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Testing a Brief Self-Directed Behavioral Weight Control Program

Jennifer A. Linde, Ph.D. and Robert W. Jeffery, Ph.D.

Division of Epidemiology and Community Health, School of Public Health, University of Minnesota

Abstract

Clinical obesity treatments are of limited reach. Self-directed weight control attempts are common, but little attention has been given to providing guidance for such efforts in the population. The present research tests a brief intervention approach to weight control. Pilot data were collected from 66 University employees (72.7% female, 81.8% white) randomized to an assessment-only control condition or a single intervention session to teach empirically valid self-directed weight control methods. Mean baseline weight was 87.1 kilograms (range 64.0–120.3 kilograms). Though statistically nonsignificant, intervention participants averaged greater weight loss by 6 months than controls [–0.80 kilograms vs. –0.19 kilograms, $F(1, 44) = 0.47$, $p = .50$, Cohen's $d = .21$]. There was a significant group $\times$ time interaction for self-weighing frequency [$F(2, 41) = 10.84$, $p < .001$]. With some enhancement and more attention to dissemination, a brief self-directed program has potential as a useful approach to population weight gain prevention.

Keywords

Weight control behaviors; Adults; Public Health

Management of population weight gain among adults calls for widespread delivery of effective weight control programs at a low cost. The high expense and narrow reach of current clinical treatments¹ suggests that such methods are unlikely to have a meaningful public health impact. In the past, public health campaigns have succeeded in elevating awareness of obesity as a health threat² and in inducing weight loss attempts.³ However, obesity rates are historically high,⁴ presenting opportunities to improve population weight control efforts.

The majority of weight control attempts are self-directed. Nearly half of women and a quarter of men report recent weight loss attempts, but only 10% of women and 4% of men use organized programs.^{5,6} The three self-described strategies most consistently associated with successful weight control are calorie/fat restriction, regular physical activity, and weight self-monitoring.^{5–12} These strategies may be simplified into concrete behaviors, such as reducing calories with an emphasis on fast food or fried food intake as sources of high caloric intake that are easy to discern,¹⁰ walking in bouts for up to 60 minutes per day,⁷ and daily weighing.^{8,9,12}

The current study presents pilot and feasibility data examining a self-directed program specifically constructed to highlight the three behaviors described above as cornerstones of the weight control process. The format draws from an earlier study designed to evaluate the effectiveness of behavior-focused (via calorie and exercise monitoring) or weight-focused (via weight monitoring) telephone feedback following two hours of behavioral weight loss instructions that included calories and exercise monitoring, stimulus control techniques, and relapse prevention information.¹³ In that study, participants attended two face-to-face treatment sessions followed by either no further contact or one of two telephone reminder formats (weight or behavior-focused). Over six months, the 2-hour treatment with telephone follow up lost 3–4 kg. Surprisingly, the control group with no further follow-up lost even more weight (5.8 kg). Results from the previous counselor-supported intervention trial,¹³ taken with the classic public health approach of encouraging small shifts in behavioral risk factor distributions to alter population health in a meaningful way,¹⁴ suggested that a minimal contact, information-based weight control intervention might be devised and distributed at low cost to achieve a relatively large effect on population weight gain; the present study was designed to test a public health approach to weight control in a briefer, more focused format that includes a relatively novel approach of daily rather than weekly weight monitoring during weight control.

Methods

Recruitment Procedures

The study protocol was approved by the University of Minnesota Institutional Review Board. Participants were recruited using flyers advertising a free self-guided weight control program offered as part of a research project. Flyers were mailed to University campus employee mailing addresses, with no attempts to screen in advance for body weight or interest in weight control. Eligibility criteria for study entry were: ages 18 to 65, body mass index of approximately 25 kg/m² to 35 kg/m² (approximately 30–100 pounds overweight for height), generally healthy and not diabetic, not currently trying to lose weight, and for women, not currently pregnant or pregnant within the past year. A relatively narrow BMI range was selected for this study to exclude individuals with BMI in a healthy range who might pursue unhealthy weights during the study, or those at greater risk for medical complications of obesity (those with BMI > 35).

Study flyers were mailed to 6000 employees (approximately 35% of total employee population) selected at random from the University's Office of Human Resources database. Of these 6000, 172 individuals responded to indicate interest in the program (2.9% response rate). Of these 172, 68 completed a screening interview to confirm eligibility, attended a baseline visit to obtain written informed consent and provide survey data, and agreed to participate in the study. Of those not participating in screenings, about half were ineligible and half did not respond to screening phone calls, or failed to attend the baseline visit. Two of the 68 who initially agreed to participate in the study withdrew following consent and randomization; one participant randomized to intervention described a change in eligibility that resulted in disqualification from the study, and one participant randomized to the

control group refused treatment assignment. The study participant flow diagram is presented in Figure 1.

Measures

Demographics and body composition—Demographic data (age, gender, marital status, race/ethnicity, education level) were collected from all participants by self-report at baseline. Study staff weighed participants in light clothing without shoes using a Seca 882 calibrated digital scale; height was measured without shoes using a wall-mounted stadiometer. Weight measurements were repeated at 3- and 6-month study visits.

Weight self-monitoring—The survey question "How often do you weigh yourself?" was asked at baseline, 3, and 6 months. Response options were: never, about once a year or less, every other month, once a month, once a week, once a day, or more than once a day. Responses were collapsed to form five categories: never (included about once a year or less), every other month, once a month, once a week, and once a day (included more than once a day). This item was developed by the research team to track weighing frequency and has been associated with body weight changes over time.⁹

Intervention behavior tracking—Participants in the intervention group only were instructed to complete 24 weekly self-monitoring records, in the form of weekly postage-paid cards to be completed and returned by mail to the research team. They were asked report their weight for that day, frequency of weighing during that week, frequency of pedometer use, exercise bouts, and a checklist of dietary activities performed during the previous week (avoiding red meat, fried food, or fast food; calorie tracking; using meal replacements; following a meal plan, increasing fruit and vegetable intake, or not eating after 8 PM). Weighing, dietary, and physical activity items on the checklist were designed to address target behaviors presented during the group session (weighing, walking for exercise, fat and caloric intake reduction).

Intervention salience and reinforcement properties—At 3 and 6 months, intervention group participants were also asked to complete an 8-item measure designed for the study that assessed the perceived salience and reinforcement properties of the intervention activities (e.g., how enjoyable, memorable, rewarding, easy to perform, useful, interesting, satisfying, motivating, and awareness-promoting was the intervention?). Items were rated on a 9-point scale from 0 = "not at all" to 8 = "extremely," with 4 = "somewhat" anchoring the midpoint of the scale. These measures demonstrated high internal consistency reliability (Cronbach's $\alpha = .93$ at 3 months, $\alpha = .94$ at 6 months) and high stability (3-month test-retest $r = .79$) in this sample.

Study Intervention Protocol

After completion of baseline questionnaires, participants were randomly assigned to control or intervention group using a random number table prepared in advance; study staff and participants were not blinded to treatment assignment. Participants in the control group were asked to complete the same survey measures as the intervention group at baseline, 3, and 6 months, but otherwise had no contact with study staff. They received a single page flyer

presenting basic nutrition advice at the baseline session, and were presented with a complete set of written study intervention materials at the final 6-month measurement visit.

Participants in the intervention group participated in one of five 90-minute weight control education sessions led by a member of the research team, scheduled within 23.4 (SD = 7.3) days of the baseline visit on average (range = 10–37 days). They met in groups of 5–10 individuals. The group session used a combined didactic and group discussion format to present a model of weight management that emphasized three validated behavioral strategies for weight control: daily monitoring of body weight, healthy dietary habits, and increasing time spent each week in physical activity. Participants were instructed to set specific short- and long-term weight goals by selecting behavioral strategies from a short list of those known to be effective (i.e., calorie monitoring, regular physical activity, fat reduction, structured meal planning, increased fruit and vegetable consumption) and adjusting their selection of strategies over time based on preferences and/or weight loss progress. Fat and fried food reduction, walking for exercise, and daily weighing were highlighted among the strategies presented, with a particular emphasis on the key role of daily monitoring of weight. Other strategies suggested from those with empirical support included calorie counting with the aid of eating and activity records,¹⁵ use of meal replacement products¹⁶ and avoidance of common food with high calorie density (e.g., fried food, fast food, red meat), and increasing walking or similar exercise up to 1 hour each day. Written contracts were used to encourage commitment to behavioral strategies.

To support their weight control efforts, intervention participants received the following materials: a self-help treatment manual developed by the study team (consisting of didactic material presented in the session), a bathroom scale and instruction for daily weight monitoring, a pedometer and instructions for monitoring physical activity by step counting, a food composition and physical activity guidebook to facilitate calculation of energy intake and energy expenditure, self-monitoring forms for recording weight, behaviors, goals, and weight control strategies, sample meal plans for preset calorie levels, instructions for using meal replacements and other low-calorie products, a graduated exercise program of moderate-intensity physical activity programs such as walking, and local resource information for places in the community that are conducive to healthy eating and physical activity (e.g., business hours for local malls with walking programs, distances around area lakes with walking trails). The total cost of providing the intervention for this study (including all materials, follow-up postcard mailings, and interventionist time across all sessions held to accommodate participants) was approximately \$2750, or \$550 per session (\$17 per person).

Data Analysis

Based on guidelines for determining sample size in a pilot study,¹⁷ the study goal of recruiting a minimum of 30 participants to each condition at baseline was met. Seventy-two percent (48/66) of participants completed the 6 month evaluation visit; there were no differences in attrition by treatment group [11 intervention vs. 7 control, $\chi^2(1) = 1.22, p = .27$]. Outcome analyses were performed with data from the 48 completers. All analyses were conducted using SAS Version 8.2. Initial comparisons of baseline measures between the two

treatment groups were made using t-tests for continuous variables and chi-square tests for categorical variables. The primary outcome analysis compared participants in terms of mean weight change by group from baseline to 6 months using general linear regression models, adjusting for baseline weight and gender. Statistical significance was determined at the $p < .05$ level, and Cohen's d statistic¹⁸ was calculated to determine the effect size for weight change at 6 months. Secondary analyses examined self-weighing frequency differences between groups over time, participation in monitoring tasks by the intervention group, and intervention participant ratings of program salience and reinforcement value over the duration of the study.

Results

Study Participants

Demographic data are presented in Table 1. Mean age of participants was 44.7 years ($SD = 11.2$ years, range = 20.4–64.6 years). Mean weight at baseline was 87.1 kg ($SD = 12.5$ kg, range = 64.0–120.3 kg), and mean baseline BMI (from measured height and weight) was 31.1 kg/m² ($SD = 3.1$ kg/m², range = 25.7–38.6 kg/m²). Nearly two-thirds (62%) of participants were obese ($BMI > 30$) at the time of study recruitment, and the remaining 38% of participants were overweight ($BMI > 25$). Women represented 72.7 percent of the sample. Two-thirds (66.7%) of participants were married. Seventy-two percent reported college education or post-graduate study, and 94% percent were employed. One participant reported Hispanic ethnicity (1.5%), and 81.8% ($n = 54$) reported white origin. Of the nonwhite participants, two (3%) reported Native American origin and nine (13.6%) reported black origin. One participant did not report race/ethnicity data. No statistically significant differences were observed between groups with regard to baseline demographic variables ($p = .14-.99$).

Weight Change Outcomes

Results of general linear models of weight change by treatment group are presented in Table 2. At 6 months, mean unadjusted weight change in the intervention group was -0.72 kg (median = -0.91 , $SD = 3.7$, range = -10.3 to $+7.8$), versus -0.22 kg (median = $+0.23$, $SD = 2.3$, range = -6.6 to $+3.9$) in the control group. The model that adjusted for gender and baseline weight was nonsignificant [$F(1, 44) = 0.47$, $p = .50$] but in the direction of improved weight outcomes for the intervention group, with a small effect size ($d = .21$) yet a difference in weight change between groups that would result in a population-level effect on weight outcomes.¹⁴ Though the difference was statistically nonsignificant, weight loss was more likely than weight gain among intervention participants compared to control participants [68.2% vs. 46.2%, $\chi^2(1) = 2.35$, $p = .13$].

Weight Self-Monitoring Changes over Time

To test adherence to the daily self-weighing instruction delivered to intervention group and changes over time, trends in weight tracking over time were compared using a repeated measures general linear model. Results indicated a significant time $\times$ treatment condition interaction [$F(2, 41) = 10.84$, $p < .001$], such that participants in the intervention group showed a statistically significant increase in self-weighing frequency from baseline to 3 and

6 months (from 7.6 days on average to 25.5 at 3 months and 19.3 days at 6 months) relative to the control group (from 5.5 days on average to 7.3 days at 3 months and 8.5 days at 6 months). The plot of changes in weighing frequency over time is depicted in Figure 2.

Intervention Process and Compliance Data

One hundred percent of intervention participants attended an intervention session. Following the intervention visit, they had no formal contact with study staff except at the evaluation sessions, or to replace defective or missing equipment (scales or pedometers). All but one participant returned at least one tracking postcard after the intervention visit. After week 1, 90% of postcards were received. After week 6, postcard compliance had dropped to 58%, which is comparable to the 68% postcard return rate from an earlier weight gain prevention study conducted by members of the research team that included regularly scheduled newsletters.¹⁹

At least two weeks of monitoring postcards were obtained from 27 of 33 participants in the intervention condition (82%), and these data were used to track behavior compliance during intervention. On average, participants completed 12.6 postcards out of 24, for an adherence rate of 52.5%. Participants complied readily with the instruction to weigh themselves daily, with a mean weighing frequency of 5.3 (0.8) days per week reported on postcards, which corresponds closely to the self-report of weighing frequency on 3- and 6-month surveys (see Figure 2). Compliance with exercise recommendations was not strong, however, with mean reported days with one hour of exercise or more of only 1.0 (0.5) per week. Participants reported avoiding fried foods 50.6% of the time, fast foods 55.7% of the time, and red meat 36.5% of the time.

Intervention participants rated the brief intervention favorably at 3 and 6 month follow-up, with mean scores on a cue salience and reinforcement measure that assessed awareness of and satisfaction with program content trending in a positive direction [3-month mean = 40.6 (SD = 14.4; range = 10–64); 6-month mean = 39.6 (SD = 15.5; range = 10–62)], with no significant change in ratings over time [paired $t(19) = 0.43$, $p = .67$]. The measures were strongly and inversely correlated with weight change, such that higher scores were associated with greater weight losses at 6 months ($r = -0.51$ for 3-month scores, $p < .05$; $r = -0.63$ for 6-month scores, $p < .01$).

Discussion

This pilot and feasibility study was implemented to test an intervention designed to deliver empirically supported weight control strategies to adults motivated to engage in self-directed weight loss, in an efficient brief format. Program materials took a particular focus on reduced fat intake, increased physical activity, and daily self-weighing. Without regular group or individual sessions, intervention participants were able to attend to recommended behaviors, particularly that of frequent self-weighing, over six months. Behavior engagement during intervention was not as strong for dietary recommendations and exercise behaviors, which likely contributed to smaller weight changes relative to previous use of the minimal contact weight control paradigm on which this study was modeled.¹³ As self-monitoring is considered a key element of behavioral weight loss programs,¹⁶ the weekly

tracking postcards are likely to have served as useful behavior prompts over the course of the study.

In retrospect, a possible reason for weaker compliance with behaviors other than weighing may have been due to the information presented on diet and physical activity changes being more complex and less prescriptive than for weighing. Giving participants choice in strategies for weight control was intended to encourage them to select behaviors that they felt most likely to perform, but may have been a mistake in that it may have reduced the perceived importance of diet and exercise changes, perhaps leading to frequent choices of ineffective, if well intended, behaviors. In addition, whereas we recorded compliance in terms of the number of self-report monitoring postcards completed during the study, we are not able to ascertain whether these postcards reflect actual behavior engagement on the weeks for which they were returned.

Weight change results were not statistically significant due to small sample size of this pilot study and outliers, retained in the dataset for analysis, that were > 2 standard deviations (SD) above or below the mean in both intervention and control groups (e.g., an intervention subject with a weight gain of 7.8 kg, or 2.3 SD above the mean, and a control subject with a weight loss of 6.6 kg, or 2.8 SD below the mean). However, the direction and magnitude of the intervention effect in this pilot study is encouraging, in that the observed effects in this minimal contact study were, though not statistically significant, in the direction of greater weight loss and a higher percentage of participants with weight losses for the intervention group compared to control.

The study was limited by the relative homogeneity of this well-educated, largely married female participant group, though the racial and ethnic diversity of the sample is comparable to other studies conducted in this region. As the study was designed to minimize exposure of control participants to intervention recommendations, only the intervention participants engaged in postcard tracking of dietary behaviors and physical activity during the 6-month period, which limits the ability to address these two critical components of the weight loss process.

The overall response rate to the study flyer was low but comparable to previous tests of single-stage direct mail recruiting to weight control programs by a member of the research team.²⁰ In this study, a random sample of employees were selected from the University's human resources database to receive study flyers, and no attempts were made to target flyers based on two key features of this study: weight status and weight control program interest. Given that a relatively narrow BMI range of 25–35 kg/m² was established as an eligibility criterion for this study, U.S. data on prevalence of overweight and obesity⁴ suggest that only half of those who received flyers might have met criteria for the study in the first place; those outside the BMI range published on the flyers would not have been expected to contact study staff with interest in the project. Also, given that interest in weight control is not likely to have been universal even among those who met study BMI criteria, it is likely that the potential pool of eligible and interested participants among those who received flyers would have been reduced even further. Therefore, the response rate was not an

accurate representation of the ability to recruit interested and eligible adults to this type of program.

Despite its limitations, this pilot study was valuable in several ways. It established that a brief intervention is able to attract interest within a broader population not prescreened for weight status or weight loss interest and that weight change differences between the two treatment conditions are of approximately the magnitude that would produce a public health intervention effect.¹⁴ Also, self-reported adherence to a key intervention instruction (that of self-weighing) was strong and well-differentiated between intervention and control participants. The results of this study suggest that future public health weight control programs should enhance recruitment efforts for optimal population reach and should detail diet and physical activity message more prescriptively to parallel the specific instructions for self-weighing. Potential delivery channels for these materials, such as primary care clinics or health maintenance organizations, worksites, or other public health access points, need to be considered further. For these reasons, additional research on this crucial topic is merited.

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Figure 1.
Study participant flow diagram.

Figure 2.
Self-weighing frequency trends over time by treatment group.

Table 1

Baseline demographic characteristics by treatment group.

	Intervention (n = 33)			Control (n = 33)		
	Mean or Percent	SD	Range	Mean or Percent	SD	Range
Age	44.9	10.9		44.0	11.7	
Weight (kg)	86.6	10.9	67.0–118.8	87.6	14.2	64.0–120.3
Body mass index (kg/m ²)	31.1	3.2	25.7–36.5	31.2	3.0	26.8–38.6
Percent female	72.7%			72.7%		
Percent married	63.6%			69.7%		
Percent white	78.8%			84.9%		
Percent Hispanic	0%			3%		
Percent college educated	69.7%			84.9%		
Self-weighing (days/month)	7.6	11.9	0–30	5.5	9.4	0–30

Note. All differences between groups were statistically nonsignificant, $p = .14-.99$.

Table 2

Weight changes in kilograms at six months by treatment group.

	Intervention (<i>n</i> = 22)		Control (<i>n</i> = 26)		<i>p</i>	<i>d</i>
	Mean	SE	Mean	SE		
Unadjusted	−0.72	0.65	−0.22	0.59	.57	.17
Adjusted *	−0.80	0.66	−0.19	0.60	.50	.21

Note. SE = standard error.

* Adjusted model controlled for gender and baseline weight.