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Teammates and social influence affect weight loss outcomes in a team-based weight loss competition

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Abstract

Team-based Internet interventions are increasing in popularity as a way of promoting weight loss in large numbers of individuals. Given that social networks influence health behavior change, this study investigated the effects of teammates and social influence on individual weight loss during a team-based weight loss competition. Shape Up Rhode Island 2009 was a 12-week online program open to adult residents of Rhode Island. Participants joined with a team and competed with other teams on weight loss and/or physical activity. OW/OB individuals (N=3,330; 76%female; age=46.1±10.8; BMI=31.2±5.3kg/m^2), representing 987 teams, completed the weight loss program. Multilevel modeling was used to examine whether weight loss clustered among teammates and whether percentage of teammates in the weight loss division and reported teammate influence on weight loss were associated with individual weight outcomes. OW/OB completers reported losing 4.2±3.4% of initial body weight. Weight loss was similar among teammates (ICC=.10, p<.001). Moreover, having a greater percentage of teammates in the weight loss division and reporting higher social influence for weight loss were associated with greater percent weight loss (p's≤.002). Similarly, achieving a clinically significant (5%) weight loss tended to cluster within teams (ICC=0.09;p<.001) and having more teammates in the weight loss division and higher social influence for weight loss were associated with increased likelihood of achieving a 5% weight loss (OR=1.06; OR=1.20, respectively). These results suggest that teammates affect weight loss outcomes during a team-based intervention. Harnessing and maximizing teammate influence for weight loss may enhance weight losses in large-scale team-based weight loss programs.

Keywords

weight loss; social network; social influence

Obesity is a serious public health problem. To promote weight loss in a cost-effective manner there has been an upsurge in statewide team-based weight loss campaigns. These programs are typically 3 to 4 months in length, are implemented over the Internet, thereby

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Conflict of interest statement

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reaching thousands of individuals, and focus on encouraging teammates to work together and compete with other teams on weight loss [1].

Weight losses associated with these low-intensity programs are modest and individual characteristics have been shown to affect weight loss outcomes. Wing (2009) reported on the 2007 Shape Up Rhode Island campaign (SURI) and found a 3.2-kg weight loss in the 16-week program and reported that higher Body Mass Index (BMI) and male gender were associated with greater weight loss [1]. Given their ability to reach large numbers of people, low intensity statewide team-based weight loss initiatives have the potential to make a significant public health impact. However, to enhance outcomes in these programs, additional research is needed to identify factors associated with weight loss in these team-based campaigns.

Findings from social network and social influence research suggest that team membership and team characteristics may have a potent effect on weight loss outcomes in team-based interventions. Christakis and Fowler (2007) [2] found that obesity clusters in social networks and that a person's chance of becoming obese increases 57% if a friend becomes obese. Social ties have also been shown to influence weight loss intentions and weight control behaviors, including healthy eating and physical activity [3–5]. Moreover, in the 2007 SURI program, we showed that changes in physical activity were similar among teammates and that team characteristics were associated with physical activity outcomes [6]. Despite these findings, no one has investigated whether teammates influence each other's weight loss during a team-based weight loss competition.

The purpose of the present study was to determine whether team factors account for individual weight loss outcomes in the 2009 SURI weight loss campaign. We first sought to determine whether weight losses in the 2009 campaign replicate Wing's results from the 2007 campaign. We then examined whether weight losses were similar among overweight or obese (OW/OB) individuals on the same team and whether team characteristics and social influence were associated with individual weight loss outcomes.

Methods & Procedures

Participants

All adults who either lived or worked in Rhode Island were eligible to participate in the 2009 Shape Up Rhode Island (SURI) campaign.[1] Participants were recruited through the use of earned media, mail marketing, and the distribution of program materials to employers. Over 12,000 participants enrolled in teams of 5 to 11 members and chose to compete in any of the following: weight loss, minutes of activity, and/or pedometer steps. All participants within each division received the same intervention components, regardless of baseline BMI or activity level. A total of 6,972 individuals entered the weight loss division of the campaign and provided their height and baseline weight data. Of those, 5,045 individuals were overweight or obese (OW/OB; BMI≥25). The majority of these individuals enrolled in all 3 divisions (i.e., weight loss, minutes of activity, and pedometer steps; N=4,251). These participants represented a total of 1,064 teams.

Procedures for SURI 2009

SURI 2009 was a 12-week team-based competition. Teams were formed by self-selected captains who recruited team members, monitored their team's progress, and motivated their

[1]A small subsample of SURI 2009 participants (N=128) were in a previously published study that compared SURI to SURI plus an Internet-based behavioral weight loss treatment [7]. To ensure that these individuals did not affect the results of the present study, all participants and their teammates from the earlier study were excluded from analyses.

teams by sending encouragement messages. Team captains received no formal training nor incentive for being a team captain.

The 2009 SURI program included many components consistent with Bandura's (1977) social learning theory [8], including self-monitoring, feedback, and social support. At the beginning of SURI, all participants were provided a log book to record their weight and physical activity information; the self-monitoring book allowed participants to track their progress toward their weight and activity goals. Participants had access to an online tracking system throughout the entire 12-week competition, which consisted of 6 rounds, each lasting 2 weeks. At the end of each round (every 2 weeks) participants entered their weight and activity information on the website and received feedback graphs depicting their performance relative to their personal goals and to their teammates. In addition, an email was sent out acknowledging team standings. Moreover, to motivate individual engagement, individuals who entered all data into the online system were eligible for 4 random prize drawings at the end of each round; prizes included gym memberships, personal training, ski lift tickets, and yoga passes. Winners were announced to all SURI participants. SURI also encouraged teams to support one another in reaching their weight goals by sharing weight loss information and exercising together. Furthermore, a variety of motivational and educational activities were provided. Specifically, media and newsletters were used to promote engagement. An opening kick-off event was conducted; approximately 500 participants attended this event. Over 720 free wellness activities supported by various community organizations were provided over the 12-weeks, including cooking lessons, basketball clinics, zumba, pilates and yoga classes, nutrition seminars, and stress reduction activities; on average, 7 individuals attended each of these classes, with some individuals attending more than 1 event. Finally, a closing ceremony was held to acknowledge winning teams from each division and award winners with a framed certificate and a small gift certificate to a local gym; approximately 100 individuals attended this event.

Measures

Demographics—When registering for SURI, participants provided basic demographic information (gender, age, ethnicity, and race).

Anthropometrics—Weight and height were self-reported at registration and weight was reported at the end of each round of the 12-week competition (i.e. every 2 weeks). Although there are limitations to self-reported weight, self-reported weight loss is frequently used in large-scale, Internet-based, community interventions [9].

Team variables—The following team characteristics were examined: team size (number of participants on a team), percentage of teammates in the weight loss division, percent male, team age range (age of oldest member minus age of youngest), and team baseline BMI range (highest team member BMI minus lowest team member BMI).[2] At the end of the SURI campaign, participants reported social influence for weight loss ("How much did your teammates influence your weight loss?"; response options ranged from 0 "not at all" to 4 "very much").

[2]We considered examining whether division heterogeneity within teams (e.g., weight loss alone v. weight loss plus pedometer steps) was associated with individual weight loss outcomes. However, given that the vast majority of participants enrolled in all 3 divisions, nearly all teams (98%) included participants competing on all 3 divisions. Thus, due to limited variability, we did not pursue division heterogeneity within teams as a predictor of individual weight outcomes.

Statistical analyses

Analyses examined the effects of SURI 2009 on percent weight loss in OW/OB participants and the effects of teammates and team characteristics on percent weight loss. Intent-to-treat analysis for percent weight loss was calculated using last observation carried forward (entering last reported weight as Round 6 weight). Completer analyses were conducted on those who completed 10 out of 12 weeks of the competition (i.e. completed >80% of the intervention). Differences in completion by demographic characteristics were examined using t-tests or χ^2 test for continuous or categorical variables, respectively. Group differences in percent weight loss were analyzed using analyses of variance. Individual level analyses were conducted using the Statistical Package for the Social Sciences, Version 14.0.

The effects of team and team characteristics on participants' percent weight loss were examined using Hierarchical Linear Modeling (HLM) [10]. Given our interest in how social influence (measured at Round 5/week 10) affected individual weight loss and the fact that we wanted to eliminate any attrition factors as confounds, team analyses were only conducted in OW/OB completers. The unconditional HLM model was used to test the clustering of weight loss within teams using between and within group variance components (ICC = U_0/U_0+R). Variables were grand mean centered. Individual percent weight loss was the dependent variable. To examine team effects beyond individual effects, participant characteristics (e.g., gender, ethnicity, team captain status) were included in Level-1. At Level-2, individuals were nested within team to examine the effects of teammates' weight loss and team characteristics (e.g., team size) on individual weight loss.

Results

Sample characteristics

Overweight and obese (OW/OB; N=5,045) participants in the weight loss division of Shape Up Rhode Island (SURI) were predominantly female, White, and had a mean age of 45.1 ± 11.1 years. Sixty-six percent of participants (N = 3,330) completed the competition. Compared to non-completers, completers were older, less overweight, and were more likely to be non-Hispanic. See Table 1.

Weight change

Individual effects—Percent weight loss for the entire cohort averaged 3.4 ± 3.2 %, or −3.0 ± 3.1 kg. Among completers, weight losses averaged 4.2 ± 3.4 percent of their initial body weight (−3.7 ± 3.3 kg). Interestingly, 33.6% (N=1,120) of completers reported a clinically significant weight loss of ≥5%, with 6.1% (N=202) reporting a 10% weight loss.

The strongest individual characteristic associated with weight loss was baseline BMI, with greater percent weight loss in obese individuals compared to overweight individuals (3.7±3.4% vs. 3.1±3.0%; $p<0.001$). Weight losses were also significantly greater for team captains (3.7±3.6% vs. 3.4±3.2%; $p=0.02$). Other participant characteristics (e.g., gender, ethnicity, race) were not associated with weight outcomes. In addition, there was no significant difference in weight loss in those who enrolled in 1 division (weight loss), 2 divisions (weight loss plus steps or activity minutes), or all 3 divisions (weight loss, steps and activity minutes) ($p=0.13$). Results were similar in completer analyses with one exception: ethnic minorities were less likely to complete, but those who did had a significantly greater percent weight loss than non-ethnic minorities (5.1 ± 4.5% vs. 4.2 ± 3.4%; $p = 0.019$).

Team characteristics associated with weight loss—OW/OB participants who completed the weight loss division of SURI represented 987 teams. The teams of OW/OB

participants, which included individuals competing in both the weight loss and physical activity divisions, had a total of 9.0 ± 2.1 members. On average 75±22% of participants' teammates were also in the weight loss division. Teams had a large age range (28.8 ± 9.8 years) and a small percentage of men (19.0 ± 21.0%). The average BMI range within teams was 12.9 ± 7.0 units, and the average team influence score was 1.9 ± 1.1 (out of a possible 4).[3]

HLM analyses showed a significant team effect for percent weight loss ($p<0.001$; ICC=0.10, indicating a medium effect [11]). These results suggest that an individual's weight loss was influenced by his/her team members' weight loss. Moreover, being on a team with a greater percentage of teammates in the weight loss division and reporting greater weight loss social influence were both associated with greater percent weight loss for the individual participant (p's < 0.002). Team demographic characteristics (i.e. gender composition and age range) were not associated with percent weight loss ($p=0.46$, $p=0.44$, respectively). See Table 2.

To illustrate these findings, two examples are provided using the HLM equations and associated coefficients for the two significant team effects: percentage of teammates in the weight loss division and social influence for weight loss. The first example illustrates the "optimal" team environment, or the team environment associated with the greatest percent weight loss for the participant. On this team, participants have high levels of positive team qualities, defined as 1 standard deviation above the mean on significant team variables (i.e., high percentage of teammates in the weight loss division (97%) and high levels of social influence (i.e., 3.0 out of 4)). On the "optimal" team, the average SURI participant who completed the campaign (gender=female, age=46.1, White, non-captain) would achieve a weight loss of 5.0%. However, if the same participant were placed on a team with a "poor" team environment (1 standard deviation below the mean on all team variables), she would only achieve a 3.8% weight loss.

We also examined the effects of team characteristics on the probability of achieving a clinically significant (5%) weight loss. Consistent with results from the continuous weight loss variable, achieving a 5% weight loss tended to "cluster" within teams (ICC=0.09; $p<0.001$). We also found significant effects for team variables; having a greater percentage of teammates in the weight loss division and reporting greater social influence for weight loss were both associated with a greater likelihood of achieving a 5% weight loss (OR=1.06, $p=0.02$; OR=1.20, $p<0.001$, respectively), with social influence having the strongest effect; a one unit increase in social influence increased the chance of achieving a clinically significant weight loss by 20%. See Table 3.

Discussion

The 2009 Shape Up Rhode Island campaign (SURI) produced an average weight loss of 3.0-kg in all overweight/obese participants. Moreover, 33% of completers achieved a clinically significant weight loss of greater than or equal to 5% of their initial body weight. These weight loss results are consistent with Wing's findings from the 2007 SURI campaign [1]. The primary purpose of this study was to determine whether teammates and team characteristics influenced weight change. Interestingly, our findings suggest that social connections (i.e. teammates) and network characteristics (i.e. team characteristics) influenced individual weight change during the 2009 SURI campaign.

[3]Given that not all team members were participating in the weight loss division and not all team members were OW/OB, we conducted additional analyses that included only team members and associated team variables of those in the weight loss division (e.g., Percent Male, etc.) and only OW/OB team members and associated team variables, and results did not differ.

Christakis and colleagues have shown that positive health behaviors (i.e., smoking cessation, alcohol abstinence) spread through social networks [12]. In the area of weight loss, Leahey found that having more social contacts trying to lose weight is associated with greater weight loss intentions and that changes in physical activity are similar among teammates in a team-based physical activity campaign [3, 6]. The findings from the present study are consistent with these results; weight losses tended to "cluster" within teams, suggesting that teammates influenced each other's weight outcomes. Moreover, a 1-unit change in self-reported teammate social influence for weight loss increased the odds of achieving a clinically significant weight loss by 20%. This effect was stronger than any other team characteristic, including percentage of teammates in the weight loss division. Taken together, results from the present study suggest that weight loss may spread through social ties and that social network characteristics may influence weight outcomes in overweight and obese individuals.

Specific social influence factors were not assessed in this study. However, previous research suggests that social norms (shared beliefs about what is socially acceptable) and social modeling (behavior imitation) impact healthy eating, physical activity, and weight loss intentions [3, 13–17]. Moreover, a recent study showed that having more social contacts trying to lose weight is associated with greater intention to lose weight in OW/OB individuals and that social norms for weight control (i.e. perceived social acceptability of weight loss in one's social circle) fully mediated this effect [3]. Thus, future research should explicitly investigate whether social norms for weight control and social modeling of healthy eating and physical activity may explain the effects of teammate social influence on individual weight loss outcomes in team-based campaigns.

Being on a team with more teammates in the weight loss division was also associated with greater percent weight loss. This finding is consistent with research in Industrial/organizational psychology; among work groups, similar overarching group goals are associated with better performance than individual goals [18]. Thus, to maximize social influence and social support in team-based health programs, future team interventions should consider requiring participants to form teams based on similar health goals (e.g., weight loss) and setting specific goals for the entire team (e.g., 5% weight loss). Moreover, findings from small group theory, organizational research, and behavioral weight loss [18–21] suggest that increasing team cohesion and offering incentives contingent upon team performance may increase social support and social influence for weight loss, thereby improving weight loss outcomes in team-based programs.

While weight-related team variables (percent of teammates in weight loss division, teammate social influence for weight loss) were associated with individual weight loss outcomes, team demographic characteristics, such as gender composition and age range, were not. These results are consistent with earlier findings showing that personal attributes (e.g., gender, age) are less associated with team performance than task-related attributes (e.g., similar goals, social influence for weight loss, etc.) [6, 22]. Future research should continue to examine the effects of task-related team variables, including aforementioned social influence variables and team goals, on weight loss outcomes in team-based campaigns.

In addition to team characteristics, individual characteristics were associated with weight outcomes. Obese individuals had a greater percent weight loss than overweight individuals, a common finding in weight loss interventions [23]. In addition, team captains achieved greater weight losses than team members, possibly due to their increased motivation and engagement in the campaign. Given this finding, future campaigns may consider requiring team members to share the leadership role; such an approach could increase overall

engagement in the campaign and accountability, thereby enhancing overall weight loss outcomes. Interestingly, we found that while Hispanics/Latinos were less likely to complete, those who did lost significantly more weight compared to non-Hispanics. A low-intensity program that allows participants to engage on their own time may be appealing to ethnic minorities, thereby improving adherence and weight outcomes. In addition, the team-based element of the SURI campaign may have provided social support from friends, family, and coworkers, something not typically targeted and explicitly cultivated in standard weight loss programs.

The 3-kg weight loss achieved in SURI 2009 is smaller than the weight losses achieved in campaigns published in the 1980s [24, 25]; the earlier, smaller campaigns involved weekly, objective weigh-ins, which may have enhanced participant accountability, thereby producing superior weight outcomes. However, SURI 2009 did produce weight losses superior to more recent large-scale/community-based weight loss programs [e.g., 9, 26], even those with more intensive intervention components (e.g., individual sessions with personal trainers and nutritionists) [9, 26, 27]. Taken together, while the weight losses achieved in SURI are modest, SURI 2009 was able to reach over 5,000 overweight or obese individuals, produced clinically significant weight losses in a sizable subsample of participants with minimal intervention, and appears to be more effective than other, recent large-scale weight loss programs.

Cost-effectiveness and scalability data also suggest that SURI may have a large public health impact. While we do not have sufficient information to do a formal cost-effectiveness analysis, SURI 2009 expenses and weight losses achieved in this campaign (3kg) show that the cost of each pound lost was approximately $12.60. If we were to incorporate the findings from this paper and optimize the team environment in a future campaign, we may be able to increase weight losses from 3kg to 5kg, and thereby reduce the cost per pound lost to $7.55. The nonprofit Shape Up Rhode Island program has increased its reach since its inception in 2005; enrollment went from approximately 1700 participants in early years to over 12,000 participants in SURI 2009. Moreover, the success of SURI has spawned a sister company, ShapeUp, Inc., whose team-based online health intervention platform has been used by nearly 1 million participants from hundreds of large companies in 93 different countries. Thus, the SURI model is efficient and highly scalable with the potential to make a large public health impact. As such, it is important to investigate ways to further enhance weight losses in this program. Thus far, we have shown that adding an Internet-based behavioral weight loss program has a positive impact on SURI weight loss outcomes.[28] The data from this study suggest that targeting the team environment and harnessing social influence for weight control may be another approach that enhances weight loss outcomes.

This study has some limitations. Consistent with previous large-scale community based campaigns [26, 27, 29], the sample was predominantly female and White. Future programs may consider increasing enrollment of males and minorities by using advertisements specifically targeting these subgroups. Attrition was an issue. Sixty-six percent of overweight or obese participants completed at least 80% of the 2009 SURI program. Obese individuals, ethnic minorities, and younger participants were less likely to complete. Individuals with a higher BMI may need more intensive treatment and support than what is offered in a low-intensity community-based program. Moreover, ethnic minorities and younger enrollees may benefit from components targeted at reducing attrition, such as problem solving tools for managing competing demands (e.g., family responsibilities and work/school obligations). While retention was suboptimal, it was slightly better than other recent large-scale community-based worksite interventions, with similar programs reporting retention rates from 47% to 59% [26, 27, 29]. Another limitation was the use of self-reported weight data. However, in previous studies that compared objective and self-

reported weight losses in community settings, the differences were small and/or non-significant [1, 25]. While participants needed the opportunity to interact with their teammates, teammate social influence for weight loss was measured only at the end of the program; future studies may consider assessing teammate influence multiple times throughout the intervention.

Strengths of this study include the large sample size and the fact that this is the only study to have examined the effects of teammates and team characteristics on individuals weight change during a large, team-based weight loss campaign. These results suggest that weight loss may cluster in social networks and that social influence factors may account for the clustering. Future studies are needed to further examine social contact and social influence factors (e.g., social norms, social modeling) that have been shown to affect health behaviors in team-based public health interventions. Identifying and harnessing social influence factors may enhance weight loss outcomes in these large-scale community-based weight loss campaigns.

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Table 1

Baseline characteristics of OW/OB participants in the weight loss division of the 2009 Shape Up Rhode Island campaign.

	Total (n=5,045)	Completers (n=3,330)	Non-completers (n=1,715)	Completers vs. Non-completers	
				χ^2 or t-value	p-value
Male, n (%)	1,155 (22.9)	786 (23.6)	369 (21.5)	2.8	0.09
Age, years, M ± SD	45.1 ± 11.1	46.1 ± 10.8	43.1 ± 11.4	9.1	<0.001
Weight, kg, M ± SD	87.5 ± 17.8	86.9 ± 17.4	88.6 ± 18.6	3.2	0.001
BMI, kg/m^2, M ± SD	31.4 ± 5.4	31.2 ± 5.3	31.8 ± 5.7	3.6	0.001
Ethnicity, n (%)				25.8	<0.001
Not Hispanic/Latino	4,335 (85.9)	2,905 (87.2)	1,430 (83.4)		
Hispanic/Latino	163 (3.2)	78 (2.3)	85 (5.0)		
Declined to answer	547 (10.8)				
Race, n (%)				1.8	0.18
White	4,214 (83.5)	2,805 (84.2)	1,409 (82.2)		
Non-white	281 (5.6)	176 (5.3)	105 (6.1)		
Declined to answer	550 (10.9)				

Table 2

Effects of team and team characteristics on percent weight loss in the 2009 Shape Up Rhode Island campaign.

	Ɣ	SE	p-value
Team size	0.04	0.04	0.35
% teammates in WL division [a]	0.05	0.02	0.002
% male [a]	0.02	0.02	0.46
Age range [a]	0.03	0.04	0.44
Team baseline BMI Range	0.02	0.01	0.08
Social Influence [b]	0.36	0.07	<0.001

[a] % teammates in WL division, % male, & age range are in 5% and 5-year units, respectively.

[b] Response options range from 0 (“not at all”) to 4 (“very much”)

Table 3

Team variables associated with 5% weight loss in OW/OB individuals in the 2009 Shape Up Rhode Island campaign.

	Ɣ	SE	Odds Ratio	CI	p-value
Team size	0.02	0.03	1.02	0.96, 1.08	0.52
% teammates in WL division	0.03	0.01	1.06	1.02, 1.16	0.016
% male	0.01	0.01	1.11	0.66, 1.86	0.69
Age range [a]	0.00	0.03	1.00	0.99, 1.01	0.98
Team baseline BMI Range	0.00	0.01	1.00	0.99, 1.02	0.58
Social Influence [b]	0.18	0.04	1.20	1.10, 1.30	<0.001

[a] % teammates in WL division, % male, & age range are in 5% and 5-year units, respectively.

[b] Response options range from 0 (“not at all”) to 4 (“very much”)