Journal of Contextual Behavioral Science 3 (2014) 45–50

Contents lists available at ScienceDirect

Journal of Contextual Behavioral Science

journal homepage: www.elsevier.com/locate/jcbs

Research – Basic Empirical Research

Efficacy of an acceptance-based behavioral intervention for weight gain prevention in young adult women

Shawn N. Katterman, Stephanie P. Goldstein, Meghan L. Butryn, Evan M. Forman, Michael R. Lowe *

Department of Psychology, Drexel University, Philadelphia, PA, USA

ARTICLE INFO

Article history:
Received 26 March 2013
Received in revised form
8 October 2013
Accepted 24 October 2013

Keywords:
Obesity
Prevention
Weight gain
Lifestyle intervention
Young adults

ABSTRACT

Young adult women, particularly those attending college, may be at risk for future weight gain. The current study examined the efficacy of a brief acceptance-based behavioral approach in facilitating weight gain prevention in female college students with a body mass index between 23 and 32 kg/m^2. Fifty-eight participants were randomized to an intervention group who attended 8 group sessions over 16 weeks (n=29), or an assessment-only control group (n=29) and completed assessments at baseline, 6 weeks, post-intervention, and 1 year. Group sessions taught behavioral (e.g., monitor weight, calories, and exercise) and acceptance-based (e.g., distress tolerance, acceptance of cravings) strategies that could be applied for weight loss or weight gain prevention. The intervention resulted in a decrease in weight and body mass index of 1.57 kg and 0.52 kg/m^2 (respectively) at 16 weeks that was maintained at 1 year follow up (M=−2.24 kg, M=−0.74 kg/m^2) whereas the control group gained 1.07 kg and 0.34 kg/m^2 over the year. Results indicate that a brief acceptance-based behavioral intervention may be effective for a group who appears to be at risk for future weight gain and further research is needed to determine mechanisms of change.

© 2013 Association for Contextual Behavioral Science. Published by Elsevier Inc. All rights reserved.

1. Introduction

Despite significant recognition and attention to the obesity problem, long-term success with weight loss maintenance continues to be rare (Wing, 2001). Given the significant health consequences (Kopelman, 2000; Rapp et al., 2005), and the limited long-term effectiveness of weight loss treatment, effective methods for obesity prevention are indicated. One group at increased risk for weight gain is young adult women, particularly those with relatively higher body weight and who are attending college (Williamson, Kahn, Remington, & Anda, 1990; Sheehan, DuBrava, DeChello, & Fang, 2003; Mokdad et al., 1999; Nelson, Story, Larson, Neumark-Sztainer, & Lytle, 2008).

Although several studies have been conducted examining weight gain prevention in normal weight college students (e.g., Hivert, Langlose, Berard, Cerrier, & Carpentier, 2007; Levitsky, Garay, Nausbaum, Neighbors, & DellaValle, 2006), only a few have examined interventions for overweight college students or young adults (e.g., Eiben & Lissner, 2006; Gow, Trace, & Mazzeo, 2010). Given that young adult women attending college (both in the normal and overweight ranges) are prone to weight gain over time (Levitsky et al., 2006; Mokdad et al., 1999; Williamson et al., 1990), college offers a unique opportunity to teach broadly applicable healthy weight control skills with an ultimate goal of achieving weight gain prevention.

Given the population of interest, we chose an acceptance-based approach which aims to promote "experiential acceptance" of internal experiences that may occur in pursuit of weight control, including but not limited to cravings, physical discomfort related to physical activity, and feelings of deprivation. This approach may be particularly useful for college-aged women, given that they are amidst a transition to independence, have increased access to high calorie foods, and factors such as sleep deprivation, stress, and emotional eating may contribute to difficulties engaging in healthy behaviors. Acceptance-based approaches improve coping with food cravings (Forman et al., 2007; Hooper, Sandoz, Ashton, Clarke, & McHugh, 2011), increase physical activity (Tapper et al. 2009; Butryn, Forman, Hoffman, Shaw, & Juarascio, 2011), reduce binge eating (Kristeller & Hallett, 1999), produce significant weight loss in adults, particularly those who struggle with emotional eating (Forman, Butryn, Hoffman, & Herbert, 2009; Tapper et al., 2009; Forman et al., in press; Niemeier, Leahey, Palm Reed, Brown & Wing, 2012), and improve weight loss maintenance (Lillis, Hayes, Bunting, & Masuda, 2009), yet little is known about their efficacy in young adult women.

* Correspondence to: Psychology Department, Drexel University, Stratton Hall, Suite 119, 3141 Chestnut St., Philadelphia, PA, 19014, USA. Tel.: + 1 215 553 7116.
E-mail addresses: shawn.katterman@gmail.com, Shawn_N_Katterman@rush.edu (S.N. Katterman), ml42@drexel.edu (M.R. Lowe).

2212-1447/$ - see front matter © 2013 Association for Contextual Behavioral Science. Published by Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.jcbs.2013.10.003

The current study utilized a randomized controlled trial to examine the efficacy of a brief acceptance-based intervention in facilitating weight gain prevention over 1 year in young adult women with a mean BMI in the overweight range (23–32 kg/m^2). Given the ubiquity of difficulty adhering to healthy eating and exercise behaviors in the college environment, we included wider range of BMIs, in attempt to examine a unique intervention that could be broadly applied. A secondary aim was to examine the effects of the intervention on short-term (i.e., over initial 6 weeks of intervention) and long-term changes (i.e., over 1 year) in weight self-efficacy, physical activity, emotional and uncontrolled eating, and experiential acceptance, and whether changes in these variables mediated changes in weight.

2. Methods

2.1. Participants

Participants were recruited with fliers and mass email to all female students ages 18–30 at a private northeastern university. Advertisements emphasized that participants may learn healthy eating and exercise behaviors and to control their weight and did not mention monetary compensation. Eligibility criteria were: (1) female, (2) undergraduate or graduate student (full- or part-time), (3) self-reported height and weight that indicated a BMI between 23 and 30 kg/m^2, and (4) planning to be in the Philadelphia area for at least 1 year. The BMI cutoff of 23 was based on our aim to be inclusive of women at risk for and concerned about future weight gain, but to avoid enrolling participants for whom weight loss could be unhealthy. Participants were excluded if they reported a current or past eating disorder diagnosis, if they were unable to attend any of the group sessions, or if their measured BMI was greater than 32 kg/m^2. Five participants self-reported their BMI to be lower than 30 but had a measured BMI between 30 and 32 kg/m^2. They were included due to initial concerns about sample size and our goal of being inclusive with regards to weight. All analyses were completed with and without these participants. Results were unchanged and therefore include all participants. The study received approval from the appropriate ethical review board.

2.2. Procedures

A randomized controlled design was used and participants completed assessments at baseline, 6 weeks, post-intervention (16 weeks), and 1 year follow up. Recruitment was conducted in two waves beginning in September 2010 and January 2011, with an equal number of participants in each wave ($n=29$). Participants were randomly assigned to the intervention or control condition. Participants in the control condition were not given any specific instructions besides to return for future assessments. All participants were given $10 for completing the 6-week assessment, $15 for the post-intervention assessment, and $20 for the 1 year assessment. At each assessment, participants completed self-report questionnaires online and an in-person assessment to assess anthropometrics (see below for details). If participants were unable to attend the in-person assessment (e.g., were away from campus during the assessment period) they were invited to complete the online questionnaires for a payment of $5.

Participants in the intervention condition were invited to attend 8 group sessions lasting 75 min each and the group was called Project HEALTH: Healthy Eating and Exercise as Long-Term Habits. Participants were told that the goal was to help them establish healthy eating and exercise behaviors that would promote long-term weight control and that they may choose to focus on weight gain prevention or "healthy weight loss" during the intervention. Healthy weight loss was described as *no more than* 1–2 pounds per week and any rapid or extensive weight loss was strongly discouraged and monitored via the assessments.

Groups were held weekly for the first 4–5 sessions (depending on holiday scheduling), then monthly for the remaining sessions. Group facilitators were graduate students with behavioral weight loss experience. Facilitators attended weekly supervision meetings with licensed psychologists with expertise in acceptance-based treatments and behavioral weight loss (EMF & MLB). All eight sessions included standard behavioral components (e.g., self-monitoring of weight, food intake, and exercise) and acceptance-related components (see Table 1 for details). The emphasis of each session was on behavior change, and acceptance-based concepts, exercises, and metaphors were utilized to facilitate this change.

2.3. Measures

2.3.1. Anthropometrics and demographic

Height and weight were measured at each assessment to calculate BMI; age, ethnicity, and parental income were also assessed.

2.3.2. Physical activity

A modified version of the Physical Activity History (PAH; Jacobs, Hahn, Haskell, Pirie, & Sidney, 1989) questionnaire was used to measure physical activity over the past month. The PAH has shown adequate internal consistency, reliability, and validity in a large epidemiological study of young adults (Jacobs et al., 1989).

2.3.3. Uncontrolled and emotional eating

The emotional eating and uncontrolled eating subscales of the 18-item version of the Three-Factor Eating Questionnaire were used as a self-reported measure of eating behavior. This measure has shown adequate reliability and robust factor structure (Cappelleri et al., 2009).

2.3.4. Weight self-efficacy

The Weight Life-Style Questionnaire (WEL; Clark, Abrams, Niaura, Eaton, & Rossi, 1991) was used to measure weight-related self-efficacy. This measure has demonstrated adequate internal consistency (Clark et al., 1991), and has been shown to increase after behavioral treatment for binge eating disorder (Wolff & Clark, 2001).

2.3.5. Experiential acceptance

The Acceptance and Action Questionnaire-II (AAQ-II; Bond et al., 2011) was used to measure experiential acceptance, that is, the degree to which an individual is willing to have difficult private events (e.g., thoughts, feelings, and physical sensations) while continuing to behave in a way that promotes a valued life. The measure has demonstrated satisfactory structure, internal consistency, reliability and validity (Bond et al., 2011).

2.3.6. Experiential acceptance related to food cravings

The Food Craving Acceptance and Action Questionnaire (FAAQ; Juarascio, Forman, Timko, Butryn, & Goodwin, 2011) was used to measure experiential acceptance specific to acceptance of food-related urges (e.g., cravings). The 10-item scale assesses the extent to which individuals are willing to experience urges, cravings, and desires to eat unhealthily and still engage in healthy eating, and has demonstrated sound psychometrics (Juarascio et al., 2011).

Table 1
Intervention components for *Project HEALTH*: Health Eating and Activity as Long-Term Habits.

Session	Behavioral[a]	Acceptance-related
1	Self-monitoring food and drink intake[b]; energy balance; self-monitoring of weight (*required through S8*)[c]	Creative hopelessness; experiential acceptance as the alternative
2	Self-monitoring caloric intake (*required through S4*)[b]; energy density; food environment; meal planning	Limits of control; willingness (i.e., the ability to experience potentially aversive internal experiences while simultaneously engaging in behavior that is consistent with values; Forman & Herbert, 2009)
3	Self-monitoring of and increasing physical activity[d] (*required through S8*); imaginal exposure to not wanting to exercise	Values clarification; willingness
4	Eating when not physically hungry; mindless eating	Mindfulness (mindful pretzel eating exercise, i.e., gaining a nonjudgmental awareness of the sensory experiences related to the tasting, chewing and swallowing of the food; Kristeller & Hallett, 1999); defusion (i.e., experiencing thoughts, feelings and urges from a psychological distance; allows for cognitive uncoupling between experience and actions; Hayes et al., 2011)
5	Eating and activity cues	Willingness; urge surfing
6	Stress management; weekly progress review[e]; holidays and weekends	Mindfulness review (leaves on a stream exercise); defusion (yellow sunglasses metaphor); committed action
7	Review	Review; defusion (thank your mind for that thought, substitute 'and' for 'but')
8	Relapse prevention	Committed action (hiker on a mountain and bumpy road metaphors)

[a] At the end of each session, participants set individual behavioral goals (e.g., have fruit for breakfast 3 days next week, walk to class every day) and reported on these goals at the beginning of the next session.
[b] Self-monitoring books were provided to participants, and they were provided with feedback/suggestions (e.g., add protein to breakfast, avoid going long periods of time without eating); if looking to lose weight, participants were told that the standard behavioral weight loss calorie goal is 1200–1500 kcal/day (if less than 200 lbs), but were encouraged to consider their activity level and set goals for safe and healthy weight loss (no more than 1–2 lbs per week), consistent with their value of health. Participants did not report specific calorie intake but instead whether or not they met their calorie goal, if they set one. Rapid or extensive weight loss was discouraged and monitored via participant report and the assessments. Notably, no unhealthy behaviors or rapid/extensive weight loss were noted during the study.
[c] Participants were loaned digital scales and encouraged to self-monitor their weight: weekly for those looking to lose weight, and weekly *or* daily for those looking to prevent weight gain.
[d] A gradual increase in physical activity was encouraged, beginning at their current level, ideally working towards 150–300 min per week (30–60 min, 5 days per week).
[e] Weekly progress reviews involved having participants make a habit of checking in with their individual goals weekly, even when sessions were held less often.

2.3.7. *Experiential acceptance related to physical activity*

The Physical Activity Acceptance and Action Questionnaire (PAAAQ; Butryn et al., 2011) was used to measure experiential acceptance with regards to physical activity. The measure has demonstrated adequate internal consistency (Butryn et al., 2011).

2.4. *Statistical analyses*

All baseline variables were compared across condition using independent samples *t*-tests; any significant between-group differences were controlled for in subsequent analyses. Linear mixed modeling was used to estimate the effects of condition on changes in weight, BMI, uncontrolled eating, emotional eating, weight self-efficacy, physical activity, and the three types of experiential acceptance across all assessments. Estimated marginal means and pairwise difference tests were used to examine changes in weight across all time points, and changes in all variables over the most intensive portion of the intervention (baseline to 6-weeks).

Formal tests of mediation were conducted using bootstrapping methods (Preacher & Hayes, 2008) to examine whether changes any behavioral or acceptance-based variable from baseline to 6 weeks mediated the effects of condition on changes in weight from baseline to 1-year.

3. Results

3.1. *Baseline characteristics*

Participant age ranged from 18 to 29 years ($M=22.35$, $SD=2.89$). Participants had a mean BMI of 26.63 kg/m^2 ($SD=2.19$; range: 23.03–31.14 kg/m^2; 24% normal weight, 67% overweight; and 9% obese). Sixty-two percent ($n=36$) of participants identified themselves as Caucasian, 11% as African American ($n=6$), 11% as Asian American/Pacific Islander ($n=6$), 7% as Latino/Latina/Hispanic ($n=4$), and 9% ($n=5$) as another ethnicity. Two participants reported a parental income of less than $20,000, 10 between $20,001 and $50,000, 9 between $50,000 and $100,000, 15 above $100,000, and 22 did not provide this information.

Despite randomization and similar mean BMIs, participants in the control condition had higher emotional eating scores ($M=15.39$, $SD=4.92$, compared to $M=12.34$, $SD=5.06$ in the intervention condition, $t(55)=2.30$, $p=0.03$), lower levels of physical activity ($M=127.43$, $SD=93.01$ compared to $M=193.10$, $SD=119.63$, $t(55)=-2.31$, $p=0.03$), and lower experiential acceptance for food cravings ($M=36.64$, $SD=6.63$ compared to $M=41.17$, $SD=7.00$, $t(55)=2.51$, $p=0.02$). Notably, none of these variables were significantly correlated with weight or BMI change. Nonetheless, all analyses controlled for these differences.

3.2. *Dropout and compliance*

Of the 58 participants enrolled in the study, 51 (88%) completed the 6-week assessment, 47 (81%) completed the post-intervention assessment, and 37 (64%) completed the 1 year follow up. Importantly, there were no significant differences in retention between conditions (see Fig. 1 for details) and no significant differences in baseline measures between participants who completed the 1 year assessment and those who did not. Of the 29 participants assigned to the intervention group, 8 participants (27.6%) dropped out at some point during the treatment. Including the make-up sessions, the mean number of sessions of content received for treatment completers was 7.8 ($SD=0.6$).

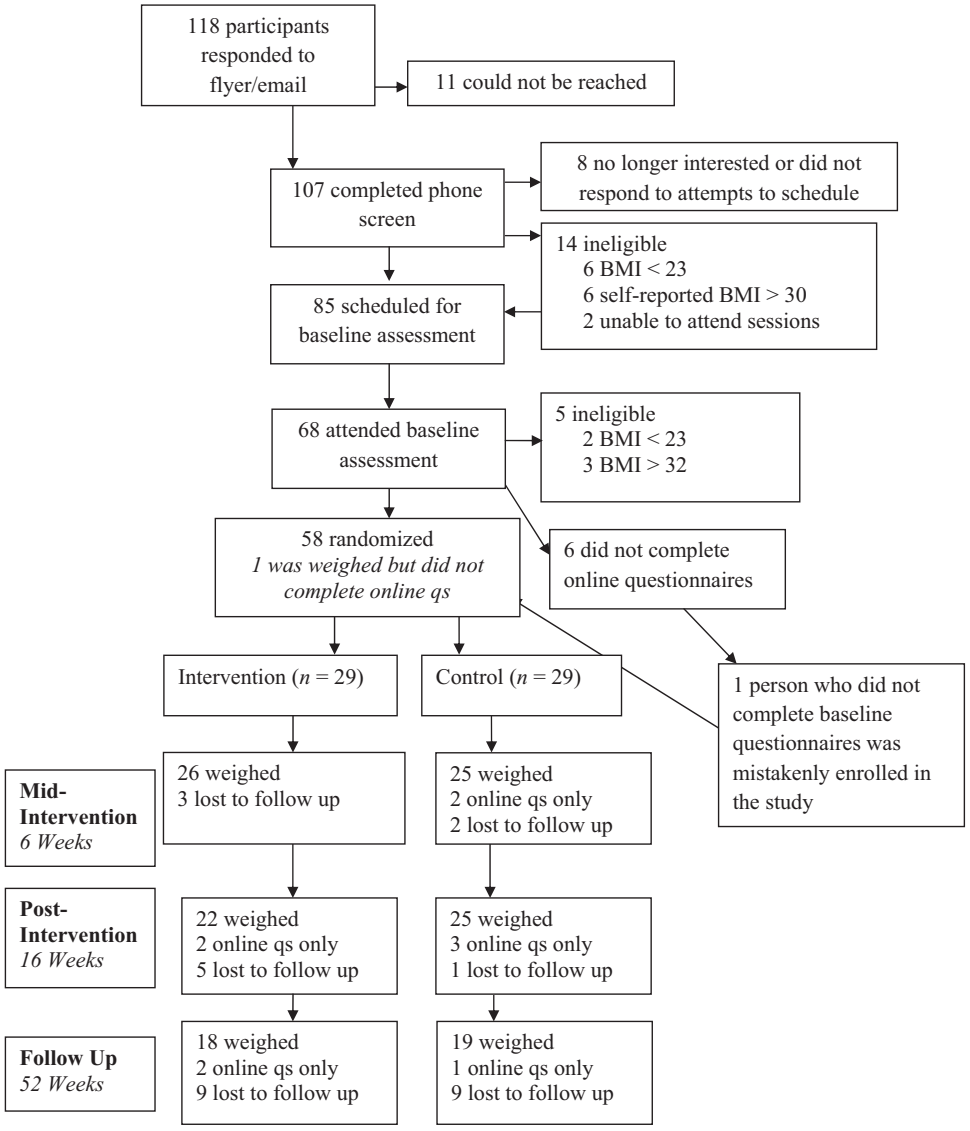

Fig. 1. Participant flow.

3.3. Impact of the intervention

Linear mixed modeling analyses revealed a significant effect of Time × Condition on change in weight ($F(1,51)=7.62$, $p=0.008$), with those assigned to the control group showing an increase in weight (+1.07 kg) and BMI over 1 year (+0.34 kg/m^2) and those assigned to the intervention group showing a decrease in weight (−2.24 kg) and BMI (−0.74 kg/m^2) (see Fig. 2). Descriptive analyses revealed that at 1 year, 58% (11 of 19) of control participants gained at least 2.2 kg while only 11% (2 of 18) of experimental participants gained this amount.

There was a significant Time × Condition interaction effect on experiential acceptance for physical activity ($F(1,52)=4.79$, $p=0.032$, Cohen's $d=0.76$), whereby intervention participants showed an increase in experiential acceptance (e.g., +2.27) and control participants showed a similar sized decrease (e.g., −1.55) across the 1 year study. Analysis of changes in physical activity approached significance, suggesting the possibility of a small effect on physical activity levels over 1 year ($F(1,52)=2.38$, $p=0.125$, Cohen's $d=0.25$). Analyses examining the impact of the intervention on uncontrolled eating, emotional eating, and experiential acceptance in general and for food cravings did not reveal a significant impact of condition on change over 1 year.

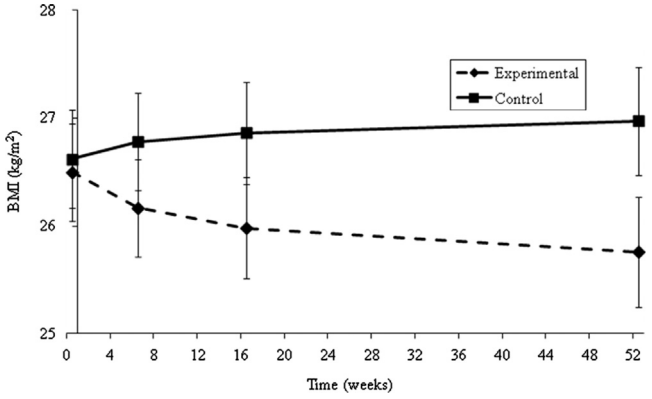

Fig. 2. Estimated marginal means for body mass index by condition over the course of the 16 weeks intervention and follow up period. *Note:* Error bars indicate standard errors.

When short-term changes (i.e., from baseline to 6-weeks) were examined, the only significant effect was for experiential acceptance for physical activity ($t=2.19$, $p=0.032$, Cohen's $d=0.69$), (see Table 2). Calculation of between-groups Cohen's d effect sizes suggested that the intervention had a moderate effect on physical

Table 2
Changes in all outcome measures from baseline to 6 weeks with least square mean estimates and differences, standard errors, and pairwise difference tests for changes in outcome by condition.

Measure	Baseline *M* (*SE*)	Change at 6-weeks *M* (*SE*)	*t*	*p*	95% CI	
					LL	UL
Weight (kg)						
Intervention	72.17 (2.10)	−1.50 (0.54)	−2.76	0.008**	−2.59	−0.41
Control	70.97 (2.11)	0.48 (0.38)				
BMI (kg/m^2)						
Intervention	26.50 (0.45)	−0.33 (0.14)	−2.52	0.015*	−0.61	−0.05
Control	26.63 (0.45)	0.15 (0.13)				
Physical activity						
Intervention	166.01 (15.6)	25.16 (9.98)	1.54	0.125	−6.09	49.55
Control	149.86 (15.6)	3.43 (9.94)				
Uncontrolled eating						
Intervention	21.68 (0.85)	−0.25 (0.37)	−1.13	0.263	−1.61	0.45
Control	21.35 (0.85)	0.33 (0.36)				
Emotional eating						
Intervention	13.48 (0.51)	−0.05 (0.32)	−0.02	0.980	−0.92	0.89
Control	14.37 (0.52)	−0.04 (0.32)				
Weight self-efficacy						
Intervention	112.29 (4.58)	−4.18 (3.01)	0.76	0.452	−5.25	11.63
Control	115.10 (4.59)	−7.34 (2.95)				
AAQ-II						
Intervention	53.16 (1.34)	−0.07 (0.50)	1.59	0.114	−0.27	2.48
Control	51.58 (1.34)	−1.18 (0.48)				
FAAQ						
Intervention	39.99 (0.95)	1.52 (0.61)	0.99	0.323	−0.85	2.56
Control	38.37 (0.95)	0.67 (0.61)				
PAAAQ						
Intervention	30.76 (0.84)	1.25 (0.64)	2.19	0.032*	0.17	3.73
Control	30.90 (0.83)	−0.70 (0.62)				

LL=lower limit; UL=upper limit. All analyses were conducted within the linear mixed models and controlled for baseline levels of emotional eating, physical activity, and experiential acceptance for physical activity.

* $p < 0.05$.
** $p < 0.01$.

activity ($d=0.51$), and small effect on weight self-efficacy ($d=0.23$) and experiential acceptance for food cravings ($d=0.33$) at 6 weeks, but that these effects were not statistically significant. Effect sizes for uncontrolled eating, emotional eating, and general experiential acceptance were all very small (i.e., less than 0.20) suggesting that condition had very minimal to no impact on these variables. None of the proposed mediation analyses showed significant effects in the expected direction for the intervention condition.

4. Discussion

Young adulthood, the college environment, and overweight status have all been identified as risk factors of for future weight gain (Leermakers, Jakicic, Viteri, & Wing, 1998; Nelson et al., 2008; Mokdad et al., 1999; Sheehan et al., 2003; Williamson et al., 1990). The current study provides evidence that without intervention, young adult college women with BMIs ranging from 23 to 32 kg/m^2 are indeed prone to weight gain. Results also demonstrate the efficacy of a unique and brief acceptance-based intervention in promoting weight gain prevention in this group.

Findings compare favorably to previous studies of weight gain prevention programs, particularly given the brevity of the intervention. In the review by Lemmens et al. (2008), only four of the nine studies (Eiben & Lissner, 2006; Leermakers et al., 1998; Howard et al., 2006; Simkin-Silverman, Wing, Boraz, & Kuller, 2003) showed any significant effect on weight and/or BMI change and of these studies, none of the interventions showed effects larger than the current study with such a brief intervention. Thus, the current study indicates a favorable approach for facilitating weight gain prevention in a group likely at risk for future weight gain, particularly in light of the limited positive findings in this area.

With regards to the question of *how* the intervention worked, the current results do not provide a conclusive answer. Although the intervention had positive effects on some of the expected acceptance-based variables (e.g., experiential acceptance related to physical activity), effects were relatively inconsistent and smaller than changes observed in previous acceptance-based behavioral interventions (e.g., Butryn et al., 2011; Forman et al., in press). This may have been due to the multi-faceted nature of the intervention and/or a brief number of sessions, which may have dampened the overall impact on individual variables, but further research is needed to answer this question. Further, data on adherence to self-monitoring of weight and caloric intake was not available and therefore it is possible that one of these consistent predictors of successful weight control (Wing & Phelan, 2005) was a contributor to the intervention's change in weight. Even more parsimoniously, it is possible that non-specific factors such as regular group support helped participants make and sustain behavior change. Regardless, results provide evidence that intervention groups can be conducted with a mixed spectrum of BMIs, and weight loss can be achieved even when it is not heavily emphasized. Given that acceptance-based approaches have positive effects on a variety of mental health domains (Hayes, Luoma, Bond, Masuda, & Lillis, 2006), future research should examine whether acceptance-based behavioral interventions could serve as broad health promotion

programs (i.e., for physical and mental health) on college campuses. It will be important to design interventions such that the effects of an acceptance-based protocol can be assessed independent of other intervention components.

The study was conducted with young adult women in undergraduate and graduate programs at a private urban university. The sample was 62% Caucasian with a small percentage of low-income individuals, so caution should be used in generalizing to other populations. Additionally, the control condition reported greater levels of emotional eating and less physical activity and acceptance of food cravings at baseline. Although these variables controlled for statistically, we cannot rule out the possibility that these pre-existing group differences had an unmeasured effect. Finally, although the dropout rate was similar at all assessment-points for the intervention and control conditions and there were no baseline differences based on dropout status, the dropout rates at follow-up could have also impacted the results in a way that was not able to be detected. Furthermore, the relatively small sample limited our power to detect smaller effect sizes, particularly in mediation analyses.

5. Conclusions

Young adult college women with BMIs of 23–32 kg/m^2 are prone to weight gain. Findings from this unique approach to weight gain prevention provide preliminary evidence for the efficacy of a brief acceptance-based behavioral intervention; with effects maintained over 1 year follow up. Given the increasingly cited need for weight gain prevention in this population, replication and follow-up research to examine efficacy and mechanisms of action are warranted. It will be important for follow up research to examine whether an acceptance-based approach is indeed a mechanism underlying weight gain prevention in this at risk population, by comparing them directly to standard behavioral interventions.

References

Bond, F. W., Hayes, S. C., Baer, R. A., Carpenter, K. M., Guenole, N., Orcutt, H. K., Waltz, T., & Zettle, R. D. (2011). Preliminary psychometric properties of the Acceptance and Action Questionnaire–II: A revised measure of psychological flexibility and experiential avoidance. *Behavior Therapy*, *42*, 676–688, http://dx.doi.org/10.1016/j.beth.2011.03.007.

Butryn, M. L., Forman, E. M., Hoffman, K. L., Shaw, J. A., & Juarascio, A. S. (2011). A pilot study of Acceptance and Commitment Therapy for promotion of physical activity. *Journal of Physical Activity and Health*, *8*, 516–522.

Cappelleri, J. C., Bushmakin, A. G., Gerber, R. A., Leidy, J. K., Sexton, C. C., Lowe, M. R., & Karlsson, J. (2009). Psychometric analysis of the Three-Factor Eating Questionnaire-R21: Results from a large diverse sample of obese and nonobese subjects. *International Journal of Obesity*, *33*, 611–620, http://dx.doi.org/10.1038/ijo.2009.74.

Clark, M. M., Abrams, D. B., Niaura, R. S., Eaton, C. A., & Rossi, J. S. (1991). Self-efficacy in weight management. *Journal of Consulting and Clinical Psychology*, *59*, 739–744.

Eiben, G., & Lissner, L. (2006). Health Hunters: An intervention to prevent overweight and obesity in young high-risk women. *International Journal of Obesity*, *30*, 691–696, http://dx.doi.org/10.1038/sj.ijo.0803167.

Forman, E. M., Butryn, M. L., Hoffman, K. L., & Herbert, J. D. (2009). An open trial of an Acceptance-Based behavioral intervention for weight loss. *Cognitive and Behavioral Practice*, *16*, 223–235, http://dx.doi.org/10.1016/j.cbpra.2008.09.005.

Forman, E. M., Butryn, M., Juarascio, A. S., Bradley, L., Lowe, M., Herbert, J. D., & Shaw, J. The Mind Your Health Project: Evaluating an innovative behavioral treatment for obesity. *Obesity*, http://dx.doi.org/10.1038/oby.20169.

Forman, E. M., & Herbert, J. D. (2009). New directions in cognitive behavior therapy: Acceptance-based therapies. In: W. O'Donohue, & J. E. Fisher (Eds.), *Cognitive behavior therapy: applying empirically supported treatments in your practice* (2nd ed.). Hoboken, NJ: Wiley.

Forman, E. M., Hoffman, K. L., McGrath, K. B., Herbert, J. D., Brandsma, L. L., & Lowe, M. R. (2007). A comparison of acceptance- and control-based strategies for coping with food cravings: An analog study. *Behaviour Research and Therapy*, *45*, 2372–2386, http://dx.doi.org/10.1016/j.brat.2007.04.004.

Gow, R. W., Trace, S. E., & Mazzeo, S. E. (2010). Preventing weight gain in first year college students: An online intervention to prevent the "freshman fifteen.". *Eating Behaviors*, *11*, 33–39, http://dx.doi.org/10.1016/j.eatbeh.2009.08.005.

Hayes, S. C., Luoma, J. B., Bond, F. W., Masuda, A., & Lillis, J. (2006). Acceptance and Commitment Therapy: Model, processes and outcomes. *Behaviour Research and Therapy*, *44*, 1–25.

Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (2011). *Acceptance and commitment therapy, second edition: the process and practice of mindful change*. New York: Guildford Press.

Hivert, M. F., Langlose, M. F., Berard, P., Cerrier, J. P., & Carpentier, A. C. (2007). Prevention of weight gain in young adults through a seminar-based intervention program. *International Journal of Obesity*, *31*, 1262–1269, http://dx.doi.org/10.1038/sj.ijo.0803572.

Hooper, N., Sandoz, E. K., Ashton, J., Clarke, A., & McHugh, L. (2011). Comparing thought suppression and acceptance as coping techniques for food cravings. *Eating Behaviors*, *13*, 62–64, http://dx.doi.org/10.1016/j.eatbeh.2011.10.002.

Howard, B. V., Manson, J. E., Stefanick, M. L., Beresford, S. A., Frank, G., Jones, B., & Prentice, R. (2006). Low-fat dietary patterns and weight change over 7 years. *Journal of the American Medical Association*, *295*, 39–49, http://dx.doi.org/10.1001/jama.295.1.39.

Jacobs, D. R., Hahn, L. P., Haskell, W. L., Pirie, P., & Sidney, S. (1989). Validity and reliability of short physical activity history: Cardia and the Minnesota Heart Health Program. *Journal of Cardiopulmonary Rehabilitation*, *9*, 448–459.

Juarascio, A., Forman, E. M., Timko, C. A., Butryn, M. L., & Goodwin, C. (2011). The development and validation of the Food Craving Acceptance and Action Questionnaire (FAAQ). *Eating Behaviors*, *12*, 182–187, http://dx.doi.org/10.1016/j.eatbeh.2011.04.008.

Kopelman, P. G. (2000). Obesity as a medical problem. *Nature*, *404*, 635–643, http://dx.doi.org/10.1038/35007508.

Kristeller, J. L., & Hallett, C. B. (1999). An exploratory study of a meditation-based intervention for binge eating disorder. *Journal of Health Psychology*, *4*, 357–363, http://dx.doi.org/10.1177/135910539900400305.

Leermakers, E. A., Jakicic, J. M., Viteri, J., & Wing, R. R. (1998). Clinic-based vs. home-based interventions for preventing weight gain in men. *Obesity Research*, *6*, 346–352, http://dx.doi.org/10.1002/j.1550-8528.1998.tb00362.x.

Lemmens, V. E., Oenema, A., Klepp, K. I., Henriksen, H. B., & Brug, J. (2008). A systematic review of the evidence regarding efficacy of obesity prevention interventions among adults. *Obesity Reviews*, *9*, 446–455, http://dx.doi.org/10.1111/j.1467-789X.2008.00468.x.

Levitsky, D. A., Garay, J., Nausbaum, M., Neighbors, L., & DellaValle, D. M. (2006). Monitoring weight daily blocks the freshman weight gain: a model for combating the epidemic of obesity. *International Journal of Obesity*, *30*, 1003–1010, http://dx.doi.org/10.1038/sj.ijo.0803221.

Lillis, J., Hayes, S. C., Bunting, K., & Masuda, A. (2009). Teaching acceptance and mindfulness to improve the lives of the obese: A preliminary test of a theoretical model. *Annals of Behavioral Medicine*, *37*, 58–69, http://dx.doi.org/10.1007/s12160-009-9083-x.

Mokdad, A. H., Serdula, M. K., Dietz, W. H., Bowman, B. A., Marks, J. S., & Koplan, J. P. (1999). The spread of the obesity epidemic in the United States, 1991–1998. *Journal of the American Medical Association*, *282*, 1519–1522, http://dx.doi.org/10.1001/jama.282.16.1519.

Nelson, M. C., Story, M., Larson, N. I., Neumark-Sztainer, & Lytle, L. A. (2008). Emerging adulthood and college-aged youth: An overlooked age for weight-related behavior change. *Obesity*, *16*, 2205–2211, http://dx.doi.org/10.1038/oby.2008.365.

Niemeier, H. M., Leahey, T., Palm Reed, K., Brown, R. A., & Wing, R. R. (2012). An acceptance-based behavioral intervention for weight loss: A pilot study. *Behavior Therapy*, *43*, 427–435, http://dx.doi.org/10.1016/j.beth.2011.10.005.

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, *40*, 879–891, http://dx.doi.org/10.3758/BRM.40.3.879.

Rapp, K., Schroeder, J., Klenk, J., Stoehr, S., Ulmer, H., Concin, H., Diem, G., Oberaigner, W., & Weiland, S. K. (2005). Obesity and incidence of cancer: a large cohort study of over 145,000 adults in Austria. *British Journal of Cancer*, *93*, 1062–1067, http://dx.doi.org/10.1038/sj.bjc.6602819.

Sheehan, T. J., DuBrava, S., DeChello, L. M., & Fang, Z. (2003). Rate of weight change for black and white Americans over a twenty year period. *International Journal of Obesity*, *27*, 498–504, http://dx.doi.org/10.1038/sj.ijo.0802263.

Simkin-Silverman, L. R., Wing, R. R., Boraz, M. A., & Kuller, L. H. (2003). Lifestyle intervention can prevent weight gain during menopause: Results from a 5-year randomized clinical trial. *Annals of Behavioral Medicine*, *26*, 212–220, http://dx.doi.org/10.1207/S15324796ABM2603_06.

Tapper, K., Shaw, C., Ilsley, J., Hill, A. J., Bond, F. W., & Moore, L. (2009). Exploratory randomized controlled trial of a mindfulness based weight loss intervention for women. *Appetite*, *52*, 396–404, http://dx.doi.org/10.1016/j.appet.2008.11.012.

Williamson, D. F., Kahn, H. S., Remington, P. L., & Anda, R. F. (1990). The 10-year incidence of overweight and major weight gain in US adults. *Archives of Internal Medicine*, *150*, 665–672, http://dx.doi.org/10.1001/archinte.150.3.665.

Wing, R. R. (2001). Behavioral treatment of obesity. In: T. A. Wadden, & A. J. Stunkard (Eds.), *Obesity handbook* (pp. 455–462). New York: Guilford Press.

Wing, R. R., & Phelan, S. (2005). Long-term weight loss maintenance. *American Journal of Clinical Nutrition*, *82*, 222S–225S.

Wolff, G. E., & Clark, M. M. (2001). Changes in eating self-efficacy and body image following cognitive-behavioral group therapy for binge eating disorder: A clinical study. *Eating Behaviors*, *2*, 97–104.