

## An Open Trial of an Acceptance-Based Behavioral Intervention for Weight Loss

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*Innovative approaches are urgently needed to improve behavioral treatment for weight loss. The weight regain that is so common after treatment may be a result of an environment that makes it challenging to adhere, long-term, to a dietary and physical activity regimen. This study was designed to test, via a 12-week open trial, the preliminary feasibility, acceptability, effectiveness, and possible mechanisms of action of a behavioral treatment that was modified to incorporate acceptance-based therapy components designed to (a) bolster participants' commitment to behavior change, (b) build distress-tolerance skills, and (c) promote mindful awareness of eating behaviors and goals. Participants ( $n=29$ ) were overweight or obese women. Among completers ( $n=19$ ; 34% attrition), weight loss averaged 6.6% of body weight at posttreatment and 9.6% at 6-month follow-up ( $n=14$ ; 52% attrition). Intention-to-treat weight losses were 4.5% at posttreatment and 6.6% at 6-month follow-up. Psychological variables targeted by the intervention (e.g., cognitive restraint, disinhibition, urge-related eating behavior, emotional eating, eating-related experiential acceptance, mindfulness and motivation) changed in the expected directions, and many of these changes were consistent with decreases in weight loss. Moreover, despite the limitations of the single-group design, this pilot study demonstrated the preliminary feasibility, acceptability, and effectiveness of a novel, acceptance-based behavioral treatment for obesity. One potential implication is that behaviorally based weight loss interventions might be improved by overlaying an acceptance-based framework.*

**T**WO-THIRDS of adults in the United States are overweight or obese (BMI > 30 kg/m<sup>2</sup>; National Center for Health Statistics, 2005), and the number worldwide is approaching 2 billion people (World Health Organization, 2006). Obesity is associated with serious health problems, including heart disease, hypertension, hyperglycemia, ischemic stroke hypercholesterolemia, and type 2 diabetes mellitus (Manson, Skerrett, & Willett, 2001). Moreover, in the U.S., obesity consumes approximately 12% (\$51.6 billion) of the annual health care budget.

Standard behavioral treatments for obesity incorporate nutritional and behavioral strategies, and in recent years the primary innovation of behavioral treatment has been the addition of cognitive change strategies (Brownell & Jeffery, 1987; Keefe & Blumenthal, 1980; Stunkard & Berthold, 1985). Yet behavioral treatments have consistently achieved only modest outcomes, typically resulting in weight loss of 5% to 10% of initial body weight over 6 to 12 months, most of which time participants are receiving the active intervention (Brownell & Jeffery, 1987; Wilson, 1994). Fully half of participants regain all of their lost weight within 5 years (Wadden & Butryn, 2003).

When the epidemic of overweight is conceptualized fundamentally as a problem of an inability to adhere,

long-term, to a dietary and physical activity regimen, a strong case can be made for enhancing standard behavioral weight loss interventions with components derived from acceptance-based therapies. These strategies are a feature of several novel models of behavior therapy, particularly Acceptance and Commitment Therapy (ACT; Hayes, Strosahl, & Wilson, 1999). The goal of acceptance-based strategies is not to reduce the frequency of aversive experiences; rather, the aim is to foster willingness to experience potentially aversive internal experiences while simultaneously promoting behavior that is consistent with desired goals and values (Forman & Herbert, 2009; Hayes, Strosahl, et al., 1999).

We propose three overlapping arguments in support of the use of such strategies for the treatment of obesity. First, the nature of the modern social environment—which is filled with readily available, high-energy, palatable foods, in combination with an energy intake motivational system adapted for our evolutionary past, in which scarcity was a common threat to survival—results in powerful urges to eat well beyond energy neutrality (Blundell & Gillett, 2001; Forman & Herbert, 2009; Lowe, 2003; Peters, Wyatt, Donahoo, & Hill, 2002). Dietary restraint likely degrades over time in the face of these relentless pressures. Thus, long-term weight control requires a lasting commitment to engage in weight control behaviors (Dishman, 1991; Williams, Grow, Freedman, Ryan, & Deci, 1996). ACT strategies are designed to

facilitate the identification and internalization of values and lasting commitment to behavior consistent with these values, and thereby target the waning of commitment generally observed among participants of long-term obesity interventions. ACT theory recognizes that a behavior that continues or increases aversive internal experiences will only be undertaken when the individual has committed to an ultimate life goal that justifies the distress. Thus, the therapy facilitates the identification and clarification of such goals, and attempts to make the individual's moment-by-moment behavior choices referendums on whether one is remaining committed to one's ultimate goals (or values) versus a more immediate wish to decrease an aversive state.

Secondly, weight control requires the ability to tolerate unpleasant experiential states, such as hunger, feelings of deprivation, and negative affect, as well as discomfort that may be associated with physical activity (Byrne, Cooper, & Fairburn, 2003; Kearney, Rosal, Ockene, & Churchill, 2002). Certain internal experiences, such as troubling thoughts, anxiety, boredom, and cravings, are universally experienced as aversive; however, individuals vary in the extent to which they tolerate or "accept" unpleasant experiences versus feel driven to diminish them psychologically (e.g., via suppression, distraction, cognitive restructuring, thought-stopping) or behaviorally (e.g., by performing an action likely to produce change in the experience, such as leaving a feared situation or eating a desired food).

The degree to which one accepts versus strives to avoid such experiences is a robust predictor of health and psychological outcomes. For instance, low distress tolerance has been shown to predict binge eating (Telch, Agras, & Linehan, 2001), alcohol abuse (Brown, Evans, Miller, Burgess, & Mueller, 1997; Patten, Drews, Myers, Martin, & Wolter, 2002) and smoking (Brown et al., 1997; Brown, Lejuez, Kahler, & Strong, 2002; Patten et al., 2002). Difficulty coping with negative emotions also has been associated with reduced dietary compliance (Kearney et al., 2002). Weight regainers, in particular, have been shown to use eating to regulate and/or distract from aversive emotional states (Byrne et al., 2003). The inability to tolerate unpleasant internal experiences also likely limits compliance with prescribed physical activity goals (Lind, Joens-Matre, & Ekkekakis, 2005).

Acceptance-based strategies have a core focus on increasing the ability to tolerate aversive internal experiences, making them a logical choice for obesity interventions. In contrast to many traditional methods of behavior therapy that are based largely on attempts to control and reduce unpleasant internal states, acceptance-based strategies focus on experiential acceptance. The approach explicitly teaches strategies designed to increase tolerance in the service of goal-directed beha-

avior, such as healthful eating and exercise. For instance, acceptance-based strategies teach the skill of "defusion," wherein thoughts, feelings, and urges come to be experienced from a psychological distance. This enables an uncoupling between experience and action (i.e., one can have a thought, feeling, or urge without acting in accordance with it). Analog laboratory studies and mediational analyses of outcome studies suggest that acceptance-based strategies are effective at promoting adaptive behavior by increasing experiential acceptance (thereby decreasing experiential avoidance; Bond & Bunce, 2000; Gifford et al., 2004; Hayes, Bissett, et al., 1999; Levitt, Brown, Orsillo, & Barlow, 2004; McCracken & Eccleston, 2006; Woods, Wetterneck, & Flessner, 2006).

A third argument for incorporating acceptance-based strategies into obesity interventions comes from theories of self-regulation that hold that successful restraint depends on the ability to maintain a continued awareness both of one's current behavioral state and of how that state compares with a relevant standard (Baumeister, 1998; Carver & Scheier, 1981, 1998; Miller, Galanter, & Pribram, 1960). Thus, we would argue that successful weight control requires an ability to remain aware of eating behavior in order to enact appropriate self-regulation (Ward & Mann, 2000). Many factors can make awareness of one's consumption levels difficult, including large portion sizes and conditions requiring cognitive resources (even those of everyday life); a common result may be "mindless eating" (Wansink, Painter, & Lee, 2006). Acceptance-based strategies directly address the problem of mindless eating through mindfulness and awareness training designed to help individuals remain aware of their in-the-moment perceptual, cognitive, and affective experiences. Increased awareness of weight control goals, surroundings, and eating behavior itself will likely work against the disinhibiting effects of affective-cognitive load and poor contextual cues (e.g., container size) that constantly challenge people's ability to exercise dietary restraint. Eating-related mindfulness training has been incorporated into two promising treatments for binge eating; Craighead's "Appetite Awareness Training" (Craighead & Allen, 1995) and Kristeller's "Eating Awareness Training" (Kristeller, Quillian-Wolever, & Sheets, 2005).

Acceptance-based strategies have demonstrated effectiveness across a number of clinical syndromes, including depression, social anxiety, and generalized anxiety disorder (for a review, see Hayes, Luoma, Bond, Masuda, & Lillis, 2006). Diabetes management and smoking cessation may represent especially close parallels to weight loss maintenance. Recent smoking cessation models have focused on distress tolerance (Brown, Lejuez, Kahler, Strong, & Zvolensky, 2005), and have spurred ACT-based smoking-cessation interventions that have outperformed

traditional CBT (Hernandez Lopez, Roales Nieto, Luciano Soriano, & Montesinos Marin, 2005) and nicotine replacement therapy (Gifford et al., 2004). An ACT-based intervention versus a standard medication management intervention produced superior diabetes management behaviors (diet, physical activity, and glucose monitoring) and HbA1c values (i.e., glycated hemoglobin, which is a reliable biological indicator of adherence to diabetes management behaviors; Gregg, Callaghan, Hayes, & Glenn-Lawson, 2007).

Most recently, Lillis (2008) evaluated the effectiveness of a one-day ACT workshop ( $n=40$ ) versus a no-treatment control ( $n=44$ ) for enhancing weight maintenance among individuals who had completed at least six months of a weight loss program (e.g., Weight Watchers). In the three months between the beginning of the weight maintenance period and follow-up, participants in the wait-list condition gained an average of 0.3 kg (0.3%), while those in the ACT condition lost an average of 1.4 lbs (1.4%;  $t=2.96$ ,  $p<.01$ ). Of note, this particular intervention focused much more on developing participants' core life values than on behavioral skills.

Preliminary support for acceptance-based approaches to behavior change is also accumulating through a growing body of analog research. For example, in a recent study of food cravings, participants were given transparent boxes of chocolates and instructed to keep the chocolates with them, but not to eat them, for 48 hours (Forman et al., 2007). Participants were randomly assigned to one of three coping interventions: standard cognitive change, acceptance-based, or no intervention. Results suggested that the acceptance-based approach was most effective in terms of craving intensity and ability to refrain from eating the chocolates, particularly for those most susceptible to the food environment.

The present study was designed to provide a preliminary evaluation of an innovative behavioral weight control program that incorporates new developments from the field of behavior therapy. More specifically, we aimed to test the preliminary feasibility, acceptability, effectiveness, and possible mechanisms of action of a behavioral treatment that was modified to incorporate components that (a) bolster participants' commitment to behavior change, (b) build distress-tolerance skills, and (c) promote mindful awareness of eating behaviors and goals. We conducted an open trial of a 12-week, acceptance-based behavioral treatment (ABBT) in order to measure changes at post-intervention and at 6-month follow-up in both relevant psychological variables and in weight, as well as participants' reports of acceptability. Positive results in the areas of short-term (weight loss) and longer-term (weight maintenance) effectiveness, improvement in acceptance-linked variables, associations between improvement in acceptance-linked variables and

weight loss, dose-response correlations, and treatment acceptability would represent encouraging signs for the potential long-term efficacy of an acceptance-based intervention, whereas absence of findings or negative results on these variables would suggest that the innovated intervention holds little promise.

## Method

### Participants

Participants were recruited from the pool of employees at an urban university and its associated medical center using flyers, email, university newsletter, and website advertisements. Potential participants were screened by phone and then in person for eligibility. Inclusion criteria were BMI  $>25$  kg/m<sup>2</sup> and agreement not to join another weight loss program for the duration of the study. Participants were excluded if they were lactating, pregnant, or planning to become pregnant in the next year; reported taking a medication or having a medical/psychiatric problem known to cause weight loss or weight gain (unless medication was long-term and dosage was unchanging); reported a medical or psychiatric condition that would have limited their ability to comply with the program's behavioral recommendations; reported a positive history of an eating disorder in the past 10 years; or had plans to leave the Philadelphia area within the next year. Potential participants also had to attend two orientation sessions and complete preliminary food records.

Participants ( $n=29$ ) were women ages 23 to 58 ( $M=43.66$ ,  $SD=9.79$ ), and were 51.7% Caucasian and 48.3% African American. About half (51.7%) were living with a partner or married, and all were employed (10.3% part-time). All had high school degrees, and 53.9% graduated from college. Household income was distributed approximately equally between \$30,000 and \$150,000. The participants' weight ranged from 67.54 kg (148.90 lbs) to 137.57 kg (303.30 lbs;  $M=96.58$  kg,  $SD=16.34$ ), and BMI ranged from 25.61 to 48.69 ( $M=35.77$ ,  $SD=5.44$ ). Three participants from outside the university/medical employment network learned of the intervention and were permitted to enroll.

### Procedures

Because of the preliminary and exploratory nature of the study, a single-group design was utilized. Participants were assessed prior to the start of treatment, at posttreatment, and at 6-month follow-up. Participants were provided compensation (\$10) for completing the posttreatment and follow-up assessments. For piloting purposes, a worksite model was chosen. Groups took place at the participants' worksite location during work hours. Groups were 1-hour weekly sessions of an acceptance-based behavioral therapy for weight loss. The interventionists were a Ph.D.-level

Table 1  
Intervention Components

| Sessions | Behavioral Components   | Acceptance and Commitment-Based Components   |
|----------|---|--|
| 1-2      | <ul style="list-style-type: none"> <li>• Introduce: Program overview</li> <li>• Introduce: Nutritional information and guidelines</li> <li>• Introduce: Guidelines for physical activity</li> <li>• Introduce: Importance of self-monitoring of caloric intake</li> <li>• Introduce: Behavioral strategies for caloric adherence</li> <li>• Introduce: Obesogenic environment as a challenge to weight loss</li> <li>• Introduce: Benefits of monitoring weight</li> </ul>  | <ul style="list-style-type: none"> <li>• Introduce: Limitations of <i>experiential control</i></li> <li>• Introduce: <i>Acceptance</i> as an alternative to control strategies (specifically relating to adhering to caloric intake and physical activity recommendations)</li> </ul>  |
| 3-4      | <ul style="list-style-type: none"> <li>• Introduction: Exposure exercises</li> <li>• Introduce: Meal planning</li> <li>• Introduce: Food guide pyramid</li> <li>• Introduce: Reading food labels</li> <li>• Introduce: Portion sizes and portion control</li> <li>• Continue: Behavioral strategies for caloric adherence</li> <li>• Continue: Exposure exercises</li> <li>• Review: Importance of self-monitoring</li> </ul>   | <ul style="list-style-type: none"> <li>• Introduce: <i>Willingness</i></li> <li>• Introduce: <i>Values</i> clarification (specifically discussing how this can enhance commitment)</li> <li>• Introduce: Importance of <i>workability</i> and <i>flexibility</i></li> <li>• Continue: Challenging unsuccessful control strategies</li> <li>• Review: Limitations of <i>experiential control</i> Review: <i>Acceptance</i> as an alternative to control</li> </ul>  |
| 5-6      | <ul style="list-style-type: none"> <li>• Introduce: Role of fat in the diet</li> <li>• Introduce: Education regarding carbohydrates and sugars</li> <li>• Introduce: Negative affect as a challenge to weight loss</li> <li>• Introduce: Problem of disinhibited eating</li> <li>• Introduce: Barriers and benefits of physical activity</li> <li>• Introduce: Trying new physical activity behaviors and use of strategies that can increase enjoyment of exercise</li> <li>• Introduce: Strategies for increasing lifestyle activity</li> <li>• Continue: Behavioral strategies for caloric adherence</li> <li>• Continue: Exposure exercises</li> <li>• Review: Self-monitoring and meal planning</li> </ul> | <ul style="list-style-type: none"> <li>• Introduce: <i>Mindless vs. Mindful</i> eating</li> <li>• Introduce: Strategies to reduce <i>mindless</i> eating</li> <li>• Introduce: Mindfulness related to exercise: teach participants how to recognize bodily sensations, changes in tension/stress before, during, after bout of exercise</li> <li>• Introduce: <i>Urge surfing</i></li> <li>• Introduce: <i>Defusion vs. fusion</i></li> <li>• Introduce: <i>Committed action</i></li> <li>• Introduce: Stimulus control as a mechanism for distress tolerance. Teach alternate ways to recognize small benefits of participating in physical activity</li> <li>• Continue: Values clarification, acceptance, willingness, urge surfing, and mindfulness</li> </ul> |
| 7-10     | <ul style="list-style-type: none"> <li>• Introduce: Energy density and how to continue restricting calories while managing hunger</li> <li>• Continue: Problem-solving strategies</li> <li>• Review: Nutrition, stimulus control, self-monitoring, and meal planning</li> </ul>   | <ul style="list-style-type: none"> <li>• Introduce: Distinction between values and goals</li> <li>• Introduce: WMD as a reminder for key concepts of Willingness, Mindfulness, and Defusion</li> <li>• Introduce: Suffering as normal human experience</li> <li>• Introduce: TIES metaphor (Thoughts, Images, Emotions, Sensations) as a reminder for the benefits of separating emotions from actions (i.e., “untying” oneself)</li> <li>• Continue &amp; Review: Defusion, committed action, values clarification, acceptance, willingness, urge surfing, and mindfulness</li> </ul>   |
| 11-12    | <ul style="list-style-type: none"> <li>• Introduce: Challenge of weight loss maintenance</li> <li>• Introduce: Weight and body image</li> <li>• Introduce: Problem of behavioral fatigue</li> <li>• Introduce: Realistic long-term weight goals</li> <li>• Introduce: Regular weighing and the use of an action plan for weight loss maintenance</li> <li>• Introduction: Distinction between lapse and relapse</li> </ul>  | <ul style="list-style-type: none"> <li>• Maintenance of acceptance-based strategies with emphasis on the following: <ul style="list-style-type: none"> <li>○ Negative internal experiences related to behavioral fatigue, negative evaluations of body, feelings of dissatisfaction, and lapses in healthy eating or physical activity behavior</li> <li>○ Renewal of commitment and continued values clarification</li> <li>○ Concept of substituting alternatives: encouraging person to exercise at beneficial times (e.g., when having urge to eat).</li> </ul> </li> </ul>  |

psychologist and a doctoral student in clinical psychology. Sessions were conducted on the basis of a 12-session manual created by the investigators that applied an acceptance-based framework to a standard behavioral package, as described next.

### Treatment

*Behavioral Components.* The structure of the sessions, the education components, and the behavioral recommenda-

tions were based on the LEARN program (Brownell, 2004). A considerable focus of the first two sessions was the provision of dietary, nutritional, and physical activity information and the introduction of behavioral strategies such as food monitoring and limiting food exposure. Throughout treatment, there was an intense focus on detailed and structured monitoring of food and calorie intake. At each session, participants reviewed their progress over the past week as well as any challenges they

experienced in meeting dietary and physical activity goals. Through these discussions, participants learned to identify triggers for overeating and engaged in problem solving to address these. Moreover, the treatment taught participants how to make use of cues that increase the likelihood of desirable behavior as well as how to reduce cues that increase the likelihood of undesirable behaviors (e.g., eating high-calorie foods). These strategies involve changing the food environment in order to decrease temptations and urges to eat, but were conducted within an acceptance-consistent framework. Specifically, participants were urged to avoid tempting food stimuli when possible (e.g., avoiding keeping tempting foods in the house) and to use acceptance-based strategies when in situations in which carrying out the behavioral strategies is impractical (e.g., being in a work or social environment in which tempting food is available) or psychologically difficult (e.g., practicing acceptance of urges to buy unhealthy foods while grocery shopping). This combination of strategies—changing what you can and accepting what you cannot—is consistent with those successfully employed within dialectical behavior therapy (Linehan, 1993). Regular weight-monitoring was encouraged and conducted at the start of each group session. Participants were instructed to monitor lifestyle activity with a pedometer and were provided specific physical activity goals.

*Differences From Traditional Behavioral Weight Loss Programs.* Most of the behavioral strategies utilized by traditional behavioral weight loss programs, such as Brownell's LEARN program, were used in this program. However, this treatment did not use the cognitive strategies that are typical of such programs because they would be antithetical to acceptance-based approaches. Cognitive restructuring is one such strategy that is heavily incorporated into the LEARN program and that was not included in our treatment. This skill includes the identification and modification of distorted thinking related to eating/overeating, weight loss success or failure, ability to engage in physical activity, body image, and relapse (Brownell, 1997; Wadden & Butryn, 2003). Our acceptance-based intervention also excluded discussion of strategies related to interrupting problematic chains of cognitions, affect and eating behavior. Moreover, rather than promoting strategies to distract from and psychologically confront cravings, these were discouraged as counterproductive; ABBT explicitly avoided endorsing as goals the reduction or elimination of cravings, urges to eat, or problematic emotional states (anxiety, sadness, boredom).

*Acceptance-Based Components.* In place of the cognitive interventions incorporated by traditional weight loss programs, our treatment included specific interventions derived principally from Hayes, Strosahl, et al. (1999) treatment description. These strategies provide an alternative to the traditional cognitive control strategies used

in existing weight loss programs. We theorized that use of acceptance-based strategies would improve adherence to weight loss behaviors. Three principle components of the acceptance-based intervention (i.e., distress tolerance, mindfulness, and commitment enhancement) are described below, and an outline of how they were distributed throughout the intervention is presented in Table 1.

#### *Distress Tolerance*

This intervention aimed to help participants recognize that eating-related mental experiences (urges to eat, hunger, cravings, deprivation, eating visualizations) are bound to occur with high intensity and frequency in today's obesogenic environment, and generally cannot be suppressed or controlled. The intervention aimed to help participants appreciate that their attempts to control these experiences are often ineffectual or even counterproductive. We encouraged the development of skills to improve tolerance of aversive internal states that include eating-related states as well as affective states such as boredom, sadness, and anxiety. Similarly, participants were helped to better tolerate physical activity-related distress. Participants were helped to recognize that attempts to modify aversive states (i.e., experiential avoidance related to intolerance of distress) are often associated with food intake because eating is a method of altering the internal experience, as well as with the cessation or avoidance of physical activity. Experiential acceptance was framed as a more adaptive alternative given that it need not involve unhealthy eating nor avoidance of activity, and skills to achieve a willingness to experience unpleasant states were taught.

One such skill is "urge surfing" (Marlatt & Kristeller, 1999), in which participants were trained to "ride" (i.e., to observe from a distance without acting on or attempting to change) their eating-related urges. A related skill crucial to the ABBT program is "defusion," the ability to distance oneself from thoughts and feelings in order to see them as merely transient psychological experiences that need not be believed, acted on, controlled, or suppressed. The notion of uncoupling internal experiences and externalized behaviors was heavily emphasized.

To facilitate the acquisition of defusion and uncoupling, simple demonstrations were performed, such as in-group exposure to food cues (e.g., chocolate bar), designed to provoke thoughts (e.g., "That will taste so wonderful, and I can always make up for the calories later") and feelings (e.g., powerful urge to eat the food) that usually lead to unhealthy eating. Simultaneously, participants practiced distancing themselves from these thoughts and feelings (e.g., explicitly recognizing a thought and its status as merely a thought) in a way that

enhanced willingness to experience the thoughts/feelings, and thereby reducing the necessity of acting to alter them.

An example of an experiential exercise that was used to help participants practice defusion was the Carrot and Chocolate Exercise. In this exercise, each participant was presented with a carrot and a piece of chocolate and asked to write down all the thoughts related to their desire to eat the chocolate (e.g., “You deserve the chocolate,” “How bad would one piece of chocolate really be,” and “You can make up for the calories later”). Subsequently, each participant was told to eat the carrot while looking at the chocolate, as another group member took on the role of the “mind” by reading aloud from the participant’s list of problematic thoughts. This exercise allowed participants to practice engaging in a valued behavior (i.e., eating the carrot) while simultaneously having thoughts that made that behavior difficult. This demonstrated for them their ability to uncouple their behaviors and their thoughts.

#### *Mindfulness*

The intervention incorporated mindfulness training designed to help individuals increase awareness of their perceptual, cognitive, and affective experiences. Metaphors and experiential exercises were utilized to train participants to become more present-centered and aware, thereby reducing the likelihood that they would engage in “mindless” behaviors. For instance, participants were each given a pretzel to eat, instructed to eat it, trained in the practice of mindful eating (via explanation and practice in becoming more deliberately conscious of the sensory experiences related to the tasting, chewing, and swallowing of the food) and then asked to eat the pretzel once more, mindfully, and to compare this with the original experience of eating the pretzel. Additionally, participants were asked to monitor their bodily reactions and feelings before, during, and after physical exercise to explore cognitive and affective responses to acute bouts of activity.

The intervention also emphasized helping participants more consistently make “mindful” deliberate behavioral (i.e., eating and physical activity) choices. Specifically, we gave participants three key questions to ask themselves before eating:

- What is triggering me to eat this food right now?
- What are my other options for food to eat or behavior in which I can engage?
- Is eating this food the option I want to choose?

Mindfulness was then discussed as a tool that allows the person to become aware of the choice they have in deciding whether or not to engage in the behavior of eating.

#### *Commitment Enhancement*

Consistent with principles of ACT and intrinsic motivation theory (Deci & Ryan, 1985), our treatment emphasized that participants must choose weight-related goals that emanate from freely chosen, personal life values (e.g., health). A structured process for the identification of such life values was followed. Specifically, participants completed a homework assignment in which they were to list the top 10 reasons that they wanted to lose weight. These lists were discussed in the following session and participants were helped to recognize the connections between their values and day-to-day eating and physical activity behaviors. Moreover, participants were helped to appreciate that commitment to difficult behavioral goals, especially those that contain sustained exposure to unpleasant experiential states, is only likely to be maintained when one connects psychologically with life values important enough and meaningful enough to make such effort and sacrifice worthwhile.

The intervention also helped participants be aware of their moment-by-moment behavior choices, and to increase the likelihood these choices reflect one’s ultimate goals (or values) rather than a more immediate wish to decrease an aversive state. In order to emphasize this point, we discussed this in terms of “short-term mind” versus “long-term mind.” The short-term mind was described as attending to immediate costs and benefits of a behavior, whereas the long-term mind was described as attending to long-term costs and benefits and having more awareness of how a behavior is or is not consistent with one’s values. For instance, at one point, participants were asked to discuss a scenario in which they ended the day feeling anxious and tired and felt a craving for ice cream. Participants discussed how the short-term and long-term mind can influence the decision to eat ice cream or not and examined how thinking with the long-term mind can enhance commitment to a healthy lifestyle.

#### **Measures**

*Height and Weight.* Height was measured with a stadiometer. Weight was determined with the patient in street clothes (without shoes) using a standardized Seca scale accurate to 0.1 kg. Participants’ weights were taken at midpoint (Session 6) as well as at the three full assessment points.

*Treatment Dose.* Dose was measured in two ways: (1) the number of sessions attended and (2) the number of daily food assignments completed and submitted. Assignments consisted of daily food monitoring forms and intervention-consistent exercises.

*Treatment Acceptability.* In a post-intervention survey, participants evaluated the following two treatment acceptability items on a 5-point Likert scale (1 = *Not at all ...*, 3 = *Somewhat ...*, 5 = *Very ...*): “How helpful did you find the strategies for responding to urges or desires pushing you to make unhealthy choices (e.g., acceptance, willingness, and defusion) in helping you lose weight?” and “How satisfied were you with the approach we used to help you lose weight?” This survey was created for the purpose of the current study. Psychometric information on these items is not available.

*Motivation.* Motivation was assessed using items adapted from the “psychological factors” section of the Weight and Lifestyle Inventory (WALI; Wadden & Foster, 2001). The WALI is a self-report instrument designed to obtain information on participants’ weight and dieting histories, eating and exercise habits, medical history, and relationships with family and friends. In the present study, participants were asked to provide ratings on four items designed to assess their motivation and readiness for engaging in a weight loss program. Items were rated on a 5-point Likert scale from 1 (*not at all*) to 5 (*a great deal*). These items have demonstrated adequate test-retest reliability (Wadden et al., 2006;  $\alpha=0.88$  in our sample).

*Disinhibition.* The disinhibition subscale of the Eating Inventory (EI; formerly, Three-Factor Eating Questionnaire; Stunkard & Messick, 1988) assesses overconsumption in response to emotional, cognitive, and social cues. The disinhibition scale has been found to have adequate test-retest reliability ( $r=0.86$ ). The disinhibition subscale has predicted weight regain in several studies (e.g., Cuntz, Leibbrand, Ehrig, Shaw, & Fichter, 2001; Foster, Wadden, Swain, & Vogt, 1998; Pekkarinen, Takala, & Mustajoki, 1996).

*Cognitive Restraint.* The cognitive restraint subscale (CRT) of the EI measures the tendency to control food intake in order to prevent weight gain or achieve weight loss. Several studies have demonstrated the construct validity of the 21-item CRT (e.g., Karlsson, Persson, Sjöstrom, & Sullivan, 2000). The internal reliability coefficient (Cronbach’s  $\alpha$ ) for the restraint scale was 0.83 (Karlsson et al., 2000). Items of the CRT demonstrated strong discriminant validity with low correlations ( $r<0.30$ ) between the items and the two other scales, and only one item failed to meet discriminant validity tests (Karlsson et al., 2000). However, the same study demonstrated that only 13 of the 21 items met convergent validity with the item-scale convergent validity ( $r\geq 0.40$ ).

*Emotional Eating.* The emotional eating scale of the Dutch Eating Behaviors Questionnaire (DEBQ; Van Strien, Frijters, Bergers, & Defares, 1986) assesses the extent to which individuals eat in response to emotional

arousal states such as anxiety and anger. In order to distinguish eating desires from eating behaviors, we modified the DEBQ such that participants were asked to rate the extent to which they desired to eat in response to the emotion as well as the extent to which they actually ate in response to the emotion. Items were rated on a 5-point Likert scale ranging from 1 (*never*) to 5 (*always*). The original emotional eating subscale has been shown to have adequate reliability ( $\alpha=.79$ ; Larsen, Van Strien, Eisenga, & Engels, 2006), and the modified version had excellent internal reliability ( $\alpha=0.96$ ) in our sample.

*Food-related Experiential Acceptance.* In order to assess experiential acceptance of food-related internal experiences, we adapted the Chronic Pain Acceptance Questionnaire (CPAQ; McCracken, Vowles, & Eccleston, 2004). The CPAQ is a 20-item measure assessing acceptance of chronic pain, and is based on the Acceptance and Action Questionnaire-2 (Bond, 2005). The CPAQ has been shown to have adequate internal consistency (Cronbach’s  $\alpha=0.78$ ; McCracken et al., 2004). Our modified version ( $\alpha$  for this sample = 0.79), referred to as the Food-Related Acceptance and Action Questionnaire (FAAQ) contains 10 items (e.g., “I need to concentrate on getting rid of my urges to eat unhealthily,” reversed scored) rated on a 7-point Likert scale (1 = *very seldom true* to 7 = *always true*). Higher scores indicate greater acceptance of motivations to eat.

*Mindful Awareness.* The Philadelphia Mindfulness Scale (PHLMS; Cardaciotto, Herbert, Forman, Moitra, & Farrow, 2008) is a self-report measure assessing level of mindfulness as defined by its two key constituents, present-moment awareness and nonjudgmental acceptance. Items are rated on a 5-point Likert scale (0 = *never*, 4 = *very often*) according to the frequency that the item was experienced within the past week. Exploratory and confirmatory factor analyses support the two-factor structure. Good internal consistency was demonstrated in both clinical (Cronbach’s  $\alpha=0.75$ ) and nonclinical (awareness; Cronbach’s  $\alpha=0.75$ ) samples.

*Quality Of Life.* The Impact of Weight on Quality of Life-Lite (IWQOL-Lite; Kolotkin & Crosby, 2002) is a 31-item self-report instrument that measures the perceived impact of obesity and weight reduction on quality of life. The five subscales (physical function, self-esteem, sexual life, public distress, and work) have demonstrated good reliability and validity (Kolotkin & Crosby, 2002; Kolotkin, Crosby, Kosloski, & Williams, 2001). Among overweight and obese individuals, the IWQOL-LITE was shown to have both good internal consistency ( $\alpha=0.96$ ) and test-rest reliability (intraclass correlation coefficients = 0.95; Kolotkin & Crosby, 2002). Additionally, strong evidence for convergent and discriminant validity was found, e.g., significant associations between

Table 2  
Comparison of those retained and those lost to follow-up

|                     | Dropout group (n=9) |      | Retained at post-intervention (n=19) |       | Dropout group vs post-intervention group |     | Retained at 6-month follow-up (n=14) |       | Dropout group vs 6-month follow-up group |      |
|---------------------|---------------------|------|--------------------------------------|-------|--|-----|--------------------------------------|-------|--|------|
|                     | M                   | SD   | M                                    | SD    | t(27)                                    | p   | M                                    | SD    | t(22)                                    | p    |
| Age                 | 45.60               | 8.85 | 42.63                                | 10.33 | 0.77                                     | .45 | 43.15                                | 10.39 | 0.24                                     | .81  |
| BMI                 | 37.56               | 6.59 | 34.83                                | 4.66  | 1.30                                     | .21 | 34.40                                | 4.86  | 1.23                                     | .23  |
| Sessions Attended   | 4.60                | 1.90 | 8.89                                 | 2.18  | 5.25                                     | .00 | 9.62                                 | 2.06  | 4.97                                     | <.01 |
|                     | %                   |      | %                                    |       | $\chi^2(1)$                              | p   | %                                    |       | $\chi^2(1)$                              | p    |
| Caucasian Ethnicity | 30%                 |      | 63%                                  |       | 2.89                                     | .09 | 67%                                  |       | 4.18                                     | .04  |

IWQOL-Lite and measures of health ( $r_s = -0.54 - 0.58$ ; Kolotkin & Crosby, 2002).

## Results

### Retention and Treatment Utilization

Among those screened for eligibility, 8 were excluded because of diabetes, 1 was excluded because she was in another weight loss program, 1 was excluded because she was underweight, and 2 were excluded because they were taking medications that may have affected their weight and/or appetite. Of the 29 eligible participants, 19 attended the posttest assessment and 14 attended the 6-month follow-up. Dropout rate varied considerably by ethnicity: at post-intervention the dropout rate was 20% for Caucasians and 46% for African Americans. BMI and age did not differ between those who were and were not retained in the study (Table 2). As can be seen in Table 2, the participants in the posttest groups attended approximately nine sessions, on average. Given the high attrition, results for both the intent-to-treat and completer samples are provided when relevant and possible.

### Treatment Acceptability

Among completers, participants' ratings (1 = *not at all effective/helpful/satisfied*, and 5 = *very effective/helpful/satisfied*) were high for satisfaction with the weight loss approach ( $M = 4.17$ ,  $SD = 1.15$ ), and perceived helpfulness of the specific strategies it contained ( $M = 4.28$ ,  $SD = 1.02$ ).

### Outcomes

Participants lost an average of 6.6% (range = 2.4% gain to 17.2% loss,  $SD = 4.49$ ) of their body weight between baseline and posttreatment ( $d_{unadjusted} = 0.42$ ,  $d_{adjusted} = 2.19^1$ ), and an average of 9.6% (range = 4.5% gain to 25.9% loss,  $SD = 7.34$ ) by 6-month follow-up ( $d_{unadjusted} = 0.58$ ,  $d_{adjusted} = 1.98$ ). (Participants attending the 6-month follow-up had lost an average of 8.8% of their body weight at posttreatment). In addition, participants' ratings of the extent to which their weight was having a

negative impact on their quality of life decreased significantly from baseline ( $M = 61.13$ ) to both post-treatment ( $M = 47.56$ ,  $t = 5.83$ ,  $p < .001$ ,  $d_{rm} = 1.37$ ) and follow-up ( $M = 51.54$ ,  $t = 4.54$ ,  $p < .001$ ,  $d_{rm} = 0.64$ ).

An intent-to-treat analysis of weight loss was also conducted by carrying forward the last observation; i.e., we assumed that the weight of participants who dropped out remained at the last known weight. Mean weight loss with these assumptions was 4.5% ( $SD = 4.53$ ) at posttreatment and 6.6% ( $SD = 5.24$ ) at 6-month follow-up.

### Dose-Response Relationship

Both the number of sessions attended and the number of food records/assignments submitted ( $M = 60.09$ ,  $SD = 23.98$ ) were strongly associated with weight loss at post-intervention ( $r = .65$ ,  $p < .01$  and  $r = .64$ ,  $p < .01$ , respectively) and at 6-month follow-up ( $r = .75$ ,  $p < .01$  and  $r = .56$ ,  $p = .04$ , respectively). Thus, there was a strong positive association between the dose of intervention and the response to treatment.

### Effects of Intervention on Targeted Process Variables

The process variables targeted by the intervention, including disinhibition, cognitive restraint, urge-related eating behavior, emotional eating, eating-related experiential acceptance, mindfulness and motivation, all changed in the expected directions (Table 2). Results from the dependent measures *t*-test indicated that most changes between baseline and posttreatment were moderate-to-large in size and were statistically significant.

<sup>1</sup> Unadjusted and adjusted refer to whether Cohen's *d* is or is not adjusted for the correlation existing between the repeated measures. While Rosenthal and colleagues (Mullen & Rosenthal, 1985; Rosenthal, 1991) have recommended a formula for *d* that accounts for the association between paired variables ( $\frac{M_1 - M_2}{\sigma_{pooled} \sqrt{1 - r_{12}}}$ ), others (e.g., Dunlop, Cortina, Vaslow, & Burke, 1996) have expressed concern that the calculated value will be an overestimate of the actual effect size and have advocated using the standard formula for Cohen's *D* ( $\frac{M_1 - M_2}{\sigma_{pooled}}$ ).

Table 3  
Process variables: change between baseline and post-intervention (paired t-test)

|                        | baseline |           | post-test |           | paired t-test ( <i>df</i> =17) |          |                      |
|------------------------|----------|-----------|-----------|-----------|--------------------------------|----------|----------------------|
|                        | <i>M</i> | <i>SD</i> | <i>M</i>  | <i>SD</i> | <i>T</i>                       | <i>p</i> | <i>d<sub>m</sub></i> |
| WALI-Motivation Items  | 12.94    | 1.89      | 13.50     | 1.65      | -1.17                          | 0.26     | 0.28                 |
| DEBQ-Desires           | 30.56    | 8.92      | 25.25     | 8.54      | 3.74                           | <.01     | 0.88                 |
| DEBQ-Behaviors         | 29.87    | 9.73      | 23.44     | 7.55      | 3.47                           | <.01     | 0.82                 |
| AAQ-Eating             | 39.66    | 9.73      | 51.90     | 9.97      | -4.91                          | 0.04     | 0.53                 |
| EI Disinhibition       | 7.89     | 3.63      | 4.83      | 2.43      | 3.73                           | <.01     | 0.96                 |
| EI Cognitive Restraint | 10.11    | 4.27      | 16.00     | 3.69      | -4.03                          | <.01     | 1.47                 |
| PHLMS                  | 65.70    | 8.45      | 69.00     | 9.65      | -3.33                          | <.01     | 0.78                 |

Note. WALI=Weight and Lifestyle Inventory ; DEBQ-Desires/Behaviors=Dutch Eating Behavior Questionnaire, Emotional Eating Subscale – Desires/Behavior; AAQ-Eating=modified Acceptance and Action Questionnaire; EI=Eating Inventory; PHLMS=Philadelphia Mindfulness Scale.

### Association Between Change in Process Variables and Outcome

The strength of the association between change in process variables and the percentage decrease in weight provides a rough indication of the degree to which the changes in the process variables may drive the intervention effects. A residualized change score was calculated by regressing the baseline score on the post-intervention score for each process variable, which were conceptualized as potential mediators. Regressed changes of several of the process variables (i.e., cognitive restraint, motivation, urge-related eating behavior, eating-linked experiential acceptance, and emotional eating) were associated with weight loss at posttreatment (Table 3). A similar pattern of results was obtained predicting weight loss 6-month follow-up (Table 4). Two exceptions were that urge-related eating behavior no longer strongly predicted weight loss, and that mindfulness emerged as a potential mediator at 6-month follow-up.

### Discussion

Effective behavioral interventions for overweight and obesity are desperately needed given the rapid increase in

the prevalence of these problems and their association with poor health and quality of life. Standard behavioral interventions have proven moderately successful in the short-term and only minimally successful in the long-term. Acceptance-based behavioral interventions represent a promising framework for encouraging health-related behavior change, including changes in eating and physical activity. The current study piloted an acceptance-based behavioral treatment for weight loss, evaluating the program's feasibility, acceptability, and effectiveness in the short- and medium-term, as well as whether its effects were associated with constructs theorized to act as mediating variables.

This was the first time that an acceptance-based innovation of standard behavior treatment for obesity was attempted. The treatment proved feasible to develop and deliver. Given that this was a newly developed approach to weight loss, it was also important to assess the acceptability of ABBT. Participants appeared to be satisfied with the treatment and found this approach to be effective in helping them to lose weight. In particular, they found the acceptance-based strategies to be helpful for improving their ability to adhere to the behaviors necessary for successful weight loss. The finding that the large majority of participants

Table 4  
Process variables: association between residualized change from baseline to post-intervention and percent weight loss at post-intervention and at 6-month follow-up

|                        | post-intervention ( <i>n</i> =19) |          | 6-month follow-up ( <i>n</i> =12) |          |
|------------------------|-----------------------------------|----------|-----------------------------------|----------|
|                        | <i>r</i>                          | <i>p</i> | <i>r</i>                          | <i>P</i> |
| WALI-Motivation Items  | .51                               | 0.03     | .39                               | .21      |
| DEBQ-Desires           | .52                               | 0.03     | -.14                              | .66      |
| DEBQ-Behaviors         | .56                               | 0.02     | .23                               | .48      |
| AAQ-Eating             | .47                               | 0.05     | .41                               | .18      |
| EI Disinhibition       | .22                               | 0.38     | .12                               | .71      |
| EI Cognitive Restraint | .60                               | 0.01     | .62                               | .03      |
| PHLMS Total            | .06                               | 0.80     | .67                               | .02      |

Note. WALI=Weight and Lifestyle Inventory; DEBQ-Desires/Behaviors=Dutch Eating Behavior Questionnaire, Emotional Eating Subscale – Desires/Behavior; AAQ-Eating=modified Acceptance and Action Questionnaire; EI=Eating Inventory; PHLMS=Philadelphia Mindfulness Scale.

reported high ratings of treatment satisfaction and perceived helpfulness provides preliminary support for the acceptability of this innovated treatment.

In this pilot test, ABBT resulted in a mean weight loss of 6.6% of baseline weight (6.2 kg) for treatment completers, which is equivalent to weight loss reported by other 12-week behavior weight loss programs (e.g., 6.0 kg, Rippe et al., 1998; 6.5 kg, Skender et al., 1996). In addition, it is consistent with Wadden and Butryn's (2003) quantitative review, which concluded that behavioral interventions produce weight losses of 0.5 kg per week. Six months after the end of the intervention, participants had not only maintained their weight loss, but had continued to lose weight, achieving a mean weight loss of 9.6% (8.5 kg). Though few other studies with similar treatment and follow-up periods have been conducted, the current results compare favorably to available data (Fontaine, Barofsky, Bartlett, Franckowiak, & Andersen, 2004; Skender et al., 1996). Thus, we can conclude that ABBT was effective, at least in terms of short- and medium-term weight loss. Moreover, the effectiveness of the treatment was tied to the "dose" of therapy they received (as measured directly by session attendance, and indirectly by food records completed), suggesting that the treatment as delivered contained genuinely active components (though it is also possible that participant motivation was the main determining factor both for weight loss and for treatment compliance).

Participants reported large increases in their weight-related quality of life over the 12 weeks, suggesting that the treatment not only impacted weight but had a more global effect on their well-being. Possibly these increases in quality of life are attributable both to changes in weight as well as to acquisition of coping strategies that resulted from the treatment.

Although the study lacked formal mediational analyses, findings offer tentative support for the notion that acceptance-linked skills were active ingredients of the intervention. Specifically, we detected hypothesized changes in various acceptance-related variables (e.g., motivation, experiential avoidance, emotional eating, and mindfulness) from baseline to post-intervention, and these changes were associated with weight loss at post-intervention and at 6-month follow-up. These findings thus lend preliminary support to our hypothesis that an improved ability to tolerate aversive states and remain mindful of goals will improve long-term weight loss. More robust support for theorized mechanisms of action must await future studies that allow for formal mediational analyses and/or utilize dismantling methodologies.

The findings from the current study support the efficacy of acceptance-based approaches for weight loss.

The results are consistent with those of Lillis (2008) wherein participants in the acceptance-based workshops maintained weight loss, but those in the comparison condition gained weight. Notably, the two interventions had differing foci (the Lillis intervention emphasized helping participants better understand their core life values, whereas the current intervention focused on acceptance-based skills that would better enable behavioral changes). Thus, when taken together, the two studies provide broader support for the role of acceptance-based approaches in obesity intervention.

A number of limitations temper the conclusions that can be drawn from study results. This study used a single-sample design, which did not allow us to control for several potential threats to internal validity (e.g., history and maturation) or the effects of participant expectancies. The absence of a comparison treatment group (e.g., standard behavioral intervention for weight loss) limited the conclusions we could draw regarding ABBT's relative effectiveness or the distinctiveness of its mechanisms of action. Our results are also limited by the use of modified versions of certain measures (i.e., WALI, DEBQ, CPAQ), meaning that psychometric properties are not fully known for these measures. In addition, the preliminary nature of the study necessitated a small sample size, which limits generalizability and power. The substantial attrition, though well within the range of previous weight loss studies (Dalle Grave et al., 2005; Honas, Early, Frederickson, & O'Brien, 2003; Padwal, Li, & Lau, 2004; Teixeira et al., 2004), further limits the ability to draw firm conclusions. For instance, it is possible that those who attended post-baseline assessments lost more weight than those who did not and were most satisfied with treatment, which would mean that our positive findings for weight loss and treatment acceptability are artificially inflated. Having said this, it is important to note that even with the conservative assumptions made in the intent-to-treat analysis, medium-term weight loss maintenance (5.2% from baseline to 6-month follow-up) was clinically significant and superior to a number of previous findings (e.g., Fontaine et al., 2004; Skender et al., 1996).

The attrition rate might be explained, in part, by our enrollment procedures, which were not stringent. We did not screen out less-motivated participants by requiring a behavioral "run-in" (during which they are required to record their food intake and physical activity for a period of time prior to being considered for enrollment) as is typical in large-scale randomized controlled trials for weight loss (e.g., The Look Ahead Research Group, 2003). Also, while we originally conceived of an on-worksites location of groups to be an aid to retention, the opposite appears to have

occurred. Groups were scheduled during participants' lunch hours or immediately at the end of the work day to facilitate attendance; however, participants told us that they viewed the sessions as an optional work activity that they attended only if they could secure permission from their supervisor and/or had a clear work schedule.

Of note, dropout rates were relatively low (21%) for Caucasian participants, but high (43%) for African-American participants. This finding is consistent with previous reports (e.g., Kumanyika, 2002) and strongly suggests that our retention methods were not equally successful across ethnic groups.

Future studies could benefit from including a stricter run-in period, using additional retention tools (e.g., study newsletters to maintain contact with participants, use of home visits to conduct assessments), and improving the cultural sensitivity of the intervention so that continued participation by African-Americans is maximized. Because our follow-up period of 6 months also leaves open the possibility that participants will regain weight in successive months and years at an equivalent rate to standard interventions, longer follow-up periods should also be conducted in future research.

Despite its limitations, this pilot study demonstrated, at least in a preliminary fashion, the feasibility, acceptability, and effectiveness of a novel, acceptance-based behavioral weight loss treatment. Even with a relatively brief intervention, participants lost a clinically significant amount of weight in the short-term, and had maintained this weight loss at the 6-month follow-up point. The intervention influenced those factors that we theorized were linked to difficulty achieving weight control, and changes in these variables were associated with weight loss and maintenance. One potential implication of this study is that weight loss interventions may be improved by incorporating components that help participants become more aware of internal experiences, more mindful of behavioral goals, and more accepting of unpleasant internal experiences.

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