J Behav Med (2019) 42:1142–1147
https://doi.org/10.1007/s10865-019-00045-0

BRIEF REPORT

Self-report versus objective measurement of weight history: implications for pre-treatment weight gain

Phoutdavone Phimphasone-Brady[1] · Lindsey M. Dorflinger[2] · Christopher Ruser[3,4] · Anastasia Bullock[5] · Kathryn M. Godfrey[6] · Dominica Hernandez[7] · Kathryn M. Min[3] · Robin M. Masheb[3,8]

Received: January 9, 2019 / Accepted: April 9, 2019 / Published online: April 23, 2019

Abstract There is increasing concern that patients gain considerable weight in the year prior to treatment and that outcomes may not reflect true treatment losses. To date, we know little about the accuracy of self-reported weight change prior to treatment. To investigate weight gain, and accuracy of self-reported recent weight history, Veterans (n = 126) reported their current weight and one-year weight history prior to entering treatment. These weights were compared to electronic medical record weights. Patients gained an average of 2.03 kg (4.5 lbs) in the year prior to treatment. Self-report and objective weight assessments showed high concurrent validity at the group level. However, standard deviations for the absolute difference scores revealed high individual variability in historical reporting, suggesting that weight loss seeking patients are inaccurate reporters of recent weight. Our findings have implications for the emerging area of pre-treatment weight gain research and processes for clinical care.

Keywords Obesity · Pre-treatment weight change · Weight recall · Veterans · Weight loss predictors

✉ Robin M. Masheb
robin.masheb@yale.edu

[1] Department of Family Medicine, Adult and Child Consortium for Health Outcomes Research and Delivery Science (ACCORDS), Center on Aging, University of Colorado School of Medicine, Aurora, CO, USA

[2] Behavioral Health, Walter Reed National Military Medical Center, Bethesda, MD, USA

[3] Veterans Initiative for Eating and Weight (The VIEW), VA Connecticut Healthcare System, PRIME Center/11ACSLG, West Haven, CT, USA

[4] Internal Medicine, Yale School of Medicine, New Haven, CT, USA

[5] Division of Behavioral Medicine, Cooper University Hospital, Camden, NJ, USA

[6] Center for Weight Eating and Lifestyle Science, Drexel University, Philadelphia, PA, USA

[7] Institute for Collaboration on Health, Intervention, and Policy, University of Connecticut, Storrs, CT, USA

[8] Department of Psychiatry, Yale School of Medicine, New Haven, CT, USA

Introduction

Weight gain in the year prior to weight loss treatment is gaining increased attention in the literature (Kerrigan et al., 2016; Tronieri et al., 2018; West et al., 2011). Tronieri et al. (2018) found that participants who gained weight between the period of screening to treatment initiation lost more weight during treatment (i.e., from initiation to post-treatment), but loss less weight overall (i.e., from screening to post-treatment). Relatedly, the effect of weight suppression (WS)—the discrepancy between treatment baseline weight and self-reported highest lifetime weight—has been associated with outcomes in weight loss treatment. In a recent study, participants with higher WS lost significantly less weight than participants with lower WS, though both groups still achieved clinically meaningful losses (Call et al., 2018). Taken together, these findings suggest that weight gain or loss prior to treatment can have implications for treatment outcomes. Given the lack of research on pre-treatment weight gain in relation to treatment planning, more research is needed in this area for potential to individually tailor weight loss expectations.

To assess weight history and pre-treatment weight gain, self-reported height and weight are commonly used for efficiency and cost-effectiveness, and/or when objective assessments are unavailable. With respect to accuracy of self-report, treatment

seeking individuals with overweight/obesity (Harvey-Berino et al., 2011) and individuals with eating disorders tend to be accurate reporters of weight (Doll & Fairburn, 1998; Masheb & Grilo, 2001), likely because of the increased focus on weight goals. To date, we know little about the accuracy of historical weight reporting. This may be critical as studies of clinical populations with overweight suggest that weight loss during treatment may reflect loss of weight that was gained in the year prior to treatment initiation (Ivezaj et al., 2014; Masheb et al., 2013). Among Veterans, a population with high prevalence of obesity and significant history of weight fluctuations to meet requirements while in service (Breland et al., 2017), little is known about pre-treatment weight gain and weight reporting. In the limited research available, previous studies found an effect of recall bias and that high weight status was associated with greater underreporting of weight (Clark et al., 2017; Kinney, 1988). Accurate methods in weight assessments could enable researchers to determine whether pre-treatment weight gain is appreciable weight loss or whether it influences health status.

The aims of this study were to: (1) determine pre-treatment weight gain, (2) determine the accuracy of current self-reported weight, and (3) determine the accuracy of self-reported weight history in the year prior to weight loss treatment. Given past studies showing greater inaccuracy of self-reported weight among Veterans with higher weight, we hypothesized that Veterans seeking behavioral weight management treatment in primary care would not be accurate reporters. We also explored possible relationships among self-reported weight and other variables, including mental health symptoms, eating behaviors, and other health behaviors.

Methods

Participants and setting

Veterans with overweight/obesity were referred by their primary care providers to the MOVE! weight management program at VA Connecticut Healthcare System (VACHS). The MOVE! program is an outpatient, evidence-based comprehensive lifestyle intervention for weight management. Prior to starting, Veterans attended an orientation session and completed self-report assessments as part of standard clinical care. The study was approved by the IRB at VACHS with written consent waived. Implied consent was inferred by participants' completion of the surveys. Data was collected from October 2014–November 2015.

Demographics and weight history measures

Demographics

Information on sex, age, ethnicity, and race was self-reported. Body mass index (BMI) was extracted from participants' electronic medical record (EMR).

Current and historical weight

Weight history was collected by two methods: (1) self-report and (2) objective weight data from the EMR. For self-reported weight, we asked participants to report their weight at orientation (i.e., baseline) and 3-, 6-, and 12-months prior to baseline. For the objective weight data, we considered the MOVE! orientation date as the baseline index date. Index dates for each retrospective time point (i.e., 3-, 6-, and 12-months) were calculated from this baseline index date. Weight data for each time point were selected based on the weight that was closest to the index date within a predetermined window of time: − 45 days before the baseline index date; ± 45 days before and after the 3-month index date, + 45 days after and − 90 days before the 6-month index date, and + 90 after and − 180 days before the 12-month index date.

Self-reported questionnaires

Participants completed the following self-report questionnaires of health behaviors and mental health symptoms. All questionnaires have demonstrated good internal consistency, reliability, and convergent validity and were selected as potential correlates of weight reporting.

Eating behaviors

A shortened version of the Eating Disorder Examination Questionnaire assessed symptoms of eating disorders (EDE-Q; Grilo et al., 2013). The Night Eating Questionnaire (Allison et al., 2008) assessed symptoms of night eating syndrome. The Yale Emotional Overeating Questionnaire (Masheb & Grilo, 2006) assessed the frequency of emotional overeating.

Health behaviors

The Insomnia Severity Index (Morin et al., 2011) measured for the presence and severity of insomnia. For pain, participants completed one measure that assessed three pain constructs: Pain, Enjoyment, and General Activity (i.e., the

PEG, Krebs et al., 2009) as well as the Brief Pain Inventory (Cleeland & Ryan, 1994). The Alcohol Use Disorders Identification Test (Bush et al., 1998) assessed alcohol consumption.

Mental health symptoms

The Patient Health Questionnaire (Kroenke et al., 2003) assessed for depression, and the Primary Care PTSD Screen (Cameron & Gusman, 2003) for the presence of PTSD symptoms.

Data analyses

All data were analyzed using SPSS version 24. Weight data was converted from pounds (lb) to kilograms (kg). Demographic information was analyzed with frequencies and descriptive statistics. A correlation analysis between self-report and EMR weights was performed. Difference scores were calculated by subtracting the self-reported weight from the EMR weight at each time point to assess under- or over-reporting of weight. A limitation of the difference score is the inability to detect average misreporting across all participants if there are comparable degrees of under- and over-reporting. Therefore, the absolute value of the difference scores were also calculated to determine the magnitude of inaccuracy, regardless of the direction of reporting (under- or over-reporting) at the individual level.

To determine the accuracy of current and historical weight reporting, we analyzed intraclass correlation coefficients (ICC) and Bland–Altman (BA) graphical plots. The BA method is considered a more robust approach to determine reliability and agreement between two types of assessment because it allows for a systematic evaluation of agreement (Bland & Altman, 1986; Earthman, 2015).

Finally, we performed Pearson correlation analyses between difference scores and absolute value of the difference scores and self-report assessments of eating behaviors, health behaviors, and mental health symptoms.

Results

Demographics and pre-treatment weight gain

Participants (n = 126) were 89.7% male with mean age of 61.8 years (SD = 8.6); 76.0% identified as White/Caucasian, 20.0% identified as Black/African American, and 4.0% identified as Asian/Pacific Islander, Native American/Alaska Native, or other. At baseline, the average EMR BMI for the total sample was 38.6 kg/m^2 (SD = 7.5).

All participants provided self-reported weight data. The total number of participants with objective weight data was 92 (71.4%) at baseline, 90 (71.4%) at 3-months, 87 (69%) at 6-months, and 95 (76.2%) at 12-months. The proportion of available objective weight data obtained at each time point was comparable to, or exceeded, previous studies (Jerome et al., 2014). A repeated measures ANOVA revealed a significant difference in EMR BMI at 12-months prior (M = 38.0, SD = 6.97) and baseline (M = 38.6, SD = 7.66; Wilks' Lambda = 0.95, F (1, 92) = 4.86, p = .030). Participants' mean EMR weight at 12-months was 116.1 kg (255.3 lbs) and mean weight at baseline was 118.08 kg (259.8 lbs). This equates to a weight gain of 2.03 kg (4.5 lbs) in the year prior to treatment.

Similarities and differences between self-reported weights and EMR weights

The means and standard deviations for self-reported and EMR weights for each time point (i.e., baseline, 3-, 6-, and 12-months prior to baseline) were significantly correlated at 0.97 or above ($p < 0.001$). The difference score means (self-reported weight minus EMR weight) ranged from 0.00 to -0.69 kg (*SDs* ranged from 4.81 to 6.44 kg) with no difference at 3-months prior to baseline and a small degree of underreporting at other time points (i.e., -0.3 to -1.5 kgs). Small difference score means are suggestive of accurate reporting; large standard deviations suggest high individual variability. Absolute value of the difference scores ranged from 2.50 to 4.99 kg (*SDs* ranged from 3.40 to 5.95 kg) with the least variability in reporting at baseline and the most variability in reporting at 12-months prior, suggesting high individual variability in reporting. Correlation analyses revealed no significant associations among difference scores and any of the variables assessing eating behaviors, health behaviors, or mental health symptoms.

Bland–Altman plots and intraclass correlation coefficients

BA plots and ICCs were analyzed to confirm degree of agreement between self-report and EMR assessments at each time point at the group level. Figure 1 of the BA plots for each time point demonstrate narrow limits of agreement (LOA), indicating good and acceptable LOA. The ICCs comparing self-report and EMR weights for each time point were 0.98 and above ($p's < .001$) indicating a high degree of agreement.

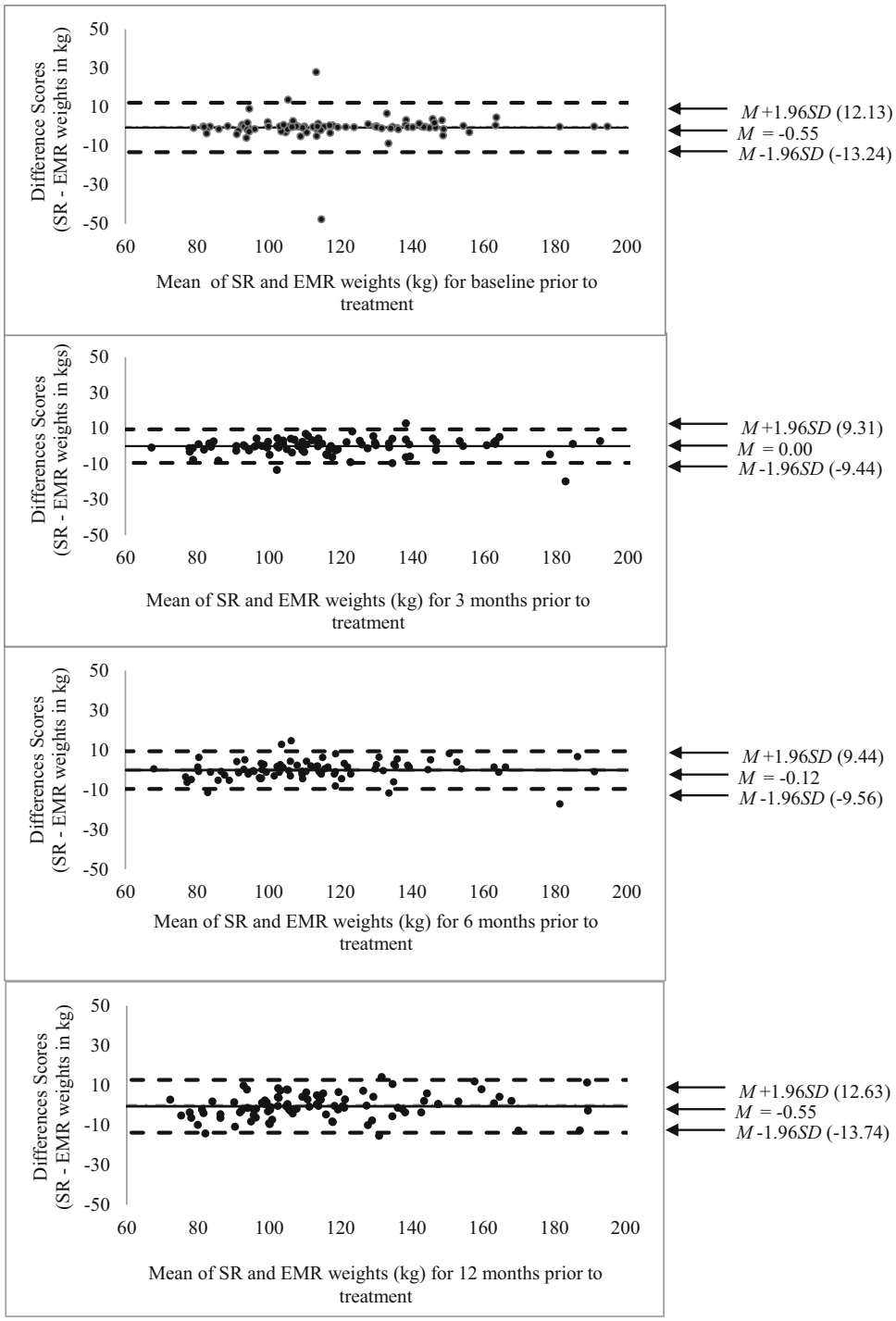

Fig. 1 Bland–Altman plots for baseline and 3-, 6- and 12-month weights prior to weight management treatment

Discussion

This study explored pre-treatment weight gain and the accuracy of self-reported weight compared to EMR weights among Veterans with overweight/obesity initiating weight management treatment. Accuracy of self-reported weight is especially important for interpreting outcomes of weight management success, given previous studies showing the effect of pretreatment weight change on outcomes (Kerrigan et al., 2016; Masheb et al., 2013; Tronieri et al., 2018; West et al., 2011).

We found that participants in this study gained on average 2.03 kg (4.5 lbs) in the year prior to initiating treatment, which has implications for the interpretation of weight gain or loss during treatment (Ivezaj et al., 2014; Masheb et al., 2013). Further, correlation analyses revealed

no significant associations among difference scores and mental health or behavioral variables, similar to previous research with a clinical sample of individuals with overweight (Masheb & Grilo, 2001; White et al., 2010); therefore, it remains difficult to identify which individuals may be at higher risk for pre-treatment weight gain. We also observed high levels of accuracy of self-reported weight relative to EMR weight at the *group level*. These findings are consistent with previous studies of high weight accuracy among individuals actively engaged in weight loss (Dahn et al., 2011; Harvey-Berino et al., 2011). BA plots and ICCs further confirmed a high degree of agreement between weight assessment methods. However, at the *individual level*, the absolute value of the difference and the standard deviation scores suggest high individual variability in accuracy. This finding confirms our hypothesis, as Veterans do not appear to be accurate reporters at the individual level. The standard deviations of the mean difference for each time point ranged widely and were higher than previous studies (Jerome et al., 2014). The wide range of absolute difference scores for each time point indicates that Veterans' accuracy in self-reported weight varied in either direction. In addition, accuracy decreased as time from baseline increased. The absolute difference at baseline was 2.5 kg (5.5 lbs) and at 12-months prior was 5 kg (11.0 lbs). This finding was consistent with previous studies showing that accuracy decreases over time (Kovalchik, 2009; Kyulo et al., 2012). Further understanding of factors and conditions that affect individual variability in weight accuracy and the determinants of pre-treatment weight gain need investigation.

These findings may have important clinical implications. Clinicians should take pre-treatment weight change into account when treatment planning and setting goals. Starting weight should be assessed upon the initiation of treatment, rather than during recruitment, as weight can change between these time points and weight goals set prior to treatment initiation may no longer be appropriate. Weight change prior to treatment can also help individually tailor weight goals to be more in line with expectations.

Limitations and strengths

This study was conducted using a clinical sample of older, mostly male Veterans, who tend to have a greater number of comorbid diagnoses and attend more medical appointments than the general population (Littman et al., 2012). This study also examined a sample of patients referred for weight management treatment within primary care at one site. Thus, findings may not generalize to other samples of Veterans, other weight loss-seeking adults, or civilian patients who are not seeking weight loss treatment. This sample of convenience, however, was demographically and diagnostically similar to the large majority of Veterans who attend MOVE! (Kahwati et al., 2011). Despite these limitations, the present study provides a few notable strengths. First, data were collected from a clinical sample, which enhances generalizability to clinically relevant studies focused on patient outcomes and success in weight management treatment. Second, Veteran patients afford a unique opportunity to compare self-report versus objective measurement of weight history. Weights are taken at every primary care visit and the healthcare system is a closed system with a national EMR, making it possible to obtain objective weight data at many time points. Finally, we utilized multiple statistical approaches to compare accuracy of weight methods, providing an indication of a robust approach to examine accuracy at both group and individual levels.

Conclusions

In conclusion, this study is the first to examine pre-treatment weight gain among weight loss seeking Veterans, and the first study to examine the accuracy of self-reported one-year weight history in any weight loss seeking population. Future studies should assess whether tailored weight goals, taking pre-treatment weight change into account, impact weight and health status as well as other outcomes of interest such as satisfaction with and adherence to treatment.

Acknowledgements We thank Alison G. Marsh for assistance in preparing this manuscript for submission. We also thank Jodi Holtrop, PhD, and Bethany Kwan, PhD, for their review on previous versions of this manuscript.

Funding This project was supported in part by VA's Health Services Research and Development (HSR&D) Center of Innovation (COIN), Pain Research, Informatics, Multi-morbidities, and Education (PRIME) Center, West Haven, CT (CIN 13-407). The content of this research is solely the responsibility of the authors and does not necessarily represent the official views of the Department of Veterans Affairs or Veterans Health Administration.

Compliance with ethical standard

Conflict of interest Phoutdavone Phimphasone-Brady, Lindsey M. Dorflinger, Christopher Ruser, Anastasia Bullock, Kathryn M. Godfrey, Dominica Hernandez, Kathryn M. Min, and Robin M. Masheb do not have any conflicts of interest or disclosures to declare.

Human and animal rights and Informed consent All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Participants completed this study as part of standard clinical care. Written consent was waived with implied consent, and the study was approved by the IRB at VA Connecticut Healthcare System.

References

Allison, K. C., Lundgren, J. D., O'Reardon, J. P., Martino, N. S., Sarwer, D. B., Wadden, T. A., et al. (2008). The Night Eating Questionnaire (NEQ): Psychometric properties of a measure of severity of the Night Eating Syndrome. *Eating Behaviors, 9,* 62–72. https://doi.org/10.1016/j.eatbeh.2007.03.007

Bland, J. M., & Altman, D. G. (1986). Statistical methods for assessing agreement between two methods of clinical measurement. *Lancet, 1,* 307–310.

Breland, J. Y., Phibbs, C. S., Hoggatt, K. J., Washington, D. L., Lee, J., Haskell, S., et al. (2017). The obesity epidemic in the Veterans Health Administration: Prevalence among key populations of women and men veterans. *Journal of General Internal Medicine, 32,* 11–17. https://doi.org/10.1007/s11606-016-3962-1

Bush, K., Kivlahan, D. R., McDonell, M. B., Fihn, S. D., & Bradley, K. A. (1998). The AUDIT alcohol consumption questions (AUDIT-C): An effective brief screening test for problem drinking. Ambulatory Care Quality Improvement Project (ACQUIP). Alcohol Use Disorders Identification Test. *Archives of Internal Medicine, 158,* 1789–1795.

Call, C. C., Piers, A. D., Wyckoff, E. P., Lowe, M. R., Forman, E. M., & Butryn, M. L. (2018). The relationship of weight suppression to treatment outcomes during behavioral weight loss. *Journal of Behavioral Medicine*, 1–11.

Cameron, R. P., & Gusman, D. (2003). The primary care PTSD screen (PC-PTSD): Development and operating characteristics. *Primary Care Psychiatry, 9,* 9–14.

Clark, H. L., Heileson, J., DeMay, J., & Cole, R. E. (2017). Misperceptions of weight status in military men and women. *Military Medicine, 182,* e1792–e1798. https://doi.org/10.7205/MILMED-D-16-00202

Cleeland, C. S., & Ryan, K. M. (1994). Pain assessment: Global use of the Brief Pain Inventory. *Annals Academy of Medicine Singapore, 23,* 129–138.

Dahn, J. R., Fitzpatrick, S. L., Llabre, M. M., Apterbach, G. S., Helms, R. L., Cugnetto, M. L., et al. (2011). Weight management for veterans: Examining change in weight before and after MOVE! *Obesity, 19,* 977–981.

Doll, H. A., & Fairburn, C. G. (1998). Heightened accuracy of self-reported weight in bulimia nervosa: A useful cognitive "distortion". *International Journal of Eating Disorders, 24,* 267–273.

Earthman, C. P. (2015). Body composition tools for assessment of adult malnutrition at the bedside: A tutorial on research considerations and clinical applications. *J Parenteral and Enteral Nutrition, 39,* 787–822. https://doi.org/10.1177/0148607115595227

Grilo, C. M., Henderson, K. E., Bell, R. L., & Crosby, R. D. (2013). Eating disorder examination-questionnaire factor structure and construct validity in bariatric surgery candidates. *Obesity Surgery, 23,* 657–662. https://doi.org/10.1007/s11695-012-0840-8

Harvey-Berino, J., Krukowski, R. A., Buzzell, P., Ogden, D., Skelly, J., & West, D. S. (2011). The accuracy of weight reported in a web-based obesity treatment program. *Telemedicine Journal of E-health, 17,* 696–699. https://doi.org/10.1089/tmj.2011.0032

Ivezaj, V., Kalebjian, R., Grilo, C. M., & Barnes, R. D. (2014). Comparing weight gain in the year prior to treatment for overweight and obese patients with and without binge eating disorder in primary care. *Journal of Psychosomatic Research, 77,* 151–154. https://doi.org/10.1016/j.jpsychores.2014.05.006

Jerome, G. J., Dalcin, A., Coughlin, J. W., Fitzpatrick, S., Wang, N. Y., Durkin, N., et al. (2014). Longitudinal accuracy of web-based self-reported weights: Results from the Hopkins POWER Trial. *Journal of Medical Internet Research, 16,* e173. https://doi.org/10.2196/jmir.3332

Kahwati, L. C., Lance, T. X., Jones, K. R., & Kinsinger, L. S. (2011). RE-AIM evaluation of the Veterans Health Administration's MOVE! Weight management program. *Translational Behavioral Medicine, 1,* 551–560.

Kerrigan, S. G., Schaumberg, K., Kase, C., Gaspar, M., Forman, E., & Butryn, M. L. (2016). From last supper to self-initiated weight loss: Pretreatment weight change may be more important than previously thought. *Obesity, 24,* 843–849.

Kinney, E. L. (1988). Accuracy of self-reported weight in a non-normal population. *Clinical and Investigative Medicine, 11,* 347–350.

Kovalchik, S. (2009). Validity of adult lifetime self-reported body weight. *Public Health Nutrition, 12,* 1072–1077. https://doi.org/10.1017/S1368980008003728

Krebs, E. E., Lorenz, K. A., Bair, M. J., Damush, T. M., Wu, J., Sutherland, J. M., et al. (2009). Development and initial validation of the PEG, a three-item scale assessing pain intensity and interference. *Journal of General Internal Medicine, 24,* 733–738. https://doi.org/10.1007/s11606-009-0981-1

Kroenke, K., Spitzer, R. L., & Williams, J. B. (2003). The Patient Health Questionnaire-2: Validity of a two-item depression screener. *Medical Care, 41,* 1284–1292. https://doi.org/10.1097/01.MLR.0000093487.78664.3C

Kyulo, N. L., Knutsen, S. F., Tonstad, S., Fraser, G. E., & Singh, P. N. (2012). Validation of recall of body weight over a 26-year period in cohort members of the Adventist Health Study 2. *Annals of Epidemiology, 22,* 744–746. https://doi.org/10.1016/j.annepidem.2012.06.106

Littman, A. J., Boyko, E. J., McDonell, M. B., & Fihn, S. D. (2012). Evaluation of a weight management program for veterans. *Preventing Chronic Disease, 9,* E99.

Masheb, R. M., & Grilo, C. M. (2001). Accuracy of self-reported weight in patients with binge eating disorder. *International Journal of Eating Disorders*, *29*, 29–36.

Masheb, R. M., & Grilo, C. M. (2006). Emotional overeating and its associations with eating disorder psychopathology among overweight patients with binge eating disorder. *International Journal of Eating Disorders*, *39*, 141–146. https://doi.org/10.1002/eat.20221

Masheb, R. M., White, M. A., & Grilo, C. M. (2013). Substantial weight gains are common prior to treatment-seeking in obese patients with binge eating disorder. *Comprehensive Psychiatry*, *54*, 880–884. https://doi.org/10.1016/j.comppsych.2013.03.017

Morin, C. M., Belleville, G., Belanger, L., & Ivers, H. (2011). The Insomnia Severity Index: Psychometric indicators to detect insomnia cases and evaluate treatment response. *Sleep, 34,* 601–608.

Tronieri, J. S., Wadden, T. A., Alfaris, N., Chao, A. M., Alamuddin, N., Berkowitz, R. I., et al. (2018). "Last supper" predicts greater weight loss early in obesity treatment, but not enough to offset initial gains. *Frontiers in Psychology*. https://doi.org/10.3389/fpsyg.2018.01335

West, D. S., Harvey-Berino, J., Krukowski, R. A., & Skelly, J. M. (2011). Pretreatment weight change is associated with obesity treatment outcomes. *Obesity, 19,* 1791–1795.

White, M. A., Masheb, R. M., & Grilo, C. M. (2010). Accuracy of self-reported weight and height in binge eating disorder: misreport is not related to psychological factors. *Obesity (Silver Spring), 18,* 1266–1269. https://doi.org/10.1038/oby.2009.347