<td>4.01 1.43</td>
<td>2.86 1.01</td>
<td>6.66*</td>
<td>.13</td>
</tr>
</tbody>
</table>

$^{*}p<0.05 \quad ^{**}p<0.01 \quad ^{***}p<0.001$

RF=Reflective Function; RME=Reading the Mind in the Eyes; TAS=Toronto Alexithymia Scale
cognitive reappraisal ($r = -.48$, $p < .001$), expressive suppression ($r = .53$, $p < .001$) and EAT-26 ($r = .86$, $p < .001$). Specifically, elevated self-RF, low alexithymia, greater use of cognitive reappraisal and reduced emotion suppression were found as related to attenuate depressive symptoms.

**PREDICTION OF THE SEVERITY OF ED SYMPTOMS**

A linear regression analysis was conducted to examine the third research hypothesis regarding the potential of the different mentalization abilities (RF, ToM and alexithymia) and emotion regulation strategies to predict the severity of ED symptomatology (EAT-26) (see Table 5). Father's education was included in the first step. In the second step, the mentalization measures were entered in a stepwise regression procedure; in the third step the emotion regulation strategies were added, and in the fourth step depression was added in a stepwise regression procedure.

The regression analysis was found to be highly significant, $F_{(7,38)} = 18.83$, $p < .001$, explaining 74.8% of the variance in the EAT-26. Specifically, in the first step father's education contributed 18.6% of the variance. The second model comprising the mentalization measures block in addition to father's education was found as significant $F_{(4,39)} = 13.24$, $p < .001$, significantly explaining an additional 39.6% of the variance. The sole significant variable in this block was the alexithymia measure (TAS) showing that elevated TAS contributed to the severity of ED symptomatology. The third model was also significant $F_{(6,30)} = 9.33$, $p < .001$, but the addition of emotion regulation strategies was not significant; father's education and alexithymia retained their significance in the prediction of ED symptoms, and cognitive reappraisal was marginally significant. In the fourth model, the inclusion of depression measure was a significant predictor, raising the explained variance to 74.8%. In this mode depression was the sole significant variable, predicting greater severity of ED symptomatology, and elevated general RF was marginally significant predictor of attenuated ED symptoms.

**DISCUSSION**

We examined the relationship between general ability of mentalization, affective mentalization regarding self and others, strategies of emotion regulation, and ED symptoms in female adolescent inpatients with EDs vs. controls. The underlying assumption was that patients with EDs would present with a deficiency in mentalization and in adopting mature emotion regulation strategies. According to Fonagy and colleagues (1), deficiencies in the development of mentalization impair the ability to develop adequate emotion regulation strategies. According to this assumption, EDs may develop as a result of not being able to develop adequate emotion regulation strategies. In addition, we designed specific general RF scores for the self, mother and father to explore the specific dimension of mentalization regarding self vs. others, rather than only examining the general ability of RF.

Preliminary analyses showed significant correlations between different mentalization abilities. Thus, higher levels of general RF and RF regarding the self were correlated with elevated accuracy in identifying the emotions.
of others (RME), as well as with lower levels of alexithymia (TAS). These data are in accordance with other studies showing an overlap between the different constructs and mentalization abilities (9).

Interestingly, no significant association was found between the subjective ability to recognize and report affects regarding the self (TAS) and the objective accuracy in recognizing emotions in others (RME). This finding is in contrast to neuroimaging studies showing that thinking on emotions of others evokes the same areas of recognition and reflection on the emotions of the self (5). Nonetheless, these data may support the description that the ability to mentalize may vary across different contexts – people may be sensitive to cues regarding affective states of others while having difficulties in being aware of their inner affective states. An alternative explanation of the self/other discrepancy may rely on the influence of the assessment procedure. Thus, whereas alexithymia is measured in this study by the subjective self-report of the TAS, emotion recognition in others is measured by an objective measure, the RME.

**MENTALIZATION AND EMOTION REGULATION STRATEGIES**

The correlations found in our study between mentalization measures and emotion regulation strategies partially support our first hypothesis, in showing that participants using more expressive suppression present marginally significant lower levels of general RF, significantly lower levels of self-RF and higher levels of alexithymia (TAS). However, cognitive reappraisal has shown a significant negative correlation only with alexithymia. These correlations between alexithymia and the different emotion regulation strategies replicate findings of Swart et al. (9) study in healthy controls.

The finding that mentalization measures are correlated to a greater extent with expressive suppression than with cognitive reappraisal suggests that mentalization processes in our sample have an influence on a later stage of emotion processing – the response phase, rather than on earlier stages, before the emotional response has been fully generated.

**BETWEEN-GROUPS DIFFERENCES IN MENTALIZATION AND EMOTION REGULATION STRATEGIES**

The second hypothesis anticipating between-group differences in mentalization measures and emotion regulation was partially confirmed. Participants with EDs showed lower levels of self-RF and higher levels of alexithymia, and used more expressive suppression and less cognitive reappraisal than controls, with small to medium effect sizes. There were no between-group differences in RME, and in general and parents’ RF.

The lack of between-group difference in RME in our study is in contrast to studies showing differences in RME between patients with AN and controls (42) but in accordance with other studies showing no RME deficits in patients with BN (17). Furthermore, our data show that the groups differ in mentalizing regarding the self (self-RF, alexithymia) but not in mentalizing others’ experiences (parents-RF, RME). This self/other gap is in accordance with claims of Skårderud and Fonagy (41) that subjects with EDs do not develop a coherent sense of self from within; rather, they invest in getting a sense of self based on the reactions of others. This gap corresponds also with self-psychology conceptualization and data showing that the development and maintenance of an ED may be associated with attunement to the needs of the other, and not to one’s own perspective (43).

The results regarding the between-group differences in emotion regulation strategies are in accordance with previous data showing that patients with EDs tend to use inadequate emotion regulation strategies, in particular expressive suppression (26). As has been previously described, cognitive reappraisal entails changing the way a situation is construed, aiming to decrease the experiential and behavioral components of negative emotion. The negative correlation between cognitive reappraisal and BDI, found in our study, is in line with this claim and with previous studies (23). Our findings suggest that attenuated use of this adaptive regulation strategy and greater use of emotion suppression are correlated with elevated depression and may lead to highly inefficient consequences, such as bingeing or other disordered eating, to alleviate their negative feelings.

**MENTALIZATION, EMOTION REGULATION STRATEGIES AND DEPRESSION AS PREDICTORS OF ED SYMPTOMS**

The third hypothesis was that elevated mentalization and adequate emotion regulation predict the attenuation of the severity of ED symptoms. By contrast, comorbidity with depression would predict elevated ED symptoms.

As expected, the preliminary data showed significant correlations between ED symptoms and general RF, self-RF, alexithymia, and both emotion regulation strategies. These findings and further data showing that in patients with EDs, alexithymia and elevated level of accurate emotion recognition in others are related to attenuated ED symptoms, lend support to this hypothesis.
However, a more detailed examination of our data using linear regression analyses showed that for the mentalization block, alexithymia was the sole variable predicting the severity of ED symptoms, i.e., elevated alexithymia predicted more severe ED symptoms. Reduced use of cognitive reappraisal also predicted greater ED symptomatology. Most importantly, upon introducing depression into the regression model, there was no longer a distinct contribution of alexithymia regarding the prediction of the severity of ED symptoms. These data may be related to the common variance between alexithymia and depression found in our study and elsewhere (44). A common variance was also found between depression and cognitive reappraisal; thus, when depression was included in the regression analysis, this emotion regulation strategy no longer predicted the severity of ED symptomatology. Our data further indicated that elevated general RF, which includes both affective and cognitive aspects, was a marginal significant contributor to the prediction of attenuated ED symptoms, independent of the predictive power of depression.

LIMITATIONS, CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH
First, our research design is cross-sectional, allowing only for inferences about associations but not causation. Second, our sample was relatively small, precluding the separate evaluation of each ED subtype. Lastly, as our sample included only inpatients, our findings cannot be generalized to less severe EDs.

Despite the aforementioned limitations, our data support the suggestion to use a multidimensional approach based on different measures for the assessment of mentalization (6). In our study, we assessed mentalizing regarding self vs. other and subcomponents of affective mentalization, and found a profile that may specifically characterize patients with EDs.

The finding that high mentalization ability bears an attenuating effect on ED symptoms, whereas depression predicts a high level of these symptoms, may have clinical implications. Treatment of EDs should focus not only on the behavioral aspects of the disorder, but should also assist patients in improving their ability to think reflectively about themselves and others, and to identify and express their emotions (41). Gaining the ability to identify mental tension and express it verbally and symbolically and further reflecting on causality of these mental states (e.g., “I feel helpless and angry when my parents quarrel”) may lead to better coping with stressors (e.g., express feelings to them). This approach may replace the tendency of using the body and ED-related symptoms as a concrete means of representing and enacting feelings and thoughts (e.g., “when my parents quarrel I work out until my body aches”). Additionally, treatment should help patients with EDs to regulate their emotions more adaptively with the use of the cognitive reappraisal process instead of suppressing their emotions; in that case, reappraisal of the emotion-eliciting negative situation (e.g., “My parents quarrel now but I remind myself that they usually work it out and solve their problems”) may change its negative impact.

Future research should be longitudinal and prospective, including a larger number of ambulatory patients, and examining whether there would be an association between improvement in ED symptoms and improvement in mentalization and emotion regulation over the course of the illness.

Contribution of the authors
The first, second and last authors substantially contributed to all phases including conception and design, analysis and interpretation of data, writing and final approval. The third and fourth authors contributed substantially to the administration, analysis, interpretation of data and critical revision.

The authors declare that they have no financial support or relationship that may pose a conflict of interest.

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