Time to Peak Weight Loss During Extended Behavioral Treatment

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Abstract

Objective—This study was designed to examine the variability in timing of peak weight loss in behavioral treatment, i.e., when during treatment participants reach their greatest amount of cumulative weight loss.

Methods—Secondary data analyses were conducted, drawing upon data from two clinical trials that provided 12 months of group-based behavioral treatment, with sessions meeting less frequently in the second half of the treatment year. Weight was measured at the beginning of each treatment session.

Results—Cumulative proportions of participants reaching peak weight loss were as follows: 25.0% of study 1 and 20.0% of study 2 participants by month 4; 43.2% of study 1 and 52.2% of study 2 participants by month 6; 54.5% of study 1 and 77.8% of study 2 participants by month 8. Among participants who peaked after 4 months, the mean amount of additional weight loss achieved between 4 months and the peak session was 4.74 kg in study 1 and 4.07 kg in study 2.

Conclusions—Substantial variability in timing of peak weight loss was observed, with larger than expected proportions of participants reaching their greatest amount of cumulative weight loss in the final months of treatment. This variability may create methodological and clinical challenges.

Keywords

weight loss; behavior therapy; treatment

Introduction

Improving weight loss maintenance (i.e., preventing weight regain after an initial period of weight loss) is a key focus of current research in obesity (1). Behavioral weight loss treatment is the first line of intervention for adults with obesity, but long-term results are disappointing, as weight regain is normative (2). As a result, many studies focus specifically

on improving outcomes after an initial weight loss period (e.g. 3, 4, 5). Extending the length of behavioral treatments has promise because data indicate that ongoing treatment contact may improve long-term outcomes (4, 6, 7).

Long-term treatment programs are typically designed, methodologically and clinically, with the expectation that after an initial period of weight loss lasting several months, participants will transition to a period of weight loss maintenance and/or weight regain. However, there is limited consensus and little empirical evidence that establishes precisely when during treatment participants reach their greatest amount of cumulative weight loss (i.e., when their initial period of weight loss naturally ends). Among the 11 studies included in a meta-analysis conducted to evaluate the impact of extended care on weight regain after initial weight loss, the length of the initial weight loss interventions ranged from 3 to 6 months, with a mode of 5 months (8). In a meta-analysis of 42 trials of non-surgical weight loss maintenance interventions, the initial weight loss phases of treatment ranged from 2 to 12 months, with a median of 4 months (9). Thus, investigators' appear to vary in expectations regarding when an initial period of weight loss should or will end. However, the design of these studies is generally consistent with the conventional wisdom that most individuals reach their peak weight loss, i.e., their greatest amount of cumulative weight loss, in the first 3 to 6 months of behavioral treatment (1, 2, 10).

Verifying when during treatment participants reach their peak amount of total weight loss is important for several reasons. The trajectory of weight loss has methodological implications, particularly as studies are increasingly being designed to focus specifically on weight loss maintenance. Timing of peak weight loss may also have clinical implications. After several months of treatment that focus on inducing weight loss, many interventions deliver content and build skills specifically focused on preventing weight regain. However, if a meaningful proportion of participants are reaching their peak weight loss earlier or later than assumed, there may be a mismatch between their experiences or goals and the focus of the behavioral intervention, which could undermine treatment engagement or response. Information on variability across participants in timing is also important to gather, because data on this aspect of weight loss trajectory is particularly lacking. Substantial variability in timing of peak weight loss among participants in group-based treatment also could have implications for group dynamics, and might influence a participant's self-efficacy or motivation. For example, participants might feel discouraged if they experience plateaus in their weight loss while other group members continue to lose weight.

The present study was designed to provide descriptive information about the timing of peak weight loss (i.e., maximum amount of cumulative weight loss) during long-term behavioral treatment. This study was conducted as a secondary analysis, drawing upon data collected from two clinical trials, both of which have previously reported their primary outcomes (11, 12). Both clinical trials provided 12 months of group-based behavioral treatment, with sessions meeting less frequently in the second half of the treatment year, and conducted assessments through 24 months (i.e., 12-month follow-up).

Methods

Participants

In the two clinical trials of behavioral weight loss from which data for these analyses were drawn, participants were adults recruited from the community. BMI inclusion criteria were 27 to 45 kg/m^2 in study 1 (11) and 27 to 50 kg/m^2 in study 2 (12). In both studies, participants age 18 to 70 years were enrolled. Participants were excluded during screening if they had a medical or psychiatric condition that might limit their ability to comply with the behavioral recommendations of the program or pose a risk to the participant during weight loss, had contraindications to exercise, recently began a course of or changed the dosage of medication that could cause significant change in weight, or were pregnant or planned to become pregnant during the study period. Written informed consent was obtained from all participants upon enrollment. Study procedures were approved by the Drexel University institutional review board.

Study Design

In each study, participants were randomly assigned at baseline to behavioral treatment conditions that varied the type of skills taught. For the present study, only the participants who were randomly assigned to the standard behavioral weight loss condition were included in the testing of primary aims, in order to maximize the generalizability of results. As a post-hoc exploratory aim, patterns of weight loss in the experimental (i.e., non-standard) treatment arms also are reported separately. Treatment was delivered in 75-minute sessions in closed groups held in a research clinic on a university campus. Clinicians had graduate training in psychology and previous experience conducting behavioral weight loss interventions. Treatment was provided over a period of 12 months, with 26 sessions in study 1 and 25 sessions in study 2. In both studies, the first 16 sessions were held weekly. In study 1, this was followed by four sessions held bi-weekly and then six monthly sessions. In study 2, the weekly sessions were followed by five sessions held bi-weekly, two sessions held monthly, and finally two sessions held bi-monthly.

Treatment

The standard behavioral treatments (i.e., BT) were based on the Look AHEAD (13) and the Diabetes Prevention Program protocols (14) and were representative of the traditional approach to behavioral weight loss. Participants learned skills for setting specific behavioral goals and were encouraged to restrict calorie intake to 1200–1800 kcal per day and gradually increase their physical activity until they reached an ultimate goal of 250 minutes per week of aerobic activity. Self-monitoring of calorie intake, physical activity, and weight was a core skill. Participants also learned skills for stimulus control, relapse prevention, problem solving, and social support. When meetings transitioned from weekly to bi-weekly (after 4 months of treatment), the program began to integrate weight loss maintenance skills with topics such as coping with plateaus in weight and identifying strategies to prevent weight regain. Although a 10% weight loss goal was suggested, participants had autonomy in choosing when they transitioned from a goal of weight loss to weight loss maintenance. Participants were not permitted to share information about specific amounts of weight

change in group, but they often shared more general information about satisfaction or discouragement with their weight trajectory.

As noted, exploratory analyses were conducted to describe patterns in the experimental treatment arms of these studies. In Study 1, the "BT+E" condition had an emphasis on modifying the home food environment in a way that would facilitate healthy eating, while "BT+EA" included this environmental emphasis and also taught acceptance-based skills. In Study 2, the "ABT" condition also taught acceptance-based skills. The acceptance-based treatments encouraged a stance of openness towards uncomfortable internal experiences encountered as part of weight loss efforts, while choosing behaviors that were consistent with values and long-term goals.

Measurement

Assessments were completed by blinded research staff during research visits at baseline, 6 months (i.e., mid-treatment), 12 months (i.e., end of treatment), and 24 months (i.e., 12-month follow-up). In addition, weight was measured by the treating clinician at the beginning of each treatment session. In all cases, weight was measured with a digital scale accurate to 0.1 kg with the participant wearing street clothes. Height was measured at baseline with a stadiometer in order to calculate BMI. Demographic information also was collected via self-report at baseline.

Statistical Analyses

Data from the two samples were analyzed separately in order to provide a more rigorous test of study aims (i.e., to determine if similar results were observed in each sample). All results reported are from the standard behavioral weight loss conditions, other than a post-hoc exploratory analysis of the experimental treatment arms. Descriptive statistics of baseline characteristics for each sample were computed. Outcomes were timing and amount of peak weight loss, as well as amount of weight loss at 12 months (i.e., end of treatment) and 24 months (i.e., one-year follow-up). To calculate the timing and amount of peak weight loss, total weight loss at each session was calculated by subtracting weight at the current session from weight at the first session. Timing of peak weight loss was operationalized as the treatment session at which a participant reached his or her greatest amount of total weight loss. Peak weight loss amount was defined as the largest cumulative weight loss (i.e., total amount lost since beginning treatment) that a participant achieved during treatment. Variability in peak weight loss and timing of peak weight loss were explored by examining descriptive statistics and frequency tables, with particular attention paid to results before and after 4 months (a common length of programs for induction of weight loss (9)), 6 months (which conventional wisdom suggest should conservatively mark the end of active weight loss (10)), and 8 months (based on anecdotal experience that many participants peak at this time). Associations between timing of peak weight loss and demographic and clinical characteristics were examined with Pearson correlations for continuous variables (age, baseline BMI, session attendance, monthly rate of weight change) and independent samples t-tests for categorical variables (sex, race). The relationship of timing of peak weight loss to amount of peak weight loss, weight loss at 12 and 24 months, and weight regain from peak

session to 24 months was examined using OLS multiple regressions, controlling for session attendance and baseline BMI.

Missing data were handled using two methods. First, analyses were conducted with and without participants who dropped out during the first 6 months of treatment (n=14 in study 1, n=13 in study 2), since early dropout could influence patterns of peak weight loss. Second, analyses were run with and without multiple imputation for missing research assessment weights (i.e., weights measured at months 12 and 24), which was performed in SPSS using MCMC algorithms known as chained equations imputation (15). Rubin's rules were used to combine analysis results from multiply imputed data. Overall, patterns remained similar regardless of whether early dropouts were excluded or missing research weight data were imputed. The analyses presented here include all participants, with multiple imputation used for missing weights at research assessments to present conservative estimates of weight loss. Analyses were conducted using R and SPSS. All reported p values are based on 2-sided hypotheses and statistical significance is taken at the 5% level.

Results

The samples were comprised primarily of female, non-Hispanic White or African-American participants (as shown in Table 1). On average, participants ($n = 88$ in study 1, $n = 90$ in study 2) attended 74.6% of group treatment sessions in study 1 and 83.5% of group sessions in study 2. Retention in research assessments among participants in the standard behavioral treatment condition was as follows: study 1: 92.0% at 6 months, 84.1% at 12 months, and 79.6% at 24 months; study 2: 85.6% at 6 months, 81.1% at 12 months, and 72.2% at 24 months.

Mean amount of peak weight loss (measured at the session at which the greatest cumulative weight loss was observed for each participant) was 10.7 kg (SD=6.9) in sample 1 and 12.4 kg (SD=6.5) in sample 2. Peak weight loss occurred at a mean of month 6 in both samples. Figure 1 shows the proportion of participants in each sample who reached their peak weight loss at each session throughout treatment.

The clinical significance of peak weight loss was explored by examining how much weight participants lost between a given point in treatment and their peak weight loss session. Among participants who peaked after 4 months (75.0% of sample 1, 80.0% of sample 2), the mean amount of additional weight loss achieved between 4 months and the peak session was 4.97 kg (SD=3.30) in sample 1 and 4.20 kg (SD=3.50) in sample 2. (In other words, among the participants who reached their greatest amount of cumulative weight loss after 4 months, mean weight loss from month 4 to the session at which peak weight loss was observed was 4.97 kg in sample 1 and 4.20 kg in sample 2.) Among participants who peaked after 6 months (56.8% of sample 1, 47.8% of sample 2), the mean amount of additional weight loss achieved between 6 months and the peak session was 2.2 kg in sample 1 and 2.0 kg in sample 2. Among participants who peaked after 8 months (45.5% of sample 1, 22.2% of sample 2), the mean amount of additional weight loss achieved between 8 months and the peak session was 2.75 kg (SD=1.68) in sample 1 and 2.22 kg (SD=1.60) in sample 2.

Timing of peak weight loss was not associated with age (study 1: $r(86) = 0.05$, $p = .62$; study 2: $r(88) = 0.06$, $p = .58$), sex (study 1: $t(86) = 0.65$, $p=.52$; study 2: $t(88) = 0.03$, $p=.97$), or baseline BMI (study 1: $r(86) = -0.12$, $p = .27$; study 2: $r(90) = 0.002$, $p = .99$). In study 1, participants identifying as white reached peak weight loss significantly later in treatment than participants identifying as non-white ($t(43.56) = 2.35$, $p = .01$); in study 2, timing of peak weight loss did not differ by race ($t(88) = 0.71$, $p = .48$). In both studies, there was a significant association between timing of peak weight loss and session attendance, such that participants who peaked later in treatment attended a greater number of sessions (study 1: $r = 0.74$, $p<.001$; study 2: $r = 0.82$, $p<.001$).

As shown in Table 2, timing and amount of weight loss were strongly related, such that participants who peaked later in treatment achieved greater maximum weight losses and had greater total weight losses at months 12 and 24 after controlling for session attendance and baseline BMI. To illustrate these patterns, Figure 2 divides participants into categories of weight loss peak timing (i.e., at or before 4 months, between 5–6 months, between 7–8 months, or after 8 months), and shows the mean amount of peak weight loss and weight loss at 12 and 24 months for each category.

Weight regain was further examined by calculating the percent of maximum weight loss regained at month 24. Timing of peak weight loss did not predict this outcome at month 24, controlling for session attendance and baseline BMI (study 1: $F(3,6.02) = 0.66$, $p = .61$; $b = -11.57$, $S.E. = 6.94$, $t(84) = -1.67$, $p = .11$; study 2: $F(3,10.26) = 1.17$, $p=.37$; $b = -11.44$, $S.E. = 6.70$, $t(86) = -1.71$, $p= .09$). Monthly rate of weight change from treatment start until peak session was also calculated. In study 1, there was no association between rate of weight loss and session at which peak weight loss occurred ($r(86) = .124$, $p = .25$); in study 2, participants who peaked later in treatment had a slower rate of weight loss from treatment start until peak session, ($r(88) = -0.26$, $p = .01$).

As shown in Table 3, timing and amount of peak weight loss were also examined as an exploratory aim in the experimental arms of study 1 and study 2; data from the BT arms of these samples are also reported in Table 3 for reference. Table 4 shows that timing and amount of weight loss were associated in the experimental arms of these studies, such that participants who peaked later in treatment achieved greater maximum weight losses and had greater total weight losses at month 12 (study 1 and study 2) and month 24 (in study 1 only) after controlling for session attendance and baseline BMI.

Discussion

Conventional wisdom is that weight loss reaches its peak in the first three to six months of behavioral treatment. While the average (i.e., mean) timing of peak weight loss observed in the current study was consistent with that conventional wisdom, remarkable variability was observed: approximately half of participants in a 12-month behavioral weight loss program reached their maximum amount of cumulative weight loss during the second half of the treatment year. Most studies of long-term weight loss treatments have been conducted with initial weight loss phases that were approximately 4 or 5 months in length (8, 9). The results from the current study suggest that researchers should expect that some participants can

continue to lose clinically significant amounts of weight during the conventional "maintenance" period, introducing variability into weight trajectory during this time. This may create complexity when designing, evaluating, and interpreting the results of long-term treatment programs. It also suggests that some of the benefit of intervention contact that continues after an initial phase of intervention may not be the result of preventing weight regain, per se, but rather from facilitating a continued trajectory of weight loss.

Participants who reached their peak amount of weight loss earlier in treatment had smaller peak weight losses than those who peaked later. At end of treatment and one year after treatment ended, weight losses also were smaller for those who peaked earlier compared to later. This pattern of findings is consistent with data published from Look AHEAD, the largest study of long-term behavioral weight loss conducted to date, which found that weight loss maintenance was superior among individuals who had sustained trajectories of initial weight losses (16).

Remarkable variability in timing was observed, such that approximately one-quarter of participants reached their peak amount of weight loss by month 4 of treatment, while a similar (study 2) or greater (study 1) proportion of participants reached their peak weight loss after month 8. This variability may make it challenging to provide a match between a group-based behavioral curriculum and participants' experiences and goals, as some participants need content that is focused on weight loss maintenance by month 4 of treatment, while this may not be applicable to other participants until much later. If the alignment between the curriculum and participants' experiences is poor, it is possible that motivation, engagement, or treatment response might suffer. In group-based programs, cohesion and support among participants may be more challenging to maintain during periods in which some participants continue to lose weight, while others are maintaining weight or beginning to experience weight regain.

These findings also raise questions about the optimal length and intensity of treatment. While many studies that aim to enhance weight loss maintenance outcomes deliver long-term treatment, briefer treatments also have appeal from a dissemination and scalability perspective, given the prevalence of obesity. Previous research has suggested that dietary adherence is a key determinant of whether weight loss continues or plateaus during treatment (17). Treatment meetings may provide important support and accountability to facilitate dietary adherence (7, 18). In the current study, greater session attendance was associated with later timing of peak weight loss. If brief treatments discontinue clinical contact before peak weight loss would otherwise be reached, the amount of weight loss achieved in the short- and long-term may be blunted.

The proportion of participants reaching peak weight loss at or before month 4 was remarkably similar (i.e., 15–25%) across traditional and experimental behavioral treatment arms, suggesting that regardless of the type of content or skills emphasized, weekly sessions of behavioral treatment from months 1 to 4 are not reaching the ceiling of weight loss for the majority of participants. Because all treatments followed the same schedule and dose of treatment, it is unknown how results may have differed if, for example, weekly sessions had continued for a longer or shorter period of time, or if sessions were held after 12 months.

This study fills a gap in the literature by providing detailed information about the point during long-term behavioral treatment when peak weight loss occurs. Strengths of this study include use of a behavioral curriculum that is representative of the standard approach, examination of study aims in two separate samples of participants, objective measurement of weight, and a moderate amount of racial diversity in the samples. However, these treatment studies were conducted in the same research center, which limits generalizability and highlights the need for other university clinics to report data on peak weight loss timing, as well as the need to examine peak weight loss in community settings. In addition, while the results from studies 1 and 2 were generally consistent, they were not identical, so additional research is needed to determine what pattern is most typical.

Conclusion

This study provides valuable information about the timing of maximum cumulative weight loss during behavioral treatment. Substantial variability in timing was observed, suggesting that it may be challenging, both methodologically and clinically, to anticipate when participants will transition to weight loss maintenance. In the two clinical trials included in this analysis, a larger proportion of participants than expected continued to lose weight during the conventional "weight loss maintenance" period of treatment.

Acknowledgments

References

1. MacLean PS, Wing RR, Davidson T, Epstein L, Goodpaster B, Hall KD, et al. NIH working group report: Innovative research to improve maintenance of weight loss. Obesity (Silver Spring). 2015; 23:7–15. [PubMed: 25469998]

2. Jensen MD, Ryan DH, Donato KA, Apovian CM, Ard JD, Comuzzie AG, et al. Guidelines (2013) for the management of overweight and obesity in adults. Obesity (Silver Spring). 2014; 22:S1–S410.

3. Wing RR, Tate DF, Gorin AA, Raynor HA, Fava JL. A self-regulation program for maintenance of weight loss. N Engl J Med. 2006; 355:1563–1571. [PubMed: 17035649]

4. Svetkey LP, Stevens VJ, Brantley PJ, Appel LJ, Hollis JF, Loria CM, et al. Comparison of strategies for sustaining weight loss: the weight loss maintenance randomized controlled trial. JAMA. 2008; 299:1139–1148. [PubMed: 18334689]

5. Perri MG, Limacher MC, Durning PE, Janicke DM, Lutes LD, Bobroff LB, et al. Extended-care programs for weight management in rural communities: the treatment of obesity in underserved rural settings (TOURS) randomized trial. Arch Intern Med. 2008; 168:2347–2354. [PubMed: 19029500]

6. Montesi L, El Ghoch M, Brodosi L, Calugi S, Marchesini G, Dalle Grave R. Long-term weight loss maintenance for obesity: a multidisciplinary approach. Diabetes Metab Syndr Obes. 2016; 9:37–46. [PubMed: 27013897]

7. Perri MG, Nezu AM, Patti ET, McCann KL. Effect of length of treatment on weight loss. J Consult Clin Psychol. 1989; 57:450–452. [PubMed: 2500466]

8. Ross Middleton KM, Patidar SM, Perri MG. The impact of extended care on the long-term maintenance of weight loss: a systematic review and meta-analysis. Obes Rev. 2012; 13:509–517. [PubMed: 22212682]

9. Dombrowski SU, Knittle K, Avenell A, Araujo-Soares V, Sniehotta FF. Long term maintenance of weight loss with non-surgical interventions in obese adults: systematic review and meta-analyses of randomised controlled trials. BMJ. 2014; 348:g2646. [PubMed: 25134100]

10. Jeffery RW, Drewnowski A, Epstein LH, Stunkard AJ, Wilson GT, Wing RR, et al. Long-term maintenance of weight loss: current status. Health Psychol. 2000; 19:5–16. [PubMed: 10709944]

11. Butryn ML, Forman EM, Lowe MR, Gorin AA, Zhang F, Schaumberg K. Efficacy of environmental and acceptance-based enhancements to behavioral weight loss treatment: The ENACT trial. Obesity (Silver Spring). 2017; 25:866–872. [PubMed: 28337847]

12. Forman EM, Butryn ML, Manasse SM, Crosby RD, Goldstein SP, Wyckoff EP, et al. Acceptance-based versus standard behavioral treatment for obesity: Results from the mind your health randomized controlled trial. Obesity (Silver Spring). 2016; 24:2050–2056. [PubMed: 27670400]

13. Forman, EM., Butryn, ML. Effective Weight Loss: An Acceptance-Based Behavioral Approach, Clinician Guide (Treatments That Work). Oxford University Press; New York: p. 2016

14. Forman EM, Butryn ML, Juarascio AS, Bradley LE, Lowe MR, Herbert JD, et al. The mind your health project: a randomized controlled trial of an innovative behavioral treatment for obesity. Obesity (Silver Spring). 2013; 21:1119–1126. [PubMed: 23666772]

15. Yuan, YC. Multiple imputation for missing data: Concepts and new development. SAS Institute Inc; Rockville, MD: 2005.

16. Neiberg RH, Wing RR, Bray GA, Reboussin DM, Rickman AD, Johnson KC, et al. Patterns of weight change associated with long-term weight change and cardiovascular disease risk factors in the look ahead study. Obesity (Silver Spring). 2012; 20:2048–2056. [PubMed: 22327053]

17. Thomas DM, Martin CK, Redman LM, Heymsfield SB, Lettieri S, Levine JA, et al. Effect of dietary adherence on the body weight plateau: a mathematical model incorporating intermittent compliance with energy intake prescription. Am J Clin Nutr. 2014; 100:787–795. [PubMed: 25080458]

18. Tinker LF, Rosal MC, Young AF, Perri MG, Patterson RE, Van Horn L, et al. Predictors of dietary change and maintenance in the Women's Health Initiative Dietary Modification Trial. J Am Diet Assoc. 2007; 107:1155–1166. [PubMed: 17604744]

Study Importance Questions

What Is Known

- Long-term behavioral weight loss treatments (i.e., those that last 12 months or longer) are increasingly being studied. Many of these programs are designed, methodologically and clinically, with the expectation that after an initial period of weight loss, participants will transition to a period of weight loss maintenance and/or weight regain.

- However, limited empirical data are available to establish when during long-term treatment participants reach their greatest amount of cumulative weight loss, or to determine how much variability there is in its timing. The time during treatment when peak weight loss occurs has implications for the methodology of weight loss maintenance studies, as well as for determining the optimal length and content of treatment.

What This Study Adds

- This study found substantial variability in timing of peak weight loss, with larger than expected proportions of participants reaching their greatest amount of cumulative weight loss in the final months of a year-long treatment.

- Participants who peaked later in treatment, rather than earlier in the year, achieved greater cumulative weight losses.
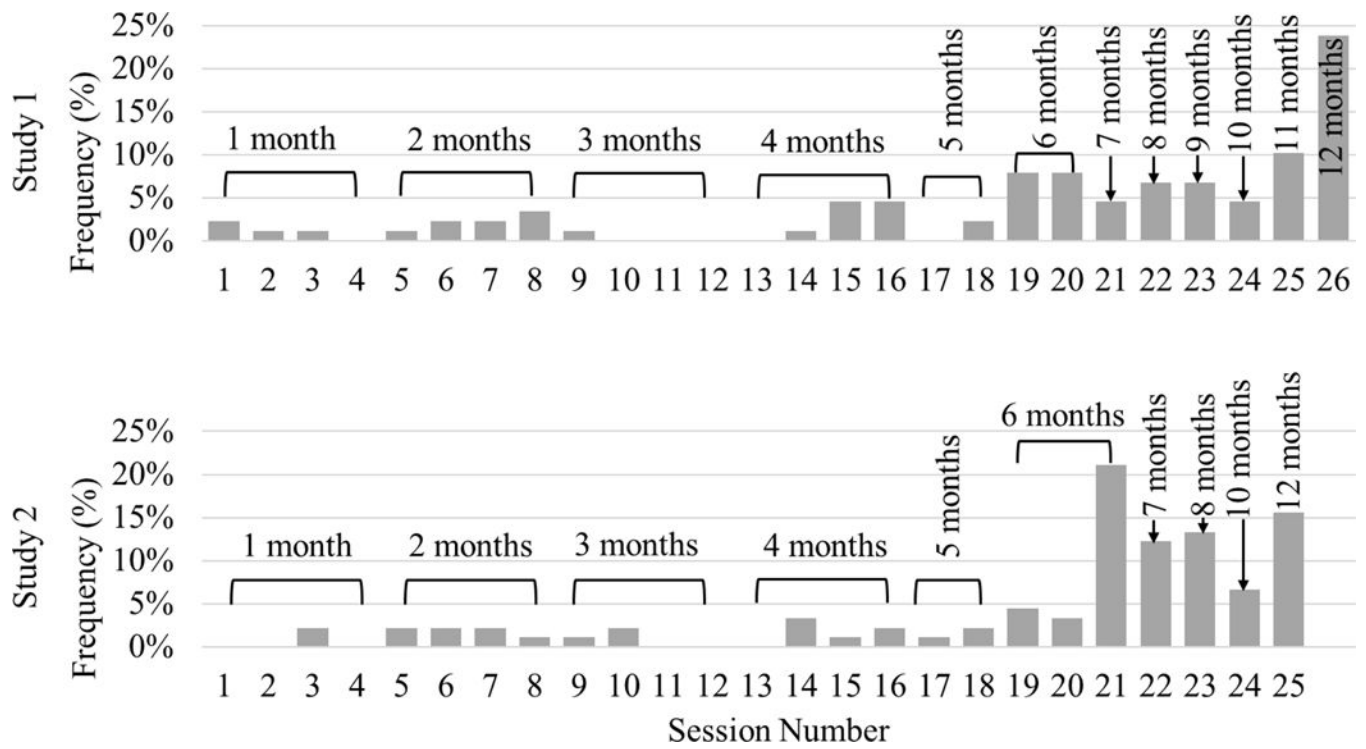
Figure 1.
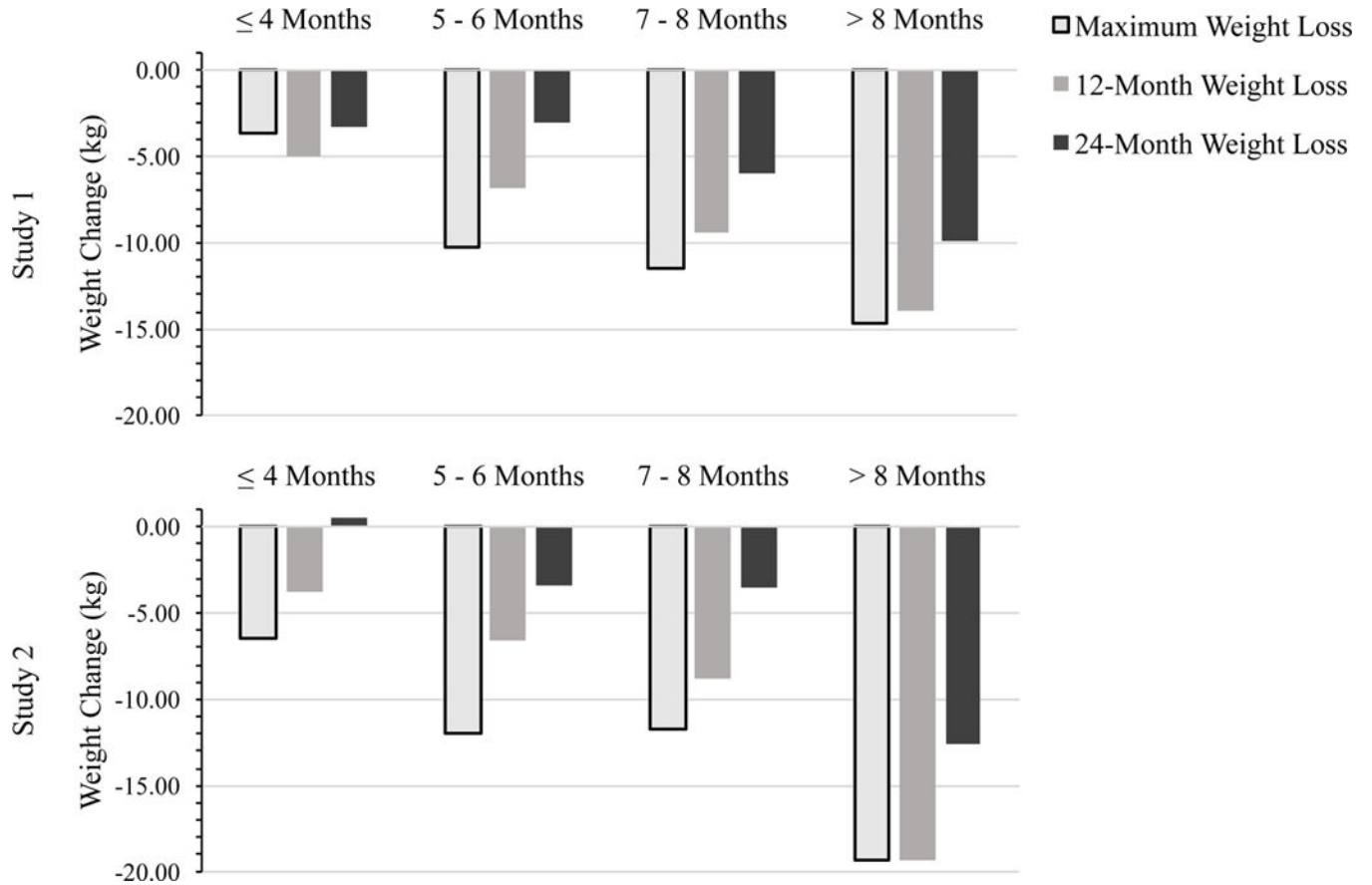Session at which maximum weight loss was achieved.

Figure 2.
Weight Change (Kg) based on Time when Peak Weight Loss was Achieved

Table 1

Participant demographic characteristics at baseline

	Study 1 (N=88)		Study 2 (N=90)	
	M	*SD*	*M*	*SD*
Age (years)	53.0	9.3	51.7	10.2
Body Mass Index (kg/m^2)	35.0	5.3	37.4	6.2
	n	*%*	*n*	*%*
Female	67	76.1%	74	82.2%
Male	21	23.9%	16	17.8%
Race/Ethnicity				
White	59	67.0%	64	71.1%
African American	24	27.3%	23	25.6%
Asian	0	0.0%	1	1.1%
Native Hawaiian or Pacific Islander	1	1.1%		
Hispanic	7	8.0%	2	2.2%
More than one race	4	4.5%	0	0.0%

Table 2

Results from regression analyses predicting weight loss at peak, 12 months, and 24 months from timing of peak weight loss.

| | Study 1 | | | | | | Study 2 | | | | | |
| | Omnibus Test | | Individual Predictor: Timing of Peak Weight Loss | | | | Omnibus Test | | Individual Predictor: Timing of Peak Weight Loss | | | |
	F	P	b	S.E.	t	P	F	P	b	S.E.	t	P
Maximum Weight Loss	24.65	<.0001	0.54	0.12	4.62	<.001	15.73	<.001	0.67	0.17	3.95	<.001
12-Month Weight Loss	4.97	.02	0.70	0.17	4.16	<.001	5.30	.008	1.21	0.29	4.16	<.001
24-Month Weight Loss	5.81	<.001	0.56	0.19	2.95	.004	3.31	.05	1.14	0.30	3.85	<.001

Note: Session attendance and baseline BMI were included as covariates in the regression models.

Table 3

Timing and amount of peak weight loss for participants in the experimental arms of study 1 and study 2

| | Study 1 | | | | | | Study 2 | | | | |
| | BT | | BT+E | | BT+EA | | BT | | ABT | |
Timing of Peak Weight Loss	n (%)	Peak Weight Loss (kg) M (SD)	n (%)	Peak Weight Loss (kg) M (SD)	n (%)	Peak Weight Loss (kg) M (SD)	n (%)	Peak Weight Loss (kg) M (SD)	n (%)	Peak Weight Loss (kg) M (SD)
4 Months	22 (25.0%)	3.63 (3.37)	19 (20.4%)	3.26 (2.43)	17 (16.7%)	3.45 (193)	18 (20.0%)	6.45 (4.07)	16 (16.7%)	5.24 (5.98)
5–6 Months	16 (18.2%)	10.25 (3.37)	20 (21.5%)	10.13 (6.43)	19 (18.6%)	9.92 (4.59)	29 (32.2%)	11.94 (4.39)	16 (16.7%)	13.28 (6.30)
7–8 Months	10 (11.4%)	11.48 (4.38)	8 (8.6%)	12.88 (5.99)	13 (12.7%)	13.06 (5.31)	23 (25.6%)	11.78 (4.69)	25 (26.0%)	15.55 (5.58)
>8 months	40 (45.4%)	14.61 (6.95)	46 (49.5%)	15.00 (6.59)	53 (52.0%)	14.49 (7.92)	20 (22.2%)	19.31 (6.66)	39 (40.6%)	19.10 (9.99)

Note. Percentages refer to the proportion of participants peaking during the specified timeframe; mean peak weight loss is presented for the participants included in those percentages

Table 4

Results from regression analyses predicting weight loss at peak, 12-months, and 24-months from timing of peak weight loss in experimental arms of Study 1 and Study 2

	Study 1												Study 2											
	BT-E						BT-EA						ABT											
	Omnibus Test		Individual Predictor: Timing of Peak Weight Loss				Omnibus Test		Individual Predictor: Timing of Peak Weight Loss				Omnibus Test		Individual Predictor: Timing of Peak Weight Loss			
	F	P	b	S.E.	t	P	F	P	b	S.E.	t	P	F	P	b	S.E.	t	P
Maximum Weight Loss	21.91	<.001	0.54	0.16	3.49	.001	15.45	<.001	0.43	0.18	2.34	.02	22.34	<.001	0.66	0.22	3.05	.003
12-Month Weight Loss	11.03	<.001	0.86	0.20	4.25	<.001	10.66	<.001	0.65	0.20	3.27	.001	8.74	<.001	0.87	0.28	3.08	.002
24-Month Weight Loss	6.75	<.001	0.67	0.19	3.61	<.001	8.95	<.001	0.93	0.20	4.69	<.001	3.538	.03	0.82	0.42	1.96	.06

Note: Session attendance and baseline BMI were included as covariates in the regression models