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Contributions of cognitive inflexibility to eating disorder and social anxiety symptoms

Jean Arlt^a, Angelina Yiu^a, Kalina Eneva^a, M. Taylor Dryman^b, Richard G. Heimberg^b, and Eunice Y. Chen^a

^aTemple Eating Disorders program, Department of Psychology, Temple University, Philadelphia, PA, United States

^bAdult Anxiety Clinic of Temple, Department of Psychology, Temple University, Philadelphia, PA, United States

Abstract

Eating disorders and social anxiety are highly co-occurring. These disorders share fears of social evaluation, possibly maintained by similar cognitive content and styles, including an inability to adapt or flexibly respond to unexpected conditions. However, the role of cognitive inflexibility in eating disorders in relation to social anxiety has not been explored.

Objective—In this study, the link between eating disorder symptoms and cognitive inflexibility, while accounting for social anxiety, is examined.

Method—Participants ($N = 461$) were undergraduates who completed the Detail and Flexibility Questionnaire 12-item Cognitive Rigidity subscale, the Eating Disorders Diagnostic Scale, and the Social Interaction Anxiety Scale.

Results—Eating disorder symptoms and social anxiety were both positively correlated with cognitive inflexibility. After controlling for social anxiety, the relationship between eating disorder symptoms and cognitive inflexibility remained robust.

Discussion—Further examination of cognitive inflexibility in eating disorders and comorbid social anxiety in clinical samples is warranted. We suggest future directions for examining cognitive inflexibility as a trans-diagnostic construct important to eating disorders and frequently comorbid disorders, consistent with NIMH Research Domain Criteria.

Keywords

Eating disorders; Cognitive flexibility; Social anxiety

Correspondence to: Jean Arlt.

Contributors: Dr. Chen designed the study. Authors Arlt, Yiu, Eneva, and Dryman conducted literature searches and provided summaries of previous research studies. Yiu conducted the statistical analysis. Arlt wrote the first draft of the manuscripts and all authors contributed to and have approved the final manuscript.

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Eating disorders (EDs) and social anxiety (SA) are each frequently co-occurring disorders and share phenomenological similarities. SA is the second most common anxiety disorder occurring with EDs, second only to specific phobias (Hudson, Hiripi, Pope, & Kessler, 2007). However, unlike specific phobias, which are limited to circumscribed situations, SA impacts innumerable situations (Menatti, DeBoer, Weeks, & Heimberg, 2015; Wong, Gordon, & Heimberg, 2014). Estimates for lifetime prevalence of SA in bulimia nervosa (BN) or binge eating disorder (BED) range from over 20% to nearly 30% (Kessler et al., 2013). EDs and SA also share common cognitive styles and content. Both EDs and SA involve anxiety and fear about social evaluation by others and these concerns, whether about evaluation regarding eating, body image or during social situations, are strongly held and inflexible (Menatti et al., 2015; Tchanturia et al., 2011). Despite overlap between EDs and SA, cognitive inflexibility has not been examined extensively in both disorders simultaneously.

Cognitive inflexibility is thought to represent a lack of awareness of options when unexpected conditions arise and the unwillingness or inability to adapt to such challenges (Roberts, Barthel, Lopez, Tchanturia, & Treasure, 2011). While self-report measures capture the subjective experience of cognitively inflexible styles, behavior can be tested using neurocognitive measures of set-shifting (Lounes, Khan, & Tchanturia, 2011). On these measures, patients with anorexia nervosa (AN), BN, and BED perform sub-optimally compared with healthy individuals (Friederich & Herzog, 2011; Mobbs, Iglesias, Golay, & Van der Linden, 2011; Van den Eynde et al., 2011). Moreover, cognitive remediation therapy (CRT), which focuses on challenging and breaking down inflexible beliefs not specific to food and eating, has shown promising results for the treatment of EDs (Tchanturia, 2014; Tchanturia, Lounes, & Holtum, 2014).

Moreover, there is an increasing body of empirical evidence supporting the importance of cognitive inflexibility in disorders that are comorbid with AN, including obsessive-compulsive disorder (OCD), autism, depression, and schizophrenia (Cunill, Huerta-Ramos, & Castells, 2013; Giel et al., 2012; Hill, 2004; Hudson et al., 2007; Zucker et al., 2007). This overlap between EDs and other disorders where cognitive rigidity is problematic highlights the necessity to further investigate the specificity of cognitive flexibility in EDs. Surprisingly, despite the high occurrence of SA in EDs and shared cognitive styles between these disorders, little attention has been given to cognitive flexibility in EDs and comorbid SA symptoms. This subject is particularly important given the movement towards characterizing broader trans-diagnostic constructs, as reflected in the NIMH Research Domain Criteria (RDoC) (Insel et al., 2010). Cognitive inflexibility may not only contribute to EDs but also to the presentation of co-occurring SA symptoms. To our knowledge, no published research to date has examined the relative contribution of cognitive inflexibility to ED symptoms compared to those of SA. It is unknown whether cognitive inflexibility represents a unique vulnerability in EDs or one that is common across comorbid, internalizing disorders.

The aim of the present study was to examine the unique contribution of cognitive inflexibility to ED symptoms and disentangle this contribution from co-occurring SA symptoms. We hypothesized that cognitive inflexibility would contribute to ED symptoms

above and beyond the contribution of SA symptoms. In order to understand the construct of cognitive inflexibility on a continuum, we examined this in a non-clinical, non-treatment seeking sample.

1. Methods

This work was reviewed and approved by University's Institutional Review Board. Participants ($N = 461$) were undergraduate students at a large Mid-Atlantic college recruited through the Psychology Research Participation System. All participants gave consent online by clicking a tab acknowledging that by proceeding to the questionnaires, they consented to participate in this research. Participants completed a battery of questionnaires that included mood disorder and psychosis screeners in addition to the instruments reported here. Demographic information including gender, age, minority status, and parental income was also collected.

Cognitive inflexibility was assessed using the Detail and Flexibility Questionnaire 12-item subscale for Cognitive Rigidity (DFlex-CR) (Roberts et al., 2011). The DFlex-CR is a self-report measure where individuals rate how much they agree or disagree (Hudson et al., 2007; Roberts et al., 2011) with statements related to managing unexpected challenges, changes in routines, and adapting plans to accommodate others (e.g. "When others suggest a new way of doing things, I get upset or unsettled."). It has been shown to discriminate well between individuals with AN and healthy controls as well as between those with current AN patients and those in recovery (Roberts et al., 2011). In the present study, the DFlex-CR showed good internal consistency ($\alpha = .82$).

ED behaviors were assessed using the Eating Disorders Diagnostic Scale (EDDS), which has been shown to have good predictive validity for onset of EDs as well as response to prevention programs (Stice, Fisher, & Martinez, 2004). In the current study, internal consistency of EDDS scores was good ($\alpha = .84$).

SA was assessed using the Social Interaction Anxiety Scale (SIAS) (Rodebaugh, Woods, Heimberg, Liebowitz, & Schneier, 2006). The SIAS discriminates well between individuals with SAD, other anxiety disorders, and controls, as well as between treated and untreated groups (Rodebaugh et al., 2006). A cut off score of 34 on the SIAS has been found to discriminate between individuals with SAD in comparison to community controls without mood or anxiety disorders (Peters, 2000). In the current study, internal consistency of SIAS scores was excellent ($\alpha = .92$).

2. Results

2.1. Preliminary analyses

The mean age of participants was 20.74 years ($SD = 3.45$). The majority of the sample was female ($n = 291$; 63.12%) and a minority of the sample self-identified as Hispanic or Latino ($n = 29$; 6.3%). The sample predominately self-identified as Caucasian ($n = 315$; 73.1%), followed by African-American ($n = 47$; 10.9%), Asian-American ($n = 46$; 10.7%), or indicated 'Other' ($n = 23$; 5.3%). Scores for the EDDS, SIAS and DFlex-CR fell within an

acceptable range of normality (skew and kurtosis <1.5 and >-1.5) (Kline, 2011). Additionally, multicollinearity among EDDS, SIAS and Dflex-CR scores was examined. All variance inflation values were between 1.01 and 1.14, suggesting minimal problems with multicollinearity. We examined age and gender as potential covariates. Gender was associated with the EDDS, SIAS, and Dflex-CR scores and was therefore controlled for in subsequent analyses. In addition, regression analyses were conducted separately for men and women to examine potential gender differences in the relationship between cognitive inflexibility and ED symptoms.

2.2 Hypothesis Testing

A minority of participants met criteria for a full-threshold or sub-threshold DSM-IV-TR ED according to the EDDS ($n = 73$; 15.8%) or for SA according to the SIAS cut-off score ($n = 96$; 20.8%), with a small proportion meeting threshold scores for both ED and SAD ($n = 16$, 3.5%). Though the EDDS is not used for diagnostic purposes, 1.1% ($n = 5$) reported symptoms above threshold for AN, 5.4% ($n = 25$) reported symptoms above threshold for BN, 1.5% ($n = 7$) reported symptoms above threshold for BED, and 7.9% ($n = 36$) reported symptoms above threshold for EDNOS. Table 1 presents means, standard deviations and correlations for the measures of interest. Table 2 presents the results of the hierarchical linear regression of cognitive inflexibility on ED symptoms, controlling for gender and SA. Gender and SIAS score were entered in the first step and Dflex-CR score in the second step of a hierarchical linear regression. Gender and SA symptoms accounted for 11.6% of the variance in the relationship with ED symptoms (Adjusted $R^2 = .116$). With the addition of the Dflex-CR score in the model, 14.4% of the variance was accounted for in the relationship with ED symptoms (Adjusted $R^2 = .144$, $R^2 = 0.03$, $F_{(1457)} = 15.99$, $p < .01$), reflecting a small effect size. Furthermore, among women, but not men, the Dflex-CR score remained positively associated with ED symptoms after controlling for SA symptoms (Adjusted $R^2 = .116$, $R^2 = 0.05$, $F_{(1288)} = 14.92$, $p < .01$), reflecting a small effect size.

3. Discussion

We found that cognitive inflexibility scores accounted for significant variance ED symptoms, above and beyond the contributions of gender and SA, suggesting that cognitive inflexibility plays a prominent role in ED symptomatology relative to SA. These findings contribute to the little research available on the relationship between cognitive flexibility, and ED and SA symptoms. The means on the Dflex-CR were similar to those reported by recovered eating disorder populations and provide normative sample information on this measure in a large young adult sample (Roberts et al., 2011). Cognitive inflexibility may represent a broad cognitive style in EDs, affecting areas not limited to social interactions and eating behaviors. These findings suggest cognitive inflexibility contributes to EDs but also underlies co-occurring clinical symptoms of SA. Additional research is warranted to better understand the role of cognitive inflexibility in EDs with comorbid SA. As research shifts focus towards examining underlying constructs rather than diagnoses and symptoms, cognitive inflexibility should be considered as a candidate for a psychological mechanism underlying ED symptoms but also underlying other clinical diagnoses, including anxiety

disorders, depression, autism, OCD and schizophrenia (Cunill et al., 2013; Giel et al., 2012; Hill, 2004; Menatti et al., 2015; Zucker et al., 2007).

The use of self-report measures in a college sample represents a limitation of this study as weight status could not be determined and no formal diagnosis of EDs or SAD could be made. Therefore, conclusions about different EDs cannot be made. However, in the move towards RDoC, it is valuable to examine relationships of symptoms in non-clinical samples to inform our understanding of how psychological constructs drive clinical symptoms across a continuum of behavior and self-reported experience. Additionally, as a cross-sectional study, we cannot draw conclusions about how these features interact over time.

Future research should seek to better define the contribution of cognitive inflexibility in clinical samples with EDs and SA as well as more broadly in the context of EDs and other comorbid anxiety disorders. Use of diagnostic assessment and neuropsychological testing as compliments to self-report measures is also needed. Given the high prevalence rates of EDs and SA in young adults, understanding the cognitive styles and neural constructs that contribute to their development and maintenance is particularly important (Kessler et al., 2013). Therapeutic interventions targeting global cognitive inflexibility, such as CRT, may be efficacious because they address a broader cognitive style, which is thought to maintain EDs, and comorbid disorders (Tchanturia et al., 2014). Examining the role of cognitive inflexibility in individuals with SAD is warranted. Rigid beliefs about social situations, common to both EDs and SAD, suggest this cognitive style may also contribute to the symptoms of SA. As the fear of social scrutiny and avoidance of situations where social evaluation may occur in both EDs and SAD may appear clinically very similar, such investigation may benefit our understanding of how EDs and SAD may be better distinguished in diagnosis and treatment.

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Table 1

Correlations, means, and standard deviations for DFlex-CR, SIAS, and EDDS scores.

	DFlex-CR	SIAS	EDDS
<i>M (SD)</i>	38.56 (9.28)	22.62 (13.01)	18.35 (15.20)
Cognitive inflexibility	–	–	–
Social anxiety	$r = 0.42^{**}$	–	–
Eating disorder symptoms	$r = 0.30^{**}$	$r = 0.28^{**}$	–

Note. DFlex = Detail and Flexibility Questionnaire 12-item subscale for Cognitive Rigidity; SIAS = Social Interaction Anxiety Scale; EDDS = Eating Disorder Diagnostic Scale.

^{**}
 $p < .01$.

Eating disorder symptoms contribute significantly to cognitive flexibility even when controlling for social anxiety and gender.

Table 2

	Adjusted R^2	Adjusted R^2	b	SE	β
Step 1	.12				
Gender			6.62	1.38	.21**
SIAS-total			0.32	.05	.27**
Step 2	.14	.03**			
Gender			5.65	1.38	.18**
SIAS-total			0.22	.06	.19**
Dflex-CR			0.32	.08	.19**

Note. SIAS = Social Interaction Anxiety Scale; EDDS = Eating Disorder Diagnostic Scale.

**
 $p < .01$.