

Mindfulness Moderates the Relationship Between Disordered Eating Cognitions and Disordered Eating Behaviors in a Non-Clinical College Sample

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Abstract Psychological flexibility and mindfulness are two related, but distinct, regulation processes that have been shown to be at the core of psychological wellbeing. The current study investigated whether these two processes independently moderated the association between disordered eating cognitions and psychological distress as well as the relation between disordered eating cognitions and disordered eating behaviors. Non-clinical, ethnically diverse college undergraduates completed a web-based survey. Of 278 participants (*n*_{female}=208; *n*_{male}=70) aged 18–24 years old, disordered eating cognitions, mindfulness, and psychological flexibility were related to psychological distress after controlling for gender, ethnicity, and body mass index. Disordered eating cognitions and mindfulness accounted for unique variance in disordered eating behaviors. Finally, mindfulness was found to moderate the association between disordered eating cognitions and disordered eating behaviors.

Keywords Disordered eating cognition · Disordered eating symptoms · Psychological distress · General psychological ill-health · Psychological flexibility · Experiential avoidance · Mindfulness

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Disordered eating cognitions, such as fear of gaining weight, importance of having an ideal weight and shape to be interpersonally accepted, and self-control over diet and weight (Cooper et al. 1997; Fairburn 2008; Fairburn et al. 2003; Mizes et al. 2000), are pervasive among youth and young adults in Western societies. In non-clinical samples, these cognitions have been linked to disordered eating behaviors (e.g., Cooper 2006; Stice et al. 1998) and general psychological distress (e.g., Masuda et al. 2010).

However, the association between disordered eating cognitions and negative psychological outcomes is not unequivocal (e.g., Brannan and Petrie 2008; Tylka 2004). Specifically, it appears that other factors may moderate the association between disordered eating cognitions and disordered eating behaviors. For example, one potential moderator may be difficulties with emotion/behavior regulation (Brown et al. 2005; Gross 1998; Hayes et al. 1996; Segal et al. 2004). Based on existing literature (Gross 1998; Hayes et al. 2006), emotion/behavior regulation abilities are defined as the processes by which individuals influence the psychological experiences they have, and how emotions are experienced and expressed.

Recently, researchers have begun to investigate the link between disordered eating problems and emotion/behavior regulation (e.g., Aldao and Nolen-Hoeksema 2010). Affect regulation models of disordered eating problems posit that, in addition to dysfunctional private events (e.g., disordered cognitions and negative affect), regulation processes plays an important role in the onset and maintenance of disordered eating problems (Aldao et al. 2010; Lavender and Anderson 2010; Lavender et al. 2009; Rawal et al. 2010). For example, a study with college males (Lavender and Anderson 2010) demonstrated that emotion regulation difficulties, which are marked, by non-acceptance of dysfunctional affect and limited access to adequate emotion

regulation strategies, accounted for the unique variance in disordered eating symptoms after accounting for the variance associated with negative affect and body mass index (BMI). Similarly, another study (Lavender et al. 2009) revealed that thought suppression, a maladaptive regulation strategy, explained the unique variance of bulimic symptoms in both college females and males after controlling for the variance explained by BMI. Furthermore, adaptive regulation processes seems to play an important role in the onset and maintenance of disordered eating problems (e.g., Lavender et al. 2009). Two salient examples of such regulation processes are mindfulness and psychological flexibility.

Mindfulness

Mindfulness, although its definition varies across investigators, can be construed as an adaptive regulation process of enhanced attention to, and nonjudgmental awareness of, present moment experiences (Brown and Ryan 2003; Chambers et al. 2009). Many psychotherapies now incorporate mindfulness into their theories and practices (e.g., Baer 2006; Hayes et al. 2004a; Kabat-Zinn 2003), in part because of its salutary effects found across diverse behavioral and clinical areas (Brown et al. 2007). Mindfulness, when defined in this way, is found to be inversely associated with a wide range of negative psychological outcomes (Brown and Ryan 2003; Roemer et al. 2009), including general psychological distress (Baer et al. 2006), and disordered eating symptoms (Lavender et al. 2009). Additionally, mindfulness has been shown to be inversely associated with disordered eating cognitions (Masuda and Wendell 2010).

Psychological Flexibility

Psychological flexibility (Hayes et al. 2006) represents another potentially important adaptive regulation process that may moderate the associations between disordered eating cognitions and disordered eating behaviors. According to Hayes et al. (2006), psychological flexibility is “the ability to contact the present moment fully as a conscious human being, and to change or persist in behavior when doing so serves valued ends” (p. 7). It can be theorized as an overarching regulation process of experiencing whatever one is experiencing nonjudgmentally without defense or judgment (e.g., mindfulness), while engaging in value-directed activities (i.e., commitment to actions). A large empirical literature suggests that psychological flexibility is a cornerstone of behavioral health (e.g., Kashdan and Rottenberg 2010). In particular, psychological flexibility is positively related to mindfulness

(Baer et al. 2006; Masuda et al. 2009a) and emotional well-being (Kashdan and Breen 2007), and inversely associated with a wide range of negative psychological outcomes (e.g., Hayes et al. 2006; Kashdan et al. 2006), including psychological distress (e.g., Bond and Bunce 2003; Masuda et al. 2011; Masuda et al. 2009b). Psychological flexibility is also found to be inversely associated with disordered eating cognitions (Masuda et al. 2010) and disordered eating symptoms (Rawal et al. 2010).

Mindfulness and Psychological Flexibility as Moderators

Accumulating evidence has shown that both mindfulness and psychological flexibility explain the onset and maintenance of various forms of psychological struggles (Brown et al. 2007; Hayes et al. 2006), including disordered eating symptoms (Lavender et al. 2009; Rawal et al. 2010). Preliminary findings have also demonstrated that mindfulness and psychological flexibility moderate a variety of associations between harmful psychological factors and behavioral health outcomes (Andrew and Dulin 2007; Feltman et al. 2009; Kashdan and Kane 2011; Kratz et al. 2007; Saavedra et al. 2010). In these studies, the strength of associations between psychological factors and outcomes is attenuated under greater mindfulness or psychological flexibility. Given the broader applicability of mindfulness and psychological flexibility, it is possible to speculate that these two processes moderate the association between disordered eating cognitions and disordered eating behaviors and the link between disordered eating cognition and psychological distress.

To date, no studies have investigated the moderating roles of mindfulness and psychological flexibility in these associations. Such an investigation is critical as it will expand our understanding of the development and maintenance of disordered eating problems and psychological distress and the ways in which other important factors may moderate the association between disordered eating cognitions and these problematic outcomes.

Current Study

Following from previous research (Lavender et al. 2009; Masuda et al. 2010; Masuda and Wendell 2010; Rawal et al. 2010), the present cross-sectional study first examined whether disordered eating cognitions, mindfulness, and psychological flexibility were related to psychological distress and disordered eating behaviors. It was predicted that disordered eating cognitions, mindfulness, and psychological flexibility would explain unique variance in both

outcome measures after controlling for gender, ethnic background, and BMI, factors often found to be associated with disordered eating symptoms (Striegel-Moore and Bulik 2007). Subsequently, the current study investigated whether mindfulness and psychological flexibility moderated the association between disordered eating cognitions and psychological distress and the link between disordered eating cognitions and disordered eating behaviors. It was hypothesized that both mindfulness and psychological flexibility would moderate these associations.

Method

Participants

The current study was conducted at a large, public 4-year university in Georgia. Participants were recruited from undergraduate psychology courses through a web-based research participant pool. Four hundred one participants ($n_{Female}=284$; $n_{Male}=117$) completed the survey package that included the measures of interest. The mean completion time for the instrument was 30 min ($SD=15.56$). As employed in previous studies (Masuda et al. 2011), given the online nature of the survey, those who completed the survey in less than 15 min or more than 45 min were removed from the study because of the questionable validity of their responses. Three hundred seventeen participants remained ($n_{Female}=234$; $n_{Male}=83$). They ranged in age from 17 to 46 years ($M=20.88$, $SD=4.30$). Additionally, 33 participants, who were aged 17 years old or 25 years old or older, were further excluded based on outlier analysis of age. Finally, five people were excluded from the study because they did not report either the height or weight to compute the body mass index (BMI). The final participants consisted of 278 participants ($n_{female}=208$; $n_{male}=70$) with the mean age of 19.68 ($SD=1.45$). The ethnic composition of the sample was representative of the university with 41% ($n=115$) identifying as “European American,” 28% ($n=79$) identifying as “African American,” 18% ($n=50$) identifying as “Asian American,” 4% ($n=12$) identifying as “Hispanic American,” and 8% ($n=22$) identifying as “bicultural” or “other.”

Procedure

Participants who enrolled in the study were asked to complete an anonymous web-based survey. Prior to the survey, information relevant to the present study was presented on a computer screen explaining the purpose of the study and providing instructions regarding how to respond to the survey. Participants anonymously filled out demographic information and completed the measures.

Measures

The following measures were used to assess disordered eating symptoms, general psychological distress, disordered eating-related cognitions, psychological flexibility, and mindfulness.

Disordered Eating Behaviors Based on previous findings (Anderson-Fye and Lin 2009; Miller et al. 2009), the sum of nine behavioral items in the 26-item version of Eating Attitudes Test (EAT-26; Garner et al. 1982) was used to measure behavioral symptoms of disordered eating. These items clearly capture the behavioral symptoms of disordered eating (e.g., “I avoid eating when I am hungry” and “I vomit after I have eaten”). All items are scored on a 6-point Likert scale: *never* (0), *rarely* (0), *sometimes* (0), *often* (1), *very often* (2), or *always* (3). The total score of the behavioral scale (EAT-26 Behavior) ranges from 0 to 27. Chronbach’s alpha was .72 in the present study.

Psychological Distress The *General Health Questionnaire-12* (GHQ-12; Goldberg 1978) is a measure of overall general psychological distress. Participants are asked to rate frequency with which they experience common behavioral and psychological stressors. Using a Likert-scale format, items are scored on a 4-point scale, ranging from 0 (*not at all*) to 3 (*much more than usual*), with a total score derived from the sum of all responses. Total scores range from 0 to 36, with higher scores indicating poorer psychological health. Previous studies reported that the GHQ-12 has good psychometric properties (e.g., Goldberg et al. 1997). A recent study with a non-clinical college undergraduate sample has shown an adequate Cronbach’s alpha of .88 (Masuda et al. 2010). Similarly, Cronbach’s alpha was .87 in the current study.

Disordered Eating Cognition The *Mizes Anorectic Cognitions Questionnaire-Revised* (MAC-R; Mizes et al. 2000) is a 24-item self-report questionnaire designed to assess distorted cognitions related to all eating disorders. These cognitions are the fear of weight gain (e.g., “When I see someone who is overweight, I worry that I will be like him/her”), the importance of being thin or attractive to be socially accepted (“No one likes fat people; therefore, I must remain thin to be liked by others”), and self-esteem based on controlled eating habits and weight gain (“If my weight goes up, my self-esteem goes down”). Each item is scored on a 5-point Likert scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), with a total score derived from the sum of all responses. Total scores range from 24 to 120 with higher scores indicating greater disordered eating-related dysfunctional cognitions. In a previous study conducted with a non-clinical college sample, Cronbach’s alpha for the MAC-R

total was .89 (Masuda et al. 2010). In the current study, Cronbach's alpha of this measure was .90.

Psychological Flexibility The *Acceptance and Action Questionnaire* (AAQ-16; Bond and Bunce 2003) was used to measure psychological flexibility for this study. The AAQ is a 16-item questionnaire designed to assess willingness to accept undesirable thoughts and feelings (e.g., "It is OK to feel depressed or anxious"), while acting in a way that is congruent with one's values and goals (e.g., "I am able to take action on a problem even if I am uncertain of the right thing to do"). The measure employs a 7-point Likert scale, ranging from 1 (*Never true*) to 7 (*Always true*). Total scores range from 16 to 112, with higher scores indicating greater psychological flexibility. Research has indicated that the AAQ has good psychometric properties (see Hayes et al. 2004b). In a previous study conducted with a non-clinical sample (Bond and Bunce 2003), alpha coefficients for this measure ranged from .72 to .79. Cronbach's alpha of this measure was .63 in the present study.

Mindfulness The Mindful Attention Awareness Scale (MAAS; Brown and Ryan 2003) is a 15-item, self-report measure, which is designed to assess the frequency of mindlessness, the opposite of the construct of mindfulness, over time (e.g., "It seems I am running automatic without much awareness of what I'm doing"). Participants rate the degree to which they function mindlessly in daily life, using a six-point Likert scale ranging from 1 (*almost always*) to 6 (*almost never*). Total scores range from 15 to 90, with higher scores denoting greater mindfulness. The MAAS has good internal consistency (i.e., Cronbach's α), ranging from .82 to .87 (Brown and Ryan 2003). In the current study, Cronbach's alpha of this measure was .90.

Data Analysis

Two hierarchical multiple regressions were conducted to investigate whether the disordered eating cognitions, mindfulness, and psychological flexibility accounted for unique variances in psychological distress and disordered eating behaviors and whether mindfulness and psychological flexibility moderated the association between disordered eating cognitions and the link between disordered eating cognitions and disordered eating behaviors. The first step included gender (dummy coded as 1 = female, 2 = male), ethnicity (dummy coded as 1 = White and 2 = Non-White), and BMI as covariates. The second step included disordered eating cognitions (MAC-R), psychological flexibility (AAQ), and mindfulness (MAAS). The two way interactions of disordered eating cognitions x psychological flexibility and disordered eating cognitions x mindfulness were entered in the third step.

Results

Participant Characteristics

The mean total score of EAT-26 ($M=8.11$, $SD=8.48$) was substantially below the clinical cutoff score of 20. BMI scores of the current sample ranged from 14.67 to 43.80, with a mean score of 23.34 ($SD=4.85$), which fell in the normal range (i.e., $BMI=18.5$ – 24.9). There was no significant gender difference between males ($M=23.85$, $SD=5.16$) and females ($M=23.18$, $SD=4.74$), $t(276)=1.01$, $p=.32$.

Associations Among Study Variables

Descriptive statistics and correlations among the study variables are shown in Table 1. Disordered eating cognitions (MAC-R) were positively associated with psychological distress (GHQ) and disordered eating behaviors (EAT-26 Behavior) and negatively related to psychological flexibility (AAQ) and mindfulness (MAAS). Psychological flexibility and mindfulness were negatively associated with psychological distress and disordered eating behaviors. Males had greater psychological flexibility. BMI was positively associated with disordered eating cognitions and disordered eating behaviors.

Roles of Disordered Eating Cognitions, Mindfulness, Psychological Flexibility on Psychological Distress

The results of the first hierarchical regression suggested that after controlling for the effects of gender, ethnicity, and BMI, disordered eating cognitions ($\beta=.13$, $p<.01$), psychological flexibility ($\beta=-.31$, $p<.01$), and mindfulness ($\beta=-.21$, $p<.01$) were related to psychological distress (Step 2; $R_{\Delta}^2=.25$, $p<.01$). Neither psychological flexibility nor mindfulness moderated the association between disordered eating cognitions and psychological distress (Step 3; $R_{\Delta}^2<.01$, $p>.05$) (Table 2).

Roles of Disordered Eating Cognitions, Mindfulness, Psychological Flexibility on Disordered Eating Behaviors

A different set of relations were obtained for the association between the independent variables and disordered eating behaviors (Table 3). The direct effects accounted for a significant portion of the variance in disordered eating behaviors, (Step 2; $R_{\Delta}^2=.16$, $p<.01$). Disordered eating cognitions ($\beta=.33$, $p<.01$) and mindfulness ($\beta=-.14$, $p<.05$) were related to disordered eating behaviors. Psychological flexibility was not related to disordered eating symptoms ($\beta<.01$, $p=.96$).

Furthermore, the two-way interaction between mindfulness and disordered eating cognitions was significant ($\beta=-.15$,

Table 1 Means, standard deviations, coefficient alphas, and zero-order relations between all variables

	1	2	3	4	5	6	7	8
1. Psychological Distress (GHQ)	–							
2. Disordered Eating Behaviors (EAT-26 B)	.20**	–						
3. Disordered Eating Cognition (MAC-R)	.34**	.39**	–					
4. Psychological Flexibility (AAQ)	-.45**	-.19**	-.45**	–				
5. Mindfulness (MAAS)	-.36**	-.25**	-.35**	.37**	–			
6. Gender	.11	.01	.09	-.14*	-.02	–		
7. Ethnicity	.08	-.04	-.02	-.09	.05	.07	–	
8. BMI	-.01	.10*	.17**	-.01	-.07	.06	-.07	–
<i>M</i>	12.80	1.63	61.03	71.62	57.77			23.35
<i>SD</i>	6.05	2.82	15.13	8.91	12.53			4.85
α	.87	.72	.89	.63	.90			

GHQ general health questionnaire, *EAT-26* eating attitudes test-26 item, *B* behavior, *MAC-R* Mizes anorectic cognition questionnaire-revised, *AAQ* acceptance and action questionnaire, *MAAS* mindfulness attention awareness scale, *BMI* body mass index

N=278, **p*<.05, ***p*<.01

p<.05; R^2_{Δ} = .03, *p*<.01). The interaction was probed at high (+1 SD) and low (–1 SD) levels of mindfulness. Increased mindfulness reduced the strength of the relation between disordered eating cognitions and disordered eating behaviors (Fig. 1).

Discussion

Employing an ethnically diverse, non-clinical college sample, the present study examined whether disordered eating cognitions, mindfulness, and psychological flexibility

separately and independently explained unique variance in psychological distress and disordered eating behaviors after controlling for one another, gender, ethnicity, and BMI. The study also investigated whether mindfulness and psychological flexibility moderated the association between disordered eating cognitions and psychological distress and the relation between disordered eating cognitions and disordered eating behaviors.

Consistent with previous work (e.g., (Masuda et al. 2010; Masuda and Wendell 2010), our findings suggest that greater disordered eating cognitions are associated with

Table 2 Final step of a hierarchical linear regression examining the role of disordered eating cognition, psychological flexibility, and mindfulness on psychological distress

Psychological distress (GHQ)	<i>b</i>	<i>SE</i>	β
Intercept	-.42	.29	
Direct Effects			
Gender	.10	.12	.04
Ethnicity	.15	.11	.08
BMI	-.05	.05	-.05
Disordered Eating Cognitions (MAC-R)	.14*	.06	.14
Psychological Flexibility (AAQ-16)	-.31**	.06	-.31
Mindfulness (MAAS)	-.21**	.06	-.21
Moderating Effects			
AAQ-16 × MAC-R	-.04	.06	-.04
MAAS × MAC-R	.03	.06	.03

N=278; **p*<.05, ***p*<.01; *GHQ* general health questionnaire, *BMI* body mass index, *MAC-R* Mizes anorectic cognition questionnaire-revised, *AAQ* acceptance and action questionnaire, *MAAS* mindfulness attention awareness scale; First step, R^2_{Δ} = .019, *p*>.15; Second step, R^2_{Δ} = .252, *p*<.01; Third step, R^2_{Δ} = .002, *p*>.74

Table 3 Final step of a hierarchical linear regression examining the role of disordered eating cognition, psychological flexibility, and mindfulness on disordered eating behaviors

Disordered eating behaviors (EAT-26-B)	<i>b</i>	<i>SE</i>	β
Intercept	.23	.30	
Direct Effects			
Gender	-.08	.13	-.04
Ethnicity	-.09	.11	-.05
BMI	.04	.06	.04
Disordered Eating Cognitions (MAC-R)	.33**	.06	.33
Psychological Flexibility (AAQ-16)	-.01	.07	-.01
Mindfulness (MAAS)	-.16**	.06	-.16
Moderating Effects			
AAQ-16 × MAC-R	-.03	.06	-.03
MAAS × MAC-R	-.14*	.06	-.15

N=278; **p*<.05, ***p*<.01; *EAT-26-B* eating attitudes test-26 item version behavior subscale, *BMI* body mass index, *MAC-R* Mizes anorectic cognition questionnaire-revised, *AAQ* acceptance and action questionnaire, *MAAS* mindfulness attention awareness scale; First step, R^2_{Δ} = .013, *p*>.16; Second step, R^2_{Δ} = .155, *p*<.001; Third step, R^2_{Δ} = .026, *p*<.05

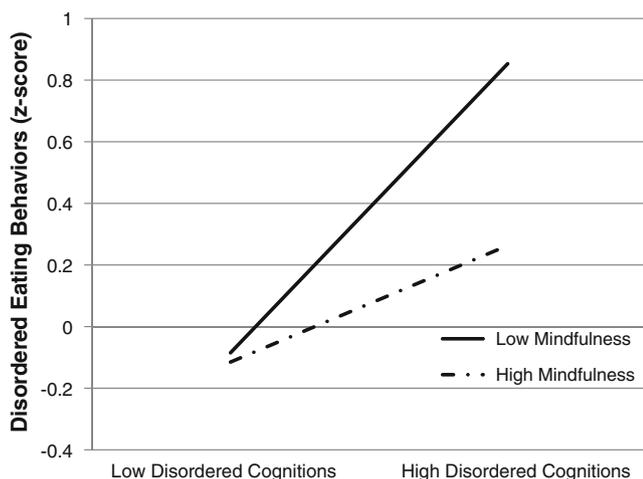


Fig. 1 Mindfulness moderates the association between disordered eating cognitions and eating behaviors. High and low values correspond to ± 1 SD from the mean. Eating behavior scores are standardized, $M=0$, $SD=1.0$

greater psychological distress, and that greater psychological flexibility and greater mindfulness are associated with lower psychological distress. However, contrary to hypotheses, neither psychological flexibility nor mindfulness moderated the positive association between disordered eating cognitions and psychological distress. This suggests that disordered eating cognitions involve features explaining psychological distress that are not shared with mindfulness or psychological flexibility.

These set of findings have important theoretical implications. Recent theoretical models of psychopathology often emphasize the importance of underlying cognitive and behavioral processes, such as emotion/behavior regulations, in the development and maintenance of psychopathology (e.g., Aldao et al. 2010; Hayes et al. 2006). These theoretical positions are also considered to be in direct contrast with conventional models which focus exclusively on the contents or presence of dysfunctional thoughts. Our results concerning psychological distress support claims advocated by both models. In other words, the present study suggests that both dysfunctional cognitions (e.g., disordered eating cognitions) and underlying cognitive/behavioral processes (e.g., psychological flexibility and mindfulness) are important and unique factors in understanding and perhaps intervening in general psychological distress in non-clinical samples.

With respect to disordered eating symptoms, the present findings are consistent with the extant literature on emotion regulation models of disordered eating problems (Ghaderi 2003; Heffner and Eifert 2004; Lavender and Anderson 2010; Lavender et al. 2009). These models posit that both dysfunctional private events and regulation processes explain the onset and maintenance of disordered eating

symptoms. The present study is the first to extend prior research by elucidating how a maladaptive factor (i.e., disordered eating cognition) and a salutary factor interact with one another to impact disordered eating behaviors. The current literature suggests that, although disordered eating cognitions are common among non-clinical samples of adolescents and young adults, only a small number of these individuals develop severe disordered eating behaviors (e.g., Ackard et al. 2007; Miller et al. 2009), and that disordered eating cognitions are not necessarily associated with severe disordered eating pathology (Brannan and Petrie 2008; Tylka 2004). The present findings suggest that the positive association between disordered eating cognitions and disordered eating behaviors are dependent on mindfulness, a salutary factor of on-going and non-judgmental awareness of internal and external environment. Under higher levels of mindfulness, the positive association between disordered eating cognitions and disordered eating symptoms is attenuated.

Psychological flexibility, which was found to be greater in males than females in the present sample, was unrelated to disordered eating behaviors. The gender difference was consistent with previous findings (Hayes et al. 2004b). The absence of association between psychological flexibility and disordered eating behaviors were somewhat surprising as psychological flexibility is often theorized to be a cornerstone of greater psychological health across diverse clinical and applied contexts. One possible explanation for this finding is that the relationship between psychological flexibility and disordered eating behaviors is better explained by disordered eating cognitions and mindfulness as opposed to general health in non-clinical samples.

Clinically, the present study suggests an important role for mindfulness in the treatment and prevention of disordered eating problems among non-clinical young adult samples. This notion is consistent with acceptance- and mindfulness-based behavioral therapies (Hayes et al. 2004a; Segal et al. 2004), positing that mindfulness and associated processes, such as psychological flexibility, are at the core of behavioral health (Brown et al. 2007; Hayes et al. 2006) and that these interventions promote positive clinical outcomes by improving these core processes. Although evidence is still limited, preliminary research has demonstrated that acceptance- and mindfulness-based treatments are effective in reducing disordered eating problems (e.g., Baer et al. 2005; Heffner and Eifert 2004; Juarascio et al. 2010; Masuda et al. 2008; Safer et al. 2001; Telch et al. 2001). The present study suggests that it is worthwhile to investigate the role of mindfulness, and associated processes, in disordered eating problems in the context of acceptance- and mindfulness-based interventions with a clinical sample.

A somewhat unexpected finding in the present study was that there was no gender difference in disordered eating cognitions or disordered eating behaviors. Although careful investigation is beyond the scope of the study, it is possible to speculate that the lack of difference could be attributed to the heterogeneous nature of the present sample with regard to racial/ethnic backgrounds. Unlike other studies, the majority of the present sample consisted of those from diverse racial/ethnic backgrounds.

The present investigation has several notable limitations. Given its nature, the present study should not be treated as a report on disordered eating psychopathology or general psychopathology in clinical samples. Additionally, the number of variables included in the study was intentionally limited in order to gain a preliminary understanding of the role of mindfulness and psychological flexibility in the association between disordered eating cognitions and disordered eating symptoms. Thus, the study purposely covered only a facet of disordered eating problems instead of examining an exhaustive model of all potential maintaining factors. Given the complex nature of disordered eating problems, other factors, such as neuroticism and social perfectionism (e.g., Striegel-Moore and Bulik 2007), as well as maladaptive regulation strategies such as rumination and suppression (Aldao and Nolen-Hoeksema 2010) are likely to explain disordered eating symptoms and to moderate the association between disordered eating cognitions and disordered eating symptoms.

Conceptually, the features and functions of mindfulness and psychological flexibility overlap with those of other regulation and executive processes (Brown et al. 2007; Hayes et al. 2006). Given these overlaps, future study should investigate their roles on disordered eating behaviors while accounting for processes, such as thought suppression (Aldao and Nolen-Hoeksema 2010; Lavender et al. 2009) and executive functions (e.g., Roberts et al. 2007). Similarly, the moderating effect of mindfulness should be re-examined while considering pertinent constructs, such as emotional awareness (Parling et al. 2010) and interoceptive awareness (Van Strien et al. 2005).

External validity is limited given that data were derived from college students attending an urban area college of the southeastern United States. From a socio-cultural perspective, some demographic factors, such as gender role, ethnicity, regional context, and university culture, are likely to shape the variables of the present study in systematic ways. Although sex was covaried out in all analyses, the use of a predominantly female undergraduate sample may limit the generalizability of our findings to more diverse populations, including those that are less educated, more clinical, and potentially more male.

Psychometrically, the scales used in the present study have not been fully tested and validated across diverse

ethnic groups. Given the ethnically diverse nature of the present sample, this is another limitation. Additionally, the coefficient alpha of the AAQ-16, a measure of psychological flexibility, was found to be lower than a conventionally acceptable level. Although this problem is not unique to the present study (e.g., Kashdan and Breen 2007), it is important to investigate the reliability and validity of this measure across diverse populations.

Perhaps the largest limitation was the reliance on a cross-sectional and correlational design with the use of self-report measures exclusively. Given the exclusive reliance of self-report questionnaires, it is unclear whether the scores, including the BMI, were subject to errors, and other types of tools, such as measurements by observers and biological measures, would probably produce different results. The analytic strategy of the present study did not permit any causal inferences or functional link among the constructs of interest.

Despite these limitations, the present study extends the existing literature on disordered eating problems by suggesting that mindfulness moderates the association between disordered eating cognitions and disordered eating symptoms. The present investigation also suggests that it is beneficial to consider not only disordered eating-related cognition, but also mindfulness in understanding and perhaps treating disordered eating symptoms.

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