ORIGINAL ARTICLE

Teaching Acceptance and Mindfulness to Improve the Lives of the Obese: A Preliminary Test of a Theoretical Model

**Jason Lillis, Ph.D. · Steven C. Hayes, Ph.D. ·
Kara Bunting, M.A. · Akihiko Masuda, Ph.D.**

Abstract

Background Obesity is a growing epidemic. Weight control interventions can achieve weight loss, but most is regained over time. Stigma and low quality of life are significant problems that are rarely targeted.
Purpose A new model aimed at reducing avoidant behavior and increasing psychological flexibility, has shown to be relevant in the treatment of other chronic health problems and is worth examining for improving the lives of obese persons.
Methods Patients who had completed at least 6 months of a weight loss program ($N=84$) were randomly assigned to receive a 1-day, mindfulness and acceptance-based workshop targeting obesity-related stigma and psychological distress or be placed on a waiting list.
Results At a 3-month follow-up, workshop participants showed greater improvements in obesity-related stigma, quality of life, psychological distress, and body mass, as well as improvements in distress tolerance, and both general and weight-specific acceptance and psychological flexibility. Effects on distress, stigma, and quality of life were above and beyond the effects due to improved weight control. Mediational analyses indicated that changes in weight-specific acceptance coping and psychological flexibility mediated changes in outcomes.

Conclusion Results provide preliminary support for the role of acceptance and mindfulness in improving the quality of life of obese individuals while simultaneously augmenting their weight control efforts.

Keywords Acceptance and Commitment Therapy · Experiential avoidance · Stigma · Coping · Obesity · Weight control

Introduction

Obesity is a growing and multifaceted problem. Recent data show that 64% of US adults are overweight or obese, a rate that continues to rise dramatically [1, 2]. Obesity is associated with significant health risks, including high blood pressure, high cholesterol, Type 2 diabetes, coronary heart disease, congestive heart failure, stroke, gallstones, osteo-arthritis, some types of cancer, pregnancy complications, and thus, premature mortality [1]. The health care cost burden this produces is approaching 100 billion dollars [3].

Well-controlled, comprehensive weight control programs can produce significant weight loss, generally through a combination of diet, physical activity, and cognitive behavior therapy [4]. The problem with weight loss interventions is maintenance, due to the fact that by 3 years most weight is regained [6, 7].

One logical response to this shortcoming has been to extend the same basic treatment approach to the weight maintenance period. These efforts have proven to be costly, time-intensive, and modest in outcomes. For example, Anderson and colleagues [7] followed participants who completed a 14-week weight loss program. Despite 70 post-treatment meetings over the next 7-year period, only 25% of participants maintained a weight loss of 10% of initial

J. Lillis (✉) · S. C. Hayes · K. Bunting
Department of Psychology/298, University of Nevada,
Reno, Nevada, USA
e-mail: jasonlillis22@gmail.com

A. Masuda
Georgia State University,
Atlanta, Georgia, USA

body weight. A similar study with 26 months of treatment resulted in only 30% of participants maintaining a weight loss of 10% at 5 years [8].

Another line of research has investigated psychological factors that seem to predict successful or unsuccessful weight maintenance in hopes of designing weight maintenance programs to target these factors. Research has shown that individuals who are unable to maintain weight loss tend to have a narrow range of coping skills [9]. When exposed to stress or negative emotions they tend to use avoidant [10, 11] or impulsive styles of coping [12, 13]. Specifically, they tend to eat in response to emotions [10, 14]. Successful maintainers and those who do not become overweight to begin with seem to have an easier time dealing with cravings and show more active, flexible, and committed styles of adjustment [15, 16].

These findings have not yet led to more successful long-term weight control results. Part of the problem may be that psychological variables such as these are rarely targeted [4]. But even when coping skills of various kinds are directly targeted, better outcomes do not seem to result [17, 18].

In part, due to the weak results on weight, many researchers have suggested that quality of life, obesity-related distress, and stigma need to be more of a focus of weight treatment [19–21]. The stigma of being overweight is pervasive and debilitating [19]. Negative attitudes regarding obesity are widespread [22, 23] and are associated with the development of depressive symptoms, self-stigma, reduced quality of life, and severe isolation [23, 24]. The degree to which stigma and resulting mental health complications affect weight and eating habits is unknown. There are, however, no well-established programs to decrease weight stigma or increase quality of life for obese individuals.

There are methods of psychological adjustment that might impact distress, stigma, and quality of life, and as secondary benefit impact weight-related issues. When negative thoughts and feelings are directly targeted for change, they can paradoxically become more difficult to deal with, particularly in persons with strong responses to their content. Psychological methods designed to teach acceptance and mindfulness skills for difficult thoughts and feelings may be more helpful, perhaps particularly so for those who are generally avoidant and psychologically inflexible. This idea comports with the substance use literature, which suggests that one of the fundamental ways to maintain abstinence is to increase openness to psychological struggles or triggers [25–27], as well as the pain literature, which reports similar findings [28].

This has been examined in the area of food cravings in a recent study [29]. Participants who were high or low in the degree to which food impacted on their behavior, thinking, and feeling, were exposed to training in control-based or acceptance-based coping strategies, or no training. The control-based strategies were drawn from LEARN, a well-known cognitive behavioral weight loss program [30], and included refocusing strategies (such as distraction or positive imagery), behavioral redirection (changing or leaving the situation), and confronting and challenging automatic thoughts. The acceptance-based coping strategies were drawn from Acceptance and Commitment Therapy [31] and included acceptance, defusion, and willingness skills. ACT [31] is a third generation cognitive behavioral approach that uses acceptance and mindfulness processes, and commitment and behavior change processes to produce psychological flexibility: the ability to defuse from difficult thoughts and accept difficult feelings while persisting in values-based action [32]. ACT attempts in part to undermine experiential avoidance, which is the tendency to try to change or avoid private experiences as a method of behavioral regulation. Experiential avoidance has been associated with a wide variety of negative outcomes [33], and seems to describe a pattern of adjustment seen in those unable to maintain weight loss [10, 14]. ACT also focuses on the person's entanglement with thoughts, or cognitive fusion. Instead of directly challenging or changing thoughts, ACT teaches participants to notice thoughts mindfully and from a distance, so as to respond more flexibly to them. Such cognitive flexibility is also known to be related to weight maintenance in naturalistic studies [34].

In the Forman et al. [29] study, participants carried chocolates continuously with them for 2 days in a transparent box, while recording craving and consumption. For participants with low levels of food impact, control-based strategies were associated with lower craving intensity, frequency, and distress than acceptance strategies. But for participants with high levels of food impact, control-based strategies were not helpful, while acceptance strategies had a large impact [29]. This analog study suggests that the problem has not been the relevance of coping training to weight issues, but the kind of training being provided.

ACT is known to decrease enacted stigma (perceived discrimination from others) and self-stigma (negative beliefs about oneself) in areas such as substance abuse [35, 36], race [37], and mental health problems [38], so it may have similar effects in the area of obesity. ACT has been shown to be effective with a wide variety of clinical problems [32] including health problems, such as chronic pain [39], diabetes [40], epilepsy [41], and smoking [25, 42] and to increase quality of life for persons suffering with these problems. In addition, several studies have shown that ACT works through changes in experiential avoidance and cognitive fusion among other ACT processes [32]. Thus, it seems possible that ACT could be helpful in increasing quality of life, and reducing the distress and stigma of

obesity while perhaps also empowering weight control efforts since it targets some of the processes known to relate to obesity as well, such as eating in response to emotions [10, 14] and using avoidant [10, 11] or impulsive [12, 13] coping styles. By directly targeting stigma and distress, instead of weight control per se, such an approach would both respond to calls for programs of this kind [19–21] and would teach needed acceptance and mindfulness skills in a fresh context where greater receptivity and innovation might be possible. Most obese individuals in weight loss programs have engaged in scores of previous weight loss efforts, and have likely done so in avoidant or self-critical ways (e.g., through severe restrictions, denial, or suppression). Thus, it could be more difficult to train a truly new psychological approach without interference from previous efforts if weight per se was directly targeted as opposed to stigma and distress.

There is an additional benefit that ACT might bring. Existing weight programs are costly and labor-intensive. The growing rate of obesity highlights the importance of developing and disseminating brief interventions that support improving the lives of obese persons. A workshop format of ACT has been shown to be helpful in relatively small doses in medical settings, which could allow for efficiency in delivery of services [32].

The present exploratory study examined whether a 1-day ACT workshop using obesity stigma as the focus, could improve obesity stigma, general mental health, and quality of life, while also augmenting weight control efforts by increasing acceptance, mindfulness, and values-based action. The field needs enhancement programs that can build upon core weight loss skills and address the myriad psychosocial issues facing those who are overweight or obese in order to produce stronger, sustained results. If a single brief program could have such an impact, it would provide preliminary support for an ACT model of change and suggest a new avenue worth exploring in the treatment of obesity.

Method

Participants and Assignment

Participants who had completed at least 6 months of any structured weight loss program in the past 2 years were recruited from a local weight loss clinic through flyers and from the community through advertisements in local newspapers ($N=87$). A structured program was defined as any program that included regular meetings, dietary education, physical activity goals, and self-monitoring. There were no exclusion criteria based on psychiatric, medical, or substance use disorders; participants did need to

be 18 or above and English speaking. Participants were recruited from one medium-sized western metropolitan area from October 2005 to July 2006.

Independent of study procedures, 38% of the participants continued in a formal weight control program while the remaining participants were attempting weight loss or maintenance on their own. The most common on-going program was Weight Watchers, which for most participants consisted of self-monitoring of food intake and regular weighing only. Participants had tried to lose weight on average 35.8 times, 5.6 times as part of a formal weight loss program. Seventy-three percent of the participants reported cycling in weight regularly. As a result of their most recent weight program, 57% of the participants reported losing at least 10% of their body weight; 19% reported losing at least 20%. Twenty-one percent had reached their ideal weight. These past history variables and demographic characteristics are shown by treatment condition in Table 1. There were no significant differences between groups at baseline for any of the previous weight loss efforts reported above, nor for age, gender, ethnicity, income, and body mass index (BMI). Nevertheless, all outcome analyses were supplemented by a series of analyses that included demographic variables and the above previous weight loss efforts as covariates. None altered the results and thus will not be reported here.

There was one baseline difference however that did require such treatment. In the control condition, 28 of 44 participants reported previously hitting their ideal weight as the result of dieting (64%) while 14 of 40 of the ACT participants (35%) had done so, which is a significant difference (Fisher's exact=.02). This was not due to the fact that ACT participants had not tried—as was just noted there was no significant difference in the number of previous weight loss attempts, and expressed as means the difference was in the other direction: ACT participants had previously tried to lose weight in a formal program 6.6 times on average while the control group participants had tried 4.8 times (see Table 1). Thus, the ACT group participants appeared to have been somewhat less successful overall in previous weight loss attempts despite as many or more organized attempts. Given this difference, all outcome analyses were supplemented by analyses that included past success as a covariate. These results will also be reported whenever they impacted the analyses (i.e., the covariate was significant, the effect size or statistical significance changed).

Study procedures were conducted at research laboratory facilities at a western state university. In an intake session, informed consent was given, psychological assessments were administered, and participant weight and breath holding was recorded by research personnel. Participants were then randomly assigned to conditions using a random numbers table by the project coordinator and first author of

Table 1 Demographic, descriptive, and past weight loss information by condition

Variable	ACT	Control
	(n=40)	(n=44)
Mean age (years)	49.8 +/−9.8	51.7 +/−12.7
Gender (%)		
Female	95	86
Ethnicity (%)		
Caucasian	95	88.5
African American	0	4.5
Hispanic/Latino	5	4.5
Multiracial	0	2
Income (%)		
$0–25,000	6	11.5
$25,001–50,000	14.5	22.5
$50,001–75,000	26.5	16
$75,001–100,000	29.5	11.5
$100,001–150,000	20.5	25
$150,001+	3	4.5
Missing	15	9
How many times have you tried to lose weight (M/SD)	35.0 (35.1)	36.6 (36.5)
How many times have you tried to lose weight with the help of a weight loss program (M/SD)	6.6 (5.8)	4.8 (6.2)
Have you ever hit your goal/ideal weight as the result of dieting (%)	35	64
Do you cycle regularly (lose weight and gain it back) (%)	75	71
Are you currently in a weight maintenance program (%)	35	41
In the program you most recently completed, did you...		
loose at least 10% of your body weight (%)	60	55
loose at least 20% of your body weight (%)	18	21
reach your goal or ideal weight (%)	15	27

this manuscript (JL). Control participants were placed on a wait list (they were offered the intervention after follow-up); those in the ACT condition were provided a 1-day workshop. Assessments were repeated 3 months later. Completion of follow-up was fostered by multiple emails, letters, and phone calls so that virtually every participant was reached and scheduled. At follow-up, research assistants who were blind to condition assignment administered all assessment procedures.

A total of 200 potential participants made an initial contact with researchers. Fifty-two people had not completed a weight loss program in the past 2 years, and were thus not eligible, while 41 people scheduled an initial assessment and did not attend the appointment. Three participants completed assessment procedures and were randomly assigned to the ACT condition but did not attend the ACT workshop and did not provide follow-up data. No

adverse events were observed or reported as a result of participating in the current study. Details on participant flow are shown in Fig. 1.

Treatment Protocol

A workshop version of ACT has been useful in a variety of group settings not conducive to traditional psychotherapy [32]. This format was used in the present study. Participants randomly assigned to ACT (n=43) were given a 1-day, 6-h workshop utilizing exercises and material from the original ACT book [31] that have been shown to be helpful in similar ACT protocols [32]. Each workshop used a structured sequence of lecture and exercises. Two workshop leaders (the senior author of this paper, and a graduate student in clinical psychology skilled in ACT) led every group. The specific methods used taught acceptance, mindfulness, and defusion skills as applied to difficult thoughts, feelings, and bodily sensations. Weight-related stigmatizing thoughts and distress were the primary focus. The workshop also sought to clarify life values, especially those related to health and relationships, identify barriers to their implementation, and to foster behavioral commitments related to life values. A general ACT workbook [43] was also distributed to participants to encourage further implementation of the methods presented.

Neither the workshop nor the workbook contained strategies for losing weight, and no weight loss goals or strategies were set during the workshop. The goal of the workshop was presented to participants as "living a more fulfilling life consistent with your chosen values." Stigma, distress, and quality of life were used as the context for attempts to reduce patterns of avoidance and increase psychological flexibility in part because more direct attention could be given to these putative mechanisms of change, which was a key focus of the present study. Participants had been in many different weight loss programs, and over a third were still participating, and thus training acceptance, mindfulness, and values-based skills in the context of specific weight control suggestions would have risked conflict and confusion. In the area of weight loss per se, the workshop leaders merely suggested that these skills might empower their other programs.

Measures

Outcome Measures

The outcomes directly targeted by the intervention in this study were distress, quality of life, and stigma outcomes. Psychological distress was measured by the General Health Questionnaire (GHQ; [44]), a 12-item, 4-point Likert type self-report questionnaire with items on somatic symptoms, anxiety, depression, and social dysfunction. It
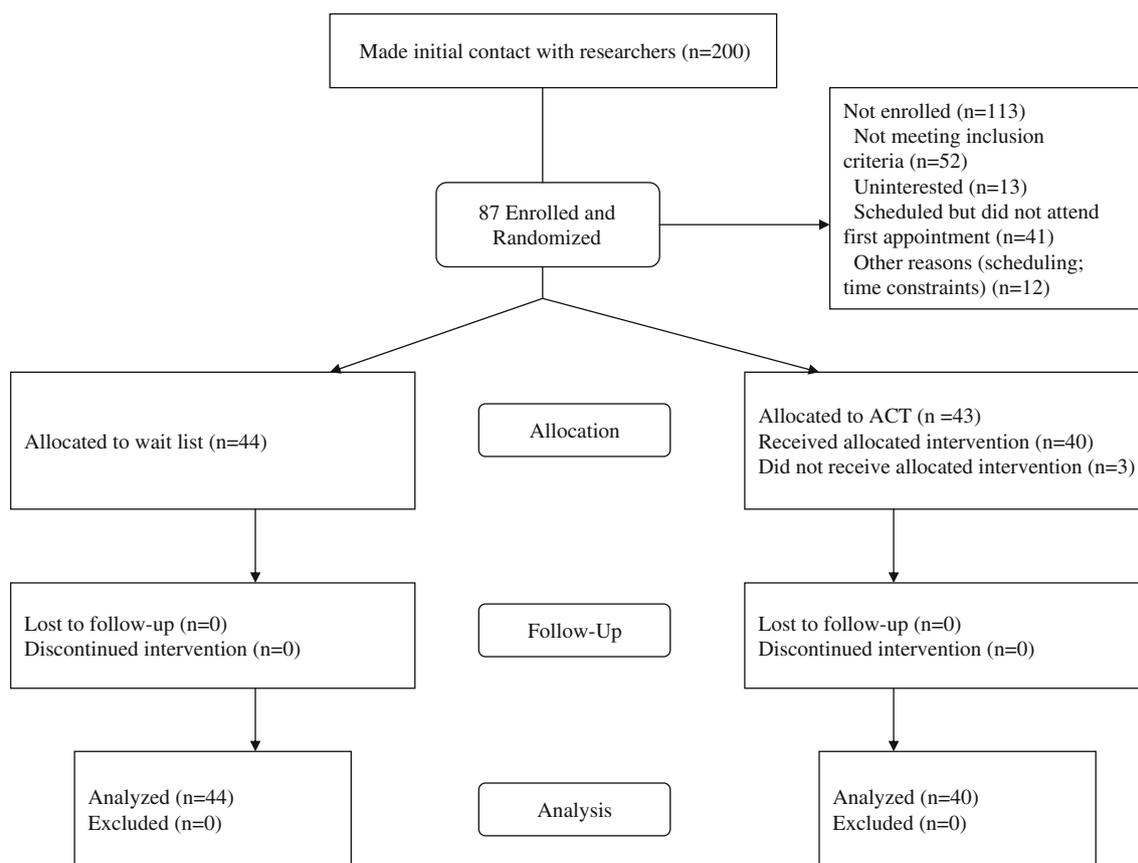
Fig. 1 Participant flow chart for the experiment

has good reliability and validity [45] in screening for psychiatric problems in a general population.

Obesity-related quality of life was assessed by the ORWELL 97 scale (ORWELL; [46]), which is an 18-item, 4-point Likert type self-report measure of satisfaction with functioning in various areas (e.g., sexuality). It has shown good reliability and validity [46] in use with obese populations.

Weight-related stigma was measured by the Weight Stigma Questionnaire (WSQ; Chronbach's $\alpha = .91$; [47]), a 20-item, Likert-type scale designed for this study because to our knowledge, no relevant measure of weight-related stigma exists. This single factor scale assesses the degree to which participants experience self and enacted stigma related to their weight, and the perceived influence of stigma on life functioning (e.g. "I became overweight because I'm a weak person"). The WSQ was based primarily on concurrent work in the area of substance abuse stigma [27, 36]. Items came from an initial pool of over 300 items that reflected various domains thought to be related to stigma (shame, blameworthiness, incompetence, moral weakness, concealment, devaluation of self, perceived discrimination, helplessness) and were drawn from a number of well established measures, including the Rosenberg Self-Esteem Scale [48], Internalized Stigma of Mental Illness Scale [49], the

Stigmatizing Situations Inventory [50], and the Attitudes Toward Obese Persons Scale [51] among others. Pilot testing and expert review resulted in the current 20-item version.

A secondary objective outcome measure was weight, measured in pounds by a standardized, high grade digital scale. For purposes of the parametric analysis, weight was converted to BMI using the formula: BMI=[(weight in pounds/height in inches squared) * 703]. In addition, weight changes were grouped into gain and loss categories using guidelines for weight maintenance studies suggested by St. Jeor and colleagues [52]. Based on a large sample of 5-year follow-up data, they noted that a gain of 5 lbs during any follow-up period indicated the need for an initiation or recommitment to a weight intervention, and suggested a gain or loss of 5 lbs be considered a "notable" weight change in naturalistic weight maintenance studies or when prior weight change data were unavailable.

Process Measures

There were three general measures of ACT processes. Global levels of psychological flexibility were assessed by the Acceptance and Action Questionnaire (AAQ; [53])

which is a 9-item Likert-type questionnaire that assesses overall levels of experiential avoidance, cognitive fusion, and action in the face of emotional barriers. It has good reliability and validity [53]. It was used in this study to confirm that the specific protocol used modifies ACT processes broadly conceived.

In previous research, it has been found that mediation of specific ACT protocols by ACT process is better assessed by modifying the general AAQ to target the specific area (e.g., [25, 40]). For that reason, the present study used a targeted measure adapted from the original AAQ as its primary process measure. The Acceptance and Action Questionnaire for Weight (AAQW; [54]; Chronbach's $\alpha = .88$) is a 22-item, Likert-type scale that measures acceptance of weight-related thoughts and feelings and the degree to which they interfere with valued action (e.g., "I try hard to avoid feeling bad about my weight or how I look"). The AAQW has displayed good preliminary psychometrics and construct validity [54].

Finally, an objective measure of distress tolerance was taken by asking participants to hold their breath as long as they could while being measured with a stopwatch. The resulting *breath-holding* time was used to provide objective confirmation of the increased ability to experience difficult sensations. Breath-holding time has been used as a behavioral measure of distress tolerance, or a person's general ability to persist during uncomfortable stimulation, and serves as a behavioral correlate to psychological flexibility in this study [55]. Researchers in the smoking cessation literature have found that how a person *reacts* to nicotine withdrawal is a better predictor of successful quitting than the overall discomfort of withdrawal [55]. Weight loss carries a similar challenge in dealing with the discomfort of food cravings.

Attrition and Analytic Strategy

Three participants were assigned to the ACT workshops but neither attended nor provided 3-month follow-up data. All remaining ACT participants ($n=40$) and all control participants ($n=44$) completed study procedures and all assessments. Thus, 97% of the designed data were available for analysis. Using a significance level of $p<.05$ and power of 80%, a sample size of 35 per group ($N=70$) was needed to detect a standardized effect of 0.6, which is below the value expected based on a meta-analysis of ACT outcome studies [32] and thus the study was adequately powered.

Follow-up scores for each measure were examined using an analysis of covariance (ANCOVA) with experimental condition as the independent variable and the prescore value as a covariate. Separate ANCOVAs were calculated using past history of success in reaching an ideal weight as a covariate. Mediational analysis methods are described in

the "Results" section. Only analyses reaching conventional levels of significance ($p \le .05$) on two-tailed tests were interpreted, and effect sizes were termed *small*, *medium*, or *large* based on cutoffs suggested by Cohen [56].

In the current study, we hypothesized that participants who received the ACT workshop would shower great improvements relative to control participants in psychological distress, stigma, and quality of life as well as weight change; and that those changes would be mediated by changes in acceptance, defusion, and action.

Results

Means, standard deviations, and between and within effect sizes derived from these values for pretreatment and follow-up measures are shown in Table 2. There were no pre-treatment differences between conditions on any measure except the single item noted on past success in reaching and ideal weight. Post hoc analyses indicated no differences among participants who remained in a formal weight program outside of the study as compared to those who did not. Degree of weight lost in their last structured program prior to entering the study also had no relationship to outcomes.

Outcome Analyses

ANCOVAs on 3-month follow-up outcome using pre-scores as the covariate showed a statistically significant and medium to large effects for condition on all outcome measures. On primary study outcomes those in the ACT condition showed:

– less psychological distress as measured by the GHQ ($F (1, 83)=17.88$, $p<.001$, partial $\eta^2=.18$, Cohen's $d=.92$—a large effect);
– better quality of life as measured by the ORWELL ($F (1, 83)=27.42$, $p<.001$, partial $\eta^2=.25$, Cohen's $d=1.14$—a large effect); and
– lower levels of weight-related stigma as measured by the WSQ ($F (1, 83)=24.34$, $p<.001$, partial $\eta^2=.23$, Cohen's $=d=1.07$—a large effect).

When entered as a covariate, baseline differences in weight loss history (more past history of success in the control condition) was not a significant covariate and statistical significance and effect sizes for treatment condition were not impacted.

On the secondary outcome, those in the ACT condition showed greater weight loss as measured by the body mass index ($F (1, 83)=9.80$, $p<.01$, partial $\eta^2=.11$, Cohen's $d=.68$—a medium effect). Mean percent weight loss was 1.5% for the ACT group and a gain of .3% for the control group, a statistically significant ($t (1, 83)=-2.75$,

Table 2 Means, standard deviations, difference scores and effect sizes linked to those values for study variables

Measure	Pretreatment		Follow-up		Difference scores		
	M	SD	M	SD	M	SD	Within d
Body Mass Index							
Control (n=44)	32.50	6.69	32.71	7.10	.20	.75	−.03
ACT (n=40)	33.59	7.61	33.20	7.30	−.40	1.11	.05*
Between-conditions (d)		.15		.07		.64*	
General Health Questionnaire							
Control	13.10	4.31	13.40	5.60	.30	5.39	−.06
ACT	13.31	6.09	8.90	4.71	−4.40	6.20	.81*
Between-conditions (d)		−.04		.85*		.81*	
ORWELL Quality of Life							
Control	52.70	26.40	56.91	30.21	4.21	16.20	−.15
ACT	58.71	26.90	39.79	23.49	−18.90	23.01	.75*
Between-conditions (d)		−.23		.63*		1.16*	
Weight Stigma Questionnaire							
Control	58.00	15.00	59.51	15.40	1.50	8.01	−.09
ACT	59.71	15.20	50.00	15.50	−9.70	12.81	.63*
Between-conditions (d)		−.11		.61*		1.05*	
Acceptance and Action Questionnaire							
Control	33.30	11.19	32.90	11.20	−.40	7.61	.04
ACT	34.61	10.70	28.30	9.20	−6.30	9.59	.63*
Between-conditions (d)		−.11		.45*		.68*	
Acceptance and Action Questionnaire for Weight							
Control	88.21	19.60	86.59	18.91	−1.60	15.41	.08
ACT	90.40	20.40	64.61	22.20	−25.80	20.39	1.21*
Between-conditions (d)		−.11		1.16*		1.34*	
Breath Holding (in seconds)							
Control	36.00	16.01	32.20	14.70	−3.80	9.61	−.12*
ACT	30.91	10.69	36.70	11.40	5.81	8.50	.52*
Between-conditions (d)		−.37		.34			1.06*

*p<.05 (as shown by t test)

p<.01) and medium effect (Cohen's d=.63). These two analyses were impacted by the better past history of weight loss for the Control condition when it was entered as a covariate. Effect sizes due to condition increased from the medium to large range for both BMI (F (1, 82)=17.30, p<.001, partial η^2=.18, Cohen's d=.92—a large effect) and mean percent weight loss (adjusted mean loss of 1.7% for the ACT group and a gain of .5% for the control group, F (1, 82)=13.66, p<.001, partial η^2=.15, Cohen's d= .82—a large effect).

In order to focus exclusively on the larger changes that might be expected to occur over 3 months, a supplementary non-parametric analysis was conducted using the cutoff for notable weight change suggested by St. Jeor et al. [52] of a gain or loss of at least 5 lbs. The results are shown in Fig. 2. While 35% of those in the ACT condition lost 5 lbs or more, 11% of those in the control condition did so; conversely 7% of those in the ACT condition gained 5 lbs or more, while 25% of those in the control condition did so. These differences represent a statistically significant

(χ^2 (1, 83)=8.81, p<.01) and large effect (Cohen's d=1.21).

Process Analysis

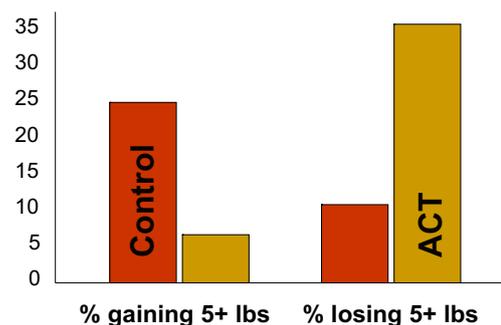Statistically significant and medium to large effects were shown on all process measures at the 3-month follow-up.

Fig. 2 Percent of ACT and control participants categorized as notable "gainers" or "losers" at 3-month follow-up

Using pre-scores as covariates, at follow-up those in the ACT condition showed:

- greater overall levels of acceptance, defusion, and action in the face of barriers as measured by the AAQ (F (1, 83)=10.46, $p<.01$, partial $\eta^2=.11$, Cohen's $d=.70$—a medium effect);
- greater weight-related acceptance, defusion, and action in the face of barriers as measured by the AAQ-W (F (1, 83)=40.69, $p<.001$, partial $\eta^2=.33$, Cohen's $d=1.38$—a large effect);
- greater levels of objective distress tolerance as measured by breath holding (F (1, 83)=16.70, $p<.001$, partial $\eta^2=.18$, Cohen's $d=.89$—a large effect).

Evidence of Mediation

Ideally mediators would be assessed before outcome changes, but due to the fact that only follow-up scores were available, the mediational analysis assessed whether pre to follow-up changes in stigma, quality of life, psychological distress, and weight (BMI) were mediated by pre to follow-up changes in the process measures.

Mediation was tested by assessing the significance of the cross product of the coefficients for the treatment group to mediator relation (the a path), and the mediator to outcome relation controlling for treatment (the b path). An ab cross product test is recognized as perhaps the best all-around available method to test mediation [57] because it tests the statistical significance of the difference between the total effect, or c path, and the direct effect, or c' path, which is the impact of treatment on outcome adjusting for the effect of the mediator. MacKinnon, Warsi, and Dwyer [58] showed that in normal least squares models ab is algebraically equivalent to $c-c'$, thus the significance of the cross product of coefficients directly tests mediation rather than doing so only by inference as is the case in the better known causal steps approach [59]. The Sobel test [60] is the most familiar cross product method but it assumes a normal distribution of ab, which is generally incorrect [61]. The non-parametric method used in the current study [61, 62] solves the distribution problem through bootstrapping, in which k samples of the original size are taken from the obtained data (with replacement after each specific number is selected), and mediational effects are calculated in each sample. In the present set of analyses, parameter estimates were based on 5,000 bootstrap samples. The point estimate of the indirect cross product (Table 4) is the mean for these 5,000 samples which ensures stability of the analyses; the bias corrected and accelerated 95% confidence intervals are similar to the 2.5 and 97.5 percentile scores of the obtained distribution over the samples, but with z-score based corrections for bias due to the underlying distribution [61,

62]. If the confidence intervals do not contain zero, the point estimate is significant at the level indicated.

In the present analysis, bias-corrected 95% confidence intervals showed that the primary process measure, weight-specific ACT processes as measured by the AAQW, significantly mediated all outcomes. Changes in general ACT processes as measured by the AAQ, mediated changes in psychological distress, quality of life, and stigma, but not BMI. Breath-holding mediated BMI and stigma but did not mediate psychological distress and quality of life (see Table 3).

Table 4 shows the t values and significance of the a, b, c, and c' paths, and the significance of the indirect effect using normal theory for the primary process measure—the AAQW. In all cases, the indirect effect was significant; the a, b, and c paths were significant; and c' paths were not significant. There is no agreed upon method for estimating the effect size of a mediation effect [63], but the proportion-mediated ($1-(c/c')$) values are also shown in Table 4, and ranged from 53% to 80% of the overall effect.

Post Hoc Analyses

In the current study, we attempted to target experiential avoidance in order to reduce stigma and distress, and improve quality of life. Given that participants in the ACT condition also lost more weight relative to the control participants, it is important to examine whether reduced weight per se accounted for the changes seen in stigma, distress, and quality of life. We thus conducted a supplementary set of ANCOVAs for stigma, distress, and quality of life using both the relevant prescore and BMI at follow-up as covariates. In all cases, the effects due to condition increased slightly, suggesting that the impact of ACT on stigma, distress, and quality of life was direct and not due to weight loss. At follow-up, those in the ACT condition, showed:

- less psychological distress as measured by the GHQ (F (1, 83)=18.19, $p<.001$, partial $\eta^2=.19$—a large effect);
- better quality of life as measured by the ORWELL (F (1, 83)=28.79, $p<.001$, partial $\eta^2=.27$—a large effect); and
- lower levels of weight-related stigma as measured by the WSQ (F (1, 83)=24.79, $p<.001$, partial $\eta^2=.24$—a large effect).

Use of the Workbook

Seventy-three percent of the ACT participants used the workbook and of those, 52% found the workbook helpful or very helpful. Paired samples t tests within the ACT condition found that those who reported reading the book at

Table 3 Bootstrapped point estimates and Confidence Intervals (CIs) for indirect effects of change in process measure scores at follow-up as mediator for outcome variables

Variable	Point Estimate	Product of coefficients			Bootstrapping 95%	
					CI	
		SE	Z	P	Lower	Upper
AAQ						
Weight (BMI)	.11	.10	1.39	<.16	−.03	.24
Psych distress	1.25	.60	2.11	<.04	.09	2.42
Quality of Life	6.31	2.50	2.57	<.01	1.49	11.09
Stigma	3.51	1.40	2.61	<.01	0.82	7.69
AAQW						
Weight (BMI)	1.99	.90	2.21	<.03	.37	3.87
Psych distress	2.36	.90	2.63	<.01	.97	3.81
Quality of Life	15.82	3.51	4.52	.00	7.69	26.17
Stigma	9.25	1.93	4.79	.00	4.55	15.01
Breath Holding						
Weight (BMI)	.24	.10	2.17	<.03	.04	.48
Psych distress	-1.16	.70	−1.66	<.09	−2.78	.31
Quality of Life	2.65	2.10	1.18	<.24	−1.37	7.15
Stigma	2.75	1.30	2.06	<.04	.34	5.72

least five times improved significantly ($p<.01$) on all outcome and process variables; those reading the book less frequently did not improve significantly on weight (BMI) or distress tolerance but did on other variables ($p<.05$).

Discussion

The present study suggests that targeting acceptance, mindfulness, and values can have an impact on stigma, distress, and quality of life in the obese, and can enhance current efforts to control weight without any focus on weight control per se. Three months after a 1-day workshop, those exposed to a 6-h ACT condition improved significantly more than those on a wait list on all outcome measures. ACT participants showed larger reductions in weight-related stigma, were generally more psychologically fit, had a higher perceived quality of life, and had lost more body mass with a more favorable distribution of notable

(plus or minus 5 lbs) weight changes than those who had not participated in the workshop.

Post hoc analyses showed that changes in stigma, distress, and quality of life could not be attributed to changes in weight, suggesting that the ACT workshop had a positive effect on participants independent of the whether or not they lost weight. This is notable given the discouraging statistics on rates of obesity and the difficulty of losing and maintaining weight loss. A brief program that could improve the lives of obese people independent of weight loss would have value, whether or not weight loss followed. However, the ACT participants also showed improved weight control efforts, suggesting a range of possible benefits for participation in the ACT workshop.

Relatively large effects for brief interventions that are maintained through several months of follow-up are not uncommon in the ACT literature. This pattern has been shown in a 3-h intervention for diabetes management [40], a 3-h intervention for coping with the symptoms of

Table 4 T and z values for normal theory mediational tests using pre to follow-up AAQ-W change scores as the mediator and similar change scores for all four outcomes

	X–M	M(X)–Y	X–Y	X (M) Y	Indirect effect (normal test z score)	Proportion-mediated
	a path	b path	c path	c′ path		
Weight (BMI)	5.97***	2.28*	3.19**	1.51	2.15*	.55
Psychological Distress (GHQ)	5.97***	2.97**	3.65***	1.56	2.69**	.52
Quality of Life (ORWELL)	5.97***	7.02***	5.33***	1.75	4.59***	.69
Stigma (WSQ)	5.97***	8.13***	4.87***	.98	4.85***	.82

*$p<.05$; **$p<.01$; ***$p<.001$

psychosis [64], a 9-h intervention for the management of epileptic seizures [41], a 4-h intervention for chronic pain [39], and similarly brief interventions in other areas [32]. What appears to happen in such studies is that the acceptance, mindfulness, and values interventions in ACT reduce patterns of experiential avoidance, which in turn leads to positive behavior change. That possibility was the focus of the present study.

One way to test this approach would be to compare ACT to other approaches of known impact that work through known and distinct mechanisms. That would be a high test, but, at present, there is no "gold standard" intervention with known impact and understood processes of change that targets stigma, distress, and quality of life for participants with extensive weight loss program exposure. Indeed, this study appears to be among the first such programs ever tested. Even in the well-researched area of weight control, continuing programs indefinitely has proven to be both expensive and relatively ineffective (e.g., [8]), and when there is positive long-term impact the processes accounting for changes are not fully known. Given this state of knowledge, crafting an active comparison group did not seem like the logical first step, since the comparison intervention would demand yet another control condition and still might not yield clear processes of change. In addition, participants had already been exposed to traditional weight loss interventions multiple times and most had basic knowledge about dieting, self-monitoring, physical activity, and goal setting.

The present approach instead targeted key psychological processes that arguably underlie not just stigma and distress, but also failures in weight maintenance. The ACT intervention used in this study focused on acceptance, mindfulness, and values, with particular attention to the difficult thoughts and feelings that can accompany being obese. This gave participants a chance to develop new skills in a new area.

In accord with an ACT model, participants in the workshop showed greater psychological flexibility, with increases in general and weight specific acceptance, defusion, and valued action in the face of psychological barriers. These self-reported changes were corroborated by objective changes in distress tolerance as measured by breath holding. Changes in weight-specific ACT processes mediated all outcomes, as assessed both by normal theory and non-parametric tests of mediation, while changes in distress tolerance and general ACT processes mediated some but not all outcomes.

Successful mediation makes several alternative explanations for these results less likely. For example, mere social support, attention, or a credible rationale might be responsible for outcomes because only a wait list control group was used. But there have been no reports in the literature that social support and attention notably increase psychological

flexibility or distress tolerance. Further, although a credible rationale might increase such processes, successful mediation also requires that process of change relate to outcome *controlling for treatment* (the "*b* path" in mediational analysis) which means that the impact of these processes cannot be an irrelevant correlate of treatment nor a general process that is not specifically related to the intervention. The broad mediational impact of these processes (not just on the targets issues of stigma, distress, and quality of life but also on weight) suggests a specific mechanism of action, and one that is promising for future inquiry.

There are weaknesses in this study. The sample is relatively homogeneous in terms of age, gender, and ethnicity. Participants were mostly white, middle-class, females from one western US metropolitan area, and thus the sample is not representative of the US population. We cannot fully characterize the sample due to the lack of specific verified information regarding precisely how much weight each participant lost prior to entering the study and the time between their most recent weight loss attempts and when they began the study. At baseline, a slightly higher percentage of participants in the control group had achieved an ideal weight as a result of their most recent weight loss attempt. However, the difference was not statistically significant and it did not change any significant results for the ACT intervention when included in outcome analyses as a covariate. Although the class was highly structured, using a specific set sequence of information and exercises (the protocol can be downloaded at www.contextual psychology.org), and was supervised by the originator of ACT, no formal measure of adherence was taken. Follow-up is not extensive and due to the design, mediator change and outcome change are contemporaneous. Ideally, mediator change would be observed before outcome change so that greater information can be gain about possible causality, as has been done elsewhere in the ACT literature [32]. Finally, one of the outcome measures (Weight Stigma Questionnaire) was created for the study because no alternative measures were available and has not previously been published.

The contribution and possible importance of the study are best understood in the context of the current efforts to improve obesity treatment. The acceptance, defusion, and values-based methods in ACT appeared to target the avoidant and emotion-focused coping style of those who struggle to maintain weight loss, and did so even in a relatively small dose. This builds on the controlled findings from Forman [29], which showed that ACT had a distinctive impact on food urges as compared to the more traditional cognitive behavioral approaches that have dominated in weight loss programs. The large effects on stigma reduction and quality of life improvements responds to a focus that many in the field have been advocating,

particularly due to the fact that weight loss is often difficult to maintain [19], yet the increased psychological flexibility that produced these effects also led to changes in actual weight loss.

Given the growing need for weight control services, and set against the current alternatives, the present study opens up a new avenue of exploration for this critical health problem. It is notable that a brief intervention could produce such outcomes in an area that has focused on frequent and extended therapeutic contact. A single workshop following a more comprehensive weight loss intervention would be less costly and easier to disseminate than an extended weight maintenance program. It is also worth testing the impact of ACT methods when built into weight control and weight maintenance programs from the beginning.

If this study opens a door, it needs to be acknowledged that it does not fully walk through it. Longer and more extensive acceptance and mindfulness protocols for weight control need to be tested, with substantially longer follow-up intervals, and more extensive measurement. This study does not show that ACT can produce significant long-term gains in weight loss or maintenance: that was not its analytic goal. Rather, the present study provides prelimi-nary evidence that when an ACT model of weight problems is applied to weight-related stigma and distress, it produces outcome and process effects that comport with the underlying model. In the history of clinical science, when models work, successful methods follow. The present results suggest that acceptance, mindfulness, and values-based action methods to improve the lives of the obese warrant further study.

References

1. Center for Disease Control. Obesity and overweight. 2007; Available at http://www.cdc.gov/nccdphp/dnpa/obesity/trend/index. Accessibility verified on October 11, 2007.
2. Hedley AA, Odgen CL, Johnson CL, Carroll MD, Curtin LR, Flegal KM. Prevalence of overweight and obesity among US children, adolescents, and adults, 1999-2002. *JAMA*. 2004; 291: 1847–1850.
3. Finkelstein EA, Fiebelkorn IC, Wang GJ. National medical spending attributable to overweight and obesity: How much, and who's paying? *Health Aff*. 2003; 22: W219–W226.
4. Avenell A, Brown TJ, McGee MA, et al. What are the long-term benefits of weight reducing diets in adults? A systematic review of randomized controlled trials. *J. Hum. Nutr. Diet*. 2004; 17: 317–335.
5. Perri MG, Corisca JA. Improving the maintenance of weight loss in behavioral treatment of obesity. In: Wadden TA, Stunkard AJ, eds. *Handbook of obesity treatment*. New York: Guilford Press; 2002.
6. Wilson GT, Brownell KD. Behavioral treatment for obesity. In: Fairburn CG, Brownell KD, eds. *Eating Disorders and Obesity*. New York: Guilford Press; 2002.

7. Anderson JW, Vichitbandra S, Qian W, Kryscio RJ. Long-term weight maintenance after an intensive weight-loss program. *J Am Coll Nutr*. 1999; 18: 620–627.
8. Wadden TA, Frey DL. A multicenter evaluation of a proprietary weight loss program for the treatment of marked obesity: A five-year follow-up. *Int J Eat Disord*. 1997; 22: 203–212.
9. Drapkin RG, Wing RR, Shiffman S. Responses to hypothetical high-risk situations: Do they predict weight-loss in a behavioral treatment program or the context of dietary lapses. *Health Psychol*. 1995; 14: 427–434.
10. Byrne S, Cooper Z, Fairburn C. Weight maintenance and relapse in obesity: A qualitative study. *Int J Obes*. 2003; 27: 955–962.
11. Kayman S, Bruvold W, Stern JS. Maintenance and relapse after weight-loss in women: Behavioral aspects. *Am J Clin Nutr*. 1990; 52: 800–807.
12. Fassino S, Leombruni P, Piero A, et al. Temperament and character in obese women with and without binge eating dis-order. *Compr Psychiatry*. 2002; 43: 431–437.
13. Ryden A, Sullivan M, Torgerson JS, Karlsson J, Lindroos AK, Taft C. Severe obesity and personality: A comparative controlled study of personality traits. *Int J Obes*. 2003; 27: 1534–1540.
14. Ganley RM. Emotion and eating in obesity: A review of the literature. *Int J Eat Disord*. 1989; 8: 343–361.
15. Ferguson KJ, Brink PJ, Wood M, Koop PM. Characteristics of successful dieters as measured by guided interview responses and restraint scale scores. *J Am Diet Assoc*. 1992; 92: 1119–1121.
16. Westenhoefer J. The therapeutic challenge: Behavioral changes for long-term weight maintenance. *Int J Obes*. 2001; 25: S85–S88.
17. Bennett GA. Behavior-therapy for obesity: A quantitative review of the effects of selected treatment characteristics on outcome. *Behav Ther*. 1986; 17: 554–562.
18. Glenny AM, Omeara S, Melville A, Sheldon TA, Wilson C. The treatment and prevention of obesity: A systematic review of the literature. *Int J Obes*. 1997; 21: 715–737.
19. Brownell KD, Puhl RM, Schwartz MB, Rudd L. *Weight bias: Nature, consequences, remedies*. New York, NY: Guilford Publications; 2005.
20. Garner DM, Wooley SC. Confronting the failure of behavioral and dietary treatments for obesity. *Clin Psychol Rev*. 1991; 11: 729–780.
21. Wooley SC, Garner DM. Controversies in management: Dietary treatments for obesity are ineffective. *BMJ*. 1994; 309: 655–656.
22. Falkner NH, French SA, Jeffery RW, Neumark-Sztainer D, Sherwood NE, Morton N. Mistreatment due to weight: Prevalence and sources of perceived mistreatment in women and men. *Obes Res*. 1999; 7: 572–576.
23. Puhl R, Brownell KD. Psychosocial origins of obesity stigma: Toward changing a powerful and pervasive bias. *Obes Rev*. 2003; 4: 213–227.
24. Puhl R, Brownell KD. Bias, discrimination, and obesity. *Obes Res*. 2001; 9: 788–805.
25. Gifford EV, Kohlenberg BS, Hayes SC, et al. Acceptance theory-based treatment for smoking cessation: An initial trial of Acceptance and Commitment Therapy. *Behav Ther*. 2004; 35: 689–706.
26. Gifford EV, Ritsher J, McKellar J, Moos R. Acceptance and relationship context: A model of substance use disorder treatment outcome. *Addiction*. 2006; 101: 1167–1177.
27. Hayes SC, Wilson KG, Gifford EV, et al. A preliminary trial of Twelve-Step Facilitation and Acceptance and Commitment Therapy with poly-substance abusing methadone-maintained opiate addicts. *Behav Ther*. 2004; 35: 667–688.
28. McCracken LM, Vowles KE, Eccleston C. Acceptance-based treatment for persons with complex, long-standing chronic pain: A preliminary analysis of treatment outcome in comparison to a waiting phase. *Behav Res Ther*. 2005; 43: 1335–1346.

29. Forman EM, Hoffman KL, McGrath KB, Herbert JD, Brandsma LL, Lowe MR. A comparison of acceptance and control-based strategies for coping with food cravings: An analog study. *Behav Res Ther*. 2007; 45: 2372–2386.

30. Brownell KD. *The LEARN program for weight management*. Dallas, TX: American Health; 2000.

31. Hayes SC, Strosahl K, Wilson KG. *Acceptance and Commitment Therapy: An experiential approach to behavior change*. New York, NY: The Guilford Press; 1999.

32. Hayes SC, Luoma JB, Bond FW, Masuda A, Lillis J. Acceptance and Commitment Therapy: Model, processes, and outcomes. *Behav Res Ther*. 2006; 44: 1–25.

33. Hayes SC, Wilson KG, Gifford EV, Follette VM, Strosahl K. Experiential avoidance and behavioral disorders: A functional dimensional approach to diagnosis and treatment. *J Consult Clin Psychol*. 1996; 64: 1152–1168.

34. Westenhoefer J, Stunkard AJ, Pudel V. Validation of the flexible and rigid control dimensions of dietary restraint. *Int J Eat Disord*. 1999; 26: 53–64.

35. Hayes SC, Bissett R, Roget N, et al. The impact of acceptance and commitment training and multicultural training on the stigmatizing attitudes and professional burnout of substance abuse counselors. *Behav Ther*. 2004; 35: 821–835.

36. Luoma JB, Kohlenberg BS, Hayes SC, Bunting K, Rye AK. Reducing the self stigma of substance abuse through acceptance and commitment therapy: Model, manual development, and pilot outcomes. Addiction Res Ther. In press.

37. Lillis J, Hayes SC. Applying acceptance, mindfulness, and values to the reduction of prejudice. *Behav Modif*. 2007; 31: 389–411.

38. Masuda A, Hayes SC, Fletcher LB, et al. The impact of Acceptance and Commitment Therapy versus education on stigma toward people with psychological disorders. *Beh Res Ther*. In press.

39. Dahl J, Wilson KG, Nilsson A. Acceptance and Commitment Therapy and the treatment of persons at risk for long-term disability resulting from stress and pain symptoms: A preliminary randomized trial. *Behav Ther*. 2004; 35: 785–802.

40. Gregg JA, Callaghan GM, Hayes SC, Glenn-Lawson JL. Improving diabetes self-management through acceptance, mindfulness, and values: A randomized controlled trial. *J Consult Clin Psychol*. 2007; 75: 336–343.

41. Lundgren TA, Dahl J, Melin L, Kies B. Evaluation of Acceptance and Commitment Therapy for drug refractory epilepsy: A randomized control trial in South Africa: A pilot study. *Epilepsia*. 2006; 47: 2173–2179.

42. Brown RA, Palm KM, Strong DR, et al. Distress tolerance treatment for early lapse smokers: Rationale, program description and preliminary findings. *Behav Modif*. In press.

43. Hayes SC. Smith S. *Get out of your mind and into your life: The new Acceptance and Commitment Therapy*. Oakland, CA: New Harbinger; 2005.

44. Goldberg DP. *The detection of psychiatric illness by questionnaire*. London: Oxford University Press; 1972.

45. Goldberg DP, Gater R, Sartorius N, et al. The validity of two versions of the GHQ in the WHO study of mental illness in general health care. *Psychol Med*. 1997; 27: 191–197.

46. Mannucci E, Ricca V, Barciulli E, et al. Quality of life and overweight: The Obesity Related Well-Being (ORWELL 97) Questionnaire. *Addictive Behaviors*. 1999; 24: 345–357.

47. Lillis J. Acceptance and Commitment Therapy for the treatment of obesity-related stigma and weight control. Unpublished doctoral dissertation, University of Nevada, Reno; 2007.

48. Rosenberg M. *Society and the Adolescent Self-Image*. Princeton, NJ: Princeton University Press; 1965.

49. Ritsher JB, Otilingam PG, Grajales M. Internalized stigma of mental illness: Psychometric properties of a new measure. *Psychiatry Res*. 2003; 121: 31–49.

50. Myers A, Rosen JC. Obesity stigmatization and coping: Relation to mental health, symptoms, body image, and self-esteem. *Int J Obes*. 1999; 23: 221–230.

51. Allison DB, Basile VC, Yuker HE. The measurement of attitudes and beliefs about obese persons. *Int J Eat Disord*. 1991; 10: 599–607.

52. St. Jeor ST, Brunner RL, Harrington ME, et al. A classification system to evaluate weight maintainers, gainers, and losers. *J Am Diet Assoc*. 1997; 97: 481–488.

53. Hayes SC, Strosahl KD, Wilson KG, et al. Measuring experiential avoidance: A preliminary test of a working model. *Psychol Rec*. 2004; 54: 553–578.

54. Lillis J, Hayes SC. Measuring avoidance and inflexibility in weight related problems. *Int J Behav Consult Ther*. 2008; 4: 30–40.

55. Brown RA, Leuez CW, Kahler CW, Strong DR, Zvolensky MJ. Distress tolerance and early smoking lapse. *Clin Psychol Rev*. 2005; 25: 713–733.

56. Cohen JC. Quantitative methods in psychology: A power primer. *Psychol Bull*. 1992; 112: 155–159.

57. MacKinnon DP, Lockwood CM, Hoffman JM, West SG, Sheets V. A comparison of methods to test mediation and other intervening variables. *Psychol Methods*. 2002; 7: 83–104.

58. MacKinnon DP, Warsi G, Dwyer JH. A simulation study of mediated effect measures. *Multivariate Behav Res*. 1995; 30: 41–62.

59. Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic and statistical considerations. *J Pers Soc Psychol*. 1986; 51: 1173–1182.

60. Sobel ME. Asymptotic confidence intervals for indirect effects in structural equation models. In: Leinhardt S. ed. *Sociological Methodlogy*. Washington, DC: American Sociological Association; 1982.

61. Preacher KJ, Hayes AF. SPSS and SAS Procedures for estimating effects in simple mediation models. *Behav Res Meth Instrum Comput*. 2004; 36: 717–731.

62. Preacher KJ, Hayes AF. Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behav Res Methods*. In press.

63. MacKinnon DP, Fairchild AJ, Fritz MS. Mediation analysis. *Annu Rev Psychol*. 2007; 58: 593–614.

64. Bach P, Hayes SC. The use of acceptance and commitment therapy to prevent the rehospitalization of psychotic patients: A randomized controlled trial. *J Consult Clin Psychol*. 2002; 70: 1129–1139.