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Daily self-weighing within a lifestyle intervention: impact on disordered eating symptoms

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Abstract

Objective—To determine whether daily self-weighing (DSW) is associated with disordered eating (DE) symptoms within an adult lifestyle intervention (LI), and to examine changes in DE symptoms during the 18-month trial.

Methods—178 adults (53% female, 90% White, 52.0±8.6 yrs, BMI=35.0±4.4 kg/m^2) were enrolled in a randomized trial testing two dietary prescriptions within a LI (standard vs. limited dietary variety). Both arms were taught DSW and had the same contact schedule and calorie and activity goals. Frequency of weighing and DE were assessed at 0, 6, 12 and 18 months. Analyses controlled for treatment arm.

Results—At BL, 16.3% of participants reported weighing ≥daily compared with 83.7%, 72.3%, and 68.2% at 6, 12, and 18 months, respectively. There was no relationship between change in frequency of self-weighing and change in DE symptoms at any time point. Further, there were no significant differences between those who weighed ≥daily vs. <daily on DE composite scores at baseline or 6 months; at 12 and 18 months participants who weighed ≥daily reported lower DE scores compared with those who weighed <daily (p = .008 and .043 at 12 and 18 months, respectively). Participants who weighed ≥daily achieved better weight losses than those weighing <daily at 12 and 18 months (p=.003 and <.001). There was a significant reduction over time in DE symptoms (p<.0001) and a reduction in odds of meeting criteria for BED (p's<.001).

Conclusions—Daily self-weighing did not appear to be related to increased disordered eating behavior and was associated with better weight loss outcomes.

Keywords

daily weighing; self-weighing; behavioral weight loss; disordered eating

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Studies suggest that daily self-weighing (DSW) may be important for long-term weight control (Wing et al, 2006; Linde et al, 2005), and decreased frequency of self-weighing is independently associated with greater weight regain over time (Butryn et al, 2007). Despite data pointing to the benefits of DSW, behavioral weight loss programs (BWLP) often recommend weekly weighing (Brownell, 2004) and some researchers have argued that frequent weighing may result in an increased risk of developing eating disorders (e.g., Dionne & Yeudall, 2005), although there are few data to support these concerns. Rather, within an adult weight loss maintenance trial, adherence to DSW prescription was high (Wing et al, 2006) and no negative consequences were observed (Wing et al 2007). Similar findings have been reported in young adult samples (Gokee-LaRose et al, 2009; LaRose et al, 2010). However, to our knowledge, the impact of DSW on disordered eating symptoms within a standard adult BWLP has not been evaluated.

The primary aim of the current study was to examine change in disordered eating (DE) over an 18-month lifestyle intervention (LI) in which all participants were instructed to weigh daily, and to examine whether DSW was associated with DE behavior. Of note, we did not exclude participants with history of binge eating and /or DE at baseline. We hypothesized that: 1) adherence to DSW would be high, 2) frequency of self-weighing would not be associated with DE symptoms, and 3) there would be a global improvement in DE symptoms during the trial.

Methods

Participants and Procedure

This secondary data analysis draws from participants in a recently completed NIH-funded trial (R01DK074721; Raynor). A total of 202 participants were randomized, but data for this secondary analysis were collected after the first cohort began treatment. Thus, a total of 178 participants with complete data were included. Participants were recruited across two sites [109 (61%) from Knoxville, TN and 69 (39%) from Providence, RI] and were assessed at baseline, and at 6-, 12- and 18-months. Eligible participants were ≥ 21 years of age with a BMI of 27–45 kg/m^2. Individuals were excluded if they could not walk 2 blocks; reported a heart condition, chest pain during activity or rest, or loss of consciousness; were using weight loss medications or participating in a weight loss program; had bariatric surgery; were pregnant, lactating, <6 months post-partum or planned to become pregnant during the study; were allergic to foods used in hedonic measures (see Raynor et al, 2012 for details); or if they consumed <5 different types of highly-palatable, high-energy-dense (e.g., chips, cookies) foods. Participants were randomized to 1 of 2 arms: standard LI or LI with limited dietary variety (LV). Both arms were instructed to weigh daily, prescribed a low-calorie diet (i.e., 1200–1500 kcals/day, ≤30% kcals from fat) and ≥200 minutes / week of moderate-intensity exercise. Both groups attended weekly groups for the first 6 months, biweekly groups for the next 12 months, and were taught core behavioral modification strategies. Full trial details (including for the dietary prescription in the LV arm) and primary findings have been published previously (Raynor et al, 2012).

Measures

Demographics—Participants reported gender, age, education, marital status, race and ethnicity at baseline only.

Anthropometrics—Height and weight were measured at baseline, and BMI was calculated to determine eligibility for the trial. Weight was measured objectively at 0, 6, 12 and 18 months.

Frequency of Weighing—Participants were asked to report frequency of self-weighing at all visits by responding to: *"During the past month, how often did you weigh yourself?"* Response options were: 1) several times/day, 2) one time/ day, 3) several times/week, 4) one time/week, 5) less than once/week, 6) less than once/month, 7) never weighed myself. These response options have been used in previous studies on DSW (Wing et al, 2006, Gokee-LaRose et al, 2009; LaRose et al, 2010).

Eating Disorder Diagnostic Screening (EDDS)—The EDDS was self-administered at all visits. The 22-item EDDS was developed to diagnose DSM-IV eating disorders, including Binge Eating Disorder (BED) and has demonstrated an internal consistency of .89, test-retest reliability of .87, criterion validity with interview diagnoses, and convergent validity with other eating pathology scales (Stice, Telch & Rizvi, 2000). It has also been used to generate an overall eating disorder composite score, in which higher total scores represent more disordered eating behavior (Stice, Fisher & Martinez, 2004). In this study, it was used to assess 1) overall DE composite score, 2) full threshold BED, and 3) compensatory behaviors.

Statistical Analyses

All data were pooled across intervention arms and arm was included as a covariate in all analyses. Statistical analyses were performed using SAS 9.3 for Windows. Analyses of variance (ANOVA) were used for continuous variables and Chi-square tests for categorical variables for cross-sectional comparisons that examined relationships between demographics and baseline variables of interest. Partial correlations, controlling for treatment arm, site, and gender, were calculated to examine cross-sectional relationships between the change in weighing frequency and change in DE symptoms. Linear mixed model repeated measures ANCOVA were conducted using Proc MIXED to examine the change across time of the continuous measures of DE behaviors. The mixed models were fit with an autoregressive covariance structure; covariates included treatment arm, site, and gender. In addition, weighing frequency (i.e., ≥daily weighing v. <daily) was entered as a time-varying covariate to examine its relationship to the DE variables. All participants were included in the analyses, as Proc MIXED accommodates missing values under the assumption of missing at random to allow maximum use of the available data from each time point. We employed Generalized Estimating Equations (GEE) methodology, using Proc GENMOD, to compare the change in BED diagnosis and other categorical measures of DE behavior over time, controlling for treatment arm, site, and gender, and entered weighing frequency as a time-varying covariate to examine its relationship to DE variables over time.

Results

Participant Characteristics at Baseline

Participants were 53% female, 90% non-Hispanic White, and 52.0±8.6 years old, with a baseline weight of 102.1±18.3 kg, and a baseline BMI of 35.0±4.4 kg/m^2. The sample was highly educated with 67% having at least a college degree; 77% were married. At baseline, 20% of participants (n=36) met DSM-IV criteria for BED and the mean disordered eating (DE) composite score was 16.5±8.6. There were no significant differences for either BED diagnosis or average composite scores by treatment arm or site, or any demographic variables. No participants endorsed vomiting or use of laxatives or diuretics, 14.0% reported fasting / skipping >2 meals, and 18.5% endorsed excessive exercise.

Self-Weighing and Disordered Eating Composite Score over Time

At baseline, 16.3% of participants reported weighing at least daily compared with 83.7%, 72.3%, and 68.2% at 6, 12, and 18 months, respectively. Partial correlations between the change in frequency of self-weighing and change in the DE composite score yielded no significant association at 6 (p=.15), 12 (p=.64) or 18 months (p=.22). Further, there were no significant differences between weighing groups (i.e., ≥daily v. <daily) at baseline or 6 months; at both 12 and 18 months participants who weighed ≥daily reported lower composite scores compared with those participants who weighed <daily (see Table 1).

There was a significant time effect (p<.0001) for change in the composite score, controlling for weighing frequency, treatment arm, site, and gender. Among the covariates, there was a significant effect for site (p=.03). Tukey-Kramer post hoc follow-up tests found the composite score was significantly reduced (p<.0001) from baseline at 6, 12, 18 months by 4.5 (SE=0.7), 3.4 (SE=0.8), and 4.0 (SE=0.8) points, respectively. There were no significant changes between intermediate time points. To evaluate the effect of site, within site partial correlations between the change in frequency of weighing and change in the composite score were conducted. There was no association at 6 (p=.13 and .58), 12 (p=.56 and .25), or 18 months (p=.23 and .50) in either Tennessee or Providence, respectively. To ensure that those individuals who reported weighing >daily were not at risk for worsening in DE symptoms, cross-sectional ANOVAs were conducted to compare the mean scores for 3 groups (>daily, daily, <daily), controlling for treatment arm, site and gender. There were no significant differences between groups at 6 months (>daily n=21, daily n=118, <daily n=27; p=.28) or 18 months (>daily n=10, daily n=95, <daily n=49; p=.11). At 12 months (n=16, 96, 43 for >daily, daily, <daily groups, respectively) there was a significant difference between groups with those participants who reported weighing *less than* daily reporting the highest composite scores [>daily = 11.65 (SE=1.9), daily = 11.89 (SE=.74), <daily = 15.36 (SE=1.1), p=.03].

Binge Eating Disorder Diagnosis over Time

A GEE analysis found a significant time effect for change in BED diagnosis (p=.0009), and a reduced odds of being diagnosed with BED at 6 (p=.004), 12 (p=.0004), and 18 months (p=.0005) compared to baseline. There were no significant changes between intermediate time points. Among the covariates, there was a significant effect for site (p=.02). Compared

to 36 participants who met criteria for BED at baseline, 9 met criteria at 6 months, 6 met criteria at 12 months, and 7 met criteria at 18 months. Of those who met criteria for BED at baseline, all but 2 participants no longer met criteria for BED at 18 months. However, 9 participants who did not meet criteria for BED at baseline met criteria at one of the follow-up assessments. Importantly, no participant met criteria for BED at all time points.

Compensatory Behaviors over Time

Linear mixed models repeated measures analysis of covariance using the same covariate set (treatment arm, site, weighing frequency, and gender) in each analysis, were used to examine change in compensatory behaviors and found no worsening of these symptoms. There was no overall significant effect of change over time for: 1) vomiting (p=.26); 2) use of laxatives or diuretics (p=.33); 3) fasting / skipping ≥ 2 meals in a row (p=.34); or 4) excessive exercise (p=.76). There were also no significant changes from baseline to any of the follow-up time points, and there were no significant effects for any of the covariates. On the individual level, there were no new cases of fasting / skipping meals or excessive exercise reported. At 6 months there were 3 participants who reported compensatory behaviors (1 vomiting and 3 laxative / diuretic use across 3 participants). At 12 months there were 2 participants who reported compensatory behaviors (1 vomiting and 2 laxative / diuretics use). At 18 months there were 3 participants who endorsed compensatory behaviors (1 vomiting and 2 laxative / diuretics use). Of note, frequency of weighing differed for these individuals at the visits at which these instances were reported and no participant endorsed compensatory behaviors at all time points.

Relationship between Weight Change and Weighing Frequency

Controlling for the same covariates (i.e., treatment arm, site and gender), there were no significant differences in weight losses achieved at 6 months between participants who weighed at least daily (n=139) compared with those who weighed less than daily (n=27, p=.08). At 12 months participants weighing at least daily (n=112) achieved greater weight losses than those weighing less than daily (n=43) [−13.8±8.6 kg vs. −9.4±7.4 kg, p=.003]. Findings were consistent at 18 months; participants weighing daily (n=105) achieved superior weight losses compared with participants weighing less than daily (n=49) [−13.4±9.4 kg vs. −7.4±7.8 kg, p<.001].

Discussion

The current findings suggest that daily self-weighing (DSW) within the context of a lifestyle intervention (LI) may not be associated with increased disordered eating (DE), or with a worsening of preexisting symptoms. Adherence to the DSW prescription was quite good and those participants who reported weighing at least daily did not report higher levels of DE symptoms on average. To the contrary, at both 12 and 18 months, participants who reported weighing less than daily reported higher composite scores on average compared with participants who reported weighing at least daily. Moreover, an overall improvement in symptoms was noted, including reduced odds of being diagnosed with full threshold BED. These findings are consistent with those from previous studies (Wadden et al, 2004; Williamson et al, 2008) that have demonstrated decreased disordered eating symptoms

following participation in a LI, and suggest that similar benefits may be derived from a program prescribing DSW. Moreover, participants who weighed daily achieved superior weight loss outcomes at 12 and 18 months compared with those who weighed less frequently, which is consistent with extant data indicating that DSW is associated with effective long-term weight control (Wing et al, 2006; Linde et al, 2005; Butryn et al, 2007).

Despite improvements in DE symptomatology overall, it is important to note the reported new instances of binge eating or compensatory behaviors among several participants at follow up time points in this study. Although these instances were rare and did not appear to be associated with DSW, it is important to evaluate DE during treatment and to address any symptoms that may develop.

Participants in this study were not randomized to receive a DSW or alternative weighing prescription, which limits the conclusions that can be drawn. Future studies should seek to replicate these findings within the context of a randomized trial in which frequency of weighing is manipulated and DE is the primary outcome. Also, DE was assessed using a questionnaire instead of a clinical interview; it is possible that using a self-report measure resulted in under- or over-estimations of DE or failed to capture changes in symptoms that may have been noted on interview with a skilled clinician. Further, the majority of the participants were non-Hispanic White, and therefore, findings may not generalize to diverse samples. And finally, findings may not translate to community samples or individuals trying to lose weight on their own as this was within the context of a structured LI and treatment groups were led by behavioral experts with training in clinical psychology and / or nutrition.

Limitations withstanding, the present findings are still clearly of interest. This was the first study to examine the relationship between DSW and DE within an adult LI; the sample was large and participants were not screened out for a history of eating disorders, which allowed us to examine these relationships in a sample that included individuals who may arguably be at greatest risk of any potentially deleterious effects of DSW. In sum, daily self-weighing did not appear to be related to increased disordered eating behavior and was associated with better weight loss outcomes.

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Table 1

Disordered eating composite score by weighing status at all time points

Time	Frequency of Self-Weighing		
	Daily	Less than Daily	p value
Baseline	18.82 (1.6) (n=29)	16.08 (.70) (n=148)	.12
6 months	11.77 (.57) (n=139)	13.91 (1.3) (n=27)	.14
12 months	11.86 (.68) (n=112)	15.35 (1.1) (n=43)	.008
18 months	11.54 (.72) (n=105)	14.14 (1.1) (n=49)	.043

[a] *Note*: Values displayed represent adjusted means and standard errors. Covariates included were gender, treatment arm, and treatment site.