



The role of negative reinforcement eating expectancies in the relation between experiential avoidance and disinhibition[☆]



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ABSTRACT

Objectives: Eating-related disinhibition (i.e., a tendency to overeat in response to various stimuli) is associated with weight gain and poorer long-term weight loss success. Theoretically, experiential avoidance (i.e., the desire or attempts to avoid uncomfortable internal experiences), may predispose individuals to developing negative reinforcement eating expectancies (i.e., the belief that eating will help to mitigate distress), which in turn promote disinhibition. Such relationships are consistent with an acquired preparedness model, which posits that dispositions influence learning and subsequent behavior. Drawing from this framework, the current study represents the first investigation of relations between negative reinforcement eating expectancies, experiential avoidance (both general and food-specific) and disinhibited eating. In particular, the mediating role of negative reinforcement eating expectancies in the relation between experiential avoidance and disinhibited eating was examined. **Method:** Participants (N = 107) were overweight and obese individuals presenting for behavioral weight loss treatment who completed measures of general and food-related experiential avoidance, negative reinforcement eating expectancies, and disinhibition.

Results: Experiential avoidance and negative reinforcement eating expectancies significantly related to disinhibition. Furthermore, the relation between experiential avoidance and disinhibition was mediated by negative reinforcement eating expectancies.

Discussion: The current study supports an acquired preparedness model for disinhibition, such that the relation between experiential avoidance and disinhibition is accounted for by expectations that eating will alleviate distress. Findings highlight the potential role of eating expectancies in models accounting for obesity risk, and identify negative reinforcement eating expectancies as a potential treatment target for reducing disinhibition.

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1. Introduction

Eating-related disinhibition refers to a tendency to overeat in response to a variety of stimuli (i.e., emotional, cognitive, and environmental cues; Hays & Roberts, 2008). A vast body of research suggests that disinhibition is an important construct for understanding maladaptive eating behavior (for review, see Bryant, King, and Blundell (2008)). For example, individuals who score higher on measures of disinhibition tend to eat more in response to a preload (Westenhoefer, Broeckmann, Münch, & Pudel, 1994), stress (Haynes, Lee, & Yeomans, 2003), and experimentally-induced negative affect (Yeomans & Coughlan, 2009).

Disinhibition is also associated with overall daily caloric intake and the health value of food choices, with individuals higher in disinhibition exhibiting greater daily energy intake and consuming a greater proportion of daily calories from fat and sucrose (Contento, Zybert, & Williams, 2005; Lindroos et al., 1997). In addition, disinhibition is positively associated with body mass index (Bellisle et al., 2004; Dykes, Brunner, Martikainen, & Wardle, 2004), and disinhibition been shown to relate to weight gain across adulthood among women (Hays et al., 2002; Hays & Roberts, 2008).

Disinhibition plays an important role in successful weight loss and weight loss maintenance among overweight and obese individuals. In particular, lower levels of internal disinhibition (i.e., eating in response to emotional and cognitive cues) at baseline are associated with greater weight loss during behavioral treatment (Niemeier, Phelan, Fava, & Wing, 2007). Similarly, among individuals who have already successfully lost weight, disinhibition level relates to weight regain (Niemeier et al., 2007; Wing & Hill, 2001; McGuire, Wing, Klem, Lang, & Hill, 1999). Larger reductions in disinhibition during weight loss treatment also predict better weight loss maintenance and greater additional

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weight loss post-treatment (Butryn, Thomas, & Lowe, 2009; Cuntz, Leibbrand, Ehrig, Shaw, & Fichter, 2001). Together, these findings highlight the importance of disinhibition in weight management. Consequently, identification and improved understanding of factors that relate to disinhibition are important for both the prevention of excess weight gain and the promotion of successful long-term weight control.

One factor that may relate to disinhibition in the context of weight control is experiential avoidance. Experiential avoidance refers to a tendency to suppress or minimize uncomfortable internal experiences (e.g., thoughts, emotions, sensations, memories) (Chawla & Ostafin, 2007; Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). A growing body of research implicates experiential avoidance in the development and maintenance of a variety of eating difficulties (Butryn et al., 2013; Hayaki, 2009; Lillis, Hayes, & Levin, 2011). Theoretically, experiential avoidance may confer risk for eating in response to situations or cues that prompt uncomfortable thoughts, feelings, or urges in an effort to mitigate distress. Although the relation between experiential avoidance and disinhibition has not yet been directly examined, disinhibition is negatively associated with distress tolerance and mindfulness (Kozak & Fought, 2011; Lattimore, Fisher, & Malinowski, 2011), two constructs that are inversely related to experiential avoidance (Bond et al., 2011).

The relation between experiential avoidance and disinhibition in eating behavior may be understood through learning processes. The acquired preparedness model (Smith & Anderson, 2001) suggests that individuals' dispositions and traits may put them at risk for developing maladaptive behavioral patterns by promoting learned expectations regarding consequences of behaviors. Both cross-sectional and longitudinal studies provide support for the relevance of expectancies in predicting maladaptive eating patterns (Fischer, Anderson, & Smith, 2004; Settles, Cyders, & Smith, 2010; Simmons, 1997; Smith, Simmons, Flory, Annus, & Hill, 2007; Hayaki, 2009). Research also supports the applicability of the acquired preparedness model, in particular, to describe numerous maladaptive behaviors, including eating disorder symptoms (Combs, Pearson & Smith, 2011; Combs, Smith, Flory, Simmons, & Hill, 2010; Combs, Smith, & Simmons, 2011; Pearson, Combs, Zapolski, & Smith, 2012). Taken together, there is support for the notion that the dispositional traits may influence behavior by encouraging certain types of learning (Caspi, 1993; Smith & Anderson, 2001). This learning then impacts the likelihood that an individual will engage in certain behaviors, such as specific eating behaviors. In accordance with an acquired preparedness model, experiential avoidance may influence an individual's readiness to learn that certain behaviors (e.g., eating) will assist in mitigating distress. Such learning could subsequently increase the likelihood that an individual would adopt expectancies about behaviors related to reductions in uncomfortable states. This may occur because experiential avoidance involves a desire to avoid distressing states (Hayes et al., 1996). Experientially avoidant individuals, then, may be particularly motivated to develop beliefs that are consistent with the hope that certain behaviors could decrease their experience of distress, in turn promoting disinhibition.

While negative reinforcement eating expectancies have been implicated in the development of bulimic behaviors, research has yet to evaluate the relation between such expectancies, experiential avoidance, and more general disinhibited eating. Examination of how such factors may relate in overweight and obese populations, in which disinhibited eating is elevated (Provencher, Drapeau, Tremblay, Després, & Lemieux, 2003), is also warranted. Finally, while experiential avoidance has been conceptualized as a general risk factor for problematic behavioral patterns, recent research has also identified domain-specific forms of this construct. With regard to eating, a measure of experiential avoidance specific to thoughts and urges about food has been developed (Juarascio, Forman, Timko, Butryn, & Goodwin, 2011). Evaluation of how disinhibition and eating expectancies may relate to both general and food-related experiential avoidance measures can inform understanding of these constructs.

The current study investigated an acquired preparedness model of disinhibition in an obese, treatment-seeking sample. We hypothesized that experiential avoidance, both general and food-related, would positively relate to disinhibition. Furthermore, we predicted that negative reinforcement eating expectancies would mediate the relations between measures of experiential avoidance and disinhibition. Food-related constructs should be associated with a tendency to develop negative reinforcement eating expectancies and overeating behavior most proximally; thus, we hypothesized that the strength of the relation between experiential avoidance and disinhibition would be greatest for food-related experiential avoidance.

2. Materials and methods

2.1. Participants and procedures

Participants were a specified cohort of 107 overweight and obese adults (11.2% men; $M_{age} = 53.3$ years, $SD = 9.7$; $M_{BMI} = 36.6$ kg/m², $SD = 5.1$) enrolled in a behavioral weight loss trial who completed the components of this substudy as part of the protocol for the larger parent study. Participants in the parent study were recruited from a large metropolitan area in the Northeastern United States through radio, newspaper, and postcard advertisements. Most participants were either White (56.1%), or African American (39.3%), but other races were also represented (0.9% American Indian or Alaskan Native, 0.9% Asian, and 2.8% multiracial). A minority (2.8%) of participants identified as Hispanic or Latino.

Eligibility required a BMI between 27.0 and 45.0 kg/m² and age between 18 and 70 years. Participants were excluded from the parent study if they: a) were lactating, pregnant, or planning to become pregnant during the course of the trial; b) reported taking a medication or having a medical or psychiatric problem known to cause weight loss or weight gain; c) reported a medical or psychiatric condition that could limit their ability to comply with the program's behavioral recommendations; d) reported having undergone weight loss surgery; e) required insulin for diabetes management; or f) had a current or lifetime history of an eating disorder, including binge eating disorder. All measures for the present study were completed prior to the start of treatment.

2.2. Measures

2.2.1. Disinhibition

Disinhibition was assessed by the Three-Factor Eating Questionnaire¹ (TFEQ; Stunkard & Messick, 1985). This measure evaluates individuals' eating behavior, and includes three subscales, one of which assesses disinhibition. A 26-item version of the disinhibition subscale (Niemeier et al., 2007) was utilized in the current study. The TFEQ has satisfactory internal consistency and predictive validity in obese samples (Stunkard & Wadden, 1990). The disinhibition subscale demonstrated acceptable internal consistency in this study, with a Cronbach's α of 0.73. Higher scores on the TFEQ-disinhibition subscale indicate higher levels of eating-related disinhibition.

2.2.2. General experiential avoidance

General experiential avoidance was assessed by the Acceptance and Action Questionnaire II (AAQ-II; Bond et al., 2011). The AAQ-II evidences adequate internal consistency and predictive validity (Fledderus, Oude Voshaar, ten Klooster, & Bohlmeijer, 2012). The AAQ-II also has good test-retest reliability, including stability across time, with 12-month reliability of .79 (Bond et al., 2011). In this study, the Cronbach's alpha for

¹ The Three-Factor Eating Questionnaire is also referred to in the literature as the Eating Inventory. It is identified here as the Three Factor Eating Questionnaire to facilitate clarity and to aid in distinguishing this measure from another key evaluation in this study, the Eating Expectancies Inventory.

the AAQ-II was excellent ($\alpha = 0.91$). Higher scores on this scale indicate higher levels of experiential avoidance.

2.2.3. Difficulties with food-related acceptance and willingness

Difficulties with food-related acceptance and willingness, also referred to as food-related experiential avoidance, were measured by the 10-item Food Acceptance and Action Questionnaire (FAAQ; Juarascio et al., 2011). This measure of responses toward eating-specific thoughts, emotions, and urges is comprised of an acceptance subscale and a willingness subscale. The acceptance subscale measures the degree to which individuals allow themselves to experience distressing food-related thoughts when they arise rather than attempting to suppress them. The willingness subscale captures the tendency to refrain from engaging in counter-productive eating despite cravings (Juarascio et al., 2011). Higher scores on these subscales are typically associated with increased food-related acceptance and willingness, respectively. However, we reverse-scored these subscales in the present study to allow for consistency in interpretation of results with the AAQ-II. Thus, in the present study, higher scores on the acceptance and willingness scales indicate greater difficulties with food-related acceptance and willingness, and thus greater food-related experiential avoidance. Difficulties with food-related acceptance and food-related willingness were significantly, but not strongly correlated in the current study ($r = .23, p < .05$). Thus, the two factors appear to represent distinct constructs with regard to food-related experiential avoidance. The FAAQ has shown adequate internal consistency, predictive validity, and test–retest reliability in an overweight and obese sample (Juarascio et al., 2011). In the current study, the Cronbach's alphas were 0.76 and 0.70 for the acceptance and willingness subscales, respectively.

2.2.4. Eating expectancies

Eating expectancies were measured using the Eating Expectancies Inventory (EEI; Hohlstein, Smith, & Atlas, 1998), which is a 34-item measure assessing cognitive expectations for eating that includes five subscales. The EEI evidences good internal consistency, predictive validity, and reliability. In the current study, only the negative reinforcement subscale was used; internal consistency for this subscale was excellent (Cronbach's $\alpha = 0.94$).

2.3. Analytic plan

Data were tested for normality, and bivariate correlations between all relevant variables were computed. Subsequently, bootstrapped mediation analyses were completed using the PROCESS SPSS macro (Hayes, 2013). General experiential avoidance, difficulties with food-related willingness, and difficulties with food-related acceptance were examined separately as predictors of disinhibition. Negative reinforcement eating expectancies were evaluated as a potential mediator of these relations.

3. Results

3.1. Descriptive statistics and bivariate correlations

All variables of interest were examined for normality and were determined to be normally distributed. Pearson product–moment correlations indicated significant associations between disinhibition and all predictor variables, including general experiential avoidance, difficulties with food-related willingness, difficulties with food-related acceptance, and eating expectancies (see Table 1). Furthermore, negative reinforcement eating expectancies are related to all experiential avoidance measures (i.e., general experiential avoidance, difficulties with food-related willingness, and difficulties with food-related acceptance). Notably, general experiential avoidance was not related to either difficulties with food-related willingness or difficulties with food-related acceptance.

Table 1
Bivariate correlations among variables of interest.

	Mean (SD)	1	2	3	4	5
1. General experiential avoidance	15.29 (7.15)	1	.06	.13	.56**	.46**
2. Food-related willingness	26.88 (5.75)		1	.23*	.25*	.40**
3. Food-related acceptance	12.31 (5.19)			1	.22*	.29**
4. Eating expectancies	3.37 (1.25)				1	.63**
5. Disinhibition	34.62 (6.67)					1

Note. General experiential avoidance measured by the Acceptance and Action Questionnaire, difficulties with food-related willingness and food-related acceptance measured by the Food Acceptance and Action Questionnaire (Willingness and Acceptance subscales), eating expectancies measured by the Eating Expectancies Inventory, disinhibition measured by the Three Factor Eating Questionnaire – Disinhibition subscale.

* $p < .05$.

** $p < .01$.

3.2. Primary analyses

Fig. 1 displays the total effects of general experiential avoidance, difficulties with food-related willingness, and difficulties with food-related acceptance on disinhibition. Fig. 2 shows the mediational models, with eating expectancies serving as a mediator in the relation between independent variables and disinhibition. Relevant statistics for each effect are also provided these figures.

3.2.1. General experiential avoidance

There was a significant relation between general experiential avoidance and disinhibition. Furthermore, general experiential avoidance scores were related to negative reinforcement eating expectancies. When the relation of general experiential avoidance and negative reinforcement eating expectancies and the relation of general experiential avoidance to disinhibition were considered together, the indirect effect of general experiential avoidance through negative reinforcement eating expectancies accounted for approximately 67.4% of the relation between general experiential avoidance and disinhibition (see Fig. 2).

3.2.2. Difficulties with food-related willingness and acceptance

Total effects for difficulty with willingness to regulate eating behavior and acceptance of distressing food-related thoughts predicting disinhibition were both significant. Furthermore, the effect of difficulties with food-related willingness on expectancies was significant. In addition, when controlling for difficulties with food-related willingness, the inclusion of negative reinforcement eating expectancies accounted for approximately 35.7% of the relation between difficulties with food-related willingness and disinhibition (see Fig. 2). A similar pattern emerged when considering eating expectancies as a mediator in the relation between difficulties with food-related acceptance and disinhibition. In this model, the indirect effect accounted for approximately 36.3% of the relation between the difficulties with food-related acceptance and disinhibition.

4. Discussion

The current study examined relations of three kinds of experiential avoidance to disinhibition. This is also the first investigation of whether negative reinforcement eating expectancies (i.e., the belief that eating will help to mitigate distress) mediates the relation of experiential avoidance and disinhibited eating. Within the context of an acquired preparedness model, which theorizes that learning is influenced by both dispositional factors and behavioral experience, we hypothesized that negative reinforcement eating expectancies would account for the impact of experiential avoidance on disinhibited eating. We chose to examine both general experiential avoidance, as well as difficulties with food-related acceptance and food-related willingness, as we expected that the impacts of both general as well as food-specific

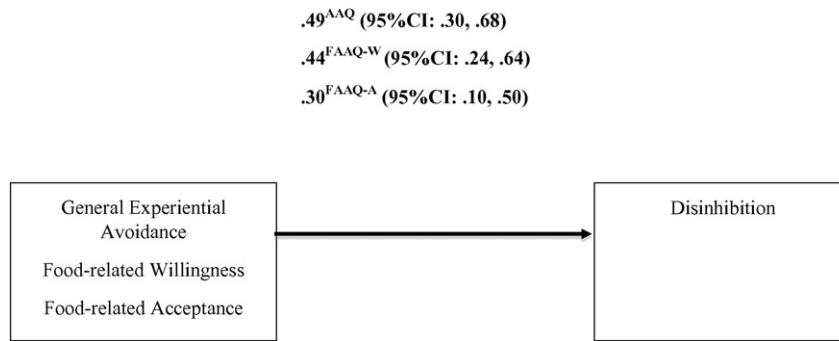


Fig. 1. General experiential avoidance measured by the AAQ – Acceptance and Action Questionnaire II; difficulties with food-related willingness measured by the FAAQ-W, Food Acceptance and Action Questionnaire – Willingness subscale, and difficulties with food-related acceptance measured by the FAAQ-A, Food Acceptance and Action Questionnaire – Acceptance subscale. Food Acceptance and Action Questionnaire subscales were reverse scored to facilitate interpretation across measures, such that higher scores indicate lower levels of willingness and acceptance. Disinhibition was measured by the Three Factor Eating Questionnaire – Disinhibition subscale. Coefficients in bold represent significant effects ($p < .05$). Coefficients represent standardized effects.

experiential avoidance may be highly influenced by negative reinforcement eating expectancies. Overall, support for our hypotheses was obtained.

In the present study, significant associations were observed between all three kinds of experiential avoidance and disinhibition, as well as between negative reinforcement eating expectancies and disinhibition. Such findings are in accord with prior evaluations of problematic eating behavior (e.g., Spoor, Bekker, Van Strien, & van Heck, 2007; Lattimore et al., 2011; Hayaki, 2009; Fischer et al., 2004), and extend previous work to the context of obesity. Negative reinforcement eating expectancies were also found to mediate the effects of all three kinds of experiential avoidance on disinhibition. Furthermore, when comparing the percentage variance accounted for in the regression models, this effect appeared to be stronger for general experiential avoidance as compared to difficulties with food-related acceptance and willingness in the current study.

Although replication of our finding of the stronger effect of general experiential avoidance is necessary in order to determine whether this is an artifact of characteristics of our sample or a broader difference, it may be explained in part by differences in the domains assessed by the two measures used in this study. The measures of difficulties with

food-related acceptance and willingness (i.e., the FAAQ subscales) and general experiential avoidance (i.e., the AAQ-II) are not strongly related (Juarascio et al., 2011), perhaps because the AAQ-II assesses a broader range of discomfort with negative thoughts and emotions as compared to the FAAQ (Juarascio et al., 2011; Bond et al., 2011). Therefore, the expectation that eating will help to alleviate distress may be more relevant when applied to general difficulties (e.g., eating to reduce salience of stress) than when applied specifically to food cravings (e.g., eating to reduce salience of stress of wanting to eat cookies) in the context of obesity. Moreover, the belief that eating will reduce general distress may be more deeply held than the belief that eating will reduce distress about food-related thoughts. In addition to these theoretical explanations, it should also be noted that the AAQ-II has been more thoroughly evaluated psychometrically, and internal consistency was higher for the AAQ-II as compared to the FAAQ in the current study. A final measurement issue of note is that disinhibition as measured in our study (i.e., via the TFEQ) reflects a general tendency toward overconsumption rather than a specific tendency to over-consume in distress-related situations. Three items on this assessment measure purport to evaluate emotional eating, which may be more specifically relevant to distress-related eating episodes, and an evaluation in the current sample showed

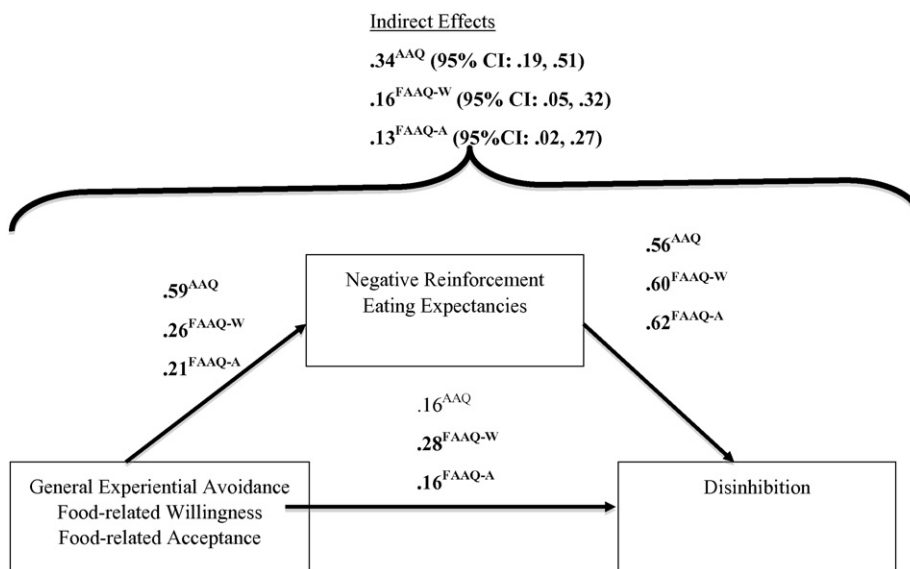


Fig. 2. General experiential avoidance measured by the AAQ – Acceptance and Action Questionnaire II; Difficulties with food-related willingness measured by the FAAQ-W, Food Acceptance and Action Questionnaire – Willingness subscale, and difficulties with food-related acceptance measured by the FAAQ-A, Food Acceptance and Action Questionnaire – Acceptance subscale. Food Acceptance and Action Questionnaire subscales were reverse scored to facilitate interpretation across measures, such that higher scores indicate lower levels of willingness and acceptance. Negative reinforcement eating expectancies was measured by the Eating Expectancies Inventory, disinhibition was measured by the Three Factor Eating Questionnaire – Disinhibition subscale. Coefficients in bold represent significant effects ($p < .05$). Coefficients represent standardized effects.

significant overlap between these items and disinhibition ($r = .80$, $p < .01$). While eating in response to emotions may be highly related to disinhibited eating episodes, more nuanced evaluation of relations between experiential avoidance, expectancies, and specific eating styles may be helpful in further examining whether such relations exist for only specific, distress-related eating episodes, or whether experiential avoidance and negative reinforcement eating expectancies create more generalized risk for disinhibited eating. Future research should thus incorporate well-validated self-report and behavioral assessments to elucidate this relationship.

In the context of previous research, findings from our mediational analyses suggest that negative reinforcement eating expectancies account for the relation between experiential avoidance and disinhibited eating. This implies that individuals with a predisposition toward difficulty accepting negative internal states engage in disinhibited eating due to the learned belief that eating will reduce their distress. In other words, the expectancy that eating will mitigate negative affect appears to serve a critical role in the relation between experiential avoidance and disinhibition. Overall, this study provides preliminary support for the hypothesis, based on the acquired preparedness model, that experiential avoidance may lead to the development of disinhibition through such expectancies.

Our results add to the growing body of research supporting the importance of learning processes to eating behaviors. While much of the past research has been conducted in the context of bulimia nervosa, the current study extends findings to more general eating patterns in obese individuals. These results thus contribute to our understanding of processes that may be involved in maladaptive eating behavior in obesity.

Clinically, this study yields several implications. In recent years, the potential role of experiential avoidance in weight management has received increased attention, and treatments that target experiential avoidance as a mechanism for weight control have been developed with promising preliminary support (e.g., Forman, et al., 2013; Lillis & Kendra, 2014; Niemeier, Leahey, Reed, Brown, & Wing, 2012). Such treatments encourage participants to identify deeply held values related to healthy living, and to allow these values to motivate and guide their behavior. Participants are also taught distress tolerance, emotional acceptance, and metacognitive awareness skills that aim to increase their ability to engage in these valued behaviors, even when doing so is uncomfortable or involves a reduction in pleasure (Forman & Butryn, 2015; Lillis & Kendra, 2014).

The current findings suggest that these acceptance-based weight management interventions may benefit from considering negative reinforcement eating expectancies in relation to the impact of experiential avoidance on eating behaviors. In particular, eating expectancies may represent a viable target for treatment. Experimental studies indicate that alcohol-related expectancies appear malleable, and that reducing such expectancies influences alcohol consumption (see Scott-Sheldon, Terry, Carey, Garey, and Carey (2012), for review). Similarly, expectancies related to eating may be amendable to change via expectancy challenge paradigms, for instance, by offering foods that are deceptively low calorie and exploring negative affect reductions associated with the consumption of such foods. Challenging the accuracy and long-term effectiveness of certain eating expectancies early in treatment may facilitate better adoption of eating regulation strategies, and ultimately improve response to treatment. As greater weight loss early in treatment predicts better weight loss maintenance (Nackers, Ross, & Perri, 2010), increasing early response rates may yield better long-term outcomes.

4.1. Limitations and future directions

This study had several strengths, including use of three distinct assessments of experiential avoidance, application of an acquired preparedness model to disinhibition, and investigation of this model in a

treatment-seeking sample with obesity. Despite these strengths, some limitations of the current study should be noted. For instance, our sample predominantly included women, potentially limiting the generalizability of our results to men. Additionally, while the use of an obese, treatment-seeking sample provides relevance to clinical contexts, motivation to lose weight may have impacted eating expectancies at treatment entry. Replication in nontreatment-seeking populations is necessary to examine whether results generalize to other populations and contexts. Given the cross-sectional design, this study was unable to investigate causal relations or to explore changes over time. Future research may benefit from employing a longitudinal design. For instance, longitudinal investigation of these relations in adolescence through adulthood would facilitate understanding of developmental factors that may lead to the initial adoption of negative reinforcement eating expectancies. Additionally, this study was also limited by the use of self-reported data, which may be subject to greater bias than observational or behavioral data. Use of behavioral tasks to measure variables of interest (e.g., disinhibition), and examination of our model in a broader patient population may enhance understanding of these important constructs. For instance, experiential avoidance may be heightened in individuals with disordered eating (Fulton et al., 2012), and individuals with significant disordered eating patterns were not included in the current sample. Future research is also warranted to investigate the implications of these findings within behavioral weight control treatments.

4.2. Conclusions

Overall, this study furthers the understanding of psychological factors affecting eating behavior among individuals seeking behavioral weight loss treatment. The study revealed positive associations between experiential avoidance and disinhibition, which were significantly mediated by negative reinforcement eating expectancies. These findings contribute to the growing body of literature that highlights the importance of eating expectancies as a key factor in the link between dispositional characteristics, such as experiential avoidance, and maladaptive eating behaviors.

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