

Join TOS Today!

THE OBESITY SOCIETY

Creative Science Driving Effective Care

OUR VISION– Solving the challenges of obesity through deeper understanding and coordinated action

OUR MISSION– To promote innovative research, effective and accessible care, and public health initiatives that will reduce the personal and societal burden of obesity

OUR VALUES– Rigorous science, highest professional standards, and strength through diversity

The Benefits of Membership

- Network directly with obesity thought leaders
- Make global connections with members of The Obesity Society (TOS), including those in your sub-specialty
- Access a wealth of networking resources: Members Directory, Clinicians Directory, Job Board
- Get a reduced rate on your registration for ObesityWeekSM, TOS annual scientific meeting
- Receive a discount on page charges when publishing your work in Obesity, the flagship scientific journal of TOS
- Become eligible for a variety of annual awards and grants

To join or renew your membership with
The Obesity Society,
visit www.obesity.org



(301) 563-6526 | contact@obesity.org | www.obesity.org

CONNECT
WITH TOS



Group Dynamics are Associated with Weight Loss in the Behavioral Treatment of Obesity

Lisa M. Nackers¹, Pamela J. Dubyak¹, Xiaomin Lu², Stephen D. Anton³, Gareth R. Dutton⁴, and Michael G. Perri¹

Objective: To assess whether group dynamics are associated with weight loss, session attendance, and self-monitoring adherence after 6 months of lifestyle intervention for obesity.

Methods: Women with obesity ($N = 125$; mean \pm SD BMI = 37.84 ± 3.94 kg/m²; age = 51.99 ± 10.81 years) participated in a 24-week group-based lifestyle weight loss intervention and achieved a weight loss of 9.13 ± 7.15 kg after 6 months. Participants reported their perceptions of group conflict, avoidance, engagement, social support, and attraction at the end of treatment. Multiple regression with forward selection assessed which group dynamic variables were associated with weight loss, attendance, and adherence.

Results: Greater perceived group conflict was associated with smaller weight losses ($\beta = 1.833$, $P = 0.044$) and lower attendance ($\beta = -2.313$, $P = 0.002$) and adherence rates ($\beta = -2.261$, $P = 0.030$). Higher group attraction was associated with higher attendance rates ($\beta = 0.051$, $P = 0.039$). The association between perceived conflict and weight change was mediated by attendance and adherence ($P = 0.019$).

Conclusions: Findings demonstrate that group dynamics associate with weight loss outcomes, attendance, and adherence. Addressing conflicts and fostering acceptance among group members may promote success in group-based lifestyle interventions for obesity.

Obesity (2015) **23**, 1563–1569. doi:10.1002/oby.21148

Introduction

Lifestyle interventions for obesity incorporate behavioral strategies to promote changes in diet and physical activity and result in clinically significant weight reductions of 7–10% (1). Studies have demonstrated greater weight loss when these interventions are delivered in group versus individual formats (2–4), regardless of participant preference for group or individual treatment (5). Based on the social-cognitive theory (6), group-based lifestyle interventions capitalize upon participant interactions to promote self-efficacy for behavior change and weight loss (7). In a recent study that demonstrated superior weight loss in group versus one-on-one treatment, participants assigned to group treatment reported that support, accountability, and information sharing among members were the most helpful treatment components (2). Other reports also have suggested that the social support, empathy, role modeling, healthy competition, accountability, and problem solving offered in group settings are important factors for lifestyle change and weight loss (8–12).

Furthermore, interaction dynamics within group settings may influence treatment outcome. Within the psychotherapy literature, greater group cohesion has been associated with goal attainment (13), susceptibility to group influence (14), and willingness to accept responsibility within the group (15). Members who identify with their group have reported greater willingness to contribute to discussion and self-exploration (16) and have demonstrated higher attendance rates (17,18).

Although the association of group dynamics and treatment outcomes has been researched extensively within the psychotherapy literature, it remains a largely unstudied phenomenon within lifestyle interventions for obesity. In a year long obesity intervention using groups of approximately 10 and 30 participants, Dutton et al. (19) found that participants within smaller groups endorsed greater cohesion than those in larger groups. Group cohesion, however, did not impact weight loss. Aside from this one study, it remains unknown whether and how group dynamics impact obesity treatment outcomes.

¹ Department of Clinical and Health Psychology, University of Florida, Gainesville, Florida, USA. Correspondence: Lisa M. Nackers (Lisa_M_nackers@rush.edu) ² Department of Biostatistics, University of Florida, Gainesville, Florida, USA ³ Department of Aging and Geriatric Research, University of Florida, Gainesville, Florida, USA ⁴ Division of Preventive Medicine, University of Alabama at Birmingham, Birmingham, Alabama, USA.

Disclosure: The authors declared no conflicts of interest.

Author contributions: L.M.N., P.J.D., S.D.A., and M.G.P. designed the study. L.M.N. and P.J.D. served as group interventionists and collected data. M.G.P. and S.D.A. supervised interventionists. X.L. conducted statistical analyses and interpretation. L.M.N., S.D.A., X.L., P.J.D., G.R.D., and M.G.P. contributed substantially to the writing of the manuscript.

Received: 31 December 2014; **Accepted:** 14 April 2015; **Published online** 14 July 2015. doi:10.1002/oby.21148

This is an open access article under the terms of the Creative Commons Attribution License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

The present study therefore assessed whether group climate, social support, and attraction significantly impacted weight loss, attendance, and treatment adherence after 6 months of weekly lifestyle intervention for obesity. We hypothesized that participants who rated group dynamics more favorably would achieve greater weight loss, attend more sessions, and demonstrate greater self-monitoring adherence than those who viewed group dynamics less favorably. This study also explored whether attendance and adherence mediated associations between group dynamics and weight loss and whether group dynamics assessed at Month 6 predicted treatment outcomes after an additional 6 months of extended care.

Methods

Participants

Women of 25-75 years of age with BMIs between 30 and 45 kg/m² who weighed between 91 and 136 kg were included in this study. Exclusion criteria included the presence of a major psychiatric disorder, excessive alcohol intake, weight loss of ≥ 4.5 kg during the preceding 6 months, inability to read English at a sixth-grade level, participation in another randomized trial, previous participation in a behavioral weight loss program, and lack of availability or willingness to attend sessions, self-monitor dietary intake, adhere to the prescribed caloric goal, or provide informed consent. Additional information on eligibility criteria, recruitment, and screening has been described previously (20). All procedures followed ethical standards and informed consent was obtained from all participants prior to enrollment. Study approval was obtained from the University of Florida's Institutional Review Board (IRB-01).

Procedure

This study includes secondary analyses from a 12-month behavioral weight loss trial (20). All eligible participants were randomly assigned in a 2 \times 2 factorial design to a group of either approximately 10 or 30 individuals and intake goals of either 1,000 or 1,500 kcal/day. The main study's primary goal was to assess the impact of group size and caloric prescription on weight change. The study included eight groups (i.e., three groups of ten participants prescribed 1,000 kcal/day, three groups of ten participants prescribed 1,500 kcal/day, one group of 30 participants prescribed 1,000 kcal/day, and one group of 30 participants prescribed 1,500 kcal/day). All participants received a standard lifestyle intervention in line with recent obesity treatment guidelines (1). Group leaders were master's-level clinicians trained in group facilitation (e.g., creating a positive tone, developing a respectful atmosphere, encouraging participation and collaboration) by a licensed clinical psychologist with expertise in group-based lifestyle intervention for obesity. Regardless of caloric prescription or group size, all groups were conducted in the same manner and consisted of an interactive check-in where progress was assessed, content delivery, and problem solving and goal setting. Group leaders solicited contributions from each participant and redirected conversations as necessary to promote a positive, nonjudgmental atmosphere.

During Months 0 to 6, participants attended 24 weekly group sessions that emphasized cognitive-behavioral skills for weight management. They were instructed to follow their prescribed condition-specific energy intake goal and consume a balanced diet according to the U.S. Department of Agriculture and the National Institutes of

Health's Dietary Approaches to Stop Hypertension recommendations (21). All participants received pedometers to monitor step counts and were encouraged to increase walking to 10,000 steps per day (or by 3,000 steps above baseline levels) based on the American College of Sports Medicine recommendations (22). Participants were instructed to maintain daily written records of dietary intake and physical activity.

From Months 7 to 12, participants met monthly for six extended-care group sessions and were instructed to maintain caloric intake goals and exercise behaviors prescribed during the initial treatment phase. The participants were asked to continue recording dietary intake and physical activity at least three times per week. Additional study design information has been described previously (20).

Measures

Height and body weight. Height, without shoes, was measured with a Seca (model 213) portable stadiometer during the baseline assessment visit. Weight was measured to the nearest 0.1 kg with a Tanita (model BWB 800S) digital scale. The participants were weighed wearing light indoor clothing, without shoes, and with empty pockets by interventionists at group sessions and independent staff members at Month 0, 6, and 12 assessment visits.

Group dynamics. Participants were provided questionnaires that assessed various group dynamics at Month 6. They were asked to complete these surveys outside of group and return them to study staff at their individual assessment visit. To report on perceived group environment, participants completed the Group Climate Questionnaire-Short Form (GCQ-S) (23). The GCQ-S contains 12 items rated on a scale that ranges from 1 (Not at all) to 7 (Extremely). Prior factor analysis indicates three dimensions of scores: Engagement, Avoidance, and Conflict (23). Higher scores on each domain suggest greater levels of that group process. The five-item Engagement scale measures group cohesion and positivity (e.g., The members liked and cared about each other. The members felt what was happening was important and there was a sense of participation.). The three-item Avoidance scale reflects group reluctance to change (e.g., The members avoided looking at important issues going on between themselves.). The four-item Conflict scale assesses interpersonal friction within the group (e.g., There was friction and anger between the members. The members were distant and withdrawn from each other; Ref. [24]). This measure has been widely used across treatment conditions, including eating disorders (25,26) and comorbid psychiatric disorders (27). The GCQ-S has demonstrated construct validity with group process and group differences (24,28,29) and satisfactory reliability (26,28,30). From the analyses of internal consistency within the present study's sample, Cronbach's α demonstrated high reliability for Engagement (0.74) and Conflict (0.82), but relatively low reliability for Avoidance (0.30).

The participants completed the 24-item Social Provisions Scale (SPS) (31,32) to measure perceived group social support. The SPS (31) assesses six provisions of social relationships (guidance, reliable alliance, reassurance of worth, attachment, social integration, and opportunity for nurturance; Ref. [33]) and also produces a global score. For this study, only the global score was used. The participants responded to each statement on a four-point scale (1 = Strongly disagree to 4 = Strongly agree) as it pertained to

current relationships with group members. Negative items (e.g., I feel that I do not have close personal relationships with other people. There is no one I feel comfortable talking about problems with.) were reversed and summed with positive items (e.g., There are people I can depend on to help me if I really need it. I feel a strong emotional bond with at least one other person.). Higher scores indicate greater perceived provisions received from group relationships. This scale has documented reliability and validity within various social networks, including new mothers and college freshmen (31,32), and has been studied within a variety of populations, such as older adults (34) and persons with alcoholism (35). An analysis of internal consistency within the present sample demonstrated high reliability (Cronbach's $\alpha = 0.92$).

To examine group attraction, or the desire to identify with and be accepted as a group member, participants completed the Group Attitude Scale (36). This 20-item questionnaire was designed for a variety of group settings and has satisfactory reliability and construct validity with other group affiliation measures (36,37). Scores correlate with interpersonal attraction among group members, attendance, and termination anxiety (36,37). Examples of items include: I feel involved in what is happening in my group; I look forward to coming to the group; and, In spite of individual differences, a feeling of unity exists in my group. Items were ranked using a nine-point scale (1 = Agree to 9 = Disagree). Negative items were reversed and summed with positive items, with higher scores indicating greater group attraction. Internal consistency within this study was high (Cronbach's $\alpha = 0.91$).

Attendance. Attendance was recorded if the participant attended the group session and was weighed by a staff member, or if the participant attended an individual make-up session with the group leader within 1 week of the group session.

Self-monitoring adherence. The participants were instructed to complete dietary intake and physical activity logs daily during Months 0 to 6 and three times per week from Months 7 to 12. A complete log was defined as having at least two designated eating episodes recorded within the day. Adherence was defined as the total number of days self-monitoring logs were completed.

Weight and program satisfaction. At Month 6, participants completed a questionnaire to rate satisfaction with their current weight and with the overall program using a scale from 0% (Not at all satisfied) to 100% (Completely satisfied).

Statistical analyses

Descriptive statistics (mean \pm SD for continuous variables and sample proportion for categorical variables) were used to summarize baseline and demographic characteristics. All participants were collapsed across caloric prescription and group size conditions. Multiple regression analyses with forward selection method were used to assess the association between group dynamics measures and weight change, attendance, and adherence from Months 0 to 6 and Months 7 to 12. Tests of multicollinearity and a sensitivity analysis using backward selection were also conducted. The analyses were performed with the adjustment of those baseline demographic factors demonstrating significant associations with weight loss and also for

TABLE 1 Baseline demographic characteristics for the 105 participants in the current analyses

	<i>M</i>	<i>SD</i>
Age (years)	52.51	11.01
Weight (kg)	104.56	10.48
BMI (kg/m ²)	37.79	3.99
	<i>n</i>	%
Race/ethnicity		
Caucasian	79	75.20
Other	24	22.90
Education		
<16 years	56	53.30
16 years or more	49	46.70
Household yearly income		
<\$35,000	23	21.90
\$35,000 or more	75	71.40
Marital status		
Married or living together	63	60.00
Other	42	40.00

participant reported satisfaction with weight and the overall program assessed at Month 6.

Multiple mediation analyses using bootstrapping (38) with bias-corrected and accelerated bootstrap confidence interval (CI) at the 95% level tested whether attendance and adherence mediated the association between group dynamics and weight change at 6 months, again adjusting for baseline covariates. Session attendance and self-monitoring adherence were the proposed mediators, weight change was the dependent variable, and group dynamics measures were predictor variables.

An exploratory analysis using the Kruskal-Wallis test assessed each group dynamic measure across the eight separate study groups to determine whether group effects existed. Spearman's correlations were conducted to determine whether weight loss was associated with group dynamic ratings at the group level. All analyses were performed in SAS 9.2 (SAS Institute Inc.).

Results

Participants

Of the 125 women enrolled, 105 completed the group dynamics measures and were included in the current analyses. No significant baseline differences existed between those who were included and excluded in terms of age, BMI, weight, income, race/ethnicity, education, or group assignment. Table 1 summarizes the baseline demographic characteristics for the 105 participants included in the current analyses.

The participants earning \geq \$35,000 per year experienced greater weight losses (-10.34 ± 7.07 vs. -5.65 ± 5.93 , $P = 0.004$), attended more sessions (17.58 ± 6.46 vs. 13.85 ± 6.32 , $P = 0.009$), and maintained more self-monitoring records (104.29 ± 53.32 vs. 74.30 ± 50.92 , $P = 0.011$) compared to lower earners. Married

TABLE 2 Group dynamics, weight change, attendance, and adherence rates from Months 0 to 6 and Months 7 to 12; mean (SE)

	Total sample	1,000 kcal/day				1,500 kcal/day			
		(n = 10)	(n = 8)	(n = 8)	(n = 27)	(n = 8)	(n = 10)	(n = 8)	(n = 26)
GCQ-S									
Engagement	5.25 (0.09)	5.21 (0.27)	4.53 (0.33)	5.33 (0.33)	5.21 (0.17)	4.98 (0.44)	5.38 (0.18)	5.18 (0.17)	5.48 (0.18)
Avoidance	3.86 (0.11)	3.63 (0.33)	4.00 (0.50)	3.83 (0.24)	4.22 (0.21)	4.21 (0.43)	3.87 (0.36)	3.33 (0.17)	3.59 (0.23)
Conflict	1.32 (0.07)	1.08 (0.04)	1.00 (0.00)	1.03 (0.03)	1.19 (0.06)	2.13 (0.35)	1.68 (0.41)	1.13 (0.07)	1.41 (0.19)
SPS	71.91 (1.11)	74.11 (3.17)	77.29 (6.90)	69.29 (4.30)	68.73 (1.87)	70.25 (4.64)	69.80 (4.98)	73.25 (1.98)	74.50 (1.81)
GAS	152.22 (2.34)	170.00 (4.48)	141.63 (6.66)	162.38 (4.95)	154.37 (4.12)	134.50 (10.49)	143.70 (13.07)	148.13 (6.33)	153.96 (3.84)
Satisfaction with program	5.35 (0.15)	5.40 (0.70)	6.00 (0.73)	6.12 (0.30)	5.59 (0.30)	4.38 (0.63)	5.40 (0.50)	4.63 (0.38)	5.73 (0.25)
Satisfaction with weight	5.50 (0.15)	5.30 (0.62)	5.88 (0.74)	6.00 (0.33)	5.22 (0.32)	4.38 (0.63)	5.40 (0.40)	4.25 (0.25)	5.77 (0.27)
Months 0-6									
Weight change (kg)	-9.13 (0.68)	-9.38 (2.86)	-10.51 (2.82)	-12.53 (1.71)	-12.45 (1.33)	-4.69 (1.75)	-7.08 (1.75)	-9.38 (2.23)	-6.35 (1.21)
Attendance ^a	16.89 (0.58)	16.92 (2.09)	15.60 (1.98)	16.27 (1.97)	18.50 (0.89)	11.45 (2.18)	17.18 (2.38)	19.78 (1.29)	16.83 (1.25)
Adherence ^b	98.48 (4.78)	97.92 (17.37)	95.80 (17.55)	81.82 (15.62)	104.94 (7.83)	51.09 (16.22)	107.18 (17.93)	122.11 (14.86)	103.90 (10.46)
Months 7-12									
Weight change (kg)	1.52 (0.47)	0.71 (0.94)	2.63 (1.90)	3.49 (2.10)	2.92 (0.95)	2.87 (1.66)	0.13 (1.46)	0.85 (1.62)	-0.02 (0.90)
Attendance ^a	3.04 (0.20)	3.00 (0.66)	2.4 (0.56)	2.64 (0.72)	3.56 (0.37)	1.82 (0.65)	3.36 (0.85)	3.44 (0.75)	3.07 (0.42)
Adherence ^b	28.14 (4.16)	32.50 (11.99)	14.40 (14.40)	14.18 (7.97)	25.75 (7.22)	3.00 (1.72)	36.00 (15.86)	55.89 (25.65)	36.93 (9.61)

^aOut of a possible 24 sessions from Months 0 to 6 and 6 sessions from Months 7 to 12.^bOut of a possible 168 records from Months 0 to 6 and 72 records from Months 7 to 12.

Abbreviations: GAS, Group Attitude Scale; GCQ-S, Group Climate Questionnaire-Short Form; SPS, Social Provision Scale.

TABLE 3 Multiple regression using forward selection of the association between group dynamics and 6-month outcomes^a

	Group dynamics measures	β	SE	P-value	R ²
Weight loss (kg)	GCQ-S Conflict	1.833	0.897	0.044	0.483
Attendance	Group Attitude Scale	0.051	0.025	0.039	0.512
	GCQ-S Conflict	-2.313	0.704	0.002	
Adherence	GCQ-S conflict	-2.261	1.026	0.304	0.360

^aAnalyses adjusted for income, marital status, race/ethnicity, and satisfaction with the overall program and weight at Month 6.

participants demonstrated greater weight losses (-10.44 ± 7.30 vs. -7.33 ± 6.60 , $P = 0.023$) and self-monitoring adherence (107.85 ± 52.92 vs. 85.33 ± 51.86 , $P = 0.020$) than unmarried participants. Caucasian participants versus those of other races/ethnicities attended more sessions (18.05 ± 5.80 vs. 14.00 ± 7.43 , $P = 0.003$) and maintained more self-monitoring records (109.60 ± 49.11 vs. 69.59 ± 55.43 , $P < 0.001$). At Month 6, participants reported $61.1 \pm 32.4\%$ satisfaction with their current weight and $93.4 \pm 14.1\%$ satisfaction with the program. Higher weight satisfaction was associated with greater weight loss, attendance, and adherence ($P \leq 0.001$). The participants reporting more program satisfaction demonstrated larger weight losses ($P = 0.002$) and greater attendance and adherence ($P < 0.001$). The analyses were therefore adjusted for income, marital status, race/ethnicity, and weight and program satisfaction. Treatment assignments (i.e., caloric prescription condition and group size) were not associated with group dynamics, and thus treatment groups were collapsed for the primary analyses.

Group dynamics and weight loss

Tests of multicollinearity demonstrated low collinearity among group dynamics variables (R^2 range = 0.22-0.50; VIF range = 1.05-1.33). Table 2 summarizes group dynamics and weight changes for the total sample and eight treatment groups. Within the multiple regression analysis using forward selection, only conflict was selected as a predictor for weight loss at Month 6 (Table 3). The participants who indicated greater group conflict attained smaller weight losses ($P = 0.044$). Perceived group engagement, avoidance of change, social support, and attraction did not significantly contribute to weight loss outcomes above and beyond conflict at Month 6. None of the group dynamics measured at Month 6 was significantly associated with weight change from Months 7 to 12.

Group dynamics, attendance, and adherence

From Months 0 to 6, participants who reported higher group conflict attended fewer sessions ($P = 0.002$) and demonstrated poorer self-monitoring adherence ($P = 0.030$). The participants reporting greater group attraction attended more sessions ($P = 0.039$; Table 3). No associations were found between group engagement, avoidance of change, or social support, and attendance or adherence. None of the group dynamics were associated with attendance or adherence from Months 7 to 12. Table 2 summarizes attendance and adherence for the entire sample and eight treatment groups.

Sensitivity analysis

A multiple regression using backward selection demonstrated similar results to the forward selection model. From Months 0 to 6, participants who indicated greater group conflict attained smaller weight losses ($P = 0.044$), attended fewer sessions ($P = 0.009$), and had lower self-monitoring adherence ($P = 0.030$). The participants indicating higher group attraction attended more sessions ($P = 0.014$).

Mediation analyses

The results of the multiple mediation analysis showed session attendance and self-monitoring adherence simultaneously mediated the association between group conflict and weight change from Months 0 to 6 ($\beta = 1.26 \pm 0.54$; 95% CI = [0.35, 2.52]; $P = 0.019$; Figure 1).

Exploratory analysis of group effect

Group size was not associated with any of the group dynamics variables. From Months 0 to 6, attraction scores were significantly different across the eight groups ($P = 0.026$), whereas conflict trended to be different across groups ($P = 0.051$). At the group level, conflict and weight change at Month 6 were associated, such that groups that experienced greater conflict demonstrated smaller weight losses (Spearman's $R = 0.79$; 95% CI = [0.18, 0.96]; $P = 0.016$).

Discussion

The participants in lifestyle interventions for obesity often achieve greater weight loss in group versus individual settings (2-5). Group

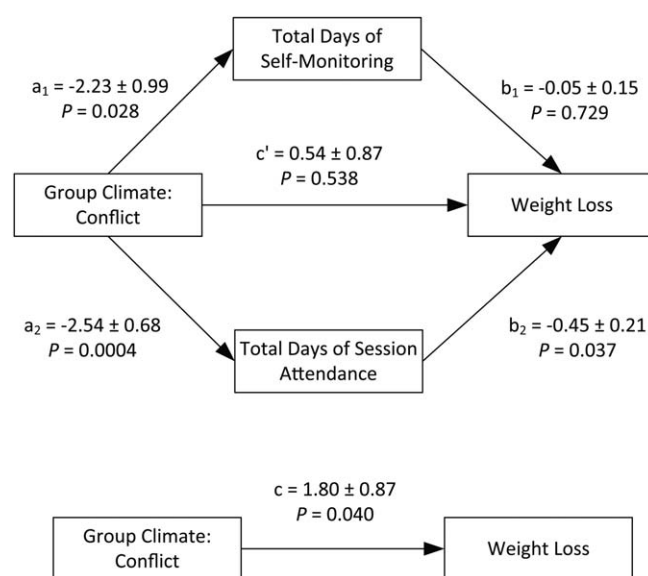


Figure 1 The analysis of session attendance and self-monitoring adherence as mediators of the association between group conflict and weight loss from baseline to Month 6, adjusting for program satisfaction, satisfaction with weight, income, marital status, and race. Unstandardized regression coefficients for each path are shown. The indirect effects and the bias-corrected bootstrapping confidence intervals (CI) of self-monitoring adherence are 0.11 (95% CI: -0.68, 1.00) and of session attendance are 1.15 (95% CI: -0.05, 2.92). Model R^2 was 0.58.

dynamics have been proposed as facilitators of treatment outcomes (2,8-12) but have not been well studied. Therefore, this study assessed whether group climate, social support, and attraction impacted weight loss within a group-based obesity intervention.

The individuals who reported greater perceived conflict achieved smaller weight losses from Months 0 to 6 than those who reported less interpersonal friction among group members. Although positive interactions, verbal persuasions, and emotional activations within groups may promote self-efficacy and encourage behavior change (7), the results of this study suggest that negative interactions, such as friction, withdrawal, distrust, and tension, may conversely inhibit group processes and thus hinder the achievement of successful weight loss.

Indeed, group dynamics appear to impact weight loss behaviors. Greater perceived conflict among members from Months 0 to 6 was associated with poorer attendance and self-monitoring adherence. Group conflict may produce adverse experiences which impede participants' desires to maintain attendance and adherence behaviors. Attendance and self-monitoring adherence are two integral components for success in lifestyle interventions for obesity (39). Given mediation analyses demonstrated that the impact of conflict on weight loss was determined by attendance and adherence, addressing group conflict may be an important treatment target to promote weight loss success in lifestyle interventions. Conversely, greater attraction, or the desire to identify with and be accepted as a contributing member, was associated with higher attendance during Months 0 to 6. Again, these results demonstrate consistency with the psychotherapy literature where greater group attraction resulted in higher attendance rates (17,18,36) and speak to the importance of developing a strong group identity.

Positive group dynamics of engagement and social provision were not associated with weight loss, attendance, or adherence from Months 0 to 6. Lifestyle interventions teach participants cognitive-behavioral strategies to increase assertiveness and social support within their personal social network (8). Perhaps participants relied on people within their social circles to provide the encouragement and nurturance necessary for behavior change and not on other group members with whom they formally interacted once per week. Furthermore, none of the group dynamics reported at Month 6 predicted weight loss, attendance, or adherence from Months 7 to 12. Given group meeting frequency decreased from weekly to monthly during the extended-care period, it is possible group dynamics exerted less effect on members.

Group dynamics may also assist or obstruct treatment outcomes at the group level. Exploratory analyses of group effects demonstrated that attraction and conflict from Months 0 to 6 varied across the eight treatment groups. Groups with higher conflict experienced lower average weight losses. The observed results were independent of group size. Interactive collaboration was encouraged in both large and small groups, with the large groups broken into smaller subgroups only during sessions where role playing was used (e.g., practicing assertive communication). Regardless of group size, leaders encouraged all participants to share personal experiences, actively listen, and respond positively. Anecdotally, leaders observed how groups with extremely talkative or nonsupportive participants had troubles collaborating and problem-solving barriers to behavior change although this was not specific to large or small groups. In such cases, the group leader addressed this issue by speaking individually with the difficult participant outside of session. Thus, to reduce conflict and promote success-

ful weight loss, the group leader is encouraged to identify and address difficult behaviors as they arise.

This study is limited in the following ways. First, it is unclear if individual factors (e.g., psychopathology and personality traits) impacted participants' abilities to identify and interact positively with others. It is unknown whether participants who reported greater conflict experienced interpersonal struggles or lower motivation for group-based treatment. Second, given our sample consisted of women, these findings cannot be generalized to men or coed groups. Third, measurements of group dynamics and weight loss coincided at Month 6. We controlled for reported weight and program satisfaction, but the ratings of group dynamics may have been influenced by a halo effect around weight loss outcomes. Group dynamics did not predict weight change from Months 7 to 12. It remains unknown whether the decreased weekly to monthly meeting frequency reduced influence of group members, or whether group dynamics were unrelated to weight loss sustainability. Future studies would benefit from sequential group dynamics measurements to address this issue. Finally, although group dynamics measures have been validated within psychotherapy, they have not undergone testing in behavioral weight management. Perhaps group dynamics were not associated with weight change owing to limited applicability to obesity treatment. Additional testing of psychometric properties and/or development of new measures for this domain is warranted.

This study also had strengths. It included a large sample and demonstrated high retention, with 84% of participants completing the group dynamics questionnaires at Month 6. All participants received a state-of-the-art obesity lifestyle intervention adapted from evidence-based protocols (40). Questionnaires utilized in this study were previously validated within diverse samples and demonstrated good reliability within the present sample. To our knowledge, only one other study has reported on group dynamics within lifestyle interventions for obesity (19), and therefore this study adds useful information on the associations between group dynamics and weight loss, attendance, and adherence.

Conclusion

This study demonstrates that both negative and positive group dynamics can impact outcomes in group-based behavioral obesity treatment. Greater perceived conflict was associated with lower weight loss and poorer rates of attendance and self-monitoring adherence during the intensive treatment phase. Conversely, higher attraction, or the desire to identify with and be accepted as a group member, was associated with greater attendance. Therefore, effectively addressing conflicts and fostering positive interactions among group members may be useful strategies to promote better treatment outcomes. Training leaders to recognize tension, distrust, and withdrawal among group members and developing conflict resolution guidelines would be important clinical goals for effective group management. This study also provides implications for future research to develop methods to identify good group member characteristics, place collaborative members into appropriate group settings, and form a solid group identity to improve weight loss success in group-based lifestyle interventions for obesity. **O**

© 2015 The Authors. *Obesity* published by Wiley Periodicals, Inc. on behalf of The Obesity Society (TOS)

References

- Jensen MD, Ryan DH, Donato KA, et al. Guidelines (2013) for managing overweight and obesity in adults. *Obesity* 2014;22(S2):S1-S410.
- Befort CA, Donnelly JE, Sullivan DK, Ellerbeck EF, Perri MG. Group versus individual phone-based obesity treatment for rural women. *Eat Behav* 2010;11:11-17.
- Jovanović Z, Crncević-Orlić Z, Stimac D, et al. Effects of obesity reduction on cardiovascular risk factors: comparison of individual and group treatment—substudy of the Croatian healthy weight loss programme. *Coll Antropol* 2009;33:751-757.
- Paul-Ebhohimhen V, Avenell A. A systematic review of the effectiveness of group versus individual treatments for adult obesity. *Obes Facts* 2009;2:17-24.
- Renjilian DA, Perri MG, Nezu AM, McKelvey WF, Shermer RL, Anton SD. Individual versus group therapy for obesity: effects of matching participants to their treatment preferences. *J Consult Clin Psychol* 2001;69:717-721.
- Bandura A. *The Exercise of Control*. New York: WH Freeman and Company; 1997.
- Palmeira AL, Teixeira PJ, Branco TL, et al. Predicting short-term weight loss using four leading health behavior change theories. *Int J Behav Nutr Phys Act* 2007;4:14.
- Butryn ML, Webb V, Wadden TA. Behavioral treatment of obesity. *Psychiatr Clin North Am* 2011;34:841-859.
- Donnelly JE, Smith BK, Dunn L, et al. Comparison of a phone vs clinic approach to achieve 10% weight loss. *Int J Obes* 2007;31:1270-1276.
- Hayaki J, Brownell KD. Behaviour change in practice: group approaches. *Int J Obes* 1996;20:S27-S30.
- Latner JD, Stunkard AJ, Wilson GT, Jackson ML. The perceived effectiveness of continuing care and group support in the long-term self-help treatment of obesity. *Obesity* 2006;14:464-471.
- Perri MG, Nezu AM, McKelvey WF, Shermer RL, Renjilian DA, Viegner BJ. Relapse prevention training and problem-solving therapy in the long-term management of obesity. *J Consult Clin Psychol* 2001;69:722-726.
- Wagner C. Expectation and attractiveness of group membership as functions of task difficulty and magnitude of reward. *Psychol Rep* 1966;18:471-482.
- Cartwright D. Achieving change in people: some applications of group dynamics theory. *Hum Relat* 1951;4:381-392.
- Lieberman MA, Yalom ID, Miles MB. *Encounter Groups: First Facts*. New York: Basic Books; 1973.
- Truax CB. The process of group psychotherapy: relationships between hypothesized therapeutic conditions and interpersonal exploration. *Psychol Monogr* 1961;75:1-35.
- Sagi PC, Olmstead DW, Atelsek F. Predicting maintenance of membership in small groups. *J Abnorm Soc Psychol* 1955;51:308-311.
- Yalom I, Rand K. Compatibility and cohesiveness in therapy groups. *Arch Gen Psychiatry* 1966;15:267-275.
- Dutton GR, Nackers LM, Dubyak PJ, et al. A randomized trial comparing weight loss treatment delivered in large versus small groups. *Int J Behav Nutr Phys Act* 2014;11:123.
- Nackers LM, Middleton KR, Dubyak PJ, Daniels MJ, Anton SD, Perri MG. Effects of prescribing 1,000 versus 1,500 kilocalories per day in the behavioral treatment of obesity: a randomized trial. *Obesity* 2013;21:2481-2487.
- US Department of Health and Human Services and US Department of Agriculture. *Dietary Guidelines for Americans, 2005*. Washington DC: US Government Printing Office; 2005.
- Donnelly JE, Blair SN, Jakicic JM, Manore MM, Rankin JW, Smith BK. Appropriate physical activity intervention strategies for weight loss and prevention of weight regain for adults. *Med Sci Sports Exerc* 2009;41:459-471.
- MacKenzie KR. The clinical application of a group climate measure. In: Dies RR, MacKenzie KR (eds). *Advances in Group Psychotherapy: Integrating Research and Practice*. New York: International Universities Press; 1983. pp 159-170.
- Kanas N, Ziegler J. Group climate in a stress discussion group for medical interns. *Group* 1984;8:35-38.
- Illing V, Tasca GA, Balfour L, Bissada H. Attachment dimensions and group climate growth in a sample of women seeking treatment for eating disorders. *Psychiatry* 2011;74:255-269.
- Tasca GA, Balfour L, Ritchie K, Bissada H. Developmental changes in group climate in two types of group therapy for binge eating disorder: a growth curve analysis. *Psychother Res* 2006;16:499-514. [CrossRef][10.1080/10503300600593359]
- Ryum T, Hagen R, Nordahl HM, Vogel PA, Stiles TC. Perceived group climate as a predictor of long-term outcome in a randomized controlled trial of cognitive-behavioural group therapy for patients with comorbid psychiatric disorders. *Behav Cogn Psychother* 2009;37:497-510.
- Kivlighan DM, Goldfine DC. Endorsement of therapeutic factors as a function of stage of group development and participant interpersonal attitudes. *J Couns Psychol* 1991;38:150-158.
- Tschuschke V, Greene LR. Group therapists' training: what predicts learning? *Int J Group Psychother* 2002;52:463-482.
- Kivlighan DM, Lilly RL. Developmental changes in group climate as they relate to therapeutic gain. *Group Dyn Theor Res* 1997;1:208-221.
- Russell D, Cutrona CE, Rose J, Yurko K. Social and emotional loneliness: an examination of Weiss's typology of loneliness. *J Pers Soc Psychol* 1984;46:1313-1321.
- Cutrona CE, Russell D. The provisions of social relationships and adaptation to stress. In: Jones WH, Perlman D (eds). *Advances in Personal Relationships*. Greenwich, CT: JAI Press; 1987. pp 37-67.
- Weiss RS. The provisions of social relationships. In: Rubin Z (ed). *Doing Unto Others*. Englewood Cliffs, NJ: Prentice-Hall; 1974. pp 17-26.
- Aquino JA, Russell DW, Cutrona CE, Altmaier EM. Employment status, social support, and life satisfaction among the elderly. *J Consult Psychol* 1996;43:480-489.
- Russell DW, Booth B, Reed D, Laughlin PR. Personality, social networks, and perceived social support among alcoholics: a structural equation analysis. *J Pers* 1997;65:649-692.
- Evans NJ, Jarvis PA. The group attitude scale: a measure of attraction to group. *Small Group Res* 1986;17:203-216.
- Moos RH, Insel PM, Humphrey B. *Preliminary Manual for Group Environment Subscale*. Palo Alto, CA: Consulting Psychologists Press; 1974.
- Preacher KJ, Hayes AF. SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behav Res Methods Instrum Comput* 2004;36:717-731.
- Weight Loss Maintenance Trial Research Group. Weight loss during the intensive intervention phase of the weight-loss maintenance trial. *Am J Prev Med* 2008;35:118-126.
- Perri MG, Limacher MC, Durning PE, 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.