Starvation and emotion regulation in anorexia nervosa
Timo Brockmeyer a,c,⁎, Martin Grosse Holtforth b, Hinrich Bents c, Annette Kämmerer c, Wolfgang Herzog a, Hans-Christoph Friederich a

aCentre for Psychosocial Medicine, University Hospital Heidelberg, Department of General Internal Medicine and Psychosomatics, Im Neuenheimer Feld 410, 69120 Heidelberg, Germany
bDepartment of Psychology, University of Zurich, Binzmühlestrasse 14/Box 19, CH-8050 Zürich, Switzerland
cDepartment for Psychology, Centre for Psychological Psychotherapy, University of Heidelberg, Hauptstrasse 47-51, 69117 Heidelberg, Germany

Abstract
Self-starvation, with concomitant weight loss, may serve as a dysfunctional behavior to attenuate negative affective states in anorexia nervosa (AN). A total of 91 participants composed of patients with acute AN, women recovered from AN, clinical controls with either depression or anxiety disorder, and healthy controls were tested on a measure of emotion regulation. Patients with acute AN as well as recovered patients with AN and clinical controls showed increased emotion regulation difficulties as compared with healthy controls. In patients with acute AN, a specific association between body weight and emotion regulation was found: the lower the body mass index in patients with acute AN, the lesser were their difficulties in emotion regulation. This association could only be found in the subsample of patients with acute AN but not in the control groups. Moreover, there were no confounding effects of depression or duration of illness. The findings are consistent with the hypothesis that self-starvation with accompanying low body weight serves as a dysfunctional behavior to regulate aversive emotions in AN.
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1. Introduction
Anorexia nervosa (AN) is mainly characterized by food restriction and severely low body weight. There is a growing body of evidence that starvation in patients with AN has widespread and profound effects on mood and cognitive functioning [1]. Biopsychologic models suggest that dieting serves as a maladaptive strategy to compensate for deficits in emotion regulation in AN [2]. Avoidance of unpleasant emotions seems to be a core feature of AN that is highly valued by the patients [3]. However, at present, there is a lack of studies that have assessed whether starvation has a beneficial influence on emotion regulation in AN.

Bruch [4,5] considered the difficulties of differentiating and describing feelings as one of the main deficits of eating disorders. Accordingly, Taylor et al [6] conceptualized eating disorders as affect regulation disorders, suggesting that dysfunctional eating patterns and weight change may be an attempt to regulate distressing emotional states. Since then, various authors have described food restriction in AN as an attempt to avoid negative affective states mainly through an obsessive focus on weight, body shape, and food consumption [7-10]. In qualitative studies, patients with AN have consistently stated that the disorder helps them to suppress and avoid aversive emotions [3,11,12]. However, empirical support of quantitative studies for this feasible construct is still lacking.

Numerous studies have emphasized the relationship between AN and deficits in emotional awareness [13] or heightened alexithymia [14-16]. However, in most studies, scores of the Toronto Alexithymia Scale were not correlated with body mass index (BMI) [14,15]. Only one single study reported a relatively weak and negative correlation between Toronto Alexithymia Scale scores and BMI [17]. Thus, patients with a lower BMI had more problems with identifying and describing their feelings. Consequently, the authors interpreted this as a deficit rather than an advantage.

Although difficulties in emotion regulation have long been linked to bulimia nervosa [18,19], more recent studies

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⁎ Corresponding author. Tel.: +49 6221 5637153.
E-mail address: timo.brockmeyer@med.uni-heidelberg.de (T. Brockmeyer).
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have shown that problems in emotion regulation are also relevant in AN [13,20-22]. This assumption receives further support from findings that patients with AN show increased fear when confronted with emotional stimuli [23,24] and recall more general memories than healthy controls [25]. These findings were the result of an autobiographic memory test, and they can be interpreted as a way of specifically minimizing negative emotions [26,27]. In addition, a recent study by Wildes et al [28] demonstrated heightened levels on the Emotional Avoidance Questionnaire in patients with AN, although the authors did not include a control group (the scores were merely compared with published data).

There is some evidence that emotion dysregulation constitutes a trait rather than a state characteristic of women with AN. For example, a greater restraint in emotional expression was observed in patients with AN. For example, a greater restraint in emotion regulation in patients with acute AN and women recovered from AN. In addition, it has repeatedly been demonstrated in experimental studies with acute and recovered AN patients that certain deficits in emotion recognition and expression seem to be traitlike [31,32]. Furthermore, several studies revealed that disturbances of serotonin and dopamine functions in cortical and limbic structures persist after recovery from AN, and those disturbances appeared to have relevant effects on mood [2,33,34]. Accordingly, acute AN can be conceptualized as a model of allostatics because weight loss may help to adapt to impaired emotion regulation capacities by changes in serotonin and dopamine functions [35,36].

In contrast, a recent study demonstrated significant differences in emotion regulation between patients with acute AN and women recovered from AN [22]. In this study, no association was observed between emotion regulation and BMI. However, it is worth noting that this study did not differentiate between the different stages of the disease but rather defined chronically ill patients with AN and women recovered from AN as 1 group.

Impaired emotional processing is not specific to AN but is also found in other emotional disorders such as depression and anxiety disorders [37,38]. In addition, patients with AN show significant levels of depressive symptoms [39]. Accordingly, previous studies have found that differences between patients with AN and healthy women, in regard to emotional processing, are mediated by emotional distress, that is, depression and anxiety [13,17,40]. However, even if emotion processing deficits covary with emotional distress, it is unclear how this affects eating behavior.

In summary, heightened problems in emotional awareness—as well as in emotion regulation—have been observed in patients with AN; however, there is a lack of evidence for a direct association between self-starvation and emotion regulation.

Therefore, the aim of the present study was to assess the association of starvation-caused low body weight and emotion regulation in patients with acute AN and women recovered from AN. If self-starvation were to provide any advantage for patients with AN to cope with negative feelings, a low BMI should be accompanied by decreased problems in emotion regulation. However, no study to date has proven this concept. Because of the low prevalence rates of AN in general and the often chronic course of this disease, prospective longitudinal studies in patients with AN that reach complete weight restoration would be complex and time consuming. Therefore, cross-sectional investigations of acute AN patients and women who have recovered from AN are a helpful first step for investigating the association between low body weight, disease stage, and emotion regulation in AN.

1.1. Hypotheses

Based on the outlined theoretical framework as well as empirical findings, the central hypothesis of this study is that, in patients with acute AN, a low BMI is associated with fewer difficulties in emotion regulation. These associations were not expected for women who have recovered from AN, for clinical controls, or for healthy controls.

Furthermore, it is hypothesized that patients with acute AN, as compared with healthy controls, show greater emotion regulation difficulties but do not differ from the clinical control group in this regard. In addition, it is expected that difficulties in emotion regulation are relatively independent of the disease stage and are therefore also to be found in women who have recovered from AN.

2. Methods

2.1. Participants

In a naturalistic study with a cross-sectional design, 23 patients with acute AN were compared with 18 women who had recovered from AN, 18 patients of a clinical control group with a diagnosis of either depression or anxiety disorder, and 32 healthy controls.

All participants were female, Caucasian, and between 18 and 45 years old. Participants in control groups had to have a normal BMI in the range between 18.5 and 25 kg/m². Inclusion criteria for the group of women recovered from AN were adopted in line with previous studies [41,42] and included a history of AN according to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV), a BMI greater than 18.5 kg/m², with regular menstruation according to Morgan-Russell outcome criteria [43] if no contraceptive medication was used, and normal eating patterns for at least the past 12 months. The DSM-IV diagnoses [44] were obtained using the German version of the Structured Clinical Interview for DSM-IV Axis I Disorders [45,46]. Exclusion criteria for clinical groups were as follows: a life-threatening condition, a medical history of psychosis, bipolar disorder, borderline personality disorder, and craniofacial injury. Exclusion criteria for the healthy control group were any DSM-IV diagnosis. Patients were recruited consecutively from the inpatient...
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