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## On the role of sadness in the psychopathology of anorexia nervosa

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## ABSTRACT

Recent models on the development and maintenance of eating disorders propose negative emotions to be important precursors for the occurrence of eating disorder symptomatology. In fact, previous research on bulimia nervosa (BN) and binge eating disorder provides evidence that negative emotions are an antecedent condition for binge eating. However, there is a lack of research examining the influence of negative emotions on restrictive eating and exercising in individuals with anorexia nervosa (AN). In an experimental study, women with AN ( $n=39$ ) and BN ( $n=34$ ) as well as a non-eating disordered control group (CG;  $n=34$ ) watched a sadness-inducing film clip. Before and after the film clip participants rated their current desire to engage in dietary restriction (DTR) and desire to exercise (DTE). Main results reveal that DTR significantly increased after the film clip in women with AN only, while DTE decreased over time in all groups. Results are in line with the notion that negative emotions have a prominent influence on the core eating pathology in AN.

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## 1. Introduction

According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association (APA), 2013) anorexia nervosa (AN) is an eating disorder characterized by a phobic fear of gaining weight along with an unwillingness to maintain the minimal healthy body weight. Typical behaviors to achieve or maintain underweight include caloric restriction which sometimes even culminates in chronic self-imposed starvation. The severe self-starvation is one reason for the increased morbidity and mortality associated with AN (Fichter et al., 2006; Mitchell and Crow, 2006; Berkman et al., 2007). With a lifetime prevalence of up to 80% extreme physical activity is another common weight-reducing behavior in individuals suffering from AN (Davis et al., 1997). While a regular amount of exercise has a beneficial effect on mood and physical health (Blumenthal et al., 2007; Deslandes et al., 2009; Archer, 2012; Morris et al., 2012), research shows that excessive exercise in AN is positively associated with eating psychopathology, hospitalization periods and rates of relaps (Strober et al., 1997; Solenberger, 2001; Peñas-Lledó et al., 2002; Carter et al., 2004; Bewell-Weiss and Carter, 2010). As such, there is a need for research identifying factors that trigger restriction of food intake and excessive exercise in AN.

Models on the maintenance of eating disorders highlight the importance of negative emotions in the occurrence of eating

disorder symptomatology (Stice, 2001; Fairburn et al., 2003). As such, a great body of research exists showing that negative feelings trigger binge eating and purging behavior in bulimia nervosa (BN) as well as binge attacks in binge eating disorder (BED) (Alpers and Tuschen-Caffier, 2001; Hilbert and Tuschen-Caffier, 2007; Smyth et al., 2007). For example, after an insecurity and sadness-inducing guided imagery task ratings of hunger and desire to binge increased in bulimic patients, whereas no changes were found in healthy controls (Tuschen-Caffier and Voegelé, 1999).

In contrast to BN and BED, research on the role of negative emotions in the maintenance of anorectic behavior is still sparse. Besides, on a theoretical level it remains controversial whether eating pathology in AN can be influenced by intense mood states. Some theoretical accounts suggest that mood intolerance and maladaptive emotion regulation behavior is rather atypical in individuals with AN compared to other eating disorders (Fairburn et al., 2003). On the other hand, there are recent models on the onset and maintenance of AN that emphasize the emotion regulation functioning of anorectic behavior (Haynos and Fruzzetti, 2011). That is, maladaptive behaviors as dietary restriction and excessive exercise may be triggered by adverse emotional states and might therefore serve as a dysfunctional form of emotion regulation. Empirical evidence supports this notion showing that individuals with AN have more difficulties tolerating and regulating negative emotions compared to healthy controls (Harrison et al., 2009; Wildes et al., 2010; Svaldi et al., 2012). Moreover, one study (Merwin et al., 2010) reports significant positive correlations of non-acceptance of emotional responses with dietary restriction in

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women with AN. In qualitative studies AN patients report that main reasons for restriction of food intake include the inability to tolerate adverse emotions, attempts to control negative emotions and efforts to provide positive feelings like pride and security (Serpell et al., 1999; Dignon et al., 2006; Nordbø et al., 2006; Federici and Kaplan, 2008). Additionally, an ecological momentary assessment (EMA) study (Engel et al., 2005) revealed a prominent correlation between stressful events and affect lability with restrictive behavior and rituals in AN. Further evidence for the reinforcing influence of negative mood on anorectic eating behavior stems from biopsychological studies showing that dietary restraint can have a decreasing effect on the plasma tryptophan availability (Kaye, 2008). The plasma tryptophan modulates brain 5-HT functional activity, which in turn, is thought to have a positive influence on mood (Frank et al., 2001).

Regarding excessive exercise, there is indirect evidence of a close linkage between negative emotions and extreme physical activity in individuals with AN. For example, Peñas-Lledó et al. (2002) found that subjects with AN subtyped as high excessive exercisers were characterized by high levels of depression and anxiety compared to those subtyped as low excessive exercisers. Likewise, an EMA study on patients with AN and BN showed that individuals with an increased desire to be physically active are disposed to suffer from a chronically negative affect (Vansteelandt et al., 2007).

Notwithstanding, the previously mentioned studies do not allow to draw conclusions about cause and effect. In a very recent study though Wildes et al. (2012) experimentally tested the effects of negative mood on eating disorder symptoms in patients with AN. Specifically, AN participants either watched a negative emotion-inducing film clip or a neutral film clip. Prior to and after the film clip, participants had to rate several self-constructed items on Likert scales ranging from one (agree not at all) to five (completely agree). The items focused on maladaptive thoughts about eating, shape and weight (e.g., I feel fat), as well as urges to engage in eating disorder behaviors typically associated with AN (e.g., I want to restrict). While no changes were found in AN participants allocated to the neutral condition, those allocated to the negative mood condition self-reported a significant increase in eating disorder symptoms following the negative emotion induction. However, as this study summed up different kinds of eating disorder pathology (e.g., urge to restrict, state body image disturbance) it remains unclear which of the specific anorectic symptoms were actually triggered by the induced adverse emotions. This is especially important as previous studies were able to show that negative mood leads to an over-estimation of the own body size as well as higher levels of body dissatisfaction (Plies and Florin, 1992; Baker et al., 1995). Therefore, it is possible that only changes in the items measuring body image disturbances were responsible for the results of Wildes et al. (2012).

In light of the research just mentioned, the aim of the present study was to experimentally test the influence of negative emotions on the urge to engage in dietary restriction (DTR) and exercise (DTE) in patients with AN. Based on former studies identifying sadness to be a common pre-binge emotion in BN and BED (Cooper and Bowskill, 1986; Chua et al., 2004), a sadness-inducing film clip was used as negative emotional stimulus. In addition to an AN group, we included both a non-eating disordered control group and a group of females with BN. The former was included to test for possible effects of mood on eating pathology. The latter was included in order to provide information about differential effects between the two eating disorders, as previous studies reported high rates of syndrome shift (Agras et al., 2000) and similarities (Norman and Herzog, 1983) between AN and BN. With regard to the extensive overlap in the diagnostic criteria particularly between AN of *bulimic* subtype and BN (American Psychiatric Association (APA), 2013), analyses comparing AN *restrictive* and *bulimic* subtypes were also included to further

explore whether the affect regulation model fits both AN subtypes. In line with current models on the onset and maintenance of AN (Haynos and Fruzzetti, 2011), we predicted that an induction of sadness would lead to an increase of DTR and DTE only in individuals with AN.

## 2. Method

### 2.1. Participants

The sample consisted of women with a DSM-IV-TR (American Psychiatric Association (APA), 2000) diagnosis of AN ( $n=39$ ) and BN ( $n=34$ ) recruited from an inpatient clinic and via advertisements and announcements in the local media. The non-eating disordered control group ( $n=34$ ) was recruited via ads in the local media. Twenty-nine (74.35%) AN subjects were classified as *restrictive* subtype and 10 (26.31%) as *bulimic* subtype.

Exclusion criteria for all participants included the presence of current substance abuse or addiction (except sustained full remission), bipolar disorder, past psychosis, schizophrenia (currently symptomatic) and current suicidal ideation. Eating disorders were diagnosed by means of the Eating Disorder Examination Interview (EDE; Fairburn and Cooper, 1993; Hilbert et al., 2004). All other diagnoses were established by means of the Structured Clinical Interview (SCID) for DSM-IV Axis I and the borderline personality section of the Axis II interview (First et al., 1997; Wittchen et al., 1997). Studies show that the prevalence of eating disorders is high in adolescent females (e.g., Hudson et al., 2007; Le Grange et al., 2012). Therefore, to increase the ecological validity of the study the lower age limit for participants was 16 years.

### 2.2. Materials

#### 2.2.1. Induction of sadness

In order to induce sadness a scene from the movie "The Lion King" (length: 2 min, 11 s) was selected in which a young lion finds his father dead. As part of a set of standardized emotional film stimuli, this movie scene from "The Lion King" has been shown to reliably elicit sadness with little influence on other negative emotions (Rottenberg et al., 2007). The following instruction adapted from Gross (1998) was presented prior to the clip: "We will now be showing you a short film clip. It is important to us that you watch the film clip carefully. However, if you find the film to be too distressing, please call the experimenter." To intensify sadness, a freeze image was presented after the film clip for 15 s, in which the young lion snuggles up to his dead father.

#### 2.2.2. Manipulation check items

On the day of the experiment, participants were instructed to eat 1–2 h prior to the experiment. However, during the hour before the experiment no food intake was allowed to control for hunger.

To check whether participants really had comparable initial hunger levels, participants rated how hungry they were on a 100 mm Visual Analog Scale (VAS) anchored from "not at all" to "very much" at the beginning of the experiment.

To ensure that the film clip induced sadness, emotional states were rated by the participants before and after the film-clip on 100 mm VASs anchored from "not at all" to "very much". State sadness was assessed by the item "At the moment I feel sad". Current positive emotion was assessed by the following item: "At the moment I feel happy".

#### 2.2.3. Self-reported desire to engage in dietary restriction (DTR) and desire to exercise (DTE)

Like the manipulation check items, items on DTR and DTE were presented via computer on 100 mm VASs anchored from "not at all" to "very much". Items were presented prior to (baseline) and after watching the film clip (post-film).

Current DTR was assessed using the following self-constructed item: *At the moment I do not want to eat anything*. The item "At the moment I would like to exercise" was used to measure the current DTE.

#### 2.2.4. Questionnaires

Internal consistencies of our study sample for the questionnaires were calculated for the entire sample. The following questionnaires were administered: (1) The Eating Disorder Examination Questionnaire (EDE-Q; Fairburn and Beglin, 1994) is a 36-item self-report measure that assesses the severity of eating pathology with four subscales (restraint eating, eating concern, weight concern and shape concern) and with a global score. The global score and the subscales show high internal consistency, stability and validity (Fairburn and Beglin, 1994; Hilbert et al., 2007). Internal consistencies in our study ranged from  $\alpha=0.91$  (EDE-Q weight concern) to  $\alpha=0.98$  (EDE-Q global score). (2) The current version of the Beck Depression Inventory-II (BDI Beck et al., 1996; Hautzinger et al., 2007) is a self-report measure that assesses severity of depression over the last two weeks.

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