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Importance of self-weighing to avoid post-cessation weight gain: A secondary analysis of the fit and quit randomized trial

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Abstract

Background: Smoking cessation is associated with weight gain, and the risk of weight gain is a common deterrent to quitting smoking. Thus, the identification of strategies for reducing post-smoking cessation weight gain is critical.

Objective: Conduct secondary analysis of data from the Fit & Quit trial to determine if greater frequency of self-weighing is associated with less weight gain in the context of smoking cessation.

Methods: Participants ($N = 305$) were randomized to one of three 2-month weight interventions (i.e., Stability, Loss, Bibliotherapy), followed by a smoking cessation intervention. Stability and Loss conditions received different types of self-weighing feedback. All participants received e-scales at baseline, to capture daily self-weighing data over 12 months. General linear models were applied to test the main objective.

Results: Frequency of self-weighing was (mean $\pm$ SD) 2.67 $\pm$ 1.84 days/week. The Stability condition had significantly higher self-weighing frequency (3.18 $\pm$ 1.72 days/week) compared to the Loss (2.51 $\pm$ 1.99 days/week) and the Bibliotherapy conditions (2.22 $\pm$ 1.63 days/week). Adjusting for baseline weight and treatment condition, self-weighing 3–4 days/week was associated with weight stability (−0.77 kg, 95% CI: −2.2946, 0.7474, $p = 0.3175$), and self-weighing 5 or more days/week was associated with 2.26 kg weight loss (95% CI: −3.9249, −0.5953, $p = 0.0080$).

Conclusions: Self-weighing may serve as a useful tool for weight gain prevention after smoking cessation. Feedback received about self-weighing behaviors and weight trajectory (similar to the feedback Stability participants received) might enhance adherence.

KEYWORDS
behavioral science, intervention, monitoring, smoking, weight maintenance

1 | INTRODUCTION

Smoking cessation is associated with reduced morbidity and mortality[1–5]; however, for most adults, cessation is also associated with weight gain. A meta-analysis found that on average, previous smokers gain about 5 kg of weight by 1 year post-smoking cessation, with the greatest weight gain occurring during the first 3 months[6] and greater weight gains experienced by those with healthy weight and overweight.[7] Weight gain after smoking cessation is also associated with an increased incidence of hypertension and an increased risk of developing type 2 diabetes,[8,9] and the risk of weight gain serves as a key barrier to quitting smoking in many adults.[10] Thus, the identification of strategies for decreasing post-smoking cessation weight gain has important public health implications.

Due to the importance of trying to reduce post-cessation weight gain, the effectiveness of many different pharmacologic and behavioral interventions on reducing post-cessation weight gain have been evaluated. Overall, the impact that these strategies have on post-cessation weight gain seems to be limited. Specifically, the most recent Cochrane review indicates that while certain medications (e.g., phenylpropanolamine, naltrexone, dexfenfluramine, bupropion, fluoxetine) may be helpful in the short-term after quitting smoking, these medications are associated with potential side effects and seem to have limited efficacy in the long-term.[11] Similarly, there have also been multiple studies investigating behavioral intervention packages (e.g., exercise, diet modification, mindful eating, cognitive behavioral therapy) for reducing weight gain after quitting smoking.[12] However, meta-analysis has shown that these behavioral weight management intervention packages did not lead to a significant improvement in post-cessation weight gain.[12] Nonetheless, particular behavioral strategies may be effective for weight management and may be appropriate for testing in future intervention packages for avoiding post-cessation weight gain.

Within the broader weight management literature, self-weighing has been identified as a key strategy for promoting weight loss and weight loss maintenance.[13–20] Most of the extant studies on self-weighing tend to analyze the *frequency* of self-weighing, defined as "the number of days that participants self-weighed".[13,15–17,19,21] Previous research has shown that self-weighing 6–7 days per week is beneficial in the context of weight loss.[13,22] However, no studies have investigated the frequency of self-weighing and the patterns of self-weighing over time that are beneficial in individuals who are quitting smoking and are thus at risk of post-cessation weight gain. Self-weighing may be a potent strategy that is easy to disseminate and thus merits investigation in preventing post-cessation weight gain.

Newer self-monitoring technologies, including e-scales (also known as smart scales) facilitate the examination of patterns of self-weighing that may be beneficial in weight management. These scales appear similar to a typical digital scale, but transmit measured weight through the cellular network, wireless Internet, or a Bluetooth connection with another device like a smartphone.[23] E-scales are more accurate measures of self-weighing frequency compared to self-report[24] and are now quite broadly available and inexpensive. E-scales also may reduce participant burden related to tracking self-weighing frequency and their weight trajectory.

This study aimed to contribute to the knowledge of post-cessation weight management by using e-scale data to examine associations between frequency of self-weighing and weight changes experienced by participants who engaged in the "Fit & Quit" post-cessation weight management clinical trial.[25] The primary hypothesis examined was that greater frequency of self-weighing is associated with less weight gain, regardless of intervention condition. Exploratory analyses evaluated whether there were potential thresholds for the frequency of self-weighing associated with weight maintenance or weight loss. Additional exploratory analyses examined the frequency of self-weighing by intervention period to determine the potential association with weight change. Self-weighing may be particularly potent or perhaps ineffective during specific intervention periods.

2 | METHODS

Self-weighing data gathered via e-scales from participants in the "Fit & Quit" randomized controlled trial was used for this secondary analysis study. All methods of the Fit & Quit trial have been described previously,[25] and main outcomes have been reported elsewhere.[26] The goal of the parent study was to investigate the efficacy of a weight loss and a weight stability intervention in reducing post-smoking cessation weight gain. Participants in the parent study were allocated by the study statistician using a custom SAS randomization algorithm with a sequence blocked by baseline weight category (normal weight, overweight, obesity) and gender to one of three conditions: Stability (focused on small changes leading to weight gain prevention), Loss (focused on weight loss) or Bibliotherapy (minimal, self-guided intervention using the EatingWell Diet book). Participants and staff were blinded to the assignment until after allocation. Although participants were randomized to different weight management intervention conditions, all conditions were given the same behavioral and pharmaceutical (varenicline/Chantix™) smoking cessation interventions. Four specific periods in the study (i.e., weeks 0–8: weight management focus; weeks 9–16: smoking cessation focus, varenicline provided; weeks 17–32: booster sessions for Stability and Loss, varenicline provided; weeks 33–52: no intervention contact) were examined. This study was approved by the University of Tennessee Health Science Center Institutional Review Board.

A total of 305 participants were recruited for the Fit & Quit trial. Inclusion criteria focused on recruiting adult cigarette smokers desiring smoking cessation who had a BMI of greater than or equal to 22 kg/m^2 and who were able to participate in study activities (e.g., had email and phone access, could exercise for 10 min). The Loss intervention encouraged all participants to lose at least 5% of their baseline weight to offset expected cessation-related weight gain; thus, the BMI cut-off of 22 kg/m^2 was selected so that even participants with normal weight were able to lose 5% of their baseline

weight without dipping into the underweight BMI category. Exclusion criteria focused on safety by excluding those with a contraindication to varenicline, those with current depression or suicidal thoughts (or history of a suicide attempt), and those with physical health conditions (e.g., pregnancy, breastfeeding) that made any of the study components inadvisable. Participants were also excluded due to participation in other weight loss or smoking interventions; recent weight loss (greater than 10 pounds); recent use of an investigational drug or a medication that impacts weight; participation of another family member in the study; or weight was greater than 385 pounds (due to a technical weight limit on the e-scales given to participants).[25] Participants did not have to indicate an interest in losing weight or even maintaining their weight to be eligible for the Fit & Quit trial; however, the participants had to report being willing to focus on weight management topics in the first 8 weeks of the program.

Participants were recruited using periodic advertising via traditional methods (e.g., local radio, mailed postcards), via a "refer a friend" program, and via electronic methods (e.g., Research Match postings, Facebook advertisements).[27] Recruitment originally occurred locally in the Memphis, TN area and then transitioned to national recruitment following transition to remote assessment procedures due to the COVID-19 pandemic. Interested persons first completed a phone screening to determine eligibility for the in-person screening visit. Further eligibility was determined at the screening visit, after obtaining informed consent. Those who continued to be interested in the study then completed a 3 day diet and exercise journal and obtained physician clearance. After each of the 10 waves were filled, participants attended a randomization visit, which included an orientation to their intervention condition and an individual meeting with the interventionist. At this time, participants also received a Body Trace™ e-scale (www.bodytrace.com), along with other intervention materials specific to the assigned condition. Participants were recruited from 2018 to 2021, and the final data collection visits occurred in 2022.

The weight management interventions for this study have been described previously.[25] Briefly, all participants from all intervention conditions were encouraged to weigh themselves daily using the BodyTrace™ e-scale which automatically uploads data from each scale to a secure database. The Stability intervention condition was based on the "Small Changes" intervention protocol from the "Study of Novel Approaches to Weight Gain Prevention" trial,[28] with the goal of helping participants make small behavioral changes in dietary intake and physical activity to prevent weight gain. Participants in the Stability condition were encouraged to weigh daily, keep their weight stable, and were provided with self-weighing feedback via a personalized, color-coded weight trajectory graph (with red, yellow, and green representing ranges above, within, or below ± 3 lbs. of baseline weight) zones. Participants in the Stability condition were also given small green prizes, such as a pen or gum, for staying in the green zone each week of the program. The Loss (i.e., weight loss) intervention was based on the Look AHEAD "Intensive Lifestyle Intervention",[29] with the goal helping participants make changes in dietary intake and physical activity[30] to produce weight losses, by week eight, of at least 5% from baseline weight. Loss participants were provided meal replacements for the initial 8 weeks intervention period and were encouraged to engage in diet, physical activity, and weight self-monitoring. Weekly and then monthly feedback was provided in relation to dietary, physical activity, and weight self-monitoring. Loss participants were also given the recommendation to weigh daily. Both the Stability intervention and the Loss intervention conditions had eight weekly 60-minute group phone sessions during the first 8 weeks of the study. The Stability and Loss groups also received monthly weight management booster sessions via telephone (with five total sessions completed with the same groups participants were in previously) after completion of the smoking cessation intervention in weeks 9–16 of the study. Participants in the Bibliotherapy self-guided intervention condition received an Eating Well Diet book and were encouraged to follow recommendations from this book during the initial 8 week period.

The smoking cessation interventions for this study followed the Clinical Practice Guidelines recommendations.[31] Starting in week nine of the study, participants in all conditions received six total weekly 60-minute group smoking cessation phone sessions, with the same group as in the previous eight weeks of the study for participants in the Stability and Loss conditions. Participants received an individual phone session during study week eleven (the week of the recommended quit date). Participants began using varenicline directly after the first smoking cessation phone session[25] and could receive 6 months of varenicline.

3 | MEASURES

Self-weighing data were collected using BodyTrace™ e-scales, which used the cellular network to transmit scale weights directly a study database. E-scale weights have been shown to be highly concordant with in-person measured weights.[24,32] Participants were instructed to not wear shoes and to wear light clothing during weighing. Research staff monitored self-weighing data for all conditions in order to gauge treatment engagement (coded daily as present or absent). Weight was measured at each in-person visit using a calibrated scale prior to COVID-19 by a research assistant blinded to treatment assignment, and by BodyTrace scale for each visit after the pandemic started. Socio-demographic characteristics were obtained via a questionnaire which included gender, age, race and ethnicity, and education level.[25]

4 | DATA PREPARATION AND ANALYSIS

All analyses were performed using SAS v. 9.4. A specialized SAS macro, %TPF,[33] was used in combination with generalized additive models (GAM) to discern true weight profiles of participants and to remove outliers (e.g., due to other persons or pets stepping on the scale). With the macro, weighing records were categorized into

groups (clusters), and "true profile" was identified and extracted by comparing self-weights with clinical data collected from participants. Using the GAM modeling, weights that were 2.27 kg (5 lbs.) above the individual's expected self-weighing data point were removed, as guided by the study from Ross and colleagues.[34] The first non-outlier self-weight measurement of each day was retained for each participant, with these data used to quantify self-weighing frequency, overall and by intervention phase.

Descriptive statistics of socio-demographic and baseline characteristics were generated overall and by treatment condition. Count of days each participant weighed themselves, proportion of days (count/365), and weekly average (count/52) were calculated and later categorized by intervention period per treatment condition (Table 1). The primary study outcome, weight change, was calculated by taking the difference of recorded weight from baseline to 12-month follow-up. General linear models were applied to determine whether the weighing frequency was associated with weight change. Results were considered statistically significant at the alpha level of 0.05, and clinical significance of results was assessed by evaluating magnitudes of association and variability.

5 | RESULTS

In total, 305 participants were randomized to the Fit & Quit trial. Data from eight participants (3.7% of the sample) were excluded from the current study due to a lack of self-weighing data or when none of the identified trajectories matched the outcome data (i.e., weights collected during data collection visits), which might indicate that someone else was regularly using the e-scale. Of the 297 participants

TABLE 1 Socio-demographic and baseline characteristics.

	Overall *n* = 297 Mean (SD) or %	Stability *n* = 107 Mean (SD) or %	Loss *n* = 107 Mean (SD) or %	Bibliotherapy *n* = 83 Mean (SD) or %
Age	54.34 (11.62)	53.39 (11.48)	55.59 (11.67)	54.10 (11.73)
Weight (kg)	89.73 (20.47)	91.48 (21.52)	88.15 (19.85)	89.51 (19.94)
BMI (kg/m2)	31.72 (6.58)	32.03 (6.47)	31.25 (6.54)	31.93 (6.82)
BMI category				
Normal weight	38 (12.79)	13 (12.15)	16 (14.95)	9 (10.84)
Overweight	99 (33.33)	29 (27.10)	38 (35.51)	32 (38.55)
Obesity	160 (53.87)	65 (60.75)	53 (49.53)	42 (50.60)
Gender				
Women	201 (67.68)	73 (68.22)	71 (66.36)	57 (68.67)
Men	96 (32.32)	34 (31.78)	36 (33.64)	26 (31.33)
Race				
White	155 (52.19)	52 (48.60)	59 (55.14)	44 (53.01)
Black	128 (43.10)	50 (46.73)	44 (41.12)	34 (40.96)
Asian	2 (0.67)	1 (0.93)	1 (0.93)	0 (0)
Other racial identities	12 (4.04)	4 (3.74)	3 (2.80)	5 (6.02)
Education level				
High school degree or less	54 (18.18)	21 (19.63)	19 (17.76)	14 (16.87)
Some college	99 (33.33)	32 (29.91)	37 (34.58)	30 (36.14)
College degree	144 (48.48)	54 (50.47)	51 (47.66)	39 (46.99)
Average self-weighing frequency, over 12 months				
≥6 days per week	6.06%	5.61%	9.35%	2.41%
≥5 days per week	16.84%	21.50%	16.82%	10.84%
≥4 days per week	22.90%	30.84%	21.50%	14.46%
≥3 days per week	37.71%	49.53%	36.45%	24.10%
≥2 days per week	57.58%	70.09%	49.53%	51.81%
≥1 day per week	77.44%	90.65%	69.16%	71.08%

included in the self-weighing analyses, mean (±SD) age was 54.34 ± 11.62 years, and about two-thirds of the participants (67.68%) identified as women (Table 1). Most participants (53.87%) had obesity, and the average BMI at baseline was 31.72 ± 6.58 kg/m^2. The majority of participants self-identified as White (52.19%) or as Black (43.10%). Over the course of the 12 months, most participants (77.44%) weighed themselves at least 1 day per week. Additional information about demographics and average self-weighing frequency by intervention condition can be found in Table 1. Twenty-nine participants did not have data on weight change due to an incomplete 12-month follow up visit, and thus were not included in the weight change-related analyses presented in Tables 3 and 4.

The frequency of self-weighing (the average number of days that participants self-weighed per week) changed over the course of the four study periods. Average weekly self-weighing frequency was highest during the weight management period (0–8 weeks) at 4.55 ± 1.99 days/week and decreased over the course of the trial, to an average of average 2.67 ± 1.84 days/week at 12 months. Self-weighing frequency was significantly different between the Stability, Loss and Bibliotherapy conditions, $p = 0.0007$, such that the Stability condition participants had a significantly greater self-weighing frequency compared to the Loss and Bibliotherapy conditions across all 12 months (see Table 2). Breaking results down by intervention period, the Stability condition had significantly greater self-weighing frequency compared to the Loss and Bibliotherapy conditions during the weight management period (0–8 weeks) and the smoking cessation period (9–16 weeks). In addition, the Stability condition had significantly greater self-weighing frequency compared to the Bibliotherapy condition during the booster session period (17–32 weeks); however, there were no significant differences between

TABLE 2 Weekly average self-weighing frequency (in days) during various time periods ($N = 297$).

	Overall *M* (SD)	Stability *M* (SD)	Loss *M* (SD)	Bibliotherapy *M* (SD)
Intervention period				
0–8 weeks (i.e., weight management period)	4.55 (1.99)	5.19 (1.67)[a]	4.31 (1.94)[b]	4.02 (2.21)[b]
9–16 weeks (i.e., smoking cessation program)	3.77 (2.32)	4.55 (1.93)[a]	3.50 (2.49)[b]	3.13 (2.30)[b]
17–32 weeks (i.e., booster sessions for stability and loss participants)	2.47 (2.23)	3.02 (2.21)[a]	2.29 (2.32)[a,b]	2.01 (2.00)[b]
33–52 weeks (i.e., no treatment)	1.64 (1.97)	1.97 (2.01)[a]	1.58 (2.12)[a]	1.30 (1.65)[a]
All 12 months of enrollment	2.67 (1.84)	3.18 (1.72)[a]	2.51 (1.99)[b]	2.22 (1.63)[b]

[a,b]Tukey adjusted post-hoc multiple comparisons; Superscripts *a* and *b* denote significant differences between conditions. Means with different letters are significantly different at alpha 0.05-level after the adjustment.

TABLE 3 Mean weight change based on self-weighing frequency ($N = 268$).

	Weight change (least squares mean)	95th confidence interval	*p*-value
Weighing frequencies			
≤1 day per week	1.83	0.2168, 3.4453	0.0264
1< days per week ≤3	0.85	−0.2589, 1.9663	0.1320
3< days per week ≤5	0.77	−2.2946, 0.7474	0.3175
5< days per week ≤7	−2.26	−3.9249, −0.5953	0.0080

TABLE 4 Model of self-weighing frequencies (weekly average) and 12-month weight change in four study periods ($N = 268$).

	Individual		All	
	B (SE)	*p*-value	*B* (SE)	*p*-value
Intervention period				
0–8 weeks (i.e., weight management period)	−0.39 (0.19)	0.0437	−0.23 (0.27)	0.3924
9–16 weeks (i.e., smoking cessation program)	−0.37 (0.16)	0.0254	0.46 (0.32)	0.1532
17–32 weeks (i.e., booster sessions for stability and loss participants)	−0.65 (0.16)	<0.0001	−0.68 (0.36)	0.0611
33–52 weeks (i.e., no treatment)	−0.71 (0.18)	<0.0001	−0.32 (0.30)	0.2832

Note: Model adjusted for baseline weight and intervention condition.

the conditions in self-weighing frequency during the no treatment period (33–52 weeks).

Over the course of the 12-month trial, greater self-weighing frequency was associated with weight stability/loss. After controlling for baseline weight and treatment condition, participants who weighed themselves on average 5–7 days per week experienced statistically significant weight loss ($p = 0.0080$), with an estimated weight loss of 2.26 kg (Table 3). Weighing on average 3–4 days per week resulted in a non-significant weight loss of −0.77 kg ($p = 0.3175$), representing achievement of the study goal of preventing post-cessation weight gain. Weighing less than once per week was associated with significant weight gain of 1.83 kg ($p = 0.0264$).

Associations between self-weighing frequency and weight loss were assessed within each study time period, to determine if there were periods during the study where self-weighing was most important. Self-weighing frequency was associated with a significant decrease in weight during each time period, after controlling for baseline weight and treatment condition, with larger magnitudes of effect during weeks 17–32 and weeks 33–52 (see Table 4). When all time periods were analyzed together in the same model, self-weighing frequency appeared to have the most impact (i.e., exhibiting the largest effect size) during the booster intervention period (i.e., weeks 17–32) compared to the other three periods. As exploratory analyses, interactions between BMI category, gender, race, education level and self-weighing frequency were tested during each of the four periods; however, no statistically significant or clinically meaningful interactions were detected.

6 | DISCUSSION

The current study aimed to investigate associations between self-weighing and weight change during a post-cessation weight management clinical trial. As hypothesized, higher self-weighing frequency was associated with greater weight loss and prevention of weight gain throughout the trial for participants quitting smoking in all conditions. These data may be crucial for informing future programs focused on post-cessation weight management (e.g., tobacco quitlines, Smokefree TXT), as self-weighing could potentially be used as an easily disseminated strategy that could be incorporated into population health-based interventions for weight gain prevention after quitting smoking.

Results also indicated that greater self-weighing frequency was helpful for weight loss and preventing weight gain among participants quitting smoking, consistent with the general weight management literature[15–17,19]; however, there also may be an important threshold effect to consider in order to produce maximum benefit from regular self-weighing. Although participants were not randomized to different frequencies of self-weighing (thus precluding causal interpretation of the current results), results provide preliminary evidence that a threshold of self-weighing greater than 4 days per week may be beneficial for weight loss and a threshold of self-weighing 3–4 days per week may be beneficial for preventing weight gain. This threshold distinction between weight loss and prevention of weight gain is important, since not all participants in this study nor in future post-cessation weight management programs need to or want to lose weight. Importantly, just over a third of participants weighed themselves an average of ≥3 days per week, meaning that most participants in the current study were not meeting the self-weighing threshold necessary for weight maintenance. As data like these emerge related to self-weighing for post-cessation weight management, clear recommendations regarding the optimal frequency for self-weighing should be developed and communicated to individuals who are quitting smoking.

Additionally, engagement with self-weighing behaviors waned throughout the course of the trial. Results demonstrated that, while self-weighing frequency was important throughout the entire trial, self-weighing had a greater effect during the booster session and no-treatment periods of the trial when participants were self-weighing the least. Emphasizing the importance of regular self-weighing and encouraging regular self-weighing to individuals undergoing smoking cessation up to a year post-cessation, and potentially beyond, will be important for clinicians and interventionists assisting individuals with smoking cessation. In addition, future studies should test potential strategies for increasing self-weighing during this critical period (e.g., using feedback messages, incentives).

There were also differences in self-weighing frequency between the intervention conditions. The Stability condition self-weighed significantly more frequently than the Loss and Bibliotherapy conditions. One may hypothesize that receiving interventionist feedback about self-weighing (as the Stability and Loss conditions did) may enhance adherence to self-weighing. However, there was no significant difference in self-weighing frequency between the Loss and Bibliotherapy conditions, which would be expected if any type of feedback or interventionist support was sufficient for engagement with self-weighing. Participants in the Stability condition may have been more motivated to self-weigh given provision of color-coded feedback on their weight trajectory and prizes for staying within 3 pounds of baseline weight.

The current study was strengthened by use e-scale technology for assessment of weight throughout the course of the weight management and smoking cessation interventions. E-scale data has demonstrated validity[24,32] and does not rely on self-report,[24] and thus, most if not all instances of self-weighing for these participants were likely detected. Despite the later waves of the study participating during the COVID-19 pandemic, e-scale technology allowed for no disruption in self-weighing data collection. There was also significant gender and racial diversity in this study, supporting generalizability of the results. Finally, the recruitment of a unique study population, focused on individuals quitting smoking, adds to the broader literature on the association between self-weighing frequency and weight loss and/or weight maintenance.[15–17,19]

The current study also had several important limitations. First, as participants were not randomized to different frequencies of self-weighing, results cannot be interpreted causally; thus, future

studies should investigate whether the potential thresholds for self-weighing identified in the current study can support weight loss and weight gain prevention. Second, there were also challenges related to the use of e-scales as an assessment measure. Due to e-scales being used at home, some participants had other persons regularly using the study scale; this pattern resulted in data from 8 participants being removed from the current study, as study participant weights could not be isolated. In addition, some instances of self-weighing recorded in this study could have been from individuals in the same household who weighed a similar amount. With the application of advanced statistical tools and methods, however, plausible outliers were removed and the correct weight profile for 96% of participants randomized to the parent Fit & Quit trial was identified. Third, although the COVID-19 pandemic did not disrupt self-weighing data collection during the study, the pandemic is an external factor that could have impacted self-weighing behavior in the later waves of the study. Fourth, participants in the Bibliotherapy condition may have self-weighed more frequently than individuals in the general population who are quitting smoking, since participants in the Bibliotherapy condition received a self-guided intervention and an e-scale (i.e., this condition was not a true control group). Additionally, individuals who enrolled in this trial may have been inherently more motivated to lose or maintain their weight than the general population of individuals quitting smoking. Lastly, only 40%–50% of participants in this study successfully quit smoking; thus, these findings represent a mix of individuals who quit smoking and those who continued to smoke,[26] which could have impacted the findings.

In conclusion, self-weighing may serve as a useful tool for weight gain prevention after smoking cessation. Feedback received about self-weighing behaviors and weight trajectory (similar to what the Stability participants received) holds potential to enhance adherence. Although personalized feedback is likely cost-prohibitive in large populations, an automated self-weighing feedback system could allow this strategy to become widely disseminated as a population health intervention for post-cessation weight gain prevention. Future research should evaluate the impact of the identified thresholds on weight loss and weight gain prevention, and identify strategies for improving adherence to self-weighing with post-cessation weight gain prevention.

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CONFLICT OF INTEREST STATEMENT

The authors have no relevant financial disclosures.

CLINICAL TRIAL REGISTRATION

The trial is registered on clinicaltrials.gov (NCT03156660).

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