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Participant and interventionist perceptions of challenges during behavioral weight loss treatment

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Abstract No prior studies have examined how interventionists' perceptions of participants' weight control challenges or the agreement between participants and interventionists on these perceptions relate to outcomes during group-based behavioral weight loss treatment. This study characterized participants' and interventionists' perceptions of, and agreement about, weight control challenges and assessed how these factors relate to weight loss. Three months into treatment, participants and interventionists independently selected three weight control challenges believed to be most relevant for each participant. Weight was measured at baseline, 3 months, and 12 months. Interventionists and participants had "no" ($\kappa < 0$) or "slight" ($0 < \kappa < .20$) agreement on most challenges. Although endorsement of certain challenges by participants and/or interventionists was related to 3- and 12-month weight losses, agreement between participants and interventionists was unrelated to weight loss at either time point. Additional research is needed to better understand the role of perceived challenges and participant/interventionist agreement about challenges on treatment outcomes.

Keywords Obesity · Weight loss · Treatment · Challenges · Behavior therapy

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Introduction

Although behavioral weight loss treatment, which is the first line of intervention for adults with obesity, generally produces clinically meaningful mean weight losses, many participants have suboptimal responses to treatment (Christian et al., 2010). The unique challenges that participants face in changing their diet and increasing their physical activity may contribute to reduced weight losses. In fact, a core focus of behavioral weight loss involves teaching participants to identify their weight control challenges and to use problem-solving skills and behavioral strategies such as goal setting and stimulus control to address these challenges (Butryn et al., 2011; Perri et al., 2001). Interventionists also form conceptualizations of individual participants' challenges, which may impact the strategies that interventionists emphasize with particular participants (Venditti et al., 2014). Despite the important role that weight control challenges may play in treatment outcome, little research has examined participants' perceptions of their own weight control challenges, interventionists' perceptions of individual participants' weight control challenges, and/or the agreement between participant and interventionist perceptions of weight control challenges. In line with a movement toward personalized medicine, which seeks to enhance outcomes by understanding and responding to patients' unique needs (Collins & Varmus, 2015; Field et al., 2013), and given the importance of improving behavioral weight loss outcomes, additional examination of perceived weight control challenges and their relation to outcomes is warranted.

At present, limited information is available about how participants engaged in behavioral weight loss treatment perceive their weight control challenges and how these perceptions relate to outcome. Prior research suggests that

certain weight control challenges, including lack of knowledge or time, limited self-control, low motivation, inadequate meal planning, and use of food as a reward, are frequently endorsed during behavioral weight control treatment (Turk et al., 2012; Welsh et al., 2012). However, previous studies have primarily examined whether the total amount of challenges endorsed (or change in perception of challenges from pre- to post-treatment), rather than endorsement of specific challenges, is related to outcome (Turk et al., 2012; Wang et al., 2015). For example, several studies have found that decreases in total weight control challenges (as measured by a composite score) predict better weight loss or weight loss maintenance (Turk et al., 2012; Wang et al., 2015; Welsh et al., 2012). Research has not yet examined the relationship between specific weight control challenges and weight loss. It is possible that different challenges may be more or less important to weight loss outcomes. Additionally, prior research has typically examined weight control challenges at the beginning of treatment, when participants have less experience with weight control and therefore may have limited insight into their challenges, and/or after treatment has ended, when participants may have made significant progress on certain challenges or retrospective recall could bias perceptions (Befort et al., 2008; Turk et al., 2012; Welsh et al., 2012). Examining weight control challenges in the midst of active treatment may have greater implications for intervention development and treatment tailoring.

Understanding how weight control challenges differ among participants (rather than only examining the most frequently endorsed challenges) may also have implications for treatment tailoring. Adapting treatments according to participants' strengths and weaknesses rather than relying on the typical one-size-fits-all approach may improve outcomes and enhance adherence (Field et al., 2013; Martin et al., 2005). Additionally, it is possible that certain challenges are experienced more often by some participants compared to others based on factors such as age, sex, or race. For example, younger participants may attend more social events that involve eating than older participants, and may thus find challenges associated with social eating to be particularly prominent (Munt et al., 2017). Because factors like age, sex, and race have been shown to predict outcomes during behavioral weight loss (Diabetes Prevention Program Research Group, 2004; Wadden et al., 2009), understanding the relationship between demographic characteristics and weight control challenges may help identify subtypes of participants with differing treatment needs.

During treatment, interventionists develop hypotheses about which weight control challenges are most pertinent to each participant whom they treat. One previous study found that among interventionists in the Diabetes Prevention Program, the most commonly perceived participant weight control challenges were in the domains of self-monitoring, social cues, vacations and holidays, physical activity, and internal (thought/mood) cues (Venditti et al., 2014). To date, the literature has not examined whether interventionists' perceptions of weight control challenges relate to participants' treatment outcomes. On the one hand, interventionists' perceptions of challenges may be important in predicting treatment outcomes given that they are likely informed by a range of experiences with different clients and an awareness of the ways in which different barriers present. Additionally, interventionists' perceptions of challenges may impact their working conceptualization of a participant and, thus, might influence the ways that they deliver the intervention to that participant (e.g., which challenges they emphasize when problem-solving with the participant) (Venditti et al., 2014). On the other hand, previous research demonstrates that basing treatment decisions on clinical judgment alone is often ineffective, which might suggest that interventionists' perceptions of weight control challenges are not predictive of outcome (Garb, 2005). Examining whether interventionists' perceptions of participants' challenges relate to outcomes may help to determine whether these perceptions can be better utilized or shaped to improve treatment outcomes.

More research is also needed to examine the extent to which interventionists and participants have shared versus discrepant conceptualizations of participant weight control challenges, and whether agreement is related to weight loss outcomes. If a participant and interventionist have different perceptions about what makes weight control challenging for that individual, the quality of the therapeutic relationship, which has been found to impact healthcare outcomes (Kelley et al., 2014), could be undermined. Additionally, differing perceptions could yield poorer participant engagement and diminished treatment efficacy (Martin et al., 2005). Prior studies on psychotherapy (not specific to obesity) suggest that greater therapist-client agreement regarding the client's level of functioning, treatment goals, and target problems predict better treatment outcomes and retention (Bar-Kalifa et al., 2016; Busseri & Tyler, 2004; Long, 2001). One previous study found that in brief (6–8 sessions), individual behavioral weight loss treatment, match between interventionist and participant perceptions was judged "accurate" (i.e., there was agreement about at least one challenge based on subjectively coded open-ended responses) in fewer than half of cases, though, importantly, accuracy was positively associated with outcomes (Pekarik, 1988). No previous research has examined the match of perceptions between interventionists and participants and their relationship to outcome in group-based treatment, where interventionists may have less

opportunity to develop an accurate conceptualization of participant challenges.

The current study utilized data from a large randomized controlled trial of group-based behavioral weight loss treatment and was designed to assess perceptions of weight control challenges among program participants and the interventionists delivering their treatment. A preliminary aim of this research was to gather descriptive information about participant and interventionist perceived challenges. Primary aim one was to examine the amount of agreement in participant and interventionist perception of challenges. Primary aim two was to determine if there were demographic differences in participants' and interventionists' perceptions. Primary aim three was to examine how participant and interventionist perceptions of challenges were concurrently and prospectively related to weight loss. Primary aim four was to examine how agreement between participant and interventionist perceptions of challenges concurrently and prospectively related to weight loss. This is the first study to our knowledge to objectively examine the agreement versus discrepancy in participant and interventionist perceptions of weight control challenges in group-based behavioral weight loss, and to examine the relationship between interventionist perceptions of weight control challenges and participant weight loss.

Methods

Participants and procedure

Participants were adults (N = 320) enrolled in a behavioral weight loss clinical trial. Inclusion criteria for the parent study included body mass index (BMI) between 27 and 45 kg/m^2 and aged 18–70 years. Exclusion criteria included history of bariatric surgery or acceptance-based weight loss treatment, taking medication with known impact on weight, losing $\geq$ 5% of body weight in the last 6 months, having any significant medical or psychiatric condition (e.g., eating disorders, psychosis) that might interfere with treatment participation or cause weight change, and currently nursing, pregnant, or planning to become pregnant during the study. A majority of participants were female (78.1%) and identified as white (70.0%) or black (25.0%). Mean age was 52.6 years (SD = 10.7) and mean baseline BMI was 35.13 kg/m^2 (SD = 4.76).

As part of the parent trial, 24 groups of 10–15 participants received 30 sessions of group-based behavioral weight loss treatment. Each group was led by a doctoral-level clinical psychologist with at least 100 h of prior experience with weight control treatment and was co-led by staff at various stages of psychology training. A total of four doctoral-level interventionists and 17 co-leader staff provided treatment to participants, resulting in 23 unique leader/co-leader pairings who provided treatment during the study (one pair led two groups and the rest led one, resulting in 24 groups total). During the first 6 months (i.e., the initial weight loss phase), all participants received 16 weekly and bi-weekly in-person sessions of standard behavioral treatment based on the Diabetes Prevention Protocol and Look AHEAD (Diabetes Prevention Program Research Group, 2002; Look AHEAD Research Group, 2006), intended to induce a weight loss of approximately 10%. The present study measured weight control challenges during this first phase of treatment when all participants were receiving the same intervention. After month six, participants were randomized into one of three maintenance conditions: continued standard behavioral treatment, behavioral treatment with an enhanced focus on physical activity, or acceptance-based behavioral treatment with an enhanced focus on physical activity. All participants received the same schedule of 14 in-person sessions and three 15-minute phone calls during the 12-month maintenance phase. Treatment attendance was high with an average of 25.28 sessions (out of 30) attended (SD = 7.17). Of note, there were no significant differences in 12-month weight losses by condition. This study was approved by an Institutional Review Board and informed consent was obtained for all participants.

Measures

At baseline, participants self-reported their gender, age, race, and ethnicity. Weight was measured in the research clinic at baseline and 12 months by a blinded member of the research staff using a calibrated, digital, research-grade scale. This scale also was used by interventionists to measure participant weight at the beginning of each treatment session, including at 3 months. Height was measured with a stadiometer at baseline to calculate BMI.

A 15-item checklist of weight control challenges (see "Appendix") was developed by consulting the relevant literature, adapting previously used methods of assessment (Venditti et al., 2014), and seeking feedback from obesity treatment experts. The measure was administered at month 3 of treatment, mid-way through the initial weight loss phase. The participant version of the checklist asked participants to identify the three statements that were most true for them during times when weight control is challenging to help interventionists best support their needs. A corresponding weight control challenge domain accompanied these statements (e.g., "Emotional eating: I have a strong urge to eat in response to emotions such as boredom, loneliness, stress, or sadness, and that makes my weight control difficult"). Doctoral-level interventionists (group leaders) and trainees (group co-leaders) were asked to

complete a separate checklist in tandem for each participant in their treatment group, identifying the three statements that most accurately reflected the interventionists' conceptualization of the challenges faced by that participant (e.g., "Support: Important people in her life do not support her weight loss efforts, and that makes her weight control difficult"). The items were identical for the participant and interventionist versions, with the exception of the pronoun change in the statement to reflect the perspective of the participant versus interventionist. Participants were not informed that interventionists would be completing a checklist.

Data analytic approach

A total of 276 participants completed the checklist and interventionists completed the checklist for 268 participants; both self-rated and interventionist-rated checklists were available for 243 participants. Given the nature of the measure, missing weight control challenge data were not imputed for participants or interventionists. Three-month weight data were available for 260 of the 273 participants (94.2%) who completed the checklist and 12-month weight data were available for 268 (97.1%) of the 273 participants who completed the checklist. Consistent with prior research (Wadden et al., 2001; Wing et al., 2006), a conservative intention-to-treat method was used for missing weight data that assumed .3 kg of weight regain per month for participants who ceased attending sessions beginning with their last observed weight.

Data were analyzed in SPSS v.24 (IBM Corp., 2016). Participant and interventionist perceptions of challenges were characterized descriptively by examining frequencies and percentages of endorsement; potential differences in overall rates of endorsement between participants and interventionists were analyzed with separate Chi Square tests for independence for each challenge (*preliminary aim*). Agreement between participant and interventionists on challenges (*primary aim one*) was examined in two ways. First, we examined agreement at the participant level by assessing how many of each participant's three challenges her/his interventionist also endorsed. We also examined agreement for each challenge by calculating how often it was endorsed by only one versus both raters (participant/interventionist) and using Cohen's Kappa tests to assess rater agreement. Given that three challenges were selected as most relevant out of 15 (rather than rank ordering all 15 challenges in order of relevance), there were differing base rates of endorsement for each item. Percentages were calculated for each challenge considering only cases for which at least one rater (participant/interventionist) endorsed that particular challenge. We did not examine agreement for challenges that neither rater endorsed, as we felt doing so would artificially inflate apparent agreement rates between raters when, in fact, by nature of the measure's design, at least nine challenges could not be endorsed by either rater. For the agreement analyses, both participant and interventionist weight control challenge data needed to be available for a case to be included in analyses. Demographic differences in perceptions of challenges for both participants and interventionists were assessed with separate t-tests for age and BMI (*primary aim two*). Participants were categorized as white versus non-white based on self-reported race, and separate Chi square tests for independence were used to examine differences in rates of participant or interventionist endorsement by race and gender. Multiple regression was used to examine whether endorsement (yes/no) for each challenge predicted concurrent percent weight loss (3 months) or percent weight loss at 12 months (*primary aim three*). To examine the relationship between interventionist/participant agreement and weight loss at 3 and 12 months (*primary aim four*), participants were categorized into three groups: those who agreed with their interventionist on no challenges, those who agreed with their interventionist on one challenge, and those who agreed with their interventionist on two or more challenges (of note, participants with two and three shared challenges were combined due to the low frequency of having three shared challenges). One-way ANOVAs were then performed to compare these three groups on mean weight loss at 3 and 12 months.

Results

Table 1 shows the frequency with which participants and interventionists endorsed each weight control challenge included on the checklist. (Percentages sum to greater than 100% because each participant and interventionist was asked to select the three challenges that were most pertinent.) Among participants, the most frequently endorsed challenges were desire for good tasting food, social life, and emotional eating. Desire for good tasting food, social life and planning/organization were the challenges most frequently cited by interventionists. As shown in Table 1, in the overall sample, interventionists endorsed the following challenges significantly more often than participants: self-monitoring (28.4% vs. 14.9%), effort (23.1% vs. 15.6%), nutrition knowledge (15.3% vs. 5.4%), and support (7.1% vs. 3.3%). Participants endorsed the following challenges significantly more often than interventionists: emotional eating (35.1% vs. 11.6%), chaos/stress (30.8% vs. 19.0%), self-control (30.1% vs. 19.4%), and hunger (15.2% vs. 4.1%).

Table 1 Frequency of challenge endorsement by participants and interventionists

	Participants		Interventionists		Chi Square	
	n endorsed	% endorsed	*n* endorsed	% endorsed	χ^2	*p*
Social life	112	40.6	113	42.2	.14	.71
Desire for good tasting foods	99	35.9	107	39.9	.95	.33
Emotional eating	97	35.1	31	11.6	42.01	< .001
Chaos/stress	85	30.8	51	19.0	5.24	.02
Self-control	83	30.1	52	19.4	8.30	.004
Planning/organization	76	27.5	77	28.7	.10	.76
Motivation	56	20.3	39	14.5	3.12	.08
Effort	43	15.6	62	23.1	4.98	.03
Hunger	42	15.2	11	4.1	19.10	< .001
Self-monitoring	41	14.9	76	28.4	14.69	< .001
Other	31	11.2	23	8.6	1.07	.30
Household foods	25	9.1	32	11.9	1.20	.27
Nutrition knowledge	15	5.4	41	15.3	14.33	< .001
Mood	12	4.3	7	2.6	1.22	.27
Support	9	3.3	19	7.1	4.08	.04

For all Chi Square models, $df = 1$ and total $N = 544$

Agreement was also examined at the individual participant/interventionist level by (a) assessing how many of the three challenges that each participant endorsed were also endorsed by his/her interventionist, and (b) examining shared endorsement between participant and interventionist on each challenge. In 26.7% of cases ($n = 65$), none of the three items endorsed by a participant were selected by his/her interventionist. In 48.1% cases ($n = 117$), there was shared agreement on one item, in 24.3% of cases ($n = 59$) there was shared agreement on two items, and all three of the participant's challenges were endorsed by the interventionist in .8% of cases ($n = 2$). Table 2 further illustrates the agreement between each participant's reported challenges and the interventionist's perception of that particular participant's challenges. Based on Landis and Koch's (1977) guidelines for interpreting Kappa, there was "no" agreement between participants and interventionists for hunger, support, and mood ($\kappa < 0$), "slight" agreement for motivation, effort, chaos/stress, nutrition knowledge, desire for good tasting food, and self-control ($0 < \kappa < .20$), and "fair" agreement for planning/organization, self-monitoring, household foods, social life, and emotional eating ($.21 < \kappa < .40$).

Participants who endorsed hunger as a challenge had a significantly lower BMI ($M = 32.6$ kg/m^2) compared to those who did not endorse this challenge ($M = 35.4$ kg/m^2, $t(274) = 2.98$, $p = .03$). Age was significantly lower for those who endorsed self-control as a challenge ($M = 50.7$ years) compared to those who did not ($M = 54.6$ years; $t(274) = 3.65$, $p < .001$). Men were significantly more likely than women to endorse hunger as a challenge ($\chi^2(1, N = 276) = 4.07$, $p = .04$), and significantly less likely than women to endorse planning as a challenge ($\chi^2(1, N = 276) = 4.80$, $p = .03$). No differences in participant endorsement by race were observed.

Analyses also were conducted to determine if interventionist perceptions differed according to participant demographic factors. Participants for whom interventionists endorsed chaos/stress as a challenge were significantly younger ($M = 49.3$ years) than participants for whom interventionists did not endorse chaos/stress as a challenge ($M = 53.3$ years, $t(266) = 2.49$, $p = .01$). Interventionist endorsement of chaos/stress as a challenge was significantly more likely for male participants than for female participants ($\chi^2(1, N = 268) = 4.05$, $p = .04$). Interventionists also endorsed the following challenges more frequently for non-white versus white participants: nutrition knowledge ($\chi^2(1, N = 268) = 9.69$, $p = .002$), planning/organization ($\chi^2(1, N = 268) = 9.35$, $p = .02$), and self-monitoring ($\chi^2(1, N = 268) = 6.62$, $p = .01$). Interventionists endorsed social challenges more frequently for white participants compared to non-white participants ($\chi^2(1, N = 268) = 11.39$, $p = .001$). No differences in BMI based on interventionist endorsement were observed.

The ability of participants' reported challenges to predict concurrent (3 months) or later (12 months) weight loss was examined. As shown in Table 3, participant endorsement of motivation or self-monitoring as a challenge was

Table 2 Agreement in challenge endorsement between participants and interventionists in the overall sample

	Total # participants for whom endorsed by participant and/or interventionist	Endorsed by participant only		Endorsed by interventionist only		Endorsed by both		Cohen's Kappa	
		n	%	*n*	%	*n*	%	κ	*p*
Social life	143	40	28.0	48	33.6	55	38.5	.25	< .001
Desire for good tasting foods	146	42	28.8	63	43.2	41	28.1	.09	.13
Emotional eating	96	66	68.8	8	8.3	22	22.9	.23	< .001
Chaos/stress	99	58	58.6	22	22.2	19	19.2	.13	.03
Self-control	111	61	55.0	33	29.7	17	15.3	.02	.75
Planning/organization	108	38	35.2	39	36.1	31	28.7	.22	< .001
Motivation	75	46	61.3	24	32.0	5	6.7	.01	.91
Effort	82	27	32.9	44	53.7	11	13.4	.06	.31
Hunger	44	35	79.5	8	18.2	1	2.3	− .02	.75
Self-monitoring	83	14	16.9	47	56.6	22	26.5	.28	< .001
Other	38	19	50.0	15	39.5	4	10.5	.12	.07
Household foods	43	15	34.9	20	46.5	8	18.6	.23	< .001
Nutrition knowledge	44	9	20.5	32	72.7	3	6.8	.06	.28
Mood	17	11	64.7	6	35.3	0	0	− .03	.59
Support	25	8	32.0	17	68.0	0	0	− .05	.43

Percentages were calculated for each challenge considering only those participants for whom at least one party (participant or interventionist) endorsed that particular challenge. Percentages for agreement on challenges that were *not* endorsed by either rater are not shown given that, by nature of the measure's design, at least nine items would not be endorsed by either rater

Table 3 Participant and interventionist challenge endorsement in relation to participant weight loss at 3 and 12 months

	Participant-endorsed challenges				Interventionist-endorsed challenges			
	3 month % weight loss		12 month % weight loss		3 month % weight loss		12 month % weight loss	
	b	*t*	*b*	*t*	*B*	*t*	*b*	*t*
Social life	− .57	− 1.25	− 2.47	− 2.45*	− 1.49	− 3.35**	− 3.23	− 3.25**
Desire for good tasting foods	− .92	− 1.97*	− 2.56	− 2.48*	− 1.42	− 3.17**	− 1.98	− 1.95
Emotional eating	− .19	− .39	− .35	− .33	− .74	− 1.06	− .20	− .13
Chaos/stress	.11	.22	.41	.38	− .33	− .57	.12	.09
Self-control	.58	1.19	.74	.68	− .12	− .20	.72	.57
Planning/organization	.64	1.27	1.61	1.44	1.92	4.00***	2.44	2.22*
Motivation	1.69	3.08**	2.66	2.15*	2.46	3.99***	4.81	3.46**
Effort	.55	.90	1.39	.1.01	2.11	4.10***	2.92	2.49*
Hunger	− 1.04	− 1.67	.90	.65	− 1.42	− 1.26	− 2.62	− 1.04
Self-monitoring	1.86	3.00**	2.68	1.91	2.71	5.80***	4.59	4.28***
Other	− 1.31	− 1.85	− 3.50	− 2.23*	− .47	− .59	.57	.32
Household foods	− .30	− .39	1.15	.66	− .76	− 1.11	− 2.57	− 1.67
Nutrition knowledge	− .39	− .39	− 2.59	− 1.17	2.71	4.52***	4.49	3.30**
Mood	.26	.24	3.44	1.40	.59	.42	− .35	− .11
Support	− .05	− .04	2.29	.81	− 1.87	− 2.17*	− 4.33	− 2.24*

*$p < .05$, **$p < .001$, ***$p < .001$. For all models examining participant endorsed challenges, df = 273. For all models examining interventionist-endorsed challenges, df = 266. Percent weight loss was scored such that more negative values indicate greater weight loss

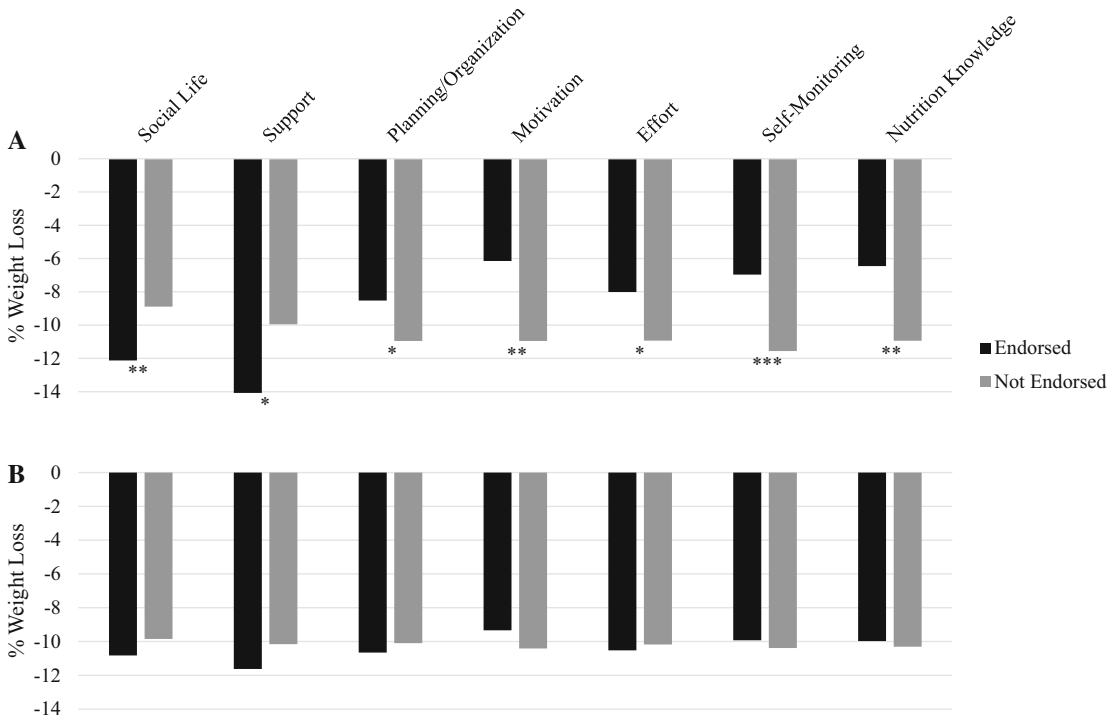

Fig. 1 Participant percent weight loss at 12 months based on select interventionist-endorsed challenges (**a**), controlling for 3-month weight loss (**b**). *Note*: $*p < .05$, $**p < .01$, $***p < .001$

associated with significantly less weight loss at 3 months, while endorsement of desire for good tasting food as a challenge was associated with greater weight loss at 3 months. Motivation and desire for good tasting food remained significant predictors of 12-month weight loss, with endorsement of motivation as a challenge predicting less weight loss and endorsement of desire for good tasting food predicting greater weight loss. Additionally, endorsement of social challenges and "other" as a challenge predicted greater weight loss at 12 months. The concurrent and predictive ability of interventionist ratings also was examined. As shown in Table 3 and Fig. 1, interventionist endorsement of each of the following challenges was associated with less weight loss at 3 months and predicted less weight loss at 12 months: motivation, effort, nutrition knowledge, planning, and self-monitoring. On the other hand, interventionist endorsement of support and social life as challenges was positively related to weight loss at 3 months and predicted greater weight loss at 12 months. Endorsement of desire for good tasting food as a challenge also was positively related to weight loss at 3 months but did not predict weight loss at 12 months. When controlling for weight loss at 3 months, participant endorsement of social life as a challenge related to greater weight loss at 12 months ($B = -1.59$, $SE = .72$, $t = -2.20$, $p = .029$). None of the other relationships between endorsement of challenges (interventionist or participant) and 12-month weight loss remained statistically significant when controlling for weight loss at 3 months.

The relationship of weight loss at 3 and 12 months to agreement between individual participants/interventionists on perceived challenges was also examined. At 3 months, there were no significant differences in percent weight loss by participant-interventionist pairings with no agreement on challenges ($M = 7.9\%$ (4.0)), agreement on one challenge ($M = 6.9\%$, (3.3)), or agreement on two or more challenges ($M = 6.5\%$, (3.5)), $F(2, 240) = 2.68$, $p = .07$, partial eta squared = .02. At 12 months, there also were no significant differences in percent weight loss by pairings with no agreement on challenges ($M = 12.2\%$ (9.0)), agreement on one challenge ($M = 9.7\%$ (7.2)), or agreement on two or more challenges ($M = 11.3\%$ (8.3)), $F(2, 240) = 2.07$, $p = .13$, partial eta squared = .02.

Discussion

This study extends the available research on participant and interventionist perceptions of weight control challenges in important ways. To our knowledge, this is the first paper to objectively assess the match between participant and interventionist perceptions of challenges during group-based behavioral weight loss treatment and to examine the

relationship between interventionist perceptions of challenges and weight loss. It also adds meaningful information to the limited body of empirical information about participant perceptions of weight control challenges by identifying challenges during active weight loss (rather than at baseline or end of treatment), and by examining the relation of specific weight loss challenges (rather than composite scores) to weight loss outcomes at two time points.

This study found certain commonly identified key challenges across participants and interventionists in the overall sample (i.e., not matched at the individual participant/interventionist level). For instance, more than one-third of interventionists and one-third of participants in the sample identified desire for good tasting food and social factors as key challenges. In general, participants endorsed chaos/stress, hunger, self-control, and emotional eating more often than interventionists. Interventionists may have difficulty accurately or comprehensively assessing these challenges in the setting of group-based treatment where participants may be less likely to disclose such factors. Interventionists should be aware that they may underestimate the likelihood that participants perceive these factors as key challenges for themselves, and structured assessment of these domains (e.g., through self-report measures) may be valuable. Overall, interventionists endorsed effort, nutrition knowledge, support, and self-monitoring as perceived challenges significantly more often than participants. Interventionists endorsement of these specific challenges may reflect their observations from treatment, including food record review, and weight change data. They also may believe that these factors are associated with poorer outcomes and therefore default to identifying them as challenges for participants who are struggling with weight control, while participants may view these factors as less important to weight control or be less likely to disclose these challenges.

A more precise picture of consistency between each participant's reported challenges and the interventionists' perception of barriers for that particular participant was examined by calculating rates of agreement and kappa values. Rates of agreement between individual participant and interventionist-reported challenges were generally low. That is, kappa values were "fair" for only 5 out of 15 items (planning/organization, self-monitoring, household foods, social life, and emotional eating). The low agreement was driven by high rates of single respondent endorsement (i.e., items being endorsed only by the participant or only by the interventionist). For example, in nearly 80% of instances in which hunger was endorsed by a respondent, it was endorsed by the participant only; agreement occurred in only one case. As another example, in over 70% of the instances in which nutrition knowledge was endorsed, it was endorsed by the interventionist only; agreement occurred in only three cases. While rates of agreement were fairly low for each particular challenge, when comparing a participant's three endorsed challenges to the ratings made by his/her interventionist, there was greater agreement. Specifically, interventionists and participants agreed on at least one perceived challenge in most cases (i.e., 73.2%), with agreement on two or more challenges occurring in approximately a quarter of the cases. Overall, these findings indicate that agreement between participants and interventionists on key challenges to weight control is limited.

Interventionists' perception of weight control challenges varied by participant sex, age, BMI, and race, which is consistent with the results of previous research. For example, in the study of clinician perceptions of weight control challenges conducted by Venditti et al. (2014), among other demographic differences, shopping, food preparation, meal planning, and self-monitoring were identified more commonly as challenges for younger versus older participants, heavier versus leaner participants, and non-white versus white participants. Previous research also has documented demographic differences in participant perception of challenges. In a sample of behavioral weight loss participants, men cited lack of knowledge as a challenge more frequently than women, and younger compared to older participants more frequently reported lack of knowledge and lack of time as challenges (Welsh et al., 2012). In the current study, it is notable that demographic differences were less frequently detected for participant versus interventionist perceptions. Future research should examine whether interventionists have pre-existing expectations that participants in different demographic groups experience certain challenges and determine if these expectations influence the accuracy of their conceptualization of challenges when working with individual participants. It is also possible that these patterns of demographic differences point to future directions to consider for treatment tailoring (e.g., which skills may be especially needed by young adults in weight loss programs), but additional research on this topic is needed.

At 3 months, weight loss was associated with interventionist and participant endorsement of certain challenges. Some challenges were favorable (e.g., desire for good tasting food, social life), in that interventionist and/or participant endorsement was associated with greater weight loss. Other challenges were negatively related to weight loss at 3 months (i.e., motivation and self-monitoring for participants, and effort, nutrition knowledge, and planning for interventionists). When controlling for 3-month weight loss, only participant endorsement of social life as a challenge independently predicted 12-month weight loss. Given the nature of this study, it is difficult to determine the causal direction of the relationship between weight loss

and perceived challenges. The findings that certain perceived challenges predicted *better* outcomes and that perceived challenges were largely not predictive of 12-month weight loss after controlling for 3-month weight loss might suggest that weight loss up to 3 months influenced which challenges were endorsed by participants and interventionists. When participants are on a trajectory of successful weight loss it may be harder to accurately identify challenges. Interventionists may initially "rule out" challenges that they believe are crucial to treatment outcome, and instead endorse challenges that they perceive as more universal. These challenges may still be important intervention targets if they are experienced by many participants, but they might not be crucial to weight loss success on their own. Conversely, when participants are on a trajectory of suboptimal weight loss, interventionists may attribute this trajectory to certain factors believed to most impact weight loss. For example, interventionists may have been predisposed to select challenges that they know have been identified in the literature as interfering with weight loss (e.g., lower motivation and difficulty self-monitoring) (Burke et al., 2011; Teixeira et al., 2005). Similarly, participants may have received implicit or explicit messages from the treatment program that these challenges make weight loss difficult. However, we cannot rule out the possibility that the challenges that were endorsed at 3 months were in fact present from the very start of treatment and contributed to participants' weight loss at 3 months. Thus, additional temporal research is necessary to clarify the correlational versus causal nature of these relationships.

There were no differences in weight losses at 3 or 12 months based on the number of weight control challenges that participants and their interventionists agreed on. Interestingly, these results contradict findings from the only other study to our knowledge that has examined how participant/interventionist agreement on treatment challenges relates to weight loss outcome during a behavioral weight loss intervention (Pekarik, 1988). This prior study focused on a brief, individual weight loss program and found that greater participant/interventionist agreement was associated with better weight loss outcomes (Pekarik, 1988). It is possible that in the context of a group-based treatment that provides only modest individualized intervention, it is less important for participants and their interventionists to have a shared conceptualization of the participant's challenges, in part because the intervention is intended to address a wide range of difficulties that participants might experience. It is also possible that agreement between participants and interventionists is important for other treatment processes that this study did not assess, like rapport or treatment engagement (Martin et al., 2005). Also, the measure of agreement used in the current study differs from the method of assessment used by Pekarik (1988), which may contribute to the discrepant findings.

Future research should address key limitations of this study. Development of validated and standardized tools to assess participant and interventionist perceptions of challenges is needed, as the tool used in this and most other work in this area was created by the research team for purposes of this study, which may have resulted in potential measurement validity issues that could have influenced study findings. The checklist from which participants and interventionists selected challenges may have been biased in over-representing some challenges or not including others that are relevant, and responses were constrained in that participants and interventionists were asked to select exactly three items. Results may have differed and may have more accurately reflected perceptions if respondents had freedom to choose a higher or lower number of challenges, or if a Likert-scale (rather than a forced-choice paradigm) was utilized. Additionally, involving participants in measurement design in future studies might be beneficial, particularly given that over 10% of participants selected "other" as a challenge, and "other" challenges were significantly correlated with 12-month weight losses.

Repeated assessment of challenges throughout treatment also would provide a more thorough understanding of the extent to which perceptions are stable versus dynamic and may better help assess temporal relationships. The current study focused on perceived challenges at 3 months; while this gave an opportunity for interventionists to form meaningful impressions of participants' potential strengths and weaknesses for weight control and for participants to experientially learn what was challenging about changing their weight control behaviors, it is unknown how the results may have differed with assessment earlier or later in treatment. Also, as discussed above, because participants had begun losing weight by this time, their perceptions and those of their interventionists were likely influenced by their weight loss trajectory. This study used weight loss as the primary outcome measure, but other treatment processes like satisfaction are important and may be related to agreement between participants and interventionists.

Additionally, pairs of interventionists (i.e., a "group leader" and "coleader") reported on perceived challenges for each participant in this study; findings might differ if only one interventionist was responsible for reporting challenges. Future research should determine if patterns of perceptions may differ by mode or intensity of treatment. In this study, all interventionists were delivering standard behavioral treatment during the time when perceptions of challenges were assessed, and interventionists and participants were blinded to which treatment condition was coming in the maintenance phase. This study did not measure perceptions of challenges during the maintenance

period when treatment protocols besides standard behavioral treatment were delivered. It is possible that interventionists conceptualized weight control challenges differently according to condition. For example, during the maintenance phase, interventionists in the acceptance-based condition may have focused more closely on how uncomfortable internal experiences (which were a primary target in the acceptance-based condition) might pose a challenge to weight control, while those in the standard behavioral condition may have focused on behavioral factors like self-monitoring. In future research, it would be valuable to assess how interventionist perceptions may vary according to the type of treatment being delivered.

Overall, this study suggests that participants and interventionists may have a surprisingly small amount of shared understanding of what makes weight control challenging for a particular participant. Additionally, relatively few perceived challenges were related to weight loss, particularly for participant-endorsed challenges. While the impressions that interventionists have of participant challenges may be inconsistent with those of their participants, at this point the data do not suggest that lack of agreement is necessarily problematic for weight loss outcomes. Before continued research is conducted in this area, a measurement validation study should be completed to determine the validity of the scale utilized in this study.

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Compliance with ethical standards

Conflict of interest Christine C. Call, Leah M. Schumacher, Diane L. Rosenbaum, Alexandra D. Convertino, Fengqing Zhang and Meghan L. Butryn declare that they have no conflict of interests.

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. Informed consent was obtained from all individual participants included in the study.

Appendix

Instructions and Items for Weight Control Challenges Questionnaire

Interventionist Instructions:

Select the **three statements** that you believe are most true for this participant. Your answers shouldn't be how you think the participant will respond, but rather your own conceptualization of the challenges the participant faces.

Participant Instructions:

When you have times in which your weight control is challenging, what factors are making things most difficult for you? First, **read all of the statements**. Then select the **three statements** that are most true for you by placing check marks next to them.

Items *[For interventionist version, first person pronouns are replaced with third person pronouns, e.g., "she" instead of "I"]***:**

	Place a checkmark next to your 3 most significant challenges
MOTIVATION: I don't always feel committed to weight control or feel motivated enough to make it a top priority, and that makes my weight control difficult.	
EFFORT: Changing my habits takes much more effort than I anticipated or feel prepared for, and that makes my weight control difficult.	
CHAOS/STRESS: My life feels chaotic and I have stressors that need my attention and energy, and that makes my weight control difficult.	
NUTRITION KNOWLEDGE: I often do not know enough about the calories in foods, or how to select or prepare foods that will be low in calories, and that makes my weight control difficult.	
DESIRE FOR GOOD TASTING FOODS: I have strong cravings for good tasting food, and that makes my weight control difficult.	
HUNGER: I often feel hungry and feel that I need more to eat, and that makes my weight control difficult.	
SELF-CONTROL: I often make impulsive decisions about food and have a hard time sticking to my goals, and that makes my weight control difficult.	
SUPPORT: Important people in my life do not support my weight loss efforts, and that makes my weight control difficult.	
PLANNING/ORGANIZING: I have a hard time planning ahead (for example, planning meals and grocery shopping) and that makes my weight control very difficult.	
KEEPING TRACK: I have a hard time keeping track of my calories completely and accurately, and that makes my weight control very difficult.	
HOUSEHOLD FOOD: The other members of my household buy, bring home, or cook foods that are high in calories and tempting, and that makes my weight control very difficult.	
SOCIAL LIFE: My social life (or work life) involves going out to eat and/or drink often, and that makes my weight control very difficult.	
EMOTIONAL EATING: I have a strong urge to eat in response to emotions such as boredom, loneliness, stress, or sadness, and that makes my weight control difficult.	
MOOD: I often feel down, depressed, or have low energy, and that makes my weight control difficult.	
OTHER: The following factor makes my weight control difficult:	

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