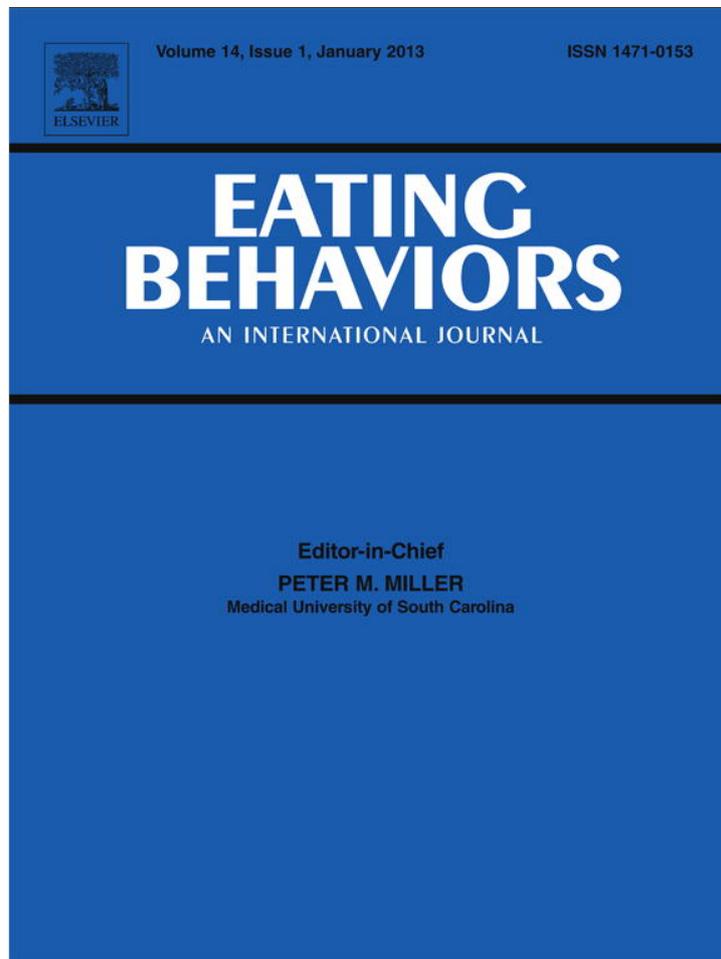


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Comparison of acceptance-based and standard cognitive-based coping strategies for craving sweets in overweight and obese women

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ABSTRACT

Existing strategies for coping with food cravings are of unknown efficacy and rely on principles that have been shown to have paradoxical effects. The present study evaluated novel, acceptance-based strategies for coping with craving by randomly assigning 48 overweight women to either an experimental psychological acceptance-oriented intervention or a standard cognitive reappraisal/distraction intervention. Participants were required to carry a box of sweets on their person for 72 h while abstaining from any consumption of sweets. Results suggested that the acceptance-based coping strategies resulted in lower cravings and reduced consumption, particularly for those who demonstrate greater susceptibility to the presence of food and report a tendency to engage in emotional eating.

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1. Introduction

Our biologically-driven urges to seek out calorically rich foods combined with their pervasive availability in the modern food environment yield food cravings that have been shown to be associated with problematic snacking, binge eating and overweight status (Flegal, Carroll, Ogden, & Curtin, 2010; Gendall, Joyce, & Sullivan, 1997; Gendall, Joyce, Sullivan, & Bulik, 1998; Schlundt, Virts, Sbrocco, Pope-Cordle, & Hill, 1993). The limited efficacy of cognitive-behavioral weight control packages (Flegal et al., 2010; Wadden & Butryn, 2003) may be due to insufficient attention on and/or an ineffective approach towards helping individuals cope with chronic cravings for high calorie foods (Mann et al., 2007). A very small portion of gold standard weight control interventions such as the LEARN Program for Weight Maintenance (Brownell, 2000) and the Diabetes Prevention Program (The Diabetes Prevention Program Research Group, 1999) are devoted to craving management strategies. Of note, the strategies employed, including distraction and cognitive restructuring of permission-giving thoughts, employ cognitive control mechanisms that have proven ineffective and even iatrogenic in several studies (e.g., Borton, Markowitz, & Dieterich, 2005; Marcks & Woods, 2005). In particular, the instruction to suppress craving-related thoughts has been associated with subsequent overeating and increased cravings (Johnston, Bulik, & Anstiss, 1999).

Developing more effective interventions to manage food cravings could be an important advance for weight control programs. Acceptance and mindfulness-based approaches, which encourage an accepting and non-judgmental stance towards thoughts and feelings represent one alternative that has shown promise. In the eating arena, acceptance-based interventions have shown promise with diabetes management (Gregg, Callaghan, Hayes, & Glenn-Lawson, 2007), binge eating (Baer, Fischer, & Huss, 2005; Telch, Agras, & Linehan, 2001) and obesity (Forman, Butryn, Hoffman, & Herbert, 2009; Lillis & Hayes, 2007; Tapper et al., 2009). Three studies have specifically examined acceptance-based interventions for cravings (Alberts, Mulkens, Smeets, & Thewissen, 2010; Forman et al., 2007; Hooper, Sandoz, Ashton, Clarke, & McHugh, 2012), and all observed positive effects, with Forman et al. finding that within a normal weight sample, those with higher levels of appetitive response to the presence of palatable food did best in the acceptance-based condition.

The current pilot study was designed to examine, in an overweight sample, the relationship between psychological traits, cravings and consumption, as well as to compare the efficacy of two cognitive-behavioral intervention strategies. This is the first study to directly compare these two conditions in an overweight sample. As such, overweight women were randomized to receive either standard or acceptance-based strategies for coping with cravings and then required to carry a transparent package of sweets while refraining, for 72 h, from consuming any food containing added or artificial sugars. Given our previous findings in a normal weight sample and the theoretical advantage of acceptance-based strategies for those with greater susceptibility to the food environment and the tendency to engage in emotional eating certain populations, it was hypothesized that overweight women would also demonstrate a particular advantage for

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the acceptance-based coping strategy group within the current study (Forman et al., 2007). We also hypothesized that emotional eating and susceptibility to the food environment would interact with group status such that individuals with higher emotional eating and susceptibility to the food environment would show greater effects in the acceptance-based group. In particular, we believed susceptibility to food immediately present in the participants' environment would most strongly moderate the effects as we explicitly created a situation where highly palatable food would be present for the 72-hour period. Additionally, given suggestions that control-based strategies have paradoxical effects (Erskine, Georgiou, & Kvavilashvili, 2010; Hayes, Luoma, Bond, Masuda, & Lillis, 2006) and can exhaust self-control resources (Muraven & Baumeister, 2000), it was predicted that those receiving the acceptance-based strategy would be less likely to experience rebound sweet eating at the conclusion of the dietary prohibition.

2. Methods

2.1. Participants

Participants ($n = 48$) were recruited from the community using flyers, advertising websites, and mass mailings. Inclusion criteria were: female, between the ages of 18 and 60, fluent in English, body mass index (BMI) ≥ 25 kg/m², access to the internet and/or mobile phone, reporting (on average, and not only during the menstrual cycle) at least a moderate amount of urges or cravings for sweet foods, and consumption of sweets at least five days per week. Participants were excluded if they were lactating or pregnant, were diabetic, had a history of an eating disorder, were allergic to or unable to eat chocolate, participated in a formal weight control program within the past three months, or were taking medications known to affect weight. Participants ranged in age from 18 to 59 ($M = 32.51$, $SD = 13.51$), and were of varying ethnic backgrounds (41.7% Caucasian, 29.2% African American, 10.4% multi-racial, 8.4% other). The average weight and BMI were 90.52 kg ($SD = 3.04$) and 33.25 kg/m² ($SD = 6.50$, range = 25.40–57.69), respectively.

2.2. Procedures

2.2.1. Interventions

Participants were randomized to either a standard cognitive-based coping strategy group (CBG) or an acceptance-based coping strategy group (ABG), 2 h in length. CBG was based on distraction and cognitive restructuring content from the LEARN Program for Weight Maintenance (Brownell, 2000), the Diabetes Prevention Program (The Diabetes Prevention Program Research Group, 1999) and the Beck Diet Solution (Beck, 2007). Broadly, the cognitive-based coping strategy group aimed to teach participants how to restructure maladaptive/indulgence-enabling thoughts about eating sweets as well as how to use techniques (e.g., positive imagery and mind games) to distract themselves from cravings.

ABG was based on the Acceptance-based Behavioral Treatment for Weight Loss (Forman et al., 2009), which itself drew heavily from Acceptance and Commitment Therapy (ACT; Hayes, Strosahl, & Wilson, 1999). Participants were taught that cravings for sweets are normal and expected, are outside of voluntary control, and that accepting cravings as they are, without trying to change them, is the most workable strategy. Participants were also taught "defusion" strategies, enabling psychological "stepping back from" cravings. The principle of willingness was emphasized, in that participants were encouraged to experience cravings without taking the usual actions (e.g., eating the desired food) that would reduce the unpleasant experience. Finally, participants were taught how the principles described facilitate committed action, i.e., the ability to behave in accordance with their goals and values rather than to manage unpleasant internal experiences.

2.2.2. Sweets exposure and restriction

In order to increase cravings, participants were each provided a transparent container of sweet foods (i.e., Hershey's Kisses®, Starbursts®, and Reese's® peanut butter cups) which they were instructed to keep with them at all times for a period of 72 h. Participants were told to "try their best" not to eat the provided sweet foods or to consume other sweet foods or drinks during the study period. Each participant received the same number of sweets, and each sweet was surreptitiously marked so as to detect any missing foods or substitutions. Participants returned food to a pre-designated drop-off where it was counted and checked for any with missing marks.

2.3. Measures

2.3.1. Moderators

The *Food Craving Questionnaire-Trait* version (FCQ-T; Cepeda-Benito, Gleaves, Williams, & Erath, 2000) was administered at baseline to assess trait-based cravings. The *Power of Food Scale* (PFS; Lowe et al., 2009) assesses the extent to which food's availability or presence influences behavior, thinking, and feelings. The scale has three subscales assessing responsiveness to food present, food available, and food tasted. We focused only on the food present subscale as the study explicitly created a situation where highly palatable food would be present for the 72-hour period. Tendency to engage in emotional eating was assessed using the 6-item *Emotional Eating subscale* of a revised version of the *Eating Inventory* (EI; formerly known as the Three-Factor Eating Questionnaire; Stunkard & Messick, 1988).

2.3.2. Outcomes

Given the evidence that retrospective self-reports suffer from recall biases (Stone & Shiffman, 1994), state-based cravings and sweet food consumption were assessed during the 72-hour period using a simplified ecological momentary assessment (EMA). During the restriction period, participants were asked to complete ratings (in a provided booklet) of their sweet cravings and consumption at 4 pre-determined time points per day which were signaled via emails, text messages, and/or phone. State craving was measured using the *Food Craving Questionnaire-State* version (FCQ-S; Cepeda-Benito et al., 2000). A *Consumption Index* was computed based on responses to two 5-point Likert scale items: sweet food consumption and sweet drink consumption. Point values were anchored to the quantity of a known sweet food (Snickers® bar) and sweet drink (soda can). No time-specific or food versus drink effects were hypothesized, thus summary craving and consumption scores were created by averaging the scores obtained across the 72-hour period. In addition to self-reported consumption, the sweets returned were counted and compared to the number of foods originally included in the container. Because of the low consumption rate, candy container consumption was dichotomized into any consumption versus no consumption. During the final assessment, a *bogus taste test* (where amount of sweet food consumed was recorded) was conducted in order to assess whether participants increased their eating after the externally-imposed restriction period had ended (i.e., the "rebound effect"). The procedures were based on those described in studies utilizing laboratory taste tests (Martin, O'Neil, Tollefson, Greenway, & White, 2008). Participants were told that the purpose of the taste test was to examine possible changes in taste perceptions of sweet foods following a period of restriction of such foods. Bowls of three different types of candies (Skittles®, M&M's®, and Reese's Pieces®; 284 g each, presented in 1 L serving bowls) were placed on a table, and participants were asked to taste each candy and complete taste ratings (sweetness, saltiness, etc.). They were told that, after completing the ratings, they could eat as much of each type of candy as they would like. Afterwards, the candy bowls were re-measured to assess amount eaten and participants were debriefed as to the purpose of the study procedures.

Table 1
Independent samples T-tests and Chi-square examining effect of group on cravings and consumption.

	CBG (<i>n</i> = 26)		ABG (<i>n</i> = 22)		<i>t</i>	<i>p</i>	<i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
State based cravings	20.91	5.81	18.73	4.29	1.46	.15	.43
Rebound ("taste test") consumption	48.44	48.10	38.42	33.21	0.78	.44	.24
Self-reported consumption (<i>z</i> scores)	.20	2.63	.21	1.61	−0.01	.99	.01
Proportion eating from sweets container	23.1%		9.1%		$\chi^2 = 1.68$.20	$\phi = -.19$

2.3.3. Manipulation check

A comprehension quiz administered at the conclusion of group revealed that a majority (79.2%) of participants achieved mastery of the material ($\geq 75\%$ correct). At the conclusion of the study, all participants reported engaging in the assigned strategies, and most (80.3%) indicated that they used the coping strategies *often to frequently* during the restriction period. Based on a checklist of strategies taught in both conditions, assigned strategies were used far more frequently than unassigned strategies ($p < .001$). Additionally, 100% of participants reported that they complied with instructions to keep the container of sweets with them at "virtually all times."

2.4. Analytic approach

Given the pilot nature of this first study, recruitment was purposefully small. Therefore, the sample size yielded low power to test study hypotheses. Where possible, we thus emphasize patterns and size of effects rather than formal statistical significance, although tests of significance will be presented to better describe trends in the data. Examination of psychological traits related to cravings and consumption was assessed using regression analyses. Main effects (primary analyses) and interaction effects (secondary analyses) were assessed using analysis of variance (ANOVAs).

3. Results

3.1. Psychological traits related to cravings and consumption

As expected, both trait- and state-based cravings were positively associated with self-reported consumption ($r_s = .27-.45$, $p_s = .07-.001$). Susceptibility to the food environment was positively associated with state-based cravings ($r = .32$, $p = .03$), but only weakly related to self-reported consumption ($r = .23$, $p = .11$). Emotional eating was not strongly associated with either state-based cravings ($r = .18$, $p = .22$) or self-reported consumption ($r = .04$, $p = .81$). Also as predicted, logistic regressions indicated that state-based craving predicted consumption from the candy containers ($OR = 1.23$, $Wald = 5.04$, $p = .02$), as did emotional eating tendencies (trend; $OR = 0.57$, $Wald = 0.14$, $p = .09$). Susceptibility to the food environment weakly predicted consumption from the candy containers ($OR = 0.96$, $Wald = 1.41$, $p = .24$).

3.2. Group differences

3.2.1. Main effect

As seen in Table 1, main analyses produced effects that were medium in size, but did not reach statistical significance. As hypothesized, the overall pattern favored ABG, with ABG participants reporting lower cravings, consuming fewer sweets from the container, and engaging in less "rebound" eating during the mock taste test.²

² Two participants were excluded because they did not fast, as requested, for the 2 h prior to the taste test.

3.2.2. Interaction with susceptibility

Group by the Food Present factor of the PFS evidenced strong effect on state-based cravings ($F = 2.71$, $p = .08$, $\eta_p^2 = .12$) and medium effect on self-reported consumption ($F = 1.36$, $p = .27$, $\eta_p^2 = .06$; see Fig. 1), with those high in food susceptibility reporting greater cravings and consumption in the CBG group. Contrary to hypotheses, the ANOVAs for the group by total PFS score interaction on measures of craving and self-reported consumption revealed only small, insignificant effects ($\eta_p^2 = .01-.04$) and no interaction effect was observed between group and PFS scores on performance in the mock taste test ($F = .07$, $p = .93$, $\eta_p^2 = .004$). Chi square analyses with group (contrast-coded) and PFS (low, moderate, high) entered as independent variables and abstinence versus non-abstinence as the dependent variable found no support for the overall PFS ($\chi^2 = 1.35$, $p = .50$) or PFS–Food Present interaction ($\chi^2 = 1.90$, $p = .38$).

3.2.3. Interaction with emotional eating

Moderate–strong trends of group by emotional eating interaction effects were observed for state-based cravings ($F = 1.20$, $p = .31$, $\eta_p^2 = .05$) and self-reported consumption ($F = 2.54$, $p = .09$, $\eta_p^2 = .11$). The pattern was consistent with hypotheses, suggesting that CBG participants reported lower cravings/consumption at low levels of emotional eating but more cravings/consumption at moderate to high levels of emotional eating. No interaction effect was observed between group and emotional eating scores on performance in the mock taste test ($F = .02$, $p = .97$, $\eta_p^2 = .001$). The group by EI–Emotional Eating interaction on candy container consumption, while non-significant ($\chi^2 = 10.97$, $p = .20$), was consistent with hypotheses and revealed a pattern wherein for those in the middle and highest bands of emotional eating, CBG demonstrated greater consumption, while for those in the lowest band, ABG demonstrated a greater consumption rate.

4. Discussion

Although this pilot study was not fully powered, the overall pattern of results suggests that, compared to standard, control-based strategies, acceptance-based strategies result in reduced cravings and consumption of sweets, especially for those with higher levels of susceptibility to the food environment and emotional eating. The results provide additional support for the theory that acceptance-based strategies may be most helpful for those individuals who have the most difficulty coping with unpleasant internal experiences and who engage in undesirable behaviors in order to reduce or eliminate them. These findings with an overweight sample replicate and extend previous studies with among normal weight samples (Forman et al., 2007; Hooper et al., 2012). Preliminary support was also obtained for the advantage of acceptance-based strategies in helping overweight and obese women resist the tendency to engage in "rebound" eating, which likely contributes to the difficulty individuals in maintaining successful weight loss.

Of note, effects were only observed for objectively measured consumption of boxed sweets, rather than self-reported sweet

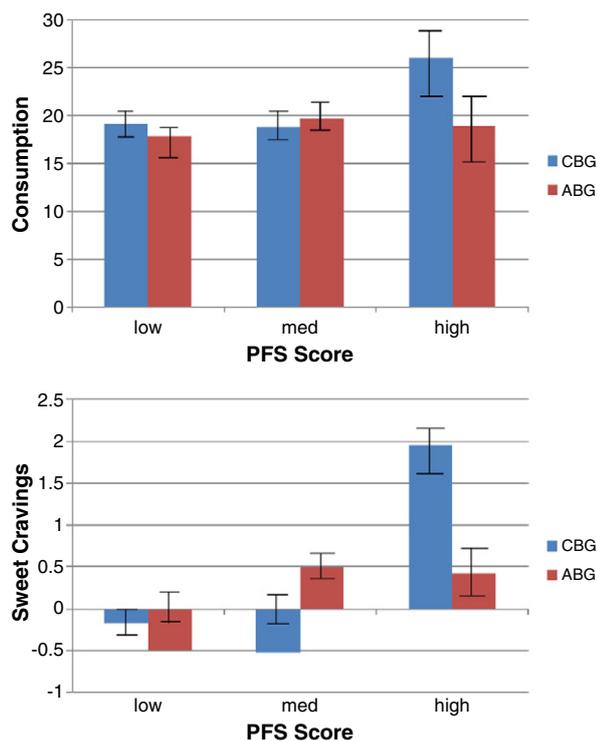


Fig. 1. Sweet cravings and self-reported sweet consumption by treatment group and food susceptibility level. Note. CBG = cognitive-based group, ABG = acceptance-based group, PFS = power of food scale, food present subscale.

consumption of any kind, perhaps due to the well-known unreliability of self-reported food intake (Stone & Shiffman, 1994). Another explanation is that effects on consuming hyper-available food were stronger than on consuming less available sweets.

While not a central aim, study results also bore out the hypothesis that sweet cravings would be positively associated with objective consumption of sweets, suggesting that cravings are implicated in dietary non-adherence and overweight (Basdevant et al., 1995). Support was also found for the notion that those with higher susceptibility to the food environment are more likely to experience cravings and consume food in response to those cravings.

There were a number of limitations in the study design, including low sample size, reliance on effect sizes and patterns instead of tests of statistical significance, the analog nature of the study, lack of a no-intervention control group, short length of the interventions, heavy reliance on self-report measures, the absence of a long-term follow-up, and lack of baseline measures for the primary dependent variables. In order to have greater confidence in our findings, research that replicates and extends the current pilot study, with a long-term follow-up assessment, should be conducted with a sufficient number of participants to yield adequate statistical power. Furthermore, the inclusion of baseline measures of outcome variables would allow for alternative hypotheses regarding pre-existing differences to be ruled-out with greater confidence.

Despite its limitations, the current study adds to the evidence suggesting that acceptance-based strategies for food cravings may represent an important addition to interventions aiming to promote weight loss and weight loss maintenance. Future weight loss interventions might benefit from incorporating acceptance-based techniques to assist patients in managing cravings and to promote weight loss and maintenance.

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Contributors

Dr. Forman and Hoffman designed the study. Dr. Hoffman and Ms. Juarascio ran subjects and interventions and contributed to the write up. Dr. Butryn and Dr. Herbert reviewed and assisted in study design and write-up of the manuscript.

Conflict of interest

All authors declare that they have no conflicts of interest.

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