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Self-focused Attention in Anorexia Nervosa

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Abstract

Objective—The clinical presentation of anorexia nervosa (AN) is characterized by preoccupation with body experience, intrusive concerns regarding shape, and pathological fears of weight gain. These symptoms are suggestive of unrelenting self-focused attention. No research to date has characterized self-focused attention (SFA) in AN nor examined neurocognitive features that may facilitate an excessive, rigid, or sustained focus on one's appearance.

Method—This study examined SFA, body image disturbance, and executive functioning in women with current anorexia nervosa (AN-C; $n = 24$), a history of AN who were weight-restored at the time of the study weight-restored (WR; $n = 19$), and healthy controls ($n = 24$).

Results—Private and public SFA were highest among WR and lowest among AN-C. Shape concerns were negatively correlated with SFA, especially among AN-C, after controlling for depression and social anxiety symptoms.

Discussion—Lower levels of SFA among AN-C were unexpected and suggest the acute state of AN may lessen pathological self-focus, negatively reinforcing symptoms. In addition, body image concerns may distract from general SFA. Deficits in executive attention may explain these findings, as each one unit increase in perseverative errors among AN-C participants was associated with an almost one-half unit decrease in public SFA.

Keywords

anorexia nervosa; eating disorders; social cognition; social perception; attention; executive functioning; self-focused attention

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Additional Supporting Information may be found in the online version of this article.

Introduction

The clinical presentation of anorexia nervosa (AN) is suggestive of perpetual and unrelenting self-focus. Pathological fears of weight gain, preoccupation with body experience, and intrusive concerns regarding weight and shape point to an unyielding narrowed attention to the self. Body image disturbance could represent the *sine qua non* of pathological self-focused attention (SFA)¹. Further precision in understanding the cognitive component of body image disturbance via an examination of SFA could have important implications for intervention development as body image disturbance has largely defied effective intervention^{2,3}.

Yet, SFA is a necessary facet of adaptive self-regulation. Awareness of one's actions, thoughts, and visceral experience guide behavior and permit evaluation of hypothetical and committed actions^{4,5}. However, when SFA becomes persistent and extreme, adaptive self-regulation is compromised⁶. Pathological self-focus has been implicated in major depressive disorder and social phobia—both frequently comorbid with AN. Pathological self-focus is “excessive, sustained, and rigid attention to information emanating from internal sources” (7, p. 169): a focus on the self that is at the expense of alternative content (*excessive*), interferes with functioning (*sustained*), and is difficult to inhibit (*rigid*).

At the neurocognitive level, impairments in executive function, including capacities to flexibly engage and disengage attention from various foci, would have implications for an individual's ability to shift attention from salient content, including self-focused content⁸. The presentation of AN implies that content related to the self (e.g., what one has eaten, how fat one feels) is salient and attention to such content is *excessive*⁹. Well-documented deficits in set shifting in AN may be permissive of a *rigid* self-focus, as individuals with AN inflexibly stick to a cognitive domain with difficulty shifting¹⁰. AN entails functional impairment which may reflect *sustained* self-focus. Thus, cognitive facets of body image may represent an illness-specific manifestation of SFA which is facilitated and exacerbated by deficits in neurocognition.

SFA has also been partitioned into private and public self-consciousness, the former being a trait in which one is acutely aware of internal thoughts, feelings, sensations, etc., and the latter focusing on concerns regarding what others think of oneself¹¹. Our goals were to: 1) compare levels of extreme private and public SFA; 2) examine the relation between SFA and an aspect of body image disturbance; and 3) examine the relation between SFA and an aspect of executive functioning in those with current AN (AN-C) relative to those with a history of AN who are weight-restored (WR) and healthy controls (CN).

METHOD

Participants

Sixty-seven adult females agreed to participate in the study. The study was part of a larger investigation of social cognition in females with AN relative to autism spectrum disorder, and thus described to participants as a study on interpersonal relationships. For both AN-C and WR, inclusion was based on the DSM-5 diagnostic criteria for AN¹². Exclusion criteria

included: 1) male; 2) active symptoms of psychosis or related thought disorder; 3) substance abuse; or 4) a self-reported learning disability. Males were excluded as part of the larger investigation to avoid confounds of sex on study variables. Participants were drawn from an initial sample of 164 individuals who responded to the study advertisement placed in the community and specialized eating disorder programs. Participants completed an initial telephone interview, followed by an in-person structured diagnostic interview of eating disorder symptoms. Ninety-five qualified based on an initial telephone screen, 17 opted not to participate, and 10 were deemed ineligible based on the diagnostic interview for a final eligible sample of 68. One individual had incomplete data. Participants were classified into three groups: current diagnosis of AN (AN-C: $n = 24$), weight-restored with a prior diagnosis of AN (WR: $n = 19$), and no history of AN, other eating disorder, or autism spectrum disorder (CN: $n = 24$). The current study was reviewed and approved by the Duke University School of Medicine Institutional Review Board and all participants provided written informed consent.

Determination of Healthy Body Mass Index (BMI)

To operationalize DSM-5 “significantly low body weight,” via structured interview we first established the weight the participant had maintained consistently, while menstruating regularly with no medical complications, in the absence of restriction or unhealthy weight control behaviors¹². If the individual was unable to remember or accurately report such a period, we used the participant’s medical record to determine premorbid optimal weight. To be considered in an optimal weight range, weight had to occur in the absence of any medical signs that would indicate the individual’s weight was too low for their health (e.g., bradycardia). We then defined ideal/optimal body weight as ± 2.5 pounds of this value. Unhealthy low weight was based on percentages relative to the lower bound of this range using the 85th percentile as a starting point, but taking into account the bounds at which the individual demonstrates medical compromise¹³. This individualized approach yielded significant differences in BMI between the AN-C and WR groups (Table 1).

Procedure

We employed structured diagnostic interviews, neuropsychological measures, behavioral measures of social perception, and self-report measures. Tasks were administered in a fixed order. Testing sessions were a maximum of 3 h with breaks offered between tasks.

Assessment Measures

The self-absorption scale¹⁴ is a 17-item self-report measure of pathological levels of SFA grounded in Ingram’s model of SFA and designed to distinguish pathological boundaries of self-focus that are excessive, sustained, or rigid (7). The measure distinguishes private from public SFA and is scaled on a five-point response format (1 = *not at all like me* and 5 = *very much like me*). The private self-absorption subscale (eight items) assesses the three aspects of excessive attention in relation to thoughts about the self, (e.g., “I think about myself more than anything else.” [Excessive]; “My mind never focuses on things other than myself for very long.” [Sustained]; and “When I try to think of something other than myself, I cannot.” [Rigidity]). The public self-absorption subscale (9 items) measures excessive focus and

difficulty disengaging from thoughts about what others are thinking about oneself (e.g., “I am very aware of what others think of me, and it bothers me.” [Excessive]; “I feel like others are constantly evaluating me when I’m with them” [Sustained]; and “I find myself wondering what others think of me even when I don’t want to” [Rigidity]). There is evidence of construct validity and incremental validity¹⁴.

The Eating Disorder Examination, 12th edition (EDE; 15) and the Eating Disorder Examination Questionnaire (EDE-Q; 16) are widely used measures of eating disorder symptomatology. Discriminant validity, internal consistency, and concurrent validity are well documented for the EDE¹⁵, an instrument that was used to aid in diagnosis. The EDE-Q is the questionnaire version of the EDE and yields four subscales: Restraint, Eating Concern, Shape Concern, and Weight Concern. We selected the Shape Concern subscale as our measure of a cognitive facet of body image disturbance.

Brief symptom inventory (BSI; 17) is a shortened form of the revised version of the Symptom Checklist-90, a self-report measure of symptoms reflective of psychopathology. Participants indicated level of distress over the past 7 days using a five-point response format (0 = *Not at all* and 4 = *Extremely*). Good convergent, construct, and predictive validity have been reported¹⁷. As depressive symptoms are often associated with private SFA, we used the Depression subscale to control for this variable in our analyses.

Fear of negative evaluation (FNE; 18) is a 30-item, widely used assessment of an individual’s apprehension regarding unfavorable evaluations by others—a fundamental component of social anxiety, which is associated with public SFA¹⁹. We used the FNE to control for social anxiety in our analyses.

Wisconsin card sort test (WCST; 20) is a standardized behavioral measure of facets of executive functioning, particularly the capacity to shift cognitive sets and behavior in the face of fluctuating rules (i.e., set-shifting) and has been used in several prior investigations in adults with eating disorders²⁰.

Analysis Plan

Differences between diagnostic groups on covariates for continuous measures were assessed using analysis of variance (ANOVA) procedures to generate a set of three two-level contrasts comparing each of the three experimental conditions to the other. Group differences between categorical measures were assessed using chi square procedures. Statistical analyses of the two SFA outcome measures were based on a series of Ordinary Least Squares regression models. Each of the two SFA outcome measures was regressed on a three-level proxy variable denoting diagnostic status (Group). Differences between groups were subsequently investigated in a series of bivariate contrasts; models also included covariates to control for depressive affect and FNE. To examine the relation with body image disturbance, a series of three models were estimated after stratifying on diagnostic condition. Each model included the covariate representing shape concern as well as covariates specifying the number of depressive symptoms and the index of FNE to control for the influence of depressive affect and FNE in our models. The stratified approach was selected to minimize concerns over confounding of the interaction term in an ANCOVA-

based analysis, which was employed due to our unbalanced sample design. Analyses for set-shifting paralleled the model used to examine the role of body image disturbance.

Results

Sample Characteristics

Significantly fewer CN participants identified themselves as Caucasian relative to AN-C or WR; which did not differ significantly. Age ($M = 27.2$, range 18–55 years), verbal IQ ($M = 122.2$, range 80–144), and years of education ($M = 15.6$, range 12–25 years) did not differ significantly across any of the three groups. Relationship status did not differ by group with 51% having a romantic partner.

Table 1 summarizes current and past eating disorder symptoms. Mean BMI for the AN-C group was significantly below the WR and CN groups, which did not differ significantly. The EDE-Q Shape Concerns Scale was significantly elevated among AN-C participants relative to both WR and CN participants—scores of the WR group were significantly lower than the AN-C group and significantly higher than the CN group. AN-C and WR groups not differ on lifetime prevalence of purging behaviors (e.g., self-induced vomiting, excessive driven exercise) or binge eating behavior.

Levels of Self-focused Attention

Associations between SFA, both private and public, and diagnosis were conducted using a variable denoting group status and including covariates for depression and FNE scores. Type 3 analysis testing for differences between diagnostic groups in levels of private SFA was significant ($\chi^2_{2df} = 5.95$; $P < .05$). Based on least square means, predicted levels of private SFA were highest among WR (19.3 ± 1.3) relative to CN (18.7 ± 1.3) and lowest among participants in the AN-C group (15.0 ± 1.3). Subsequent a priori contrasts between pairs of each condition were conducted. Only contrasts between AN-C and WR participants were statistically significant; differences between AN-C and CN participants were marginally significant, while the final contrast between WR and CN was not significant.

Associations between public SFA and diagnosis were similar but more robust. The overall main effect testing for differences across diagnostic groups in levels of public self-absorption was statistically significant ($\chi^2_{2df} = 15.05$; $p < .001$). Least square means were highest among WR (28.6 ± 1.5) relative to CN (27.7 ± 1.6) with lowest estimated levels again observed among participants with a current diagnosis (AN-C, 20.3 ± 1.5). Model covariate associations between absorption, both public and private, and depressive symptoms were positive (model coefficient = 5.6, $p < .0001$) and significant. Associations between absorption and FNE were also positive (model coefficient = 0.29, $p < .01$). Tables with model parameters are available through online Supporting Information.

Relationship to Cognitive Aspects of Body Image

A negative association between shape concerns and private SFA among AN-C participants was statistically significant. Each one unit increase in the index of shape concerns was associated with a three unit decrease in the index of private SFA. Associations in the

remaining two groups were also negative although of smaller magnitude (WR: -1.59 ; CN: -1.10) and nonsignificant. Although the magnitude of the coefficients associated with shape concerns and public absorption were substantially lower among WR and CN participants relative to AN-C, none of the differences attained statistical significance. The association between the number of depressive symptoms and private SFA was positive and significant for all groups except among WR participants. The associations between FNE and SFA were also positive, but were only significant for public SFA in CN.

Relationship to Deficits in Executive Functioning

Coefficients estimating the association between private SFA and perseverative errors were negative among AN-C, were approximately neutral among WR, and had positive valence among CN; statistical significance was marginal for the former (AN-C, $p < .06$) and latter (CN, $p < .06$) groups and non-significant in the WR group. The association between public SFA and perseverative errors in the AN-C was also of negative sign and, in contrast to private SFA, was statistically significant. Thus, each one unit increase in perseverative errors among AN-C individuals was associated with an almost one-half unit decrease in public SFA. Coefficients for perseverative errors among WR and CN were of positive sign and did not differ statistically from zero. Null findings should be interpreted with caution due to the probability of Type II errors associated with limited sample size.

Discussion

Positioned against prior research literature, findings that levels of both private and public SFA were lower in the AN-C group and highest in the WR group were unexpected. This pattern suggests that the acute state of AN may lessen pathological self-focus. Given that the state of AN has long been characterized as an *ego-syntonic* state (i.e., symptoms are sought after and valued), reductions in pathological self-focus may be one mechanism whereby the symptoms of AN are negatively reinforcing¹.

This raises the question of how AN reduces SFA. Critically, SFA was positively associated with symptoms of depression and social anxiety, consistent with prior research. However, when controlled for in linear models, shape concerns, evaluative aspects of body image, were negative correlated with private SFA and this relationship was significantly stronger in AN-C. Stated differently, the greater one's dissatisfaction with his or her body shape, the less he or she endorsed general negative SFA. Furthermore, the WR group, but not the AN-C group, endorsed significantly greater public and private SFA relative to CN. These two lines of evidence suggest that although SFA is not functioning differently in individuals with either current or prior AN, eating disorder symptoms of body image disturbance, specifically shape concerns, may be. In other words, cognitions about body image may have a distracting or suppressive effect on more general pathological SFA. These findings raise some interesting questions about what aspect of the ill state of AN is contributing to lowered aversive self-awareness and particularly, how cognitions about body image function differently than anxious or depressive thoughts about the self.

Certain neurocognitive features of AN may strengthen the potency of the relationship between negative SFA and clinical variables. Deficits in executive attention were

significantly associated with SFA, a novel finding that may be important to explore in other conditions with elevated SFA (e.g., major depressive disorder, social anxiety) (6). However, the nature of the relationship differed by clinical group. Specifically, in AN-C, deficits in set-shifting (i.e., decreased cognitive flexibility) were negatively associated with public SFA. In other words, in the actively ill state, the more rigidly an individual with AN thinks, the less she worries about what others think of her. Thus, deficits in executive function may be permissive in facilitating a perseverative focus on salient cognitive content. In AN, symptoms such as concerns about shape are ego-syntonic and salient, meaning that those with AN are consonant with these symptoms and do not wish to be rid of them. This is in contrast to the negatively-valenced cognitive content of depressive affect and social anxiety, both highly comorbid with AN. Of interest, increased cognitive rigidity was associated with *increased* SFA in WR and CN, suggesting that the focus of cognitive perseveration differs in the ill state relative to the weight-restored state. Notably, the ill state of AN is one extreme food deprivation and physical threat. If extreme SFA predates and persists in those vulnerable to AN, such extreme conditions may be necessary to suppress or distract from SFA.

Clinical Implications

Given the small sample size and novelty of the study findings, any clinical implications from this study are premature. If these findings are replicated, one potential clinical implication is the value of attention retraining as a clinical tool. Given that eating disorder symptoms are proposed to function as ways to divert attention from aversive self-content, interventions that employ attention retraining, specifically enabling individuals to more flexibly engage and disengage attention, would render the function of eating disorders obsolete. Rather than using eating disorder symptoms to manipulate the content of cognition, individuals can master the ability to flexibly engage and disengage attention foci. Evidence of the clinical efficacy of such programs has been demonstrated in anxiety disorders²¹.

Limitations

This study was cross-sectional and used neuropsychological measures and self-report measures to formulate a theory of the function of eating disorder symptoms. Further, our sample size, though large enough to detect these preliminary associations, may not have been sufficient to detect trends in our models of three-way interactions. Finally, while our strategy for defining ideal body weight was sensitive to previous critiques of using BMI cut-offs, this strategy is more challenging to replicate¹³.

Summary

SFA may be an important construct in understanding the functional value of symptoms in AN, specifically body image disturbance, which is a historically intractable feature of the illness. Future studies should further explore what aspects of body image disturbance are or are not associated with SFA to more precisely define this relationship.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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TABLE 1

Associated eating disorder psychopathology by group

Group	Weight History			Presence of Lifetime Threshold Symptoms			Current Self-Reported Eating Disorder Attitudes			
	Age of Eating Disorder Onset (years)	Lowest BMI (kg/m ²)	Current BMI (kg/m ²)	Lifetime Binge Eating	Lifetime Driven Exercise	Lifetime Self-induced Vomiting	Restraint	Weight-concern	Shape-concern	Eating Concern
AN-C (n = 24)	17.5 (4.4)	14.6 (2.0) ^d	17.4 (1.3) ^a	40.0%	81.0%	42.9%	3.9 (1.7) ^d	4.4 (1.1) ^d	4.8 (.99) ^d	3.5 (1.3) ^d
WR (n = 19)	15.5 (4.3)	15.3 (2.4) ^d	21.5 (2.2) ^b	68.4%	52.6%	29.4%	2.1 (1.3) ^b	2.5 (1.2) ^b	2.6 (1.2) ^b	1.3 (1.1) ^b
CN (n = 24)		20.4 (2.2) ^{ba}	22.6 (3.8) ^{ba}				0.9 (1.0) ^{ca}	.09 (.87) ^{ca}	1.2 (.96) ^{ca}	0.2 (.32) ^{ca}

Note: Mean (standard deviation), % (Percentage of each group as indicated). Different superscripts connote differences between groups. Given the difficulty in estimating symptoms at earlier periods, lifetime data reflects the average values of those individuals who felt they could estimate this history with reasonable certainty (68–100%). AN-C = current diagnosis of anorexia nervosa; WR = prior diagnosis of anorexia nervosa but weight restored; CN = healthy control with no prior diagnosis of eating disorder. Groups did not significantly differ on lifetime symptom levels.

^a $p < .01$.