Published in final edited form as:

Psychol Health. 2013 ; 28(10): . doi:10.1080/08870446.2013.789875.

Step-down approach to behavioural weight loss treatment: a pilot of a randomised clinical trial

Robert A. Carels^{a,*}, Debra A. Hoffmann^a, Nova Hinman^a, Jacob M. Burmeister^a, Afton Koball^a, Lisham Ashrafioun^a, Marissa W. Oehlhof^a, Erin Bannon^a, Michelle LeRoy^a, and Lynn Darby^b

^aDepartment of Psychology, Bowling Green State University, Bowling Green, OH, USA

^bDepartment of Kinesiology, Bowling Green State University, Bowling Green, OH, USA

Abstract

Background—In a stepped-down approach, patients begin with a more intensive treatment and are stepped down to a less intensive treatment based on achieving treatment goals. This study compared a standard behavioural weight loss programme (BWLP) to a stepped-down approach to treatment.

Methods—Fifty-two overweight/obese adults (Age: $M = 47$ years, $SD = 13.5$; female = 67%) participated in an 18-week BWLP. Half of them were randomly assigned to be stepped down from weekly group meetings based on completion of weight loss goals (3%) every 6 weeks, while the other half remained in their groups regardless of weight loss.

Results—There was a significant difference favouring the BWLP in the proportion of participants who met or exceeded their 3% weight loss goal during the first six weeks. While not statistically significant by the end of treatment, the BWLP participants lost nearly 3% more body weight than stepped-down participants ($SC = 4.9\%$ vs. $BWLP = 7.8\%$; $p = .10$). Greater self-monitoring was associated with increased likelihood of stepped-care eligibility and higher percent weight loss at the end of treatment ($p < .01$).

Conclusion—There was little evidence to support the efficacy of the stepped-down approach for behavioural weight loss treatment employed in this investigation.

Keywords

stepped-care; weight loss; obesity

Introduction

Rising levels of obesity correspond with the increasing levels of obesity-related diseases (e.g. heart disease, hypertension, diabetes; Mokdad, Ford, Bowman, Dietz, & Vinicor, 2003), years of life lost (Fontaine, Redden, Wang, Westfall, & Allison, 2003), costs of medical care (Andreyeva, Sturm, & Ringel, 2004) and negative impact on psychological well-being (e.g. depression; van Hout, van Oudheusden, & van Heck, 2004). These health concerns point towards the need for novel therapeutic approaches that are cost-effective, wide-reaching and efficient (Wyatt, Winters, & Dubbert, 2006). To address these concerns, recent research has examined stepped-care (SC) designs (e.g. Haaga, 2000) for weight loss interventions as one alternative treatment modality to standard behavioural weight loss

programmes (BWLPs). SC models are distinct among weight loss approaches due to the adaptive nature of the programmes. The protocols typically involve assessments of participant progress at several points throughout the programme and modification of treatment delivery (e.g. the intensity, content) as needed (Sobell & Sobell, 2000; Wadden, Brownell, & Foster, 2002).

Recent work has focused on the implementation of stepped-up approaches for weight loss in which individuals are closely monitored throughout an intervention and, following failures to meet treatment goals at designated time points, are stepped-up to more intensive treatment (e.g. Carels et al., 2005, 2007, 2009; Jakicic, Tate, Lang, Davis, & Polzien, 2012). In traditional stepped-up SC models, the treatment begins with an initial, low-intensity self-help (SH) treatment protocol. This is supported by the rationale that beginning with the least intrusive and least costly treatment modality will conserve resources (Latner, 2001). Indeed, a randomized controlled trial found that a stepped-up SC weight loss intervention costs less money to implement per pound lost by participants (Jakicic et al., 2012). Empirical studies have shown that beginning with SH results in approximately 40–60% of participants being stepped-up to the next level of intervention due to failure to achieve designated weight loss goals, typically a 5% weight loss at 12 weeks (e.g. Carels et al., 2008, 2009; Jakicic et al., 2012).

A full discussion of SC interventions also includes approaches that step-down participants from greater intensity treatments to lower intensity intervention. In a step-down design, all participants initially receive the strongest dose of treatment. Thus, they may succeed in starting weight loss efforts with the most intense intervention, including components such as strong social support and accountability offered by a group intervention, didactic instruction, interactive feedback on homework assignments, etc. before transitioning to a lower intensity intervention. Additionally, this model may ameliorate some of the discouraged attitudes and attrition that researchers suggest may arise from the participants' perceptions of initially being assigned to a group that is not receiving an adequate level of treatment (e.g. a control group; Goldberg & Kiernan, 2005). Benefits of a step-down approach include the cost-saving nature of a programme that transitions successful participants to a treatment level requiring fewer resources. Another potential benefit may also include the provision of continued, low-intensity support to individuals following participation in a more intensive treatment as a means to maintain treatment gains and prevent relapse (Bauer, de Niet, Timman, & Kordy, 2010).

To date, step-down approaches have shown promise in a variety of medical interventions, including treatments for rheumatoid arthritis (Verschuere, Esselens, & Westhovens, 2008), gastroesophageal reflux disease (Inadomi et al., 2001) and asthma (Bateman, Jacques, Goldfarb, Atienza, & Mihaescu, 2006). Additionally, step-down approaches have shown some promise in the treatment of psychological issues such as personality disorders (Chiesa, Fonagy, Holmes, & Drahorad, 2004) and substance abuse (McKay et al., 2004; McKay, Lynch, Shepard, & Pettinati, 2005). For example, McKay et al. (2005) found following a 4-week intensive outpatient programme for substance abuse that patients who showed favourable progress in the programme continued to benefit from being stepped-down to a 12-week telephone-based continuing care model. In contrast, those who did not do well in the initial intervention maintained recovery more effectively when they continued care in more intensive treatment (i.e. twice-weekly standard group counselling).

Step-down approaches have been implicated as having potential for effective treatment of eating disorders (e.g. binge eating disorder; Masheb & Grilo, 2007) and have been used to a limited extent in weight loss interventions. Bauer, de Niet, Tinman, and Kordy (2010) found successful effects of stepping down children enrolled in a 3-month intensive weight loss

intervention to 9 months of less intensive follow-up (check-ins via a messaging system). However, this study was designed to primarily measure the effectiveness of maintenance treatment. Because they did not include a non-stepped care control group and the sample included only children, conclusions about the efficacy of a step-down approach relative to standard treatment in adults are not clear. As of yet, no published study has compared a step-down model with a standard BWLP.

The current study aimed to examine the efficacy of a step-down approach compared with a standard group-based BWLP. The programme was designed to provide all participants with the knowledge and tools to make healthy lifestyle choices through participation in weekly group meetings. Participants in the control condition remained in a weight loss group throughout the 18-week intervention, while those in the SC condition had the opportunity to be stepped down to less-intensive treatment based on progress during two assessment periods, at weeks 6 and 12. Participants remaining in the group class may benefit from the continued accountability and instruction the class offers, while those stepped down may benefit from opportunities to practise engaging in healthy behaviours through guided SH, thus building self-efficacy and other skills implicated in weight loss maintenance.

Methods

Participants

Participants were recruited for an 18-week behavioral weight loss programme through advertisements on community bulletin boards, newspapers and emails sent to faculty and staff at a Midwestern university. Participants were included if they: (1) were overweight or obese (BMI ≥ 27 kg/m²), (2) had no major medical conditions (e.g. pacemaker, recent heart attack, insulin-dependent diabetes, uncontrolled hypertension, etc.) and (3) received medical clearance from their primary care physician. Participants were excluded if they: (1) were pregnant or currently nursing, (2) had bariatric surgery or (3) had a serious mental illness (i.e. schizophrenia, bipolar disorder, eating disorder).

Of the 321 individuals who inquired about the programme, 52 were eligible, interested in participating and randomized (see Figure 1). Participants' mean age was 47 years (SD = 13.5), and mean BMI was 38.2 (SD = 8.3; range 27.0–63.4). The participants were primarily Caucasian (83%), female (67%), and living with a partner (75%). Most participants (66%) reported an annual income of over \$45,000 and 64% had at least a bachelor's degree. Participants attended an average of 78% of their required meetings and submitted calorie intake and expenditure data for an average of 52% of possible days during the programme (see Table 1 for more information).

The investigation was approved by the university's Human subjects review board and all participants gave their consent. In order to reduce attrition, all participants provided a \$100 deposit which was refunded when they completed the programme. The deposit was waived for one participant with financial hardship.

Study design

Participants were randomly assigned to one of the two conditions: a BWLP or a BWLP that included a SC component at week 6 (end of Phase 1) and week 12 (end of Phase 2). Both groups received identical programme orientations, utilised the same weight loss treatment manual and met in identical weekly group meetings during the first six weeks of the programme.

At the start of the programme, all the participants were provided with an initial six-week weight loss goal of 3%. The weight loss goal of 3% after each six-week period was designed

to help participants achieve a clinically significant weight loss over the 18-week programme (7–10%; Pi-Sunyer, 1996). A successful participant (i.e. someone who achieved at least a 3% weight loss during each stepped-down point) would have achieved approximately 9% total weight loss by the end of treatment. Participants were considered dropouts if they stopped attending sessions and were unable to be reached or they decided to withdraw from the study.

SC condition participants were informed of their 3% weight loss goal required to transition to SH. After the first 6 weeks of the programme (end of Phase 1), the participants in SC condition who met or exceeded their initial 3% weight loss goal were required to discontinue attendance of the weekly group meetings for the following 6 weeks (Phase 2: see Figure 1). Participants who did not meet their initial 3% weight loss goal continued with the weekly group meetings for Phase 2. All participants were assigned a new 3% weight loss goal based on their current weight at week six (end of Phase 1). At week 12 (end of Phase 2), the participants in SC condition who met or exceeded their second 3% weight loss goal were then stepped down to SH and discontinued attendance of the weekly group meetings. Participants who had previously met or exceeded the initial 3% goal at week 6, but did not meet or exceed the second 3% goal at week 12, resumed attendance of the weekly group meetings. At week 12, all participants were given another 3% weight loss goal for week 18 (end of phase 3), during which the final weight assessment was conducted.

Participants who were stepped-down to SH during the programme were asked to continue reading the weekly lessons from the manual, perform in-class activities at home, self-monitor calorie intake and expenditure and to continue to be active in their attempts to lose weight. Participants in the BWLP condition were assigned 3% weight loss goals in an identical manner but were required to attend weekly meetings regardless of their weight loss. Weight loss groups were led by a licensed clinical health psychologist and/or graduate students in psychology.

Weight loss programme treatment manual—The current study utilised a BWLP derived from previously validated investigations (Carels et al., 2011, 2009, 2012). The current intervention utilised similar lesson content, which was reconfigured to a better fit with this investigation (see programme outline in Table 1). Additionally, this intervention included an emphasis on self-monitoring and participants were given information about nutrition, determining correct portions and other topics important for weight loss (e.g. carbohydrates-, protein-, fiber-intake, resting metabolic rate, physical activity, meal planning and making a grocery list). In particular, this programme emphasised the modification of two important areas: (1) participants' unhealthy relationships with food, their bodies and weight, and (2) participants' personal food and physical activity environment (including habit change and motivation for weight loss).

Emphasis area 1: unhealthy relationships with food, body and weight: Factors influencing participants' unhealthy relationships with food were addressed through instruction on physiological vs. psychological hunger, emotions that can elicit overeating and cultural and familial traditions that influence consumption. Lessons that focused on unhealthy relationships with one's body (i.e. poor body image) included instruction about the interpersonal, media and cultural influences on body image, common myths about body shape and size, consequences of striving for a thin ideal and how to form a more comprehensive perspective about weight loss and health that emphasised the body's function over appearance. Finally, to address unhealthy attitudes about weight (i.e. weight bias), participants were taught to identify and challenge implicit and explicit negative attitudes and stereotypes about overweight and obese persons (e.g. overweight people are lazy) and to

compare this form of bias with other types of discrimination as a way to develop more adaptive attitudes.

Emphasis area 2: personal food and physical activity environment: Factors influencing the participants' personal food environment were addressed through instruction on helping participants develop and maintain healthy habits. Participants were taught ways to develop stable weight loss routines, anticipate and minimise disruptions to these routines, follow engagement of positive weight-loss behaviours with immediate reinforcement and form implementation intentions related to target behaviours (e.g. 'If I go out to eat, then I will order a side salad to go with my meal'). Moreover, participants were taught to disrupt unhealthy habits that may interfere with weight loss by making unhealthy foods and behaviours less-reinforcing (e.g. to make unhealthy snacks, it requires substantial preparation time and effort), identify and eliminate triggers for unhealthy habits and form implementation intentions to engage in healthy behaviours in response to cues signalling unhealthy behaviours (e.g. 'If it is raining outside, then I will workout in my home using an exercise DVD.'). Additionally, participants were taught to create a personal food and exercise environment that emphasised on increased exposure to healthy eating and physical activity, as well as encouragement of automatic responding to goal-related cues. Finally, principles of self-regulatory theory were used to facilitate participants' weight loss motivation (Higgins, 2000). Participants trait regulatory fit (i.e. promotion-focused, 'A major goal in life right now is to achieve weight loss success' vs. prevention-focused, 'A major goal in life right now is to avoid weight loss failure;' Higgins, 2000) was assessed through in-class writing activities and discussion. For example, participants were asked to imagine their lives in 5 years either having achieved their weight loss goals (promotion-focused) or having avoided negative consequences of overweight (prevention-focused).

Lessons generally included PowerPoint presentations on weekly topics (see Table 1), followed by group discussion on relevant themes. Participants were instructed to read weekly lessons prior to class. Typically, participants were given additional homework relevant to the current lesson (e.g. participants were asked to bring in a 'made over' recipe that incorporated healthy changes). Group facilitators presented lessons, facilitated group discussion, answered weight loss related questions and measured the participants' weight after each meeting.

Measures

Weight and body mass index (BMI)—The participants' weights were measured to the nearest 0.1 lb at baseline, week 6, week 12 and post-treatment (week 18) using a digital scale (BF-350e; Tanita, Arlington Heights, IL). The height was measured at baseline to the nearest 0.5 inch using a steel height rod on a standard spring scale. Height and weight were converted to meters and kilograms, respectively before calculating BMI as kg/m^2 .

Caloric intake and expenditure—At an orientation meeting, prior to the start of the programme, the participants received instructions for tracking calorie intake and were encouraged to practice self-monitoring. To assist with self-monitoring, the participants were provided with calorie content for a list of common foods and were instructed how to use various popular online calorie databases, such as CalorieKing.com and NutritionData.com. Following orientation, participants attended a screening visit where they discussed their experiences with self-monitoring calorie intake, generated a list of pros and cons of joining a weight loss programme, and were provided with Caltrac accelerometers to assess total daily energy expenditure and physical activity energy expenditure. The Caltrac accelerometer measures vertical acceleration and converts the measurement into an energy expenditure value. The caltrac accelerometers provide a reliable assessment of total energy expenditure

(Balogun, Martin, & Clendenin, 1989; Fehling, Smith, Warner, & Dalsky, 1999). The participants were asked to submit calorie intake and expenditure data to a website on a daily basis. They were asked to submit calorie intake (total amount of calories consumed) and expenditure data (total amount of calories used per Caltrac), activity expenditure (amount of calories used during physical activity per Caltrac) and minutes exercised (self-reported number of minutes engaging in activity, e.g. 20 min walking) to a website on a daily basis.

Data analysis

Chi-square and ANOVAs were used to examine the differences between SC and BWLP conditions in weight loss and self-monitoring characteristics at the end of each of the three phases as well as total intervention effects. For each of the three phases and total intervention effects, all the participants in the SC condition, regardless of whether or not they were stepped-down, were compared with the participants in the BWLP condition. Within the SC condition, chi-square and ANOVAs were also used to examine differences in weight loss and self-monitoring characteristics between those who were stepped down and those who remained in treatment. When multiple ANOVAs were used, Bonferroni corrections were employed to reduce the chances of Type I errors. In cases where participants did not return to group meetings or the follow-up visit, they were considered dropouts. The dropouts were not included in the analyses for each phase, thus complete analyses are presented for all results. The means and standard deviations for self-monitoring variables were calculated using only the data reported by participants and no values for missing data were imputed. All analyses were performed using SPSS Version 19.0 (SPSS, Inc. Chicago, IL, 2010).

Results

There were no significant differences between the SC and BWLP conditions in baseline demographics (i.e. age, marital status, education, income, ethnicity, BMI, weight, percent body fat).

Phase 1: baseline to week 6

When comparing the SC and BWLP conditions at the end of Phase 1, percent weight loss and total weight loss (kg) did not differ significantly; however, there was a significant difference favouring the BWLP in the proportion of participants who met or exceeded their 3% weight loss goal, $\chi^2(1, N = 50) = 5.7, p < .05$ (see Table 3). There were no significant differences between conditions in the proportion of those who self-monitored, or in caloric intake, caloric expenditure, activity expenditure, caloric deficit and minutes exercised (see Table 3).

Phase 2: week 7 to 12

At the end of Phase 2, percent weight loss, total weight loss (kg) and the proportion of participants who met or exceeded their 3% weight loss goal did not differ significantly between those in the SC condition and those in the BWLP condition. There were no significant differences between conditions in the proportion of those who self-monitored, and in caloric intake, caloric expenditure, activity expenditure, caloric deficit and minutes exercised (see Table 2).

Next, in the SC condition, weight loss and self-monitoring characteristics for those who successfully met their 3% goal in Phase 1 and stepped down to self help for Phase 2 were compared with those who did not meet their 3% goal in Phase 1 and remained in groups for Phase 2. The total weight loss (kg) during Phase 2 was significantly greater in individuals who were stepped down at the end of Phase 1 compared with those who were not, $F(1,21) =$

56.2, $p < .001$, partial $\eta^2 = .69$. A significantly greater proportion of participants who were stepped down after Phase 1 self-monitored during Phase 2 compared with those who were not stepped down, $\chi^2(1, N = 23) = 5.2, p < .05$. There were no significant differences between those who were stepped down and those who were not in caloric intake, caloric expenditure, activity expenditure, caloric deficit and minutes exercised during Phase 2 (see Table 3).

Phase 3: week 13 to 18

At the end of Phase 3, there was a significant difference between conditions favouring the BWLP condition in percent weight loss, $F(1,39) = 8.450, p < .01$, partial $\eta^2 = .26$; total weight loss (kg), $F(1,39) = 7.943, p < .01$, partial $\eta^2 = .22$; and the proportion of participants that met or exceeded their 3% weight loss goal, $\chi^2(1, N = 42) = 4.9, p < .05$. If participants in the SC condition who were in SH (i.e., they met their 3% weight loss goal during Phase 2) are removed from the analyses, participants in the SC condition still lost less weight relative to BWLP participants during Phase 3 (BWLP = 2.1%; SC = 0.5%, $p < .01$). There were no significant differences between conditions in the proportion of those who self-monitored, nor in caloric intake, caloric expenditure, activity expenditure, caloric deficit and minutes exercised (see Table 2). At the end of the treatment (end of phase three), only one participant in the SC condition met his or her 3% weight loss goal. Therefore, weight loss and self-monitoring characteristics in participants who successfully met their 3% goal and those who did not meet their 3% goal were not compared.

Total intervention effects across conditions

By the end of the treatment, SC participants lost 4.9% total body weight and BWLP participants lost 7.8% total body weight although this difference was not statistically significant (see Table 2). Across the entire programme, there were no significant differences between conditions in percent weight loss, total weight loss (kg), body fat (%) and BMI.¹ There were no significant differences between conditions in the proportion of those who achieved at least a 9% weight loss (SC: 5 out of 21 participants; 24%; BWLP: 8 out of 21 participants; 40%).

In terms of self-monitoring, there were no significant differences between conditions in the proportion of those who self-monitored, or in caloric intake, caloric expenditure, activity expenditure, caloric deficit and minutes exercised (see Table 2). Also, there were no significant associations between percent weight loss and caloric intake, caloric expenditure, activity expenditure, caloric deficit and minutes exercised.

Discussion

The current investigation compared a standard group-based BWLP with a stepped-down approach. There was little evidence to support the efficacy of the stepped-down approach for behavioural weight loss treatment employed in this investigation. While not statistically significant, by the end of the treatment, the standard treatment participants lost nearly 3% more body weight than the stepped-down participants (BWLP = 7.8% vs. SC = 4.9%).

¹Completer analyses were reported because of the nature of the research (i.e. the effectiveness between two treatment groups at different times within treatment were compared). If intent-to-treat analyses were performed, then zero percent weight loss would be carried forward into each Phase. It would appear that some people were eligible for stepped-care, when, in fact, they were a drop-out. To be consistent, completer analyses were conducted within each Phase and at post-treatment. However, intent-to-treat analyses were also performed comparing pre-to post-treatment change in weight using all participants (dropouts were assumed to have returned to baseline weight) and results showed no significant differences between conditions in percent weight loss (BWLP: -6.6 vs. SC: -3.8) and total weight loss (kg; BWLP: -7.5 vs. SC: -4.2).

One potential obstacle to favourable treatment outcomes in this investigation may have been SC participants' concerns regarding being stepped-down to SH. Several participants indicated a desire to remain in a weight loss group and very few participants expressed a desire to *actually* be stepped-down. This may be, at least in part, a function of the majority female composition (69%) of the sample. Generally speaking, research suggests that women prefer weekly face-to-face group meetings relative to other weight loss treatment modalities (Phelan et al., 2010). Interestingly, SC participants were less likely to meet their 3% weight loss goal in Phase 1 (which would have resulted in them being stepped-down) than standard BWLP participants, 46 vs. 79%, respectively. It is possible that SC participants' conscious or unconscious desires to stay in the group contributed to their diminished weight loss success. Thus, by failing to meet their 3% weight loss goal, some participants may have been able to stay in their preferred treatment format (group). However, even if a preference for treatment modality was a motivation for poor short-term performance during Phase 1 and Phase 2, it failed to favourably translate to later positive treatment outcomes in Phase 3 when meeting a goal to stay in group or step down was no longer a factor.

During weeks 6 through 12 (Phase 2), approximately 50% of the participants in the SC condition who were stepped-down to less intense treatment failed to meet their 3% weight loss goal and had to rejoin the treatment group. That is, approximately 50% of the participants performed well on their own and 50% were asked to rejoin the group. Only one participant who had previously missed the 3% goal in Phase 1 became eligible for stepped-down treatment in Phase 2. As such, those who did poorly during Phase 1 and remained in group treatment during Phase 2 continued to do poorly in subsequent phases. It would appear that treatment problems detected early in treatment (losing less than 3% weight loss during the first six weeks) decreased the likelihood of later success (reaching 3% in later phases). This is not entirely surprising because early weight loss performance is typically related to later weight loss performance. In fact, in one study, weight loss at week two was significantly correlated with post-treatment weight loss (Dubbert & Wilson, 1984).

It is not clear why some participants did well on their own, while others benefited from the group. Caloric intake, caloric expenditure, activity expenditure, caloric deficit and minutes exercised were not associated with SC eligibility. Of course, self-reported dietary intake and exercise often reflect errors in estimating and reporting as well as social desirability and social approval bias (Trabulsi & Schoeller, 2001). However, a significantly greater proportion of participants who were stepped-down self-monitored during Phase 2 compared with those who were not stepped-down (83 vs. 29%, respectively). In this investigation, because self-monitoring simply reflected whether an individual reported intake and expenditure on a particular day, it is likely less susceptible to error and bias. The findings from this investigation on self-monitoring are consistent with research indicating that self-monitoring is associated with positive treatment outcomes (Wing, 2002). Additionally, some participants appeared to benefit from the support, accountability and weekly attention that a group-based weight loss programme provides, while others appeared better able to lose weight on their own. Therefore, the ability to consistently self-monitor as well as a participants' responsiveness to group-based programmes may be important factors in creating future weight loss treatment algorithms (Wadden et al., 2002).

During Phase 3 (weeks 13 through 18), there was relatively little weight loss in the SC condition while participants in the standard BWLP continued to lose weight (2.1%). It is not entirely clear why the standard BWLP outperformed the SC treatment during this Phase 3. Interestingly, the performance was unrelated to treatment intensity. As previously indicated, participants in the SC condition lost less weight relative to BWLP participants during Phase 3, even after participants in the SC condition who were in SH were removed from the analyses. It is possible that in the SC group, the processes of leaving and/or rejoining the

group, or having other members transition in and out of the group was disruptive to group support and cohesion and compromised the performance of some participants.

SC approaches to weight loss have shown to be cost-effective (Jakicic et al., 2012). However, determining the optimal timing and level of intensity of SC treatments has proven to be somewhat elusive. For example, in the largest weight loss, SC, randomised clinical trial to date (i.e. Step-Up Study), a standard BWLP was compared with a SC weight loss intervention (Jakicic et al., 2012). The SC intervention was more cost-effective than the standard BWLP (i.e. cost per participant for BWLP was \$1357 vs. \$785 for the STEP group). However, weight loss outcomes favoured the standard BWLP (Jakicic et al., 2012). The standard BWLP participants lost 1.3 kg more than STEP participants at the 18-month assessment. Again, research on the appropriate timing and intensity of the stepped-progression is greatly needed.

Several limitations of the study should be acknowledged. The modest sample size in this investigation had limited power to detect group differences that did not evidence a large effect size. Additionally, the small number of individuals who participated in SC and the predominately Caucasian and female sample suggest that replication with a larger, more diverse sample is warranted. Future research may benefit from a thorough examination of baseline factors, such as motivation via stages of change (Prochaska & DiClemente, 1982), treatment preferences and their relationship to treatment outcome, SC status, attrition, group cohesion, attitudes towards stepping down, etc. Further, the observed changes in dietary intake in this study are based on self-report data, which are susceptible to considerable underreporting (Trabulsi et al., 2001). Similarly, because participants could use various sources to estimate caloric intake, discrepancies between caloric estimation sources may further diminish comparability among participants. Finally, because follow-up assessments beyond the end of treatment were not conducted, weight loss maintenance cannot be assessed.

Given the scope of the obesity epidemic, time-efficient and minimally intrusive treatments are greatly needed (Mokdad et al., 2003). SC treatments have considerable potential, but additional attention is needed to the timing and intensity of treatment, as well as patient characteristics associated with outcomes. While it is premature to conclude that a stepped-down approach has no merit for weight loss treatment, the findings from this investigation suggest that participant behaviours and predisposing factors may be an important consideration.

References

- Andreyeva T, Sturm R, Ringel JS. Moderate and severe obesity have large differences in health care costs. *Obesity Research*. 2004; 12:1936–1943. [PubMed: 15687394]
- Balogun J, Martin D, Clendenin M. Calometric validation of the Caltrac accelerometer during level walking. *Physical Therapy*. 1989; 89:501–509. [PubMed: 2727075]
- Bateman ED, Jacques L, Goldfard C, Atienza T, Mihaescu T. Asthma control can be maintained when fluticasone propionate/salmeterol in a single inhaler is stepped down. *Journal of Allergy and Clinical Immunology*. 2006; 117:563–570. [PubMed: 16522454]
- Bauer S, de Niet J, Timman R, Kordy H. Enhancement of care through self-monitoring and tailored feedback via text messaging and their use in the treatment of childhood overweight. *Patient Education and Counseling*. 2010; 79:315–319. [PubMed: 20418046]
- Carels RA, Burmeister J, Koball A, Oehlhof MW, Hinman N, Leroy M, et al. A randomized trial comparing two approaches to weight loss: Differences in weight loss maintenance. *Journal of Health Psychology*. in press.

- Carels RA, Darby LA, Cacciapaglia HM, Douglass OM, Harper J, Kaplar M, et al. Applying a stepped care approach to the treatment of obesity. *Journal of Psychosomatic Research*. 2005; 59:375–383. [PubMed: 16310019]
- Carels RA, Darby LA, Cacciapaglia HM, Konrad KK, Coit C, Harper J, et al. Using motivational interviewing as a supplement to obesity treatment: A stepped-care approach. *Health Psychology*. 2007; 26:369–374. [PubMed: 17500624]
- Carels RA, Wott CB, Young KM, Gumble A, Darby LA, Oehlhof MW, et al. Successful weight loss with self-help: A stepped-care approach. *Journal of Behavioral Medicine*. 2009; 32:503–509. [PubMed: 19521759]
- Carels RA, Young KM, Coit C, Darby LA, Clayton AM, Spencer A, et al. The failure of therapist assistance and stepped-care to improve weight loss outcomes. *Obesity*. 2008; 16:1460–1462. [PubMed: 18356835]
- Carels RA, Young KM, Koball A, Gumble A, Darby LA, Oehlhof MW, et al. Transforming your life: An environmental modification approach to weight loss. *Journal of Health Psychology*. 2011; 16:430–438. [PubMed: 20929947]
- Chiesa M, Fonagy P, Holmes J, Drahorad C. Residential versus community treatment of personality disorders. *The American Journal of Psychiatry*. 2004; 161:1463–1470. [PubMed: 15285974]
- Dubbert P, Wilson G. Goal-setting and spouse involvement in the treatment of obesity. *Behavioral Research and Therapy*. 1984; 22:227–242.
- Fehling P, Smith D, Warner S, Dalsky G. Comparison of accelerometers with oxygen consumption in older adults during exercise. *Medicine & Science in Sports & Exercise*. 1999; 31:171–175. [PubMed: 9927026]
- Fontaine K, Redden DT, Wang C, Westfall AO, Allison DB. Years of life lost due to obesity. *Journal of the American Medical Association*. 2003; 289:187–193. [PubMed: 12517229]
- Goldberg JH, Kiernan M. Innovative techniques to address retention in behavioral weight-loss trial. *Health Education Research*. 2005; 20:439–447. [PubMed: 15598664]
- Haaga DA. Introduction to the special section on stepped care models in psychotherapy. *Journal of Consulting and Clinical Psychology*. 2000; 68:547–548. [PubMed: 10965628]
- Higgins ET. Making a good decision: Value from fit. *American Psychologist*. 2000; 55:1217–1230. [PubMed: 11280936]
- Inadmoi JM, Jamal R, Murata GH, Hoffman RM, Lavezo LA, Vigil JM, et al. Step down management of gastroesophageal reflux disease. *Gastroenterology*. 2001; 121:1095–1100. [PubMed: 11677201]
- Jakicic JM, Tate DF, Lang W, Davis KK, Polzien K, Rickman AD, et al. Effect of a stepped-care intervention approach on weight loss in adults. *JAMA*. 2012; 307:2617–2626. [PubMed: 22735431]
- Latner JD. Self-help in the long-term treatment of obesity. *Obesity Reviews*. 2001; 2:87–97. [PubMed: 12119666]
- Masheb RM, Grilo CM. Rapid response predicts treatment outcomes in binge eating disorder: Implications for stepped care. *Journal of Consulting and Clinical Psychology*. 2007; 75:639–644. [PubMed: 17663617]
- McKay JR, Foltz C, Leahy P, Stephens R, Orwin R, Crowley E. Step down continuing care in the treatment of substance abuse. *Evaluation and Program Planning*. 2004; 27:321–331.
- McKay JR, Lynch KG, Shepard DS, Pettinati HM. The effectiveness of telephone-based continuing care for alcohol and cocaine dependence. *Archives of General Psychiatry*. 2005; 62:199–207. [PubMed: 15699297]
- Mokdad AH, Ford ES, Bowman BA, Dietz WH, Vinicor F, Bales VS, et al. Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. *JAMA*. 2003; 289:76–79. [PubMed: 12503980]
- Phelan S, Smith K, Steele JM, Wilt D, Ames S, McClure L. What type of weight loss program do postpartum women want? Treatment preferences for postpartum women in two community settings. *Californian Journal of Health Promotion*. 2010; 1:22–31.
- Pi-Sunyer FX. A review of long-term studies evaluating the efficacy of weight loss in ameliorating disorders associated with obesity. *Clinical Therapeutics*. 1996; 18:1006–1035. [PubMed: 9001821]

- Prochaska JO, DiClemente CC. Transtheoretical therapy: Toward a more integrative model of change. *Psychotherapy: Theory Research and Practice*. 1982; 19:276–288.
- Sobell MB, Sobell LC. Stepped care as a heuristic approach to the treatment of alcohol problems. *Journal of Consulting and Clinical Psychology*. 2000; 68:573–579. [PubMed: 10965632]
- Trabulsi J, Schoeller DA. Evaluation of dietary assessment instruments against doubly labeled water, a biomarker of habitual energy intake. *American Journal of Endocrinology Metabolism*. 2001; 281:E891–E899.
- van Hout GC, van Oudheusden I, van Heck GL. Psychological profile of the morbidly obese. *Obesity Surgery*. 2004; 14:579–588. [PubMed: 15186623]
- Verschuere P, Esselens G, Westhovens R. Daily practice effectiveness of a step-down treatment in comparison with a tight step-up for early rheumatoid arthritis. *Rheumatology*. 2008; 47:59–64.
- Wadden TA, Brownell KD, Foster G. Obesity: Managing the global epidemic. *Journal of Consulting and Clinical Psychology*. 2002; 70:510–525. [PubMed: 12090366]
- Wing, RR. Behavioral weight control. In: Wadden, T.; Stunkard, A., editors. *Handbook of obesity treatment*. 2. New York, NY: Guilford; 2002. p. 301-317.
- Wyatt SB, Winters KP, Dubbert PM. Overweight and obesity: Prevalence, consequences, and causes of a growing public health problem. *American Journal of Medical Sciences*. 2006; 331:166–174.

Figure 1.
Participant flow diagram.

Table 1

Weekly lesson topics.

Week 1	Introductions The Importance of Self-monitoring Maintaining a Healthy Lifestyle and Achieving Weight Loss Goals
Week 2	The Importance of Examining Attitudes toward Food, Weight and Your Body Environment
Week 3	Relationships with Food: Food, Hunger and Awareness Nutrition Primer I
Week 4	Relationships with Food: Food and Negative Emotions Nutrition Primer II
Week 5	Relationships with Food: Food and Pleasure
Week 6	Relationships with Food: Food, Family and Culture
Week 7	Inspiring Weight Loss
Week 8	Creating Healthy Habits
Week 9	Taking Control of Food Servings/Taking Control of Portions
Week 10	The Impact of Media and Culture on Body Image
Week 11	The 'Thin is Healthy and Preferred' Myth
Week 12	Body and Self-Acceptance
Week 13	Inspiring a Healthy Lifestyle
Week 14	Disrupting Unhealthy Habits at Home
Week 15	Body for Performance
Week 16	Debunking Stereotypes about Weight
Week 17	Don't Believe Everything You Hear: Internalised Weight Bias & the Glycemic Index
Week 18	Excess Weight is Not a Destiny: Protect Yourself against Self-Fulfilling Prophecy and Proactive Coping

Table 2

Comparison of self-monitoring, energy intake and expenditure, and weight loss between the stepped-care (SC) and behavioural weight loss program (BWLP) conditions.

	Phase 1		Phase 2		Phase 3		Post-treatment	
	SC M (SD) or %	BWLP M (SD) or %	SC M (SD) or %	BWLP M (SD) or %	SC M (SD) or %	BWLP M (SD) or %	SC M (SD) or %	BWLP M (SD) or %
Sample	26	23	23	22	21	21	21	21
% Body weight lost	-3.3 (3.4)	-4.1 (2.2)	-1.3 (2.2)	-1.9 (2.0)	+0.2 (2.2)**	-2.1 (2.4)	-4.9 (6.0)	-7.8 (5.4)
Weight lost (kg)	-3.7 (8.4)	-4.5 (6.7)	-1.3 (5.2)	-2.0 (4.8)	0.0 (4.4)**	-2.4 (7.4)	-5.4 (14.6)	-9.0 (17.0)
% Meeting goal	46%*	79%	26%	23%	4.5%*	30%	24%	38%
% Self-monitored	89%	77%	37%	50%	24%	29%	24%	29%
Caloric intake (kcal/daily)	1670.9 (389.7)	1634.6 (450.7)	1463.4 (367.3)	1539.6 (365.0)	1560.2 (460.3)	1457.1 (273.6)	1690.5 (384.6)	1638.1 (443.5)
Caloric expenditure (kcal/daily)	2584.4 (510.3)	2592.3 (524.5)	2732.9 (573.1)	2491.8 (562.8)	2901.0 (603.3)	2484.2 (566.0)	2584.9 (519.8)	2602.8 (536.5)
Caloric expenditure from activity (kcal/daily)	604.2 (375.6)	596.3 (291.7)	786.6 (514.7)	581.3 (426.4)	993.7 (369.1)**	563.9 (281.9)	601.1 (392.0)	610.3 (256.7)
Caloric deficit	-913.1 (737.5)	-957.5 (370.6)	-1273.0 (773.3)	-948.1 (473.1)	-1342.9 (880.6)	-1043.1 (575.9)	-896.3 (747.0)	-967.4 (398.1)
Exercise (mins/day)	25.2 (29.8)	26.6 (26.4)	40.2 (30.6)	25.6 (21.8)	48.7 (42.9)	40.1 (32.6)	30.9 (32.6)	28.8 (25.3)

Note:

* $p < .05$,

** $p < .01$.

Table 3Treatment outcomes by stepped-care eligibility: Phases 1 and 2 for the stepped care (SC) condition^a.

	Phase 1		Phase 2	
	Stepped, M (SD) or %	Non-stepped, M (SD) or %	Stepped, M (SD) or %	Non-stepped, M (SD) or %
Sample	13	13	6	17
% Body weight lost	-6.3 (2.0)**	-0.7 (1.9)	-4.3 (1.0)**	-0.2 (1.4)
Weight lost (kg)	-7.0 (5.5)**	-0.8 (4.3)	-4.6 (1.2)**	-0.1 (3.1)
% Self-monitored	92%	86%	83%*	29%
Caloric intake (kcal/daily)	1782.6 (465.6)	1520.4 (246.7)	1462.1 (471.2)	1464.6 (291.1)
Caloric expenditure (kcal/daily)	2733.4 (583.5)	2488.9 (425.4)	2664.0 (612.1)	2791.9 (579.5)
Caloric expenditure from activity (kcal/daily)	652.4 (360.1)	611.3 (381.6)	534.5 (311.3)	966.6 (574.7)
Caloric deficit	-1214.1 (585.5)	-704.5 (793.2)	-1201.4 (799.0)	-1334.3 (809.0)
Exercise (mins/day)	18.8 (16.9)	33.2 (37.8)	28.6 (23.6)	50.2 (34.1)

Notes: Phase 1: Performance during weeks 1–6; Phase 2: Performance during weeks 7–12.

^aPhase 3: Performance during weeks 13–18. Only one participant achieved his or her 3% weight loss goal during Phase 3. Because a meaningful comparison between stepped and non-stepped participants cannot be made, Phase 3 data is not reported. Also, Phase 3 performance reflects the end of the intervention and is not a phase with future treatment implications (the step-down periods were at weeks 6 and 12).

*
 $p < .05$,

**
 $p < .01$.