



## Emotion regulation in broadly defined anorexia nervosa: Association with negative affective memory bias



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### ABSTRACT

Theoretical models in anorexia nervosa (AN) implicate difficulties with emotion regulation as a maintaining factor. To date little is known about how different factors might maintain these difficulties. Forty eight women were recruited, 24 receiving treatment for AN (called broadly defined AN) and 24 healthy controls. Self-report measures of difficulties with emotion regulation and current depression were used in addition to computerized tasks which provided measures of social attentional bias and anger–threat bias, as well negative affective memory and recognition bias. Compared to controls, women with AN had significantly higher levels of difficulties with emotion regulation, depression, and negative affective memory bias, as well as lower bias for anger–threat. Simultaneous examination of the two variables that met pre-conditions for mediation of the relationship between group membership and difficulties with emotion regulation (anger–threat bias and negative affective memory) indicated negative affective memory bias to be a mediator, accounting for around one-third of the total effect a diagnosis of AN has on difficulties with emotion regulation. The association of these variables with AN may indicate shared risk factors with depression, and the variety of therapeutic approaches found to be effective with depression may be useful to further incorporate into treatments for AN.

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Anorexia nervosa (AN) is a severe psychiatric illness characterized by maintenance of low body weight, fear of weight gain, a chronic and relapsing course, and seeming indifference to the seriousness of the illness. The lifetime prevalence across studies from Australia, New Zealand, Europe, and North America ranges from .9% to 2.2% in females (Wade, Keski-Rahkonen, & Hudson, 2011), but this will increase to between 3% and 4.6% with the advent of the next version of the psychiatric diagnostic classificatory system (DSM-5) when the amenorrhoea criterion will be waived. The maintenance of AN is puzzling to many observers, given the serious problems accruing over time, including a substantial harmful burden with respect to both psychological and physical health. AN is associated with the highest proportion of admissions and the longest median length of stay of all psychiatric disorders (Thompson et al., 2004), higher health care utilization than individuals with all other forms of mental illness (Striegel-Moore et al., 2007), and all-cause mortality rates that are significantly elevated compared to non-affected individuals (Sullivan, 1995), more than 12 times higher than the annual death rate for females aged 15–24 years old in the general population. Further,

AN is associated with the highest mortality rates of any psychiatric disorder (Birmingham, Su, Hlynsky, Goldner, & Gao, 2005; Papadopoulos, Ekblom, Brandt, & Ekselius, 2009) and there exists no clearly supported treatment approach apart from a general consensus on the need for specialist care that includes nutritional rehabilitation and weight restoration in addition to psychotherapy (Hay & Claudino, 2010).

In an attempt to better understand maintaining factors that may identify effective interventions, different theories have been generated. Reflecting the finding that negative affect is one of the most robust risk factors for the development of an eating disorder (Jacobi & Fittig, 2010), one of the maintaining factors featuring across different theories is difficulty with emotion regulation (Fairburn, Cooper, & Shafran, 2003; Fox & Power, 2009; Schmidt & Treasure, 2006). The first of these, the transdiagnostic theory of eating disorders (Fairburn et al., 2003), suggests four key mechanisms that maintain eating disorders: clinical perfectionism, low self-esteem, mood regulation problems in response to life stressors, and problems with interpersonal functioning. In the cognitive-interpersonal model of anorexia nervosa (Schmidt & Treasure, 2006), avoidance is one of the four postulated maintaining factors, with a focus on experiential avoidance of emotions, emotional memories and intimate relationships. The other maintaining factors include pro-anorectic beliefs (i.e., positive beliefs about the

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value or function of the illness or particular symptoms), perfectionism and obsessive–compulsive personality traits, and unhelpful responses elicited from close others. Finally, in the Schematic Propositional Analogical Associative Representation System model applied to eating disorders (Fox & Power, 2009), central consideration is given to difficulties in managing strong, unpleasant emotion. All of these theories recognise the reinforcing loop between starvation and emotion, in line with recent research showing lower body mass index (BMI) in AN to be associated with less difficulties in emotion regulation (Brockmeyer et al., 2012), suggesting that very low body weight regulates aversive emotions in AN.

While increasing interest is being directed towards AN as a disorder of emotion regulation (Haynos & Fruzzetti, 2011), it is unclear whether difficulties with emotion regulation is a consequence of AN or pre-dispositional trait for AN. While women with AN have been shown to have significantly higher levels of difficulty with emotional regulation than healthy controls (Brockmeyer et al., 2012; Harrison, Sullivan, Tchanturia, & Treasure, 2010; Harrison, Tchanturia, & Treasure, 2010), one study has shown no difference between women recovered from AN and healthy controls (Harrison, Tchanturia et al., 2010) while another study found healthy controls had significantly better emotion regulation than people with current AN, people with depression or anxiety disorders, and people recovered from AN (Brockmeyer et al., 2012). What maintains emotion regulation difficulties apart from current psychopathology and starvation is not well understood.

One possible broad mechanism whereby emotion regulation difficulties may be maintained is via attentional bias to emotional content. While attentional bias to food- and body-related stimuli has been widely investigated in eating disorders (Dobson & Dozois, 2004; Johansson, Ghaderi, & Andersson, 2005), less attention has been paid to bias to emotional content. This latter construct may be operationalized in several different ways. First, social attentional bias has been observed in males with Asperger's syndrome (Ashwin, Wheelwright, & Baron-Cohen, 2006) and females with AN (Harrison, Sullivan et al., 2010) compared to controls using a Stroop paradigm, with a longer mean response time to name colours associated with faces (neutral and angry) versus neutral objects (e.g., chairs). These findings have been interpreted as an attention bias towards threatening stimuli in populations where social interaction is aversive or anxiety-provoking. A multivariate comparison of healthy controls and women with AN showed both depression and social attentional bias to have significant independent associations with emotion regulation difficulties (Harrison, Sullivan et al., 2010). The second related measure of bias to emotional content is an anger–threat bias, using the same Stroop task but indicating a longer latency for angry than neutral faces with women with AN compared to controls (Harrison, Sullivan et al., 2010). This finding reflects previous findings showing anger is a highly salient and threatening emotion for individuals with eating disorders (Fox & Power, 2009).

Two further measures of bias to emotional content yet to be used with eating disorder populations is a modified Stroop task (MacLeod, 1991), where relative response latency associated with delayed naming of affectively-laden themes related to negative affect compared to neutral stimuli shows large and robust depression-related effects in adults (Epp, Dobson, Dozois, & Frewen, 2012). A related task for children and adolescents measures response bias favouring the report of negative versus positive adjectives across both memory recall and recognition tasks (Neshat-Doost, Taghavi, Moradi, Yule, & Dalgleish, 1998), referred to throughout this report as negative affective memory bias and negative affective response bias respectively. The presence of depression in adolescents is associated with the recall of significantly more negative than positive adjectives compared to the absence of depression, where an equal number of both adjectives are recalled. Given the shared

genetic risk between major depression and AN (Wade, Bulik, Neale, & Kendler, 2000), and the finding that depression is associated with emotion regulation difficulties (Harrison, Sullivan et al., 2010), we can predict that negative affective memory bias and negative affective response bias may represent a key risk factor for the emotion regulation problems observed in AN.

The aim of the current study was to develop a better understanding of the factors that maintain difficulty with emotion regulation in AN. For the purpose of testing a meaningful structure, we made two assumptions. First, we assumed that difficulty with emotion regulation is caused by AN (Harrison, Tchanturia et al., 2010). Second, we assumed that variables related to attentional bias to emotional content (i.e., social attentional bias, anger–threat bias, negative affective memory bias and negative affective response bias) would mediate the relationship between diagnostic status (AN, healthy control) and difficulties with emotion regulation. Given the lack of causal research in this specific area, this assumption was based on a large body of findings showing that symptoms of depression and lability of mood frequently get worse as weight is initially lost and improve with weight regain (Fairburn & Harrison, 2003). Current levels of depression were included as a covariate, in order to retain focus on variables that may be additionally useful to target in treatment. Cross-sectional mediation was examined using the novel methodology of Preacher and Hayes (2008), where multiple simultaneous mediators were examined, thus allowing for identification of independent relationships.

## Method

### Participants

There were two groups of participants. The first consisted of 24 females aged 16–60 years who were currently receiving treatment for AN. Participants were recruited via fliers from their treating specialists at Flinders Medical Centre or the Flinders University Service for Eating Disorders, where each treating specialist ( $N = 3$ ) confirmed that the person currently or recently (in the last 6-month period) met the diagnostic criteria for AN according to a diagnostic interview schedule. BMI in this group ranged from 14.42 to 24.03, and 10 women (42%) had a BMI < 17.5 which is associated with the cut-off BMI used in the diagnostic criteria for AN (American Psychiatric Association, 2000). We therefore labelled this group as having “broadly defined AN”. Recovery in AN is defined as *both* the attainment of an ideal body weight (IBW) as well as cognitive and behavioural symptoms that are within one standard deviation of healthy controls (Couturier & Lock, 2006). Therefore while some women in the group had gained weight, this is not necessarily indicative of recovery.

The second group was a healthy control or comparison group which consisted of 24 female undergraduate psychology students from Flinders University, recruited via advertisement on the University's online research participation system and screened for disordered eating. Apart from sex, there was one exclusion criteria: all women participating in the study had to have the ability to clearly differentiate between the colours red, blue, green and yellow given the use of these colours in the social Stroop task (i.e., social and angry faces). This was confirmed verbally at the time of testing for all participants. The Southern Adelaide Clinical Human Research Ethics Committee approved this study.

### Measures

#### Screening questions for disordered eating

To screen the healthy control group for disordered eating, six diagnostic questions of the Eating Disorder Examination-

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