The Accuracy of Weight Reported in a Web-Based Obesity Treatment Program

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Abstract

Objective: The overall goal of the study was to understand the accuracy of self-reported weight over a 6-month Web-based obesity program. **Materials and Methods:** As part of a larger study, subjects ($n = 323$; 93% female; 28% African American) were randomized to a 6-month Internet-based behavioral weight loss program with weekly group meetings delivered either: (1) entirely by online synchronous chats or (2) by a combination of online chats plus monthly in-person group sessions. Observed weights were obtained at 0 and 6 months for all participants. Self-reported weights were submitted weekly to the study Web site. Differences in Observed and Reported weights were examined by gender, race, and condition. **Results:** Observed and Reported weight were significantly correlated at 0 and 6 months ($r = 0.996$ and 0.996 , $p < 0.001$ respectively). However, Reported weight underestimated Observed weight by 0.86 kg ($p < 0.001$) at 6 months. Further, there was a significant weight loss effect ($p < 0.001$) with those losing more weight more accurately estimating their Reported weight at 6 months. Additionally, 6-month Reported weight change differed from Observed weight change (difference = 0.72 kg, $p < 0.001$), with weight change using Reported weights estimating a slightly larger weight loss than Observed weights. **Conclusions:** In general, the accuracy of self-reported weight is high for individuals participating in an Internet-based weight loss treatment program. Accuracy differed slightly by amount of weight lost and was not improved with periodic in-person assessment. Importantly, weight change by self-report was comparable to observed, suggesting that it is suitable for Web-based obesity treatment.

Key words: e-health, telemedicine, telecommunications

Introduction

Previous research suggests that accuracy of self-reported weight can vary based on gender, race, education, body mass index (BMI), and age.^{1,2} Accuracy of self-reported weight during a weight loss intervention is unknown and

could differ based on degree of weight loss and type of intervention. Understanding the accuracy of self-reported weight is critical to implementation of Web-based obesity interventions in which participants are not weighed in-person. However, there are no data to inform whether self-reported weight is accurate in this context. Therefore, the aims of this study were (1) to understand the accuracy of self-reported weight over a 6-month Web-based obesity program; (2) to evaluate whether accuracy improved with periodic in-person observed assessment; and (3) to assess the effect of gender, race, and amount of weight lost on accuracy of self-reported weight.

Materials and Methods

Subjects were recruited in two clinical centers, Vermont and Arkansas, for a larger clinical trial that has been reported previously.³ In brief, eligibility criteria included age >18 years, BMI 25 to 50 kg/m², ability to participate in moderate physical activity, no major health problems for which weight loss was contraindicated, and Internet access. Recruitment was conducted from February 2003 to March 2005 and the study was approved by the Committee on Human Research in the Behavioral Sciences at the University of Vermont and the Institutional Review Board at the University of Arkansas for Medical Sciences.

Subjects were randomized to one of three 6-month, group-based behavioral weight control programs, which differed only in treatment delivery modality (in person or online). Of specific interest for the current report are the two programs delivered online. All aspects of the programs were similar, with identical treatment goals (dietary intake, physical activity, and weight loss) and behavioral strategies introduced to achieve these goals. All conditions were provided instructions to weigh themselves and record their weight on a weekly basis at a minimum, with recommendations that daily weighing would be beneficial.⁴ The online treatment conditions examined in this report included the following:

INTERNET

Participants in this condition attended weekly synchronous group chat sessions facilitated by a trained interventionist. All participants were asked to self-report their weight weekly on-line before the group session and were provided with an online tool with which to graph their weight change over time.

INTERNET + IN-PERSON (HYBRID)

Participants in this condition also attended online group synchronous chat sessions and reported their weight online. They attended weekly group chats 3 weeks out of the month and in the fourth week they had an in-person group meeting at which weight was

measured and recorded by study staff. Participants were provided with an online tool with which to graph and monitor weight over time.

MEASURES

Demographic data were obtained at baseline by self-report. Observed weights (referred to henceforth as Observed) were collected in the clinic at 0 and 6 month data collection visits on all participants. Weight was measured in street clothes, without shoes, on a calibrated digital scale. Self-reported weights (referred to henceforth as Reported) were examined to determine correspondence with Observed weights. Participants were required to self-report weight at baseline as part of the online application process. These self-reported weights were utilized for the baseline Reported weight value. Self-reported weights recorded online as part of the intervention proximal in time to the 6-month data collection visits were used for the 6-month Reported weight values. The self-reported weights were considered proximal if they were provided within 2 weeks of the observed weights.

ANALYSES

Baseline characteristics of subjects who had a 6-month self-reported weight were compared to those who did not using chi-square tests for dichotomous variables and t-test for continuous variables. The relationship between reported and observed weights was examined with Pearson correlation coefficients and paired t-test were used to compare reported and observed weights at 0 and 6 months. A relative difference percentage (RDIFF%) was calculated as [Observed-Reported/Observed]. T-tests were also used to examine RDIFF%'s by race, gender, and condition at both baseline and at 6 months. Simple linear regression was used to evaluate the relationship between RDIFF% at 6 months and amount of weight lost. Repeated measures analysis of variance was used to evaluate the differences in Reported versus Observed weight change by gender, race, and condition.

Results

Three hundred twenty-three individuals were randomized to the Internet ($n = 161$) and Hybrid ($n = 162$) conditions. Participants were predominantly female (93%) with 28% self-identifying as African American. Observed and Reported weights were available for all participants at baseline. Ninety-nine percent ($n = 319$) of randomized participants attended the 6-month assessment and therefore had an Observed weight; however, Reported weights were only available for 234 participants (73% of those completing 6-month assessment), due to failure to provide a weight within the 2-week window proximal to the Observed weight, which was considered in this analysis. *Table 1* presents the baseline characteristics of the sample overall, as well as data comparing those who had a qualifying 6-month self-reported weight with those who did not.

Among those attending the 6-month data collection visit, those who did not have a proximal reported weight at 6-month were significantly more likely to be female and African American than those

who did have a Reported weight available at 6 months. Additionally, those who did not have a 6-month Reported weight had significantly higher BMIs at baseline and had lost significantly less weight at 6 months compared with the participants who had a weight reported on the intervention Web site proximal to the 6-month point.

At baseline, the average Observed (97.0 kg) and Reported weight (97.0 kg) were significantly correlated ($r = 0.996$, $p < 0.001$). There were no significant differences in RDIFF% by gender at baseline. However, accuracy differed by race at baseline such that whites underestimated and blacks overestimated weight (RDIFF $-0.19\% \pm 1.8\%$ vs. $0.32\% \pm 1.4\%$, $p < 0.01$, respectively). Further, accuracy also differed by condition ($p < 0.001$). Participants who would be randomized to the Internet condition underestimated their weight by $0.62\% \pm 1.6\%$ when applying to the treatment program, whereas those who would go on to be randomized to the Hybrid condition overestimated their weight by $0.52\% \pm 1.7\%$.

As previously reported, both conditions achieved significant weight losses at 6 months (Internet: 5.5 ± 5.6 kg; Hybrid: 6.0 ± 5.5 kg, with no differences between treatment conditions.³ At 6 months, Observed and Reported weights for the sample were significantly correlated ($r = 0.996$, respectively, $p < 0.001$). Reported weight was underestimated in comparison to Observed weight by 0.86 kg (95% CI = 0.68 to 1.1 kg, $p < 0.001$) at 6 months in the sample as a whole. This magnitude of underestimation corresponds to $< 1\%$ of weight at 6 months. Simple linear regression analysis examining RDIFF% at 6 months as a function of weight loss showed as weight loss increased the relative difference between observed and reported weight decreased ($p < 0.001$). There were no significant differences in the RDIFF% between the conditions at 6 months, nor were there significant differences in RDIFF% by gender or race.

Finally, when examining weight change in the sample overall, there was a significant difference between the weight loss when calculated using change in Reported weight from baseline to 6 months compared to weight loss calculated using the change in Observed weights (difference = 0.72 kg, $p < 0.001$), with weight change using Reported weights estimating a somewhat larger weight loss than Observed weights. The discrepancy between Reported and Observed weight change over 6 months was also significantly different by race (1.3 vs. 0.55 kg, $p = 0.04$, for African Americans and whites, respectively) and by condition (0.18 vs. 1.4 kg, $p < 0.001$, for Internet and Hybrid, respectively). There was no significant difference in Reported versus Observed weight change by gender (0.81 vs. 0.27 kg, $p = 0.35$ for females and males, respectively).

Discussion

The accuracy of weight reported online in the context of a behavioral weight control treatment program was high. At program entry, there was no significant difference between weights reported online by participants and the weight observed in the clinic. However, after engaging in the 6-month online program, self-reported weight was significantly lower than weight observed in the clinic, although the magnitude of under-reporting of weight was quite small ($< 1\%$). Further, despite a significant discrepancy in weight change

Table 1. Baseline Subject Characteristics

	TOTAL RANDOMIZED (N= 323)	REPORTED WEIGHT AT 6-MONTH AVAILABLE (N= 234)	DID NOT HAVE A 6-MONTH REPORTED WEIGHT (N= 89)	p-VALUE (6-MONTH REPORTED WEIGHT VS. NO 6-MONTH REPORTED WEIGHT)
Gender (%)				
Male	6.8	8.6	2.3	
Female	93.2	91.4	97.7	0.04
Race (%)				
African American	27.7	23.2	39.8	
Caucasian	72.3	76.8	60.2	0.003
Condition (%)				
Internet	49.8	52.6	42.7	
Hybrid	50.2	47.4	57.3	0.11
Baseline Weight ^a (kg)	97.0 ± 17.4	96.0 ± 17.6	99.8 ± 16.6	0.08
Baseline BMI ^a (kg/m ²)	35.6 ± 5.6	35.1 ± 5.6	37.0 ± 5.4	0.01
Weight loss 0–6 months ^a (kg)	5.8 ± 5.5	7.1 ± 5.3	1.7 ± 4.1	<0.001
^a Mean ± SD.				
BMI, body mass index.				

reported from 0 to 6 months, the difference of the difference was only 0.72 kg. Thus, while there were absolute discrepancies between self-reported weight and observed values at post-treatment, and there were differences in self-reported weight change and observed weight change, the magnitude of the differences was consistently small, suggesting that self-reported online weights may be adequate for use in monitoring weight change over the course of treatment in Web-based programs.

Mattila and colleagues⁵ also evaluated electronically self-reported weights in comparison to observed weight as part of a 12-week study that utilized a Wellness Diary application on a mobile phone. Mattila et al. found that self-reported weights were underestimates of both baseline and post-treatment observed weights although the correlations between reported and observed weights at both times were still high (r 's > 0.80). The authors cite the timing of the measures, accuracy of home scales, and time of day home weights obtained as possible reasons for these discrepancies. These factors may also account for some of the variance between self-reported and observed weights in the current study.

Discrepancy between self-reported and observed weight varied based on race, with African Americans overestimating and whites underestimating weight at baseline. This is in contrast to studies by Gillum² and Field,⁶ who found African Americans and Caucasians to be similarly accurate in their estimations of weight. However, these studies were not conducted among individuals applying for a weight

loss program and the samples in these studies included individuals representing a wide range of body weights, unlike the present study, which is limited to treatment seeking, overweight and obese individuals. However, current finding that a slight discrepancy existed between Reported and Observed weight among overweight African American women is not inconsistent with other reports that indicate overweight individuals tend to underreport weight to a greater degree compared to those who have a lower body weight.^{1,7} There were also differences between races in the magnitude of weight change over the 6-month period, with African Americans overestimating the amount of weight they lost to a significantly greater degree compared to Caucasians. The utility of self-reported weight in online programs may not be consistent across racial and ethnic groups. This is something that should continue to be examined in future research.

Most previous research suggests that men overestimate their weight and women underestimate when self-reporting their weights,^{8,9} contrary to the current study in which there were no gender differences in accuracy of self-reported weights. These studies examined concordance in self-reported and observed weights in samples that were not restricted to treatment-seeking individuals and which included a spectrum of body weights—potentially meaningful distinctions between available research on gender differences in self-reported weight accuracy and the current study. It is possible that having few men in this study and restricting the sample to overweight or obese participants contributed to the lack of a gender difference in this study.

A key finding from this study is that accuracy of self-reported weight appeared to be better among individuals who lost more weight. As the amount of weight lost increased, the relative difference between actual and self-reported weight decreased. These findings could potentially be attributed to a less difficulty keeping track of a large weight loss than a small weight loss. Alternatively, those losing larger amounts were more focused on achieving lower body weight, perhaps valuing lower body weights to a greater degree, and therefore were more likely to keep accurate track of their progress.

Finally, periodic in-person meetings at which an observed weight was obtained did not enhance the accuracy of weight self-reported online. At 6 months, participants in both conditions tended to underreport their weight, but the differences between conditions were not significant ($p=0.19$). However, an examination of the discrepancy between Reported and Observed change in weight from 0 to 6 months revealed that those in the Hybrid condition overestimated their weight change when compared to the Internet only participants. Thus, although there were monthly opportunities for accountability or correction in the accuracy of perceived weight in the Hybrid group, this appears to have conferred no advantage on accuracy of self-reported weight.

Individuals who failed to supply an online weight proximal to their 6-month clinic visit also failed to lose a much weight as those who did provide a self-reported weight at 6 months. This is consistent with emerging evidence that regular self-weighing is strongly associated with successful weight loss.⁴ In the current study, those who were self-monitoring their weight at 6 months using the online tools had lost over four times as much weight as those who had not self-monitored at that point in the intervention.

In summary, self-reported weights recorded on-line as part of an Internet-based behavioral weight loss program were found to be valid and were capable of adequately capturing changes in weight. Our results are consistent with previous literature indicating that the magnitude of the discrepancies in self-reported weight is minor.^{1,2,5-10} In fact, while there were some differences in accuracy based on race and amount of weight lost, discrepancies rarely approached 1% of body weight. The addition of periodic in-person weigh-ins did not improve the accurate reporting of weight online. These data indicate that the additional expense and complexity of offering and staffing in-person weigh-ins is not beneficial in improving weight tracking in online programs.

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Disclosure Statement

No competing financial interests exist.

REFERENCES

1. Kovalchik S. Validity of adult lifetime self-reported body weight. *Public Health Nutr* 2008;15:1-6.
2. Gillum RE, Sempos CT. Ethnic variation in validity of classification of overweight and obesity using self-reported weight and height in American women and men: The Third National Health and Nutrition Examination Survey. *Nutr J* 2005;4:27-32.
3. Harvey-Berino J, West D, Krukowski R, Prewitt E, VanBiervliet A, Ashikaga T, Skelly J. Internet delivered behavioral obesity treatment. *Prev Med* 2010;51:123-128.
4. Wing RR, Tate DF, Gorin AA, Raynor HA, Fava JF. A self-regulation program for the maintenance of weight loss. *N Engl J Med* 2006;355:1563-1571.
5. Mattila E, Lappalainen R, Parkka J, Salminen J, Korhonen I. Use of a mobile phone diary for observing weight management and related behaviours. *J Telemed Telecare* 2010;16:260-264.
6. Field AE, Aneja P, Rosner B. The validity of self-reported weight change among adolescents and young adults. *Obesity* 2007;15:2357-2364.
7. Elgar FJ, Stewart JM. Validity of self-report screening for overweight and obesity. Evidence from the Canadian Community Health Survey. *Can J Public Health* 2008;99:423-427.
8. Lucca A, Moura EC. Validity and reliability of self-reported weight, height and body mass index from telephone interviews. *Cad Saude Publica* 2010;26:110-122.
9. Merrill RM, Richardson JS. Validity of self-reported height, weight, and body mass index: Findings from the National Health and Nutrition Examination Survey, 2001-2006. *Prev Chronic Dis* 2009;6:A121.
10. Ahluwalia IB, Tessaro I, Rye S, Parker L. Self-reported and clinical measurement of three chronic disease risks among low-income women in West Virginia. *J Womens Health* 2009;18:1857-1862.

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