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Impact of Simulated Ostracism on Overweight and Normal-Weight Youths' Motivation to Eat and Food Intake

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Abstract

There is growing evidence that the experience of being ostracized can impair individuals abilities to self-regulate, which in turn, leads to negative health behaviors, such as increased unhealthy eating. Research has focused on adults, but deficits in eating regulation in response to ostracism may be particularly detrimental for overweight or obese youth. This study examines the effects of a brief episode of ostracism on the motivation to eat and food intake of overweight and normal-weight young adolescents (*M* age = 13.6 years). A computerized ball-tossing game (Cyberball) was used to induce ostracism or inclusion. Following the inclusion/ostracism manipulation, all participants completed an operant computer task to earn points exchangeable for portions of food or for time socializing with an unfamiliar peer. Participants' responses for food and their subsequent energy intake were recorded. As hypothesized, ostracized overweight participants responded more for food and had a greater energy intake than overweight participants in the inclusion/control condition; whereas this was not the case for normal-weight participants. These results are important as studies indicate that overweight and obese youth may be at risk of social isolation and peer difficulties. Social adversity, if left unchanged, may increase the difficulty of promoting long-term changes in overweight youths' health behaviors.

Keywords

Ostracism; reinforcing value of food; overweight and normal-weight youth

Introduction

Ostracism is the intentional ignoring and excluding of individuals or groups by individuals or groups (Williams, 2007). Ostracism is quite common, with most individuals reporting at least one episode of ostracism each day (Williams, Wheeler, & Harvey, 2001). Studies consistently show that single episodes of ostracism are extremely stressful, as indexed by both self-report and physiological measures of stress and reactivity (Eisenberg, Neumark-Sztainer, & Story, 2003; Stroud, Tanofsky-Kraff, Wilfley, & Salovey, 2000; Zadro, Williams, & Richardson, 2004), and can negatively impact self-esteem, cognition, and mood

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(Bastian & Haslam, 2010; Boyes & French, 2009). The effect of ostracism appears to be so powerful because it undermines fundamental acceptance and belonging needs, which leads to negative emotional and psychological reactions (Williams, 2007)

There is growing evidence that the experience of being ostracized can impair individuals' abilities to self-regulate, leading to negative health behaviors, such as unhealthy eating (Baumeister, DeWall, Ciarocco, & Twenge, 2005; Oaten, Williams, Jones, & Zadro, 2008). One explanation for this impairment is that ostracism focuses attention and evokes threat responses (Williams, 2007), which causes attention and effort to be drawn away from self-monitoring and self-regulatory processes. It is well-established that self-regulation requires self-monitoring (Carver & Scheier, 1998) and that controlled eating requires self-monitoring (Saelens & McGrath, 2003; Yon, Johnson, Harvey-Berino, Gold, & Howard, 2007). Thus, it seems likely that ostracism interferes with an individual's capacity for self-monitoring, thereby disrupting the regulatory processes needed for controlled healthy eating. Recent studies in adults support this model, in that brief episodes of ostracism lead to increased consumption of unhealthy and energy dense foods (Baumeister, et al., 2005; Oaten, et al., 2008).

Impairment in self-regulation as a result of ostracism may be particularly detrimental for overweight or obese youth. Overweight children and adolescents are more likely to be ostracized, rejected, and marginalized than normal-weight youth, and are more likely to encounter difficulties and negative interactions with the larger peer group (Andreyeva, Puhl, & Brownell, 2008; Brownell, Puhl, Schwartz, & Rudd, 2005; Friedman & Brownell, 1995; Puhl & Brownell, 2001; Puhl & Brownell, 2003b; Puhl, Moss-Racusin, Schwartz, & Brownell, 2008). As a result of these problematic peer experiences, overweight youth may be especially likely to choose solitary and comforting activities (i.e., eating) and to avoid social situations involving unknown peers when ostracism occurs. Furthermore, evidence indicates that overweight youth find food more reinforcing than their normal-weight peers, which raises the possibility that the strong motivation to eat in obese youth helps to explain their positive energy balance (Temple, Legierski, Giacomelli, Salvy, & Epstein, 2008). The greater reinforcing value of food (greater wanting or motivation to eat) for overweight youth may also lead them to turn to food when adverse events occur.

One possible mechanism moderating the relationship between ostracism and food intake is emotional distress, as research has shown that both positive and negative mood increase eating compared to neutral mood (Patel & Schlundt, 2001) and studies suggest that obese individuals are more likely to overeat in response to emotional reactions (Greeno & Wing, 1994; Wing, Blair, Epstein, & McDermott, 1990). Yet, the hypothesis that emotional distress mediates or moderates the behavioral effects of social exclusion has not been supported in many recent studies - at least in those studies that rely on self-report measures of emotional states (Twenge, Baumeister, Tice, & Stucke, 2001; Twenge, Catanese, & Baumeister, 2002, 2003).

An alternative potential mechanism moderating the relationship between ostracism, reinforcing value of food, and impairment in self-regulation is dietary restraint. Restrained eaters attempt to restrict their eating by dieting or inhibiting their intake of desired, but forbidden foods (Heatherton, Herman, & Polivy, 1992; Herman & Polivy, 1980, 1984). However, because dietary restraint and self-regulation both rely on a limited supply of regulatory resources, restrained eaters may be more vulnerable to impairment in self-regulation when factors disrupt regulatory processes. Conceivably, overweight youth might display greater dietary restraint and attempt to inhibit their intake of palatable food. Because ostracism impairs regulatory resources, overweight youth may be especially susceptible to a

“restraint breakdown” or a restraint failure in response to ostracism (Braet & Wydhooge, 2000; Shunk & Birch, 2004).

The Present Research

Few studies of ostracism and eating have focused on overweight adolescents. This research gap is important because there is some indication that the mental and behavioral costs of ostracism may be greater during adolescence relative to adulthood (Kloep, 1999; Sebastian, Viding, Williams, & Blakemore, 2010). The importance of being accepted and fears of being rejected are the greatest during adolescence, and especially the early adolescent developmental period, or 10–14 years (Rubin, Bukowski, & Parker, 2006).

This study assesses the effect of a brief episode of simulated ostracism on overweight and normal-weight young adolescents’ motivation to eat and food intake. After being exposed to either an ostracism or inclusion/control manipulation, overweight and normal-weight participants had the opportunity to work for servings of a preferred unhealthy snack food and/or time for social interaction with an unfamiliar peer of their age and sex. At the end of the experimental paradigm, participants had the opportunity to consume the food that they earned or interact with the peer. The main outcome variables of interest were the number of responses participants performed to earn servings of snack foods and subsequent food intake in kilocalories.

We used the reinforcing value and consumption of unhealthy, palatable snacks as a measure of self-regulatory failure. This procedure has been used previously in research on the impact of ostracism on self-regulation in adults (Baumeister, et al., 2005; Oaten, et al., 2008; Oliver, Huon, Zadro, & Williams, 2001). The rationale for using this paradigm is that the over consumption of unhealthy snack foods is a widely-recognized contributing factor to the worldwide obesity epidemic. People are attracted to the pleasant taste of fattening foods and must therefore overcome their desire to eat these snacks (Baumeister, et al., 2005). Curtailing or inhibiting the consumption of snack foods qualifies as self-regulation and consuming a large amount of unhealthy palatable snacks is tantamount to impairment in self-regulation.

Consistent with the research by Baumeister et al. as well as Oaten and her colleagues, we predicted that relative to included/control, ostracized participants would consume greater energy from unhealthy palatable snacks (Baumeister & Sommer, 1997; Oaten, et al., 2008). This is the first study on the effects of ostracism in overweight and normal-weight youth, and so predictions regarding weight status differences were tentative. However, previous findings indicated that overweight youth often experience negative peer experiences and that dietary restraint and reinforcing value of food are greater among overweight than normal-weight youth. Therefore, we predicted a greater impairment in self-regulation and as a result greater motivation to eat and greater energy intake in ostracized overweight youth than included overweight participants; whereas no differences were expected between included and ostracized normal-weight participants.

Method

Participants

Participants were 59 young adolescents (29 girls; *M* age = 13.55 years) between the ages of 12 and 14 years. Adolescents were screened over the phone, with a semi-structured interview, to assess their eligibility for the study. Adolescents were excluded from participating if they reported having any food allergies, intolerances to the experimental foods or any medical conditions that would affect their eating or if they had upper respiratory illness that would affect their sense of smell or taste. Adolescents were also

excluded if they reported that they were underweight ($< 5^{\text{th}}$ BMI percentile), if they endorsed any diagnosed psychological disorders, if they reported being on a special diet or eating plan, or if they reported any behavior indicative of eating pathology as assessed by questions of the Eating Disorder Examination Questionnaire (Fairburn & Beglin, 1994; Luce & Crowther, 1999; Mond, Hay, Rodgers, Owen, & Beumont, 2004). Also during the phone screening, participants' favorite unhealthy snack food from our snack options was determined by asking participants to rate on a 5-point scale their preference for each snack (see Table 1 for snack food options). Adolescents were only eligible if they reported liking (score equal or greater than 3 for liking) for at least one of the unhealthy snack foods offered.

The study sample was a community sample recruited from September 2009 until December 2009 from the laboratory's database of families who volunteered for previous studies and from flyers and posters distributed around the community. The Social and Behavioral Sciences Institutional Review Board of the University at Buffalo approved all procedures used in this study, and all applicable institutional and governmental regulations concerning the ethical use of human volunteers were followed.

Procedure

Prior to coming to the laboratory for their experimental session, participants were sent measures of dietary restraint to complete at home (described below), and were asked to abstain from eating two hours prior to the laboratory visit. Upon arrival to the laboratory on the day of the experimental session, written parent consent and adolescent assent was obtained, and participants completed a same-day food recall measure to ensure they had followed the 2 hour no-food study requirement. All participants were found to be in compliance with the eating requirement.

Following the assent and food recall procedures, participants were escorted to a room where they were instructed on how to play the Cyberball game (Williams & Jarvis, 2006). Cyberball is a virtual ball-toss game used to simulate ostracism, and participants were randomly assigned to either the ostracism ($n = 29$) or inclusion/control condition ($n = 30$). After playing Cyberball for 5 minutes, participants completed the Aversion Impact Index (Williams, Cheung, & Cho, 2000) which assesses the effects of the ostracism manipulation on mood and psychological needs (the conditions and measures are described in greater detail below). Next, participants played an operant computer task to assess the reinforcing value of (or motivation) snack food relative to time socializing with a same-sex, unfamiliar peer/confederate.

After completing the computer task, participants were served a large portion (M weight = 416.47 grams) of the snack food that they had earned in a pre-weighed bowl. Participants did not receive the exact number of portions they earned during the computer task because we did not want to create a ceiling effect that would influence participants' food intake. Participants were told they could eat as little or as much of the snack as they desired. After participants finished eating their snack, the bowl was weighed again to record the amount of food consumed.

Next, participants were introduced to a confederate and conversed with him or her for the amount of social time earned. The confederates were same-sex, same-age (within a year of each participant's age) peers who were recruited in the same manner as the study participants. Same-sex, same-age peers were used as confederates because it is well-established that children and young adolescents prefer same-sex, same-age peers as social interaction partners and friends (Rubin, et al., 2006). Confederates were instructed to converse with the participants for the allotted amount of social time that the participants had

earned and to ask the participants “getting to know you” questions (i.e., Where do you go to school? How long have you lived here? Do you have any hobbies?). Confederates were compensated with a \$15 dollar gift card to a local mall for their participation in the study.

After eating and/or socializing, the height and weight of the study participants were measured, debriefed, and participants received a \$30 gift card to a local mall. If participants did not earn points for one of the activities (eating snack food or interacting with an unfamiliar peer), they simply skipped that particular activity.

Experimental Manipulation

Study participants played Cyberball (Williams & Jarvis, 2006), a computerized game that simulates a brief episode of ostracism (exclusion). This game has been used previously with samples of adults and adolescents (Oaten, et al., 2008; Oliver, et al., 2001; Williams & Jarvis, 2006; Zadro, et al., 2004). The game begins with one of the players on the screen throwing the ball to the participant. When the ball is thrown to the participant, he or she is able to then choose an alleged player to throw the ball to by clicking the icon representing the player with their mouse.

Participants were randomly assigned to either an ostracism/exclusion or inclusion/control condition. In the ostracism condition, the participant received the ball twice at the start of the game, and thereafter, never received it again. Thus, participants in the ostracism condition received 6.7% of the throws. In the inclusion condition, the participant received the ball approximately 33% of the time. In both conditions, there was a total of 30 throws that occurred between the players, lasting approximately 5 minutes. All participants were instructed to imagine with whom they were playing, what the physical environment looks like, and anything else they might wish to imagine about the situation and the players.

Measurements

Anthropometric Measures—Height and weight were measured using a Digi-Kit digital stadiometer (North Bend, WA) and a Tanita digital weight scale (Arlington Heights, IL) to calculate BMI(kg/m²). BMI percentiles (zBMI) were used to classify participants as either overweight/obese or normal weight, according to the Center for Disease Control and Prevention’s average BMI for age percentiles and guidelines (Kuczmarski et al., 2000). Participants were considered overweight or obese if they were above the 85th BMI percentile for their age and sex ($n = 21$), and normal-weight if they were at or below the 85th BMI percentile ($n = 38$) (Barlow, 2007).

Manipulation check—The Aversion Impact Index (AII) assesses the effects of the ostracism manipulation on mood, self-esteem, and psychological needs which include feelings of belonging, control, meaningful existence (Williams, et al., 2000). Mood, self-esteem, and the psychological needs are each assessed with single items (each rated on a 5-point scale). Items were reverse-scored such that greater values for the belonging, self-esteem, meaningful existence, and control items indicated lower (or less positive) levels. However, greater scores for negative mood indicated more negative mood. As part of the manipulation check, participants were also asked the percentages of ball tosses that they believed where thrown to them (“Assuming that the ball should be thrown to each person equally, what percentage of throws was directed to you?”).

Reinforcing value of food and social interactions—The relative reinforcing value (RRV) is a commonly used, empirical index of motivation. It is defined by how hard an individual is willing to work to gain access to a commodity relative to another equally available commodity (Epstein, Beecher, Graf, & Roemmich, 2007). The reinforcing value is

measured by having individuals make operant responses (clicking on a computer mouse) for a computerized task to earn points that are exchangeable for food and the alternative activity on a progressive ratio schedule of reinforcement. In this study, participants were initially required to press the mouse 4 times to obtain 1 serving of unhealthy snack food (Table 1) or 3 minutes of conversation/social time with a same-sex peer confederate. The response requirements for food and social time increased progressively over the subsequent trials such that participants had to press the mouse 4, 8, 16, 32, 64, 128 times, etc. to earn the same amount of points for snack food and social time. Two computer monitors were placed in the room and both were equipped with the computer operant task. One computer monitor was labeled as the “Snack Food Computer” while the other was labeled as the “Social Computer.” Participants were instructed to work on one computer at a time, and to remain seated at that computer while earning points. However, participants were also informed that they could switch between the two computers as often as they wished. The task typically ends after a total of 9 points have been earned or if participants choose not to earn 9 points. In this study, it was made clear to the participants that they could stop whenever they wanted and that they did not have to complete all trials, but all participants completed the 9 trials.

Dietary restraint—A modified version of the Dutch Eating Behavior Questionnaire (DEBQ) was used to measure dietary restraint (Hill & Pallin, 1998). This version contains 6 of the 10 original questions that have been rephrased to be understandable to children and young adolescents ≥ 8 years of age. Furthermore, compared to the original version of the DEBQ, this version does not include items assessing emotional and external eating. Participants were asked to circle ‘Never’ (0), ‘Sometimes’ (1), or ‘Often’ (2) in response to the questions. Item responses were summed to obtain dietary restraint scores.

Analytic Plan

Double data entry and quality check were performed prior to performing statistical analysis to ensure accuracy of the data. All statistical analyses were performed using SAS Software (SAS, 2009).

Individual characteristics—First, zBMI of the overweight/obese and normal-weight participants was examined, and because dietary restraint can be greater in overweight/obese youth than normal-weight youth (Braet & Wydhooge, 2000; Vander Wal & Thelen, 2000), a *t*-test was used to determine if dietary restraint scores differed by weight status.

Manipulation check—Multivariate analysis of variance (MANOVA) was performed with the dependent variables of feelings of belonging, control, meaningful existence, self-esteem, and perceived percentage of throws received. The between-subjects factor was experimental condition (ostracism vs. inclusion).

Responses for food—This study assessed the effect of a brief episode of ostracism on the relative reinforcing value of food (i.e., number of responses performed to gain access to food) and on food intake in overweight/obese and normal-weight young adolescents. The analysis of the pattern of responses for food over the nine trials (i.e., schedule of reinforcement FR4-FR1024) was completed using mixed regression models (MRM; also called random-effects models) with random intercept and unstructured covariance. These models allow simultaneously estimating the parameters of the regression model and the variance components that account for the data clustering (Gibbons & Hedeker, 1994). The MRM assessed the relationship between Cyberball conditions (inclusion vs. ostracism) and responses for food as a function of weight status. Scores of dietary restraint were added to the model to test the effect of restrained eating on motivation to eat and whether it interacted with weight status or Cyberball condition.

Energy intake—Analysis of participants' energy intake was performed using GLM that assessed the impact of Cyberball conditions (ostracism vs. inclusion) and weight status on participants energy intake in kilocalories. Similar to the previous analysis, scores of dietary restraint were added to the model to test the effect of restrained eating and interaction between dietary restraint and weight status or Cyberball condition on energy intake.

Results

Individual Characteristics

The average zBMI was 1.84 ($SD = 0.67$) for overweight participants and was 0.09 ($SD = 0.76$) for normal-weight participants. Overweight participants ($M = 11.19$, $SD = 3.56$) scored higher on the dietary restraint scale than normal-weight participants ($M = 7.94$, $SD = 2.73$), $t(55) = 3.87$; $p = 0.003$.

Manipulation Check: Mood and Physiological Needs

MANOVA revealed a significant multivariate effect for Cyberball condition (Wilks' lambda = 0.35, $p < .001$). Participants in the included condition reported greater feelings of belonging ($M = 3.93$, $SD = 1.41$) than participants in the ostracized condition ($M = 7.67$, $SD = 3.33$), $F(1,53) = 29.78$, $p < .001$, and participants in the included condition reported greater (or less negative) self-esteem ($M = 2.43$, $SD = 1.10$) than participants in the ostracized condition ($M = 3.15$, $SD = 1.17$), $F(1,53) = 5.53$, $p < .02$. Included participants also reported greater feelings of having a meaningful existence ($M = 4.39$, $SD = 2.02$) relative to participants in the ostracized condition ($M = 8.00$, $SD = 3.81$); $F(1,53) = 19.40$, $p < .001$. Included participants reported a lower negative mood score ($M = 10.96$, $SD = 3.19$) compared to ostracized participants ($M = 17.19$, $SD = 4.67$), $F(1,53) = 33.44$, $p < .001$, and a greater sense of control ($M = 9.82$, $SD = 3.29$) than did ostracized participants ($M = 13.56$, $SD = 1.5$); $F(1,53) = 28.96$, $p < .001$. In addition, included participants reported receiving a greater proportion of the ball throws ($M = 25.9\%$ of the throws, $SD = 8.1$) than ostracized participants ($M = 10.8\%$ of the throws; $SD = 12.9$), $F(1,53) = 27.49$, $p < .001$.

Although scores on the measures of belonging, control, meaningful existence, self-esteem and negative mood were different as a function of the experimental manipulation, it is important to note that these measures did not predict responses for food or food intake (all $p > 0.1$).

Reinforcing Value of Food

Figure 1 illustrates overweight/obese and normal-weight participants' pattern of responses for food as a function of condition. Table 2 depicts the mean (SD) minutes of social interaction earned as a function of Cyberball condition and weight status, whereas Table 3 depicts the average number of responses and kilocalories consumed by condition and weight status.

Analyses revealed an interaction of condition by weight status by schedule of reinforcement, $\beta = 0.19$ (95% CI: 0.1 – 0.3), $p < .001$. Probing of the interaction for Cyberball conditions (running the model on each Cyberball condition separately) revealed that overweight/obese participants responded more for food than normal-weight participants in the ostracism condition, $\beta = 0.09$ (95% CI: 0.02–0.16), $p < .05$, whereas normal-weight participants responded more for food than overweight/obese participants in the inclusion condition, $\beta = -0.10$ (95% CI: -0.18- -0.03), $p < .01$. Probing the interaction for weight status (running the model on each weight status separately; see Figure 1) revealed that the overweight/obese participants in the ostracism condition responded more for food than overweight/obese participants in the inclusion/control condition, $\beta = 0.09$ (95% CI: 0.005 –0.17), $p < .05$,

whereas ostracized normal-weight participants responded less than normal-weight participants in the inclusion/control condition, $\beta = -0.11$ (95% CI: $-0.17 - -0.04$), $p < .001$. There was no main effect or interaction of dietary restraint on responses for food, $p = .78$.

Food Intake Data

There was an interaction of weight status by condition, $F(3,55)=7.46$, $p < .05$, when food intake served as the dependent variable (Table 3). Overweight/obese participants in the ostracism condition consumed more food than overweight/obese participants in the inclusion condition ($p = .009$). In contrast, normal-weight participants in the inclusion condition consumed more food than the normal-weight participants in the ostracism condition, although this difference was not significant ($p = .33$). There was no main effect or interaction of dietary restraint on food intake, $p = .37$.

Discussion

Studies of ostracism and eating have focused exclusively on adults (e.g., Baumeister, et al., 2005; Oaten, et al., 2008). No studies, to our knowledge, have examined whether ostracism leads to unhealthy eating during early adolescence, which is the developmental period during which individuals are the most sensitive to rejection and negative peer experiences, and when the effects of ostracism may be the greatest. In addition, investigators have yet to study the impact of ostracism on the eating behavior of overweight and normal-weight individuals. This study addressed these research gaps by assessing the effect of a brief episode of simulated ostracism on overweight and non-overweight young adolescents' motivation to eat and food intake.

As hypothesized, ostracized overweight participants responded more for food and had greater energy intake than overweight participants in the inclusion/control condition. These results add to the recent literature on the impact of social exclusion and ostracism on eating regulation (Baumeister, et al., 2005; Oaten, et al., 2008; Oliver, et al., 2001). The present study also extends previous results by providing preliminary evidence for a differential effect of social exclusion on overweight and normal-weight young adolescents, as normal-weight participants in the ostracized condition responded less for food than normal-weight participants in the inclusion condition and there was no difference in food intake between normal-weight youth in the ostracism condition and those in the inclusion/control condition.

The differential effect of ostracism on eating as a function of weight status supports our initial hypothesis that overweight individuals would show more impairment of eating regulation. However, the mechanisms accounting for the different patterns of response and energy intake are unclear. We initially hypothesized that dietary restraint would moderate the relationship between ostracism and impairment in self-regulation. This hypothesis was based on findings indicating that restraint of eating is an effortful process and that consequently overweight youth would be more vulnerable to impairment in self-regulation when attention and effort were drawn away from self-monitoring and self-regulatory processes. Although scores of dietary restraint were greater among overweight than among normal-weight participants, results failed to show a relationship between dietary restraint and motivation to eat or energy intake as a function of Cyberball condition. Thus, it is critical for future work to explore new factors that can account for the weight status by condition effects found herein. One possibility is different coping strategies used by overweight and normal-weight youth. Overweight children and adolescents are more likely to encounter problems with the larger peer group (Andreyeva, et al., 2008; Brownell, et al., 2005; Friedman & Brownell, 1995; Puhl & Brownell, 2001; Puhl & Brownell, 2003b; Puhl, Moss-Racusin, et al., 2008), and as a result, may be especially likely to use solitary, comforting, and avoidant coping strategies (i.e., eating) to deal with interpersonal stressors.

In this regard, the choice of alternatives (i.e., interactions with an unfamiliar peer vs. unhealthy snack foods) should be acknowledged as a limitation of this study. Providing another alternative to eating, such as interacting with a friend or another sedentary activity (e.g., watching television, playing video games), may have resulted in different patterns of responding and eating behavior. However, the choice of alternatives in the current study was not arbitrary, but based on the premise that overweight youth encounter more difficulties with the larger peer group (Andreyeva, et al., 2008; Brownell, et al., 2005; Friedman & Brownell, 1995; Puhl, Andreyeva, & Brownell, 2008; Puhl & Brownell, 2001; Puhl & Brownell, 2003a, 2003b; Puhl, Moss-Racusin, et al., 2008). Nevertheless, friendships are mutual, voluntary, close relationships that have been shown to have unique effects on young adolescents' social, emotional, and psychological development and adjustment (Rubin, et al., 2006). Thus, friends may have a different impact following ostracism than unfamiliar peers.

Additional limitations of the study include the use of a between-subjects design and the small number of participants involved in this research. The small sample most certainly limited statistical power, and our design limits our interpretation of the results since there were no direct comparisons of the impact of ostracism and inclusion within the same participants. As we were designing the study, we deemed that a carry-over effect could potentially influence the findings of the experiment so we avoided a within-subjects design. It is likely that participants exposed to the ostracism condition first would approach the experimental tasks differently than participants first exposed to the control/included condition.

Despite these limitations, the current study provides new information regarding linkages between ostracism and motivation to eat and food intake in overweight and normal-weight youth. The limitation outlined above in terms of alternatives suggests interesting future research directions with regard to ways to cope with social exclusion and negative peer experiences. The effect of ostracism appears to be so powerful, in part, because ostracism undermines fundamental acceptance and belonging needs, which in turn, leads to negative behavioral and psychological reactions (Williams, 2007). There is also some evidence that many individuals seek to connect with others when ostracism occurs, likely to restore lost belonging and acceptance needs (Baumeister, Brewer, Tice, & Twenge, 2007; Carter-Sowell & Williams, 2005; DeWall, Baumeister, Stillman, & Gailliot, 2007; Lakin & Chartrand, 2005; Pickett, Gardner, & Knowles, 2004; Williams & Sommer, 1997). Connecting with others may therefore restore depleted social needs, which in turn, replenishes the resources required for self-regulation and allows individuals to regain capacity to control their behavioral and psychological responses (Gross, 2009; Twenge, Baumeister, DeWall, Ciarocco, & Bartels, 2007). Based on these findings, it is possible to hypothesize that friends operate as a protective factor in buffering the negative impact of ostracism on youths' eating behavior. If overweight individuals are especially prone to unhealthy eating following interpersonal difficulties, then such interpersonal difficulties may be interfering with attempts to adopt healthier lifestyle recommendations. Thus, to produce long-term results and improvement in health trajectories, prevention efforts may need to intervene on overweight youths' social difficulties or on ways overweight youth deal with these difficulties. Future research on the "power" of social connections and relationship-related activities following ostracism may inform such efforts.

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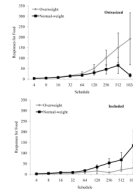


Figure 1.

Top panel: Responses for food per trial (SE) performed by overweight ($n=11$) and normal-weight ($n= 18$) participants in the ostracism condition. Overweight youth in the ostracism condition responded more for food than overweight youth in the inclusion/control condition ($p < .05$). *Bottom Panel:* Responses for food per trial (SE) performed by overweight ($n = 10$) and normal-weight ($n = 20$) participants in the inclusion/control condition. Normal-weight youth in the ostracism condition responded less for food than normal-weight youth in the inclusion/control condition ($p < .001$).

Table 1

Experimental foods used in the experiment.

Foods	Serving (g)	Kilocalories	Fat (g)	Carbohydrates (g)	Protein (g)
Potato chips*	19	103	6.7	10.0	1.3
Cool Ranch Doritos*	20	100	5.0	12.9	1.4
M & M's [∞]	20	100	5.0	14.3	1.0
Twix [∞]	16	80	5.0	10.0	1.0
Kit Kat ^{**}	14	67	4.8	9.0	1.0
Butterfingers ^{∞∞∞}	19	85	4.5	13.5	1.0

* Frito-layTM ;

[∞] Mars;

** The Hershey Company;

^{∞∞∞} Nestle

Table 2

Mean (SD) minutes of social interaction earned as a function of Cyberball condition and weight status.

	Ostracism		Control	
	<i>n</i>	Social Time	<i>n</i>	Social Time
Overweight	11	7 (7.6)	10	14 (3.9)
Normal-weight	18	10 (6.9)	20	9 (6.7)

Table 3
 Mean responses (SD) for food and kilocalories consumed as a function of Cyberball condition and weight status.

	Ostracism		Control	
	<i>n</i>	Responses food Kcal	<i>n</i>	Responses food Kcal
Overweight	11	552 (796) 364 (169)	10	95 (149) 185 (100)
Normal-weight	18	206 (318) 251 (146)	20	332 (604) 303 (176)