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The relationship between social network body size and the body size norms of Black and Hispanic adults

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ABSTRACT

Objective. To examine the relationship between the body size norms of Black and Hispanic adults and the body sizes of their social network members.

Methods. Egocentric network data were examined for 245 adults recruited from 2012–2013 in New York City. A multivariable regression model was used to examine the relationship between participants' perception of normal body size and the body sizes of their network members adjusted for participant age, education, race/ethnicity and network size. Participants' body size norms were also examined stratified by the following characteristics of obese network members: frequency of contact, living proximity, relationship, and importance of relationship.

Results. Index participants were 89% female with mean body mass index 33.5 kg/m^2. There were 2571 network members identified (31% overweight, 10% obese). In the fully adjusted multivariable model, perception of normal body size increased as the number of network members with obesity increased ($p < 0.01$). Larger body size norms were associated with increased frequency of contact with obese network members ($p = 0.04$), and obese members living in the home ($p = 0.049$).

Conclusions. These findings support a relationship between the body size norms of Black and Hispanic adults and their social network body size.

Introduction

Obesity continues to be a major health challenge in the United States, with Black and Hispanic adults disproportionately affected (Ogden et al., 2012). Previous research suggests that obesity clusters in social networks and that a person's chance of becoming obese increases if their network members become obese (Christakis and Fowler, 2007; Hruschka et al., 2011; Bahr et al., 2009). However, mechanisms by which networks may facilitate weight gain remain uncertain. It has been proposed that shifts in social norms regarding the acceptability of obesity may contribute to weight gain in networks (Christakis and Fowler, 2007; Chandler-Laney et al., 2009). Examination of longitudinal data from the National Health and Nutrition Examination Survey (NHANES) indicates a shift in social norms regarding the acceptability of overweight body sizes as the prevalence of obesity has increased in the United States (Burke et al., 2010). Further data are needed on the relationship between the body size norms of adults and the body sizes of their social network members.

The primary aim of this study was to use egocentric social network data, that is network data collected from the perspective of the index individual (Marsden, 2005), to examine the relationship between perception of normal body sizes among Black and Hispanic adults and the body sizes of their social network members. A secondary aim was to examine the relationship between participants' body size norms and the following characteristics of network members with obesity: frequency of contact, living proximity, relationship, and importance of relationship. We hypothesized that participants would perceive a larger body size as normal as the number of network members with obesity increased. We also hypothesized that participants would select a larger body size as normal as their frequency of contact with network members with obesity increased.

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Methods

Setting and participants

Adults included in this analysis were enrolled in the Small Changes and Lasting Effects (SCALE) trial. SCALE is a randomized, controlled behavior change weight loss study utilizing a small change approach (Hill, 2009; Lutes et al., 2013). The study methods for the trial have been previously described (Phillips-Caesar et al., 2015). Enrollment data were collected from August 2011 through March 2013. Participants were recruited at clinical and community sites in Harlem and the South Bronx, New York. Inclusion criteria were age ≥ 21 years, BMI 25–50 kg/m^2, and self-identification as Black and/or Hispanic. Exclusion criteria were pregnancy, enrollment in another weight loss program, intention to undergo weight loss surgery within the year, untreated mental illness, untreated thyroid disease, active cancer, advanced chronic obstructive pulmonary disease, renal disease on dialysis or inability to control meal content (i.e., living in an institutional setting).

All participants were followed by a trained community health worker at routine intervals for a one year period. The study was approved by the Institutional Review Board and all participants provided written informed consent.

Measures

Socio-demographic and clinical data were collected from participants at enrollment. Education was defined as less than high school education, or completed high school. Participants assessed their body image at enrollment using the Stunkard figure rating scale (Stunkard et al., 1983). The Stunkard scale is a silhouette figure rating scale that consists of 9 male and 9 female figures of increasing body size. The Stunkard scale is a valid and reliable measure of body image perception that has been used to assess body image in diverse race/ethnic groups (Sanchez-Johnson et al., 2004; Cachelin et al., 2002; Fitzgibbon et al., 2000). At enrollment participants were asked to select the figure that best resembles 1) "how you look now", and 2) "normal body size".

At study completion, participants were asked to list their social network members in order of importance using a bull's eye figure developed from the Convoy Model of Social Relations (Antonucci and Akiyama, 1987). Social network members were defined as "people who are important in your life right now." Participants were shown a set of three overlapping concentric circles. In the inner circle they were asked to list network members "to whom you are so close it is hard to imagine life without"; in the middle circle "people to whom you may not feel quite that close to but who are still very important to you"; and the outer circle "people whom you haven't already mentioned but who are close enough and important enough in your life that they should be placed in your personal network". There was no limit on the number of members listed. Participants were asked to provide the following information on each member: frequency of contact (once a day, several times a week, once a week, a few times a month, or once a month), living proximity (lives in the home, within walking distance, within same borough, within the 5 boroughs, outside of New York City), relationship (sibling, friend, parent, partner, child), gender, and perceived body size (identified using the Stunkard scale). The Stunkard figures were categorized based on associated BMI values as follows (Bulik et al., 2001): Fig. 1 = underweight, Figs. 2–4 = normal weight, Figs. 5–6 = overweight, and Figs. 7–9 = obese.

Statistical analysis

Means and proportions were used to calculate descriptive statistics. One way analysis of variance (ANOVA) tests were used to compare participants' perception of normal body size stratified by: 1) the number of network members with obesity (0 vs. 1–2 vs. ≥3); 2) frequency of contact with obese members (no contact vs. less than daily contact vs. daily contact); 3) living proximity of obese members (no members with obesity vs. obese members living outside the home vs. obese members living in the home); and 4) the number of same sex network members with obesity (0 vs. 1 vs. >1). Post-hoc Tukey tests were then used for group comparisons. Student's t-tests were used to compare participants' perception of normal body size stratified by the circle placement of obese network members and the relationship of obese network members. A multivariable linear regression model was used to examine the relationship between participants' perception of normal body size measured using the Stunkard scale (dependent variable) and the number of network members with obesity (0 vs. 1–2 vs. ≥3) adjusted for participant BMI, age, race/ethnicity and network size. A similar model was used to examine the relationship between participants' perception of normal body size and the frequency of contact with obese network members.

A network body size score was calculated for each index participant by assigning a numeric value to each network member based on their body size (−1 for under or normal weight, +1 for overweight, +2 for obese), and then adding the assigned values for members of a participant's network. For example, a participant with three network members with Stunkard Figs. 2 (assigned −1 for normal weight), 6 (assigned +1 for overweight), and 8 (assigned +2 for obese) would have a network body size score of +2. A multivariable linear regression model was used to examine the relationship between index participants' perception of normal body size (dependent variable) and the social network body size score adjusted for index participant age, education, race/ethnicity, and network size. Interactions by race/ethnicity and gender were examined in the fully adjusted model.

Results

There were 405 participants randomized in the SCALE trial, 248 completed the study, and social network data were collected on 245 participants included in this analysis. Table 1 shows the baseline characteristics of the index participants who provided social network data. The

Table 1
Characteristics of index participants (n = 245).

Characteristics	No. (%)
Female	219 (89%)
Black	124 (51%)
Hispanic	121 (49%)
Age, mean (SD), y	50.5 (12.7)
Body mass index, mean (SD)	33.5 (5.9)
Perception of current body size[a]	6.1 (1.3)
Completed high school	187 (76%)
Native language English	132 (54%)
Marital status	
Married	68 (28%)
Committed relationship	26 (11%)
Single	81 (33%)
Separated/divorced/widowed	55 (23%)
Employment status	
Currently employed	103 (46%)
Homemaker	34 (29%)
Unemployed looking for work	26 (22%)
Retired	34 (29%)
Insured	187 (76%)
Type of insurance	
Medicaid	56 (23%)
Medicare	32 (13%)
Commercial	81 (33%)
Hypertension	80 (33%)
Diabetes	43 (18%)
Ever smoked	84 (34%)
Current smoker	13 (15%)

SCALE trial, New York City, 2012–2013.
Missing data = marital status, n = 1; current smoker, n = 1.
[a] Measured using the Stunkard scale. Interpretation of scale: Fig. 1 = underweight, Figs. 2–4 = normal weight, Figs. 5–6 = overweight, and Figs. 7–9 = obese.

mean age of index participants was 50.5 years, mean BMI 33.5 kg/m^2, 51% were Black, and 49% Hispanic. The majority of participants completed high school (76%) and were insured (76%). English was the native language for 95% of Black and 14% of Hispanic participants. On average, participants perceived their own body size at enrollment to be Fig. 6 on the Stunkard scale which correlates with a BMI of approximately 30 kg/m^2 (Bulik et al., 2001).

Table 2 shows the characteristics of the social network members (n = 2571). Mean network size was 10.5 (SD 5.9, range 0–37 network members per participant). Black participants had a larger mean network size compared to Hispanic participants [11.6 (10.3) vs. 9.3 (8.5), p = 0.004]. Thirty-five percent of network members were identified as friends, 17% children, 15% siblings and 13% other family. The majority of network members were identified by participants as normal weight, 31% overweight, and 10% obese. The majority of network members lived outside the index participants' homes (81%).

Table 3 shows mean values for participants' perception of normal body size examined by network member characteristics. Participants reported a larger body size as normal as the number of network members with obesity increased (0 vs. 1–2 vs. ≥3 network members with obesity, ANOVA p = 0.03). A post hoc Tukey test showed that participants with 3 or more obese network members had a significantly larger body size norm compared to participants with no obese network members at p < 0.05; the other group comparisons were not significant. In a multivariable regression model adjusted for index participant BMI, age, race/ethnicity and network size, participants with ≥3 network members with obesity perceived a larger body size as normal compared to participants with no network members with obesity [parameter estimate 0.442, 95% CI (0.103, 0.782), p = 0.01].

Participants reported a larger body size as normal as frequency of contact with at least 1 network member with obesity increased (no contact vs. less than daily contact vs. daily contact, ANOVA p = 0.04). A post hoc Tukey test showed that the group with once daily contact with obese network members selected a larger body size as normal compared to the group with no contact with obese network members (p < 0.05); the other group comparisons were not significant. In a multivariable regression model adjusted for participant BMI, age, race/ethnicity and network size, participants in daily contact with at least one obese member had larger body size norms compared to participants without obese members [parameter estimate 0.277, 95% CI (0.046, 0.509), p = 0.02], and participants with less than daily contact with obese members had no difference in body size norms compared to those without obese members [parameter estimate 0.064, 95% CI (−0.161, 0.289), p = 0.58].

There was a difference in perception of normal body size of borderline significance for participants with no obese members vs. obese members living outside the home vs. at least one obese member living in the home (ANOVA, p = 0.049, Table 3). A post hoc Tukey test showed that the group with obese network members living in the home selected a larger body size as normal compared to the group with no obese network members (p < 0.05); other group comparisons were not significant.

There was a trend towards participants perceiving a larger body size as normal when they had a partner (husband, wife, girlfriend, boyfriend) with obesity compared to those without an obese partner [3.70 (0.80), n = 20 vs. 3.42 (0.78), n = 225, p = 0.13]. There was no significant difference in perception of normal body size between participants with vs. without at least 1 obese network member of other relationships (siblings, parents, children, and friends). There was no significant difference in mean values for normal body size stratified by the number of friends with obesity (0 vs. 1–2 vs. ≥3, ANOVA, p = 0.4), or the number of siblings with obesity (0 vs. 1 vs ≥ 2, ANOVA, p = 0.32).

When only female index participants were examined, there was no difference in their perception of normal body size as the number of female network members with obesity increased [0 vs. 1 vs. >1 female member with obesity, ANOVA p = 0.83]. There was no significant difference in perception of normal body size between participants with inner circle network members with obesity compared to participants with only middle and outer circle network members with obesity [3.59 (0.78), n = 96 vs. 3.40 (0.73), n = 42, p = 0.18].

Table 4 shows the results of a multivariable regression model examining the relationship between participants' perception of normal body size and the network body size score adjusted for participant age, education, race/ethnicity and network size. Perception of normal body size increased as the body size of network members increased (p = 0.028). In addition, perception of normal body size was larger among Black compared to Hispanic participants. There was no interaction by race/ethnicity or gender in the relationship between the network body size score and perception of normal body size (p = 0.41 and 0.5 for interaction terms, respectively).

Table 2
Characteristics of social network members (n = 2571).

Characteristics	No. (%)
Mean network size, members (SD)	10.5 (5.9)
Women, %	1689 (66%)
Mean age of members ≥ 18 years old, (SD), y	49.2 (17.1)
Mean age of members < 18 year old, (SD), y	9.8 (4.9)
Number of network members by relationship, %	
Friend	887 (35%)
Child	444 (17%)
Sibling	385 (15%)
Other family[a]	329 (13%)
Parent	133 (5%)
Grandchild	118 (5%)
Partner	106 (4%)
Coworker	69 (3%)
Other [b]	52 (2%)
Other undefined	15 (0.6%)
Body size of network member, %	
Underweight	195 (8%)
Normal weight	1245 (51%)
Overweight	767 (31%)
Obese	248 (10%)
In contact once a day, %	918 (38%)
Living proximity, %	
In the same home or building	476 (19%)
Outside home/building but within New York City	1242 (51%)
Outside of New York City	725 (30%)

SCALE trial, New York City, 2012–2013.
Missing data: age, n = 165; gender = 17; relationship, n = 32; network member body size, n = 116; circle, n = 10; frequency of contact, n = 151; living proximity, n = 128.
[a] Other family = aunt, uncle, cousin, niece, nephew, sister-in-law, brother-in-law, grandmother, grandfather, mother-in-law, father-in-law.
[b] Other = godmother, godfather, god-daughter, god-son, community health worker, church member, pastor, neighbor, prayer partner, therapist.

Table 3
Participants' perception of normal body size stratified by network member characteristics.

	Normal figure[a] [mean (SD)]	P value[b]
Number of network members with obesity		
0 (n = 107)	3.34 (0.79)	0.03
1–2 (n = 115)	3.49 (0.79)	
≥3 (n = 23)	3.78 (0.60)	
Frequency of contact		
No contact (n = 107)	3.34 (0.79)	0.04
Less than daily (n = 73)	3.44 (0.69)	
Once daily (n = 65)	3.65 (0.84)	
Living proximity		
No obese network members (n = 107)	3.34 (0.79)	0.049
Obese network member(s) living outside the home (n = 97)	3.47 (0.77)	
Obese network member(s) living in the home (n = 41)	3.68 (0.76)	

SCALE trial, New York City, 2012–2013.
[a] Defined using the Stunkard figure rating scale. Interpretation of scale: Fig. 1 = underweight, Figs. 2–4 = normal weight, Figs. 5–6 = overweight, and Figs. 7–9 = obese.
[b] ANOVA test.

Table 4
Multivariable model examining the relationship between network body size score and participants' perception of normal body size (dependent variable).

Variable	Parameter estimate (S.E.)	95% C.I.
Network body size score	0.026 (0.009)*	0.010, 0.043
Age[a]	0.004 (0.004)	−0.004, 0.012
Education[a]	0.157 (0.121)	−0.080, 0.393
Race/ethnicity[a]	−0.247 (0.108)**	−0.459, −0.035
Network size	−0.009 (0.009)	−0.026, 0.009

SCALE trial, New York City, 2012–2013.
* $p < 0.01$.
** $p < 0.05$.
[a] Age, education and race/ethnicity are for the index participants.

Discussion

In this study, we found that participants reported a larger body size as normal as the number of social network members with obesity increased. In addition, increased frequency of contact with obese network members, and obese network members living in the home were associated with larger body size norms. Interestingly, while there was a trend towards larger body size norms among participants with obese partners, we did not find that the relationship of obese network members significantly predicted index participants' body size norms. In addition, the circle placement of network members with obesity (that is the importance of the relationship) was not associated with participants' perception of normal body size. Our findings suggest that network characteristics, specifically the number of obese network members and their frequency of contact and living proximity, may play a role in predicting an individual's body size norms.

Previous studies have examined the body size preferences of Black and Hispanic adults (Sanchez-Johnsen et al., 2004; Cachelin et al., 2002; Fitzgibbon et al., 2000; Kumanyika et al., 1993). Studies have found that Black and Hispanic women are likely to underestimate their body size and perceive a large body size as ideal compared to Caucasian women (Potti et al., 2009; Breitkopf et al., 2007; Fitzgibbon et al., 2000). Perception of normal body size was previously examined among Black and Hispanic adults with normal to overweight BMIs, and results show that smaller body sizes were perceived as normal compared to our study results (Cachelin et al., 2002). This suggests that perception of normal body size may increase as a person's BMI increases. In our analysis, we found that after controlling for participant BMI in a multivariable model, participants who had no network members with obesity had smaller body size norms compared to participants with 3 or more network members with obesity. This finding supports a relationship between the body size norms of participants and network member body size that is independent of participant BMI.

Researchers have hypothesized a social network effect on the body size norms of adults (Christakis and Fowler, 2007; Chandler-Laney et al., 2009). However, to our knowledge this is the first study to use egocentric social network data to examine the relationship between the body size norms of Black and Hispanic adults and the body sizes of their social network members. Body size norms are important to consider in weight management interventions because they may influence motivation to engage in weight loss behavior change (Lynch et al., 2009; Anderson et al., 2002). While published network data are not available for direct comparison with our study results, previous studies have shown that network member body size may play a role in the expansion of networks (Gesell et al., 2012; Schaefer and Simpkins, 2014). In addition, previous research has shown that bullying of persons with obesity decreased with increasing BMI at the county-level, suggesting a shift in social norms regarding acceptability of larger body size (Kuebler et al., 2013). In general, interventions targeting individual weight loss have overlooked potential social network effects on eating and physical activity behavior change (Leroux et al., 2013).

The main strengths of our study include the examination of network effects on the body size norms of obese adults in two race/ethnic groups that are disproportionately affected by obesity, and use of a validated figure rating scale to measure body size perception. An additional strength is that we controlled for the measured baseline BMI of the index participants in our models since body size perception is highly influenced by actual BMI (Lynch et al., 2007).

The study has limitations that should be taken into consideration. First, we collected egocentric network data and therefore do not have the direct body size measurements of network members. Second, data on body size norms were collected at enrollment and network data were collected at study completion. It is possible that network composition and characteristics changed over the course of the study. Third, we examined the networks of participants enrolled in a weight loss study and it is possible that their network characteristics and body size norms differ from other adults. Finally, we did not collect network data from participants who did not complete the weight loss study. It is possible that network characteristics of study non-completers differed from those of study completers. It is also important to note that we cannot conclude a causal relationship between social network member body size and the body size norms of index participants in our study. It is possible that participants selected their network members based on already established body size norms. Longitudinal examinations of social network composition are needed to better understand the relationship between individuals' body size norms and the body sizes of their network members.

Conclusion

Our findings support a relationship between the body size norms of individuals and their social network body size. Future studies should consider longitudinal examination of the relationship between index individuals' body size norms and the body sizes of network members.

Conflict of interest

The authors have no conflicts of interest to report.

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