WEIGHT AND SOCIAL NORMS: PREDICTING PALATABLE FOOD INTAKE IN FIRST-YEAR COLLEGE WOMEN

by

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ABSTRACT

ABIGAIL STROM HARDIN. Weight and social norms: Predicting palatable food intake in first-year college women. (Under the direction of DR. JENNIFER B. WEBB)

Weight gain in first year university students may be of particular concern in the development of lifelong overweight or obesity. Both Social Facilitation Theory and the Norms Matching Approach have been invoked to explain the augmentation of caloric consumption in social scenarios, yet neither paradigm is sufficient to explain observed patterns of social eating. The present experimental study attempted to resolve these two discrete approaches by hypothesizing that social facilitation of eating works by invoking stricter adherence to social norms. More specifically we investigated whether first-year, first-time college women's palatable food intake was adjusted to match researcher-set consumption norms while in groups of two or in two possible alone conditions (videotaped vs. not), and whether the weight status of participants affected adherence to these norms. Ninety-two women recruited through the University subject pool were asked to complete a survey on their interests and activities either alone, alone and videotaped or with a partner and were provided cookies purportedly as a snack during the survey. Normative consumption was set by a research assistant who stated how many cookies most participants ate, giving three possible manipulations (1, 4 or 7 cookies) and caloric consumption was measured. Neither norm condition nor BMI/weight status were found to be significant predictors of caloric consumption, however, as expected participants who were alone but told they were being observed by a video camera decreased their consumption by about 107-116 calories, depending on model, compared to those participants who were alone and unobserved after controlling for hunger, sociability and

dietary restraint. Contrary to predictions, however, paired individuals also decreased consumption but to a lesser extent than those alone but observed by video camera, by about 65 calories. Future directions and limitations are discussed.

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INTRODUCTION

Obesity [having a body mass index (BMI) $\geq$ 30 kg/m^2], labeled in popular culture as a recent "epidemic," is a significant health concern and affects more than one third of adults in the United States, and about 17% of children and adolescents (CDC, 2011). Politicians and government agencies have taken note; in an effort to mitigate this growing social problem, regulations have been proposed and sometimes adopted targeting restaurants, convenience stores and movie theaters. Many states now require that caloric information be available in all restaurants (Berman & Lavisso-Mourey, 2008). And in New York, Mayor Michael Bloomberg has proposed legislation that would limit the cup size of sugary drinks to a maximum of 16 ounces (Gross, 2012).

Obesity and weight gain generally may be particularly problematic for first-year undergraduate students because of the development of life-long eating habits in freshman students that may contribute to continued or developed obesity or overweight (having a BMI between 25-29.9 kg/m^2) in later life (Lloyd-Richardson, Bailey, Fava & Wing, 2009). Because of the high costs both for an individual's health and society due to the high rates of obesity in the United States, research has focused on identifying periods of risk for weight gain. One such period is the first year of undergraduate college. Although the traditional concept of the "Freshman 15" has been largely debunked and shrunk to a more realistic "Freshman 5," the weight gained by first-year college students is still 5.5 times greater than the average weight gain in the general population (Levitsky, Halbmaier, & Mrdjenovic, 2004). Furthermore, if this weight gain is maintained, many students can become obese (Mihalopoulis, Auinger & Klein, 2008). Indeed, this lifespan perspective on obesity has been supported. Weight gained during the first year of college

may not be lost over the life course and obesity rates in college populations have been demonstrated to climb modestly between the freshman and sophomore year (Lloyd-Richardson, Bailey, Fava & Wing, 2009). In fact, the same study suggests that the first semester of college may confer the greatest risk of weight gain. Vella-Zarb and Elgar noted in their meta-analysis of college weight gain studies that although 5 pounds of weight gain may seem minor, given the health risks like those mentioned above, further research to determine predictors of first-year weight gain is warranted, particularly in areas outside of diet and exercise habits and rather in the realms of psychological and environmental contributors (Vella-Zarb & Elgar, 2009). Supporting this suggestion that the first year of college may be a particularly important time period for weight gain, Webb and Hardin (2012) investigated elevated BMI as a moderator of weight gain across the first semester of college in first year women. Greater BMIs at the start of the first year were associated with greater changes in body composition and were associated with less adaptive eating behaviors such as greater binge eating and less intuitive eating regardless of time (Webb & Hardin, 2012). Moreover, health risks associated with overweight college students go beyond the development of obesity, but include abnormal HDL cholesterol, pre-diabetes, risk for metabolic syndrome, and abnormal glucose and insulin metabolism (Huang, et al., 2004).

Initially, theories involving deliberate choices like the Theory of Reasoned Action (Fishbein, 2008) and the Theory of Planned Behavior (Ajzen, 2007) were offered as explanations for overeating leading to obesity, suggesting that deliberate choices are made by individuals based on logical trade-offs between goals that involve proximal versus distal benefits (Rothman & Sheeran, 2009). Upon further investigation, however,

these theories have given way to a focus on habitual reactions, contextual cues, social norms and emotional regulation as potential contributors to obesity and overweight.

The present study has two aims. First, this study aims to integrate Social Facilitation Theory with the Social Norms Approach to better understand eating behavior in social situations. Ultimately this knowledge could then be applied to preventative measures and treatment that could help individuals and groups of entering first-year females reduce risk of unhealthy body composition changes during their initial transitional college year and manage current overweight and obesity through awareness of social eating tendencies.

Second, this study aims to clarify the role of one potential moderator of norms matching, weight status, on food consumption, to determine if weight status moderates the relationship between combined Social Facilitation/Social Norms and consumption.

Social Facilitation Theory

Social Facilitation Theory has been studied frequently with respect to eating behavior. The theory can be applied to a number of behavioral augmentations in addition to eating, and suggests that a drive state is created by the mere presence of others, increasing the probability of a behavior, called the "dominant response" (Gipson, Yates, Beckmann, Marusich, Zentall, & Bardot, 2011). A dominant response can be any behavior with a high probability of occurrence given a cue, like eating in response to the presence of food. In the eating literature, this theory has been applied such that the consumption of food in response to its presence is enhanced by the cue of the presence of others. (Clendenen, Herman & Polivy, 1994). For instance, in their seminal study of social facilitation of eating, Clendenen and colleagues (1994) indeed found that compared

with groups of two or four, subjects eating alone ate less, suggesting the mere presence of others may enhance consumption.

Despite this seemingly parsimonious theory, it appears that social facilitation of eating is not sufficient to explain observed eating behavior in groups (Pliner et al., 2006). And, although multiple moderators of social facilitation of eating have been proposed, including familiarity, social facilitation cannot account for observations in which individuals actually decrease consumption in groups or pairs, a result seemingly inconsistent with the predictions of this theory.

Moderators

One example of a problematic aspect of using social facilitation alone to understand social eating behavior is the debate over meal duration. Pliner, Bell, Hirsch and Kinchla (2006) found support for their hypothesis that social facilitation of eating occurs entirely because of increased meal duration. This conclusion was predicated on evidence that when meal duration was extended, all the adult participants, aged 22-66, ate more. But, contrary to the authors' conclusions, a separate, earlier study by de Castro and colleagues (1990) observed that meal duration is actually not the only moderator of social facilitation, and that social facilitation of eating occurs regardless of time of day, alcohol consumption, during which meal, day of the week or at a restaurant.

Limiting the applicability of social facilitation to eating behavior further, Pliner and colleagues (2006) found that regardless of group size, participants ate nearly identical amounts, a finding that is inconsistent with the theory of social facilitation entirely. And, rather the authors found main effects only for gender and meal duration concluding that the "mere presence" effect may be spurious (Pliner, Bell, Hersch & Kinchla, 2006). In

contrast, Hetherington and colleagues (2006) observed a different effect, noting that participants who ate with others did indeed eat more, even when compared to those who ate while distracted by a T.V., thus ruling out the possibility of distraction accounting for the effect (Hetherington, Anderson, Norton & Newson, 2006). Consumption of highly palatable foods like cake and cookies around others was also observed to be more sensitive to social facilitation in that study.

Perhaps contributing to the differing effects observed by these two studies were the average age of participants. While Pliner and colleagues investigated a sample of adults with an average age of about 42, Hetherington and colleagues investigated a younger, college-aged sample. Likewise, geographical location may also contribute to the differing effects. Pliner and colleagues conducted their experiment in Toronto, Canada, whereas Hetherington and colleagues conducted theirs in Glasgow, Scotland ((Pliner, Bell, Hersch & Kinchla, 2006; Hetherington, Anderson, Norton, & Newson, 2006)

Clearly, Social Facilitation Theory alone is insufficient to understand complex social eating behaviors. And, to complicate issues even further, the presence of others does not always exert the same influence. Perhaps due to the apparent limitations of Social Facilitation Theory, a separate branch of literature, the Social Norms Approach, has been used to try to more fully understand eating behaviors in social settings.

Social Norms Approach

As an alternative branch of eating literature, the Social Norms Approach was developed to explain the variability in consumption that is observed under different social circumstances. This approach suggests that eating behavior can be inhibited or disinhibited based on the present norms set by others in the social group (Lally, Bartle &

Wardle, 2011). For instance, Fitzgerald, Heary, Kelly, Nixon and Shevlin (2012) identified a significant influence of peer support for both healthy and unhealthy eating in adolescents that ultimately affected healthy and unhealthy food intake. More specifically, the intake of others may set a norm specific to a context that then informs others of the socially acceptable levels of food consumption given that context. Howland, Hunger and Mann (2012) observed that when two of three friends in a group were instructed to restrict their consumption of snacks to only a few vegetables, the friend who had not been instructed tended to restrict consumption as well.

Specifically in young adults, social norms have been associated with a "clustering" effect of obesity among young people. Leahey, LaRose, Fava and Wing (2011) found that obese or overweight young adults tend to have more social contact with other overweight or obese individuals than do normal weight individuals, in the form of friends, relatives and romantic partners, for example. Yet, the social norms regarding obesity and its acceptability in society shared in these clusters did not account for this relationship. Rather, the authors suggested social phenomena like social modeling might explain this clustering effect (Leahey, LaRose, Fava & Wing, 2011). Expanding on the work of Leahey, LaRose, Fava and Wing (2011), in their seminal study, Christakis and Fowler (2007) investigated the spread of obesity within a social network of about 12,000 adult participants over 32 years. The authors found that obesity spread within this network in a particular pattern, indicating that social distance, not geographical distance, was important in the spread of obesity. Furthermore, by ruling out common exposure to local environmental factors, the authors were able to conclude that it was the social connection among the participants that was contributing to the developed obesity. And,

although the data could not support inferences regarding what about the social network was contributing to the spread, the authors hypothesized that norms about overweight and obesity, norms about food consumption or both could be impacting the network (Christakis & Fowler, 2007).

Hruschka, Brewis, Wutich and Morin (2011) assessed additional networks among women and their social ties and supported Christakis and Fowler's conclusions from 2007. Yet, the authors found no support for the proposition that shared social norms about body size and acceptability of overweight and obesity played a part in this social spreading. Rather, the authors concluded that norms regarding specific eating behaviors were more likely to be contributing to the spreading (Hruschka et al., 2011). Thus, this line of research has pointed to a social contagion effect, likely due to specific eating behavior norms and their transmission via social networks.

But, as with social facilitation, the Social Norms Approach alone has also failed to fully explain observed results, such as a lack of norms matching behavior in certain circumstances as well as important moderators of norms matching, including overweight status.

Moderators

Multiple studies have focused on specifying boundary conditions and moderators of the Social Norms Approach in the context of eating behavior, yet results have remained inconclusive. Further, not all potential moderators have been investigated.

Salvy and colleagues (2008) investigated the impact of eating with an overweight or normal-weight partner on pre-adolescent girls ages 5-11, and found that overweight individuals partnered with other overweight individuals consumed more cookies than

overweight participants with normal weight partners, normal weight participants with normal weight partners or normal weight participants with overweight partners. The study did not include underweight or slim as a possible weight status (Salvy, Vartanian, Coelho, Jarrin, & Pliner, 2008). Hermans, Larsen, Herman and Engels (2008) manipulated the weight status of a confederate researcher and found that normal weight undergraduate women matched the consumption norms set by the confederate only when she was of "normal" rather than "slim" weight (she wore a waist belt to appear larger). Though the authors did not specify the confederate's BMI status, it is likely that she appeared underweight in the "slim" condition. This study did not include overweight as a possible weight status.

In a separate study, Bevelander, Anschutz and Engels (2012) found that in children ages 6-11, participants not only matched consumption to a guideline set by a peer, but that this new norm persisted over time into a later free-eating session at least 24 hours later (Bevelander, Anschutz & Engels, 2012). In this case, overweight children only ate more than normal weight children when the peer setting the norm was not eating at all, a finding inconsistent with studies of adolescent or college-aged girls and women (Bevelander et al., 2012). Clearly, the impact of weight status on consumption and norm matching is not clear based on the current state of the literature, perhaps due to the large number of moderators that are frequently not held constant, the varying age ranges of the samples and specific methodological differences among studies, such as the use of video cameras or lack thereof.

In their study of undergraduate women aged 18-27, Hermans, Engels, Larsen and Herman (2009) found that consumption of popcorn was only matched to manipulated

norms when the confederate setting the norms was sociable, and not when the confederate was unsociable (Hermans et al., 2009). Cruwys and colleagues (2011) found that college participants only matched the norms set by confederates if they had the in-group status of being students at the same university, and did not match norms when set by a confederate purported to be from a different institution (Cruwys, Angullia, Chang, Diler, Kirchner & Wadley, 2011).

Although there are a host of potential moderators that should be investigated with respect to Social Facilitation Theory and the Social Norms Approach (such as familiarity, in-group status and sociability), the issue of weight status is one such moderator that is ripe for further investigation and clarification. This is especially indicated because of its greater potential for influence in real life outside the lab, for example eating with normal versus overweight friends or colleagues.

The Present Study

The present between-subjects study seeks to resolve two apparently conflicting theories relevant to eating behavior in first-year female college students: Social Facilitation Theory and the Social Norms Approach. Under this new theoretical framework, social facilitation works to affect eating behavior not by directly augmenting the food intake, but by augmenting norm matching behavior. Thus, norm-matching is conceptualized as a mediator lying between Social Facilitation and eating augmentation. This theoretical model is presented in figure 1.

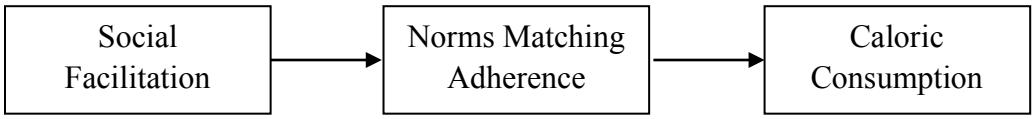

Figure 1: Theoretical model with norms matching adherence as a mediator of social facilitation's effect on consumption

Ultimately, the first aim of this study is to generate a new theoretical perspective that will help further understand eating behaviors and circumstances under which food intake may be augmented. The ability to predict augmented food intake under a variety of social circumstances would help individuals and groups manage food consumption with the goal of limiting overeating to help prevent and treat overweight and obesity.

The second aim of the present study is to investigate one predicted moderator of this new integrated approach: BMI/weight status. Weight status of other participants or a confederate has been found to affect eating behavior in the Social Norms Approach literature (Salvy, Vartanian, Coelho, Jarrin, & Pliner, 2008). Weight status has not, however, been investigated in a college population with respect to norms matching thoroughly, despite the indications that first year college women may be particularly at risk for increased weight gain, particularly if they are overweight (Levitsky, Halbmaier, & Mrdjenovic, 2004; Webb & Hardin, 2012). Nor has weight status been studied thoroughly with respect to weight status of the participants while holding constant the other potential moderators presented above, such as familiarity, in-group status and sociability. In addition to these important moderators discussed above, the current study will also hold constant hunger and dietary restraint. Because increased hunger is expected to increase caloric intake, and vice versa participants' attempts to restrict caloric consumption is expected to decrease intake, both hunger and dietary restraint will be measured.

Aims and Hypotheses

Aim #1

The present study has two aims. First, this study aims to integrate Social Facilitation Theory with the Social Norms Approach to better understand eating behavior in social situations. Ultimately this knowledge could then be applied to preventative measures and treatment that could help individuals and groups of entering first-year females reduce risk of unhealthy body composition changes during their initial transitional college year and manage current overweight and obesity through awareness of social eating tendencies.

The hypotheses for aim one are as follows:

1. In the "alone" social condition, participants who know they are being observed via video camera by researchers are expected to adjust intake to be similar to set consumption norms, whereas participants who are not being observed are expected to display a greater variance in food consumption. Thus, participants exposed to the "low" norm should eat significantly less than those exposed to the "medium" norm, and the "medium" norm participants should eat significantly less than the "high" norm group.
2. Participants in the "pair" social condition are expected to adjust intake to be similar to set consumption norms as stated above, as the co-participant is expected to function as an observer, much like the video camera.

Aim #2

Second, this study aims to clarify the role of weight status on food consumption, to determine if weight status moderates the relationship between combined Social Facilitation/Social Norms and consumption.

The hypotheses for aim two are as follows:

1. In both the "alone" conditions, overweight and obese participants are expected to eat more than the normal weight participants overall.
2. In the "pair" social condition, normal weight participants paired with an overweight or obese partner are expected to adjust intake to be similar to set consumption norms, but overweight participants paired with an overweight partner are expected to adjust intake to consumption norms but consume significantly more than their normal weight counterparts, as observed by Salvy and colleagues (2008). Expected relationships are included in Figure 2.
3. Normal weight participants paired with normal weight partners are expected to adhere to consumptions norms to the same degree as normal participants paired with an overweight partner, consistent with the findings of Salvy and colleagues (2008) suggesting that only overweight individuals paired with other overweight individuals should augment one another's consumption.

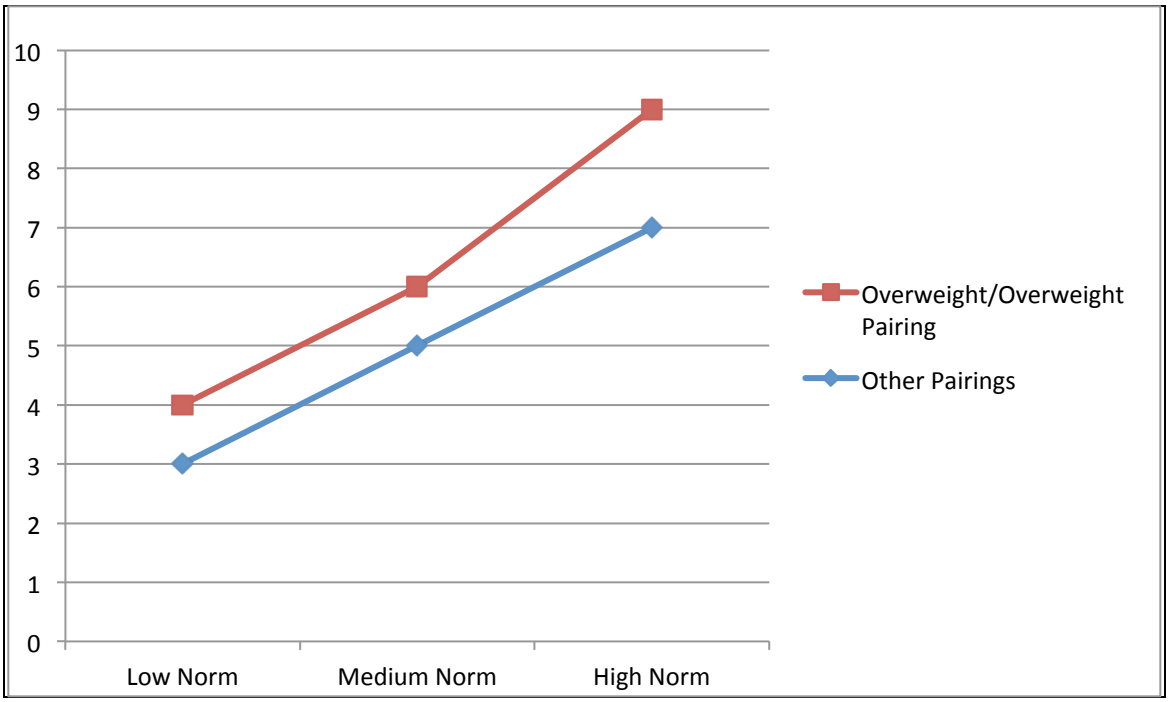

Figure 2: Predicted mean consumption by norm condition and weight status in paired condition

METHODS

Overview

This study employed a 2 x 2 factorial design with norm condition and social condition as between-subjects factors. Additionally, this study included two sub-studies of the participants in the alone and pair social conditions. The alone condition sub-study employed a 2 x 2 factorial design with norm condition and observation condition as between-subjects factors. And, the pair condition sub-study also employed a 2 x 2 factorial design with norm condition and weight status as between-subjects factors.

Participants

Participants for this study were 92 undergraduate first-year women recruited through convenience sampling in the undergraduate psychology subject pool (SONA system). Only women were asked to participate in this study to minimize the complicating factors of mixed-gendered group social interactions. Students in the subject pool received course credit for participation at the rate of one credit per hour.

Exclusion criteria for participants included pregnant and non-English speakers, as the measures were all given in English and pregnancy could result in abnormally high BMI in women who are, in fact, at a healthy weight given their pregnancy. Also, anyone with a food allergy to the ingredients in the snacks (chocolate, wheat, gluten, sugar, etc.) was excluded. Exclusion criteria were presented at the time of recruitment, so participants self-selected out of the study if they did not pass exclusion criteria. At the time of the sessions, individuals were reminded during informed consent that they could not continue if they met exclusion criteria. No participants were excluded at the time of the session.

Methods

At the time of recruitment, all participants were told that the study was investigating interest in and experience with on-campus activities. Each participant was scheduled for a time slot and instructed to not eat lunch (or any other full meal) prior to the session under the pretense that food might impact mood and opinion during their interactions. The consumption of light snacks was considered acceptable. The word "snack" was not operationally defined for participants, and thus subjective interpretations of what constitutes a "snack" was left to the determination of individual participants at the time of the session. However, what participants ate prior to the session, if anything, and when they last ate was measured in the questionnaire. As such, adherence to instructions was then interpreted subjectively by the primary investigator at the time of data analysis.

Prior to the scheduled experiment days, each participant submitted as part of the subject pool pre-screen their self-reported height and weight. This information was used to calculate BMI and participants were then purposively assigned to one of two social conditions: alone or pair. Purposive assignment ensured that overweight participants were represented in both social condition groups. All experiments took place between 11:00 a.m. and 3:00 p.m. Participants were asked by research assistants if they had eaten lunch or a full meal prior to the session and were also asked to report what they ate as a snack, if anything.

Participants were provided informed consent and then asked to fill out a short demographic questionnaire, which included questions pertaining to the cover study of on-campus activities and interests. Participants in the pair condition were ushered into a room pre-set with large bowls filled with a variety of cookies. These bowls were set at

each chair, reachable only by the participant sitting in that chair. Each participant had access to her own bowl. The researcher then told the pair one of the following manipulations, assigned randomly using a number generator:

- "There are cookies for you each on the table and we just refilled the bowls – eat as many as you like; most people eat only one."
- "There are cookies for you each on the table and we just refilled the bowls – eat as many as you like; most people eat about four."
- "There are cookies for you each on the table and we just refilled the bowls – eat as many as you like; most people eat about seven."

Participants were then instructed to discuss their interest in and participation in on-campus activities either in a pair or by themselves and were instructed to jot down responses in a short, qualitative survey. The data from this survey was not analyzed.

If assigned to the alone condition, participants were given the same qualitative survey and the same prompt, but were simply asked to write responses in the survey by themselves. In the alone and observed condition, the participant was informed verbally during consent that she would be videotaped, and a video camera was placed unobtrusively but not hidden in the room. The video camera did not contain tape and thus did not actually record the participant. The researcher then provided the participant one of the above manipulations, assigned randomly. Like the pair condition, the participant was ushered into a room pre-set with a large bowl filled with a variety of cookies.

Regardless of social condition, study durations were 30 minutes. Research assistants set stopwatches to exactly 30 minutes and re-entered the room to collect surveys once that duration had elapsed. For the first 5 minutes, the research assistants left

the participants alone with the cookies. To explain this delay, research assistants stated, "Excuse me for just one minute while I make additional photocopies of the survey and then I will be right back." If there were two participants, the research assistant added "Go ahead and introduce yourselves; I'll be right back." The research assistant returned in exactly 5 minutes, timed by a stopwatch, and left the survey with the participant(s) for an additional 25 minutes, for a total of 30 minutes. Participants were then told they had 25 minutes to complete the survey in order to encourage them to use all the available time. Time of survey completion was recorded if participants finished prior to the 25 minute cutoff.

The cookie bowls were pre-stocked with 25 cookies, and the participants also had access to 24-ounce bottles of water upon leaving the session. Cookie bowls contained both Nabisco™ Chips Ahoy! Original Chocolate Chip Cookies and Fudge Shoppe™ Fudge Stripe Cookies. These cookies were chosen due to their popularity as measured by sales figures from 2011. Chips Ahoy! cookies were the top grossing mass-produced cookie in 2011, and Keebler, the maker of Fudge Shoppe™ Fudge Stripe Cookies, was ranked second highest among mass-production cookie companies in unit sales, second only to Nabisco (AIB International, 2011). More cookies were included in the bowl than would be likely eaten during a 30-minute duration to prevent restriction of consumption data. The chocolate chip cookies had a mean of 53 calories per cookie, according to the nutrition information provided on the packaging. Fudge Shoppe™ Fudge Stripe Cookies had 50 calories per cookie, according to the packaging. The cookies were purchased and checked for consistency of cookies across groups; no broken cookies were provided to participants.

Following the 30 minute study duration, participants were debriefed and then measured for accurate height and weight, as well as asked to fill out a questionnaire which assessed the following topics: familiarity with other participants (if applicable), a manipulation check of the norm setting, dietary restraint, and the extent to which the participant viewed the research assistant as sociable, level of cookie palatability, hunger at the beginning of the session and time since last meal. One participant declined to participate in the post-manipulation questionnaires and body measurements. Exact time of the session was also recorded. Upon completion of the study, participants received SONA credit at the rate of one credit per hour, and were thanked for their participation.

Training

Research assistants were trained by the primary investigator and expected to follow specific procedures outlined in a protocols guide. Prior to data collection, each assistant was expected to demonstrate knowledge of all protocols in several practice sessions with the primary investigator.

Data Integrity

All surveys were administered using paper-and-pencil formats. To ensure data integrity while entering, all data was entered in SPSS databases and checked for consistency. To assess integrity of the manually-entered data, 10 surveys (about 11% of the total) were randomly selected to be double-checked for accuracy. Across all 10 verified surveys, no errors were found, suggesting that the data set could be considered accurate for the purposes of further analysis.

Measures

Weight Status and BMI.

Weight status was assessed initially for purposes of purposive assignment using self-reported height and weight variables. Then, following height and weight measurements in the lab, objective BMIs were computed using the BMI calculator at http://www.nhlbisupport.com/bmi. A BMI of 30 or above was considered "obese" in keeping with the Centers for Disease Control definition. A BMI between 25.0 and 29.9 was considered "overweight." A BMI between 18.5 and 24.9 was considered "normal" and below 18.5 was considered "underweight." This weight status variable was analyzed twice, once as a dichotomized variable with overweight/obese and normal/underweight as the two conditions, and analyzed again as a continuous variable. All statistical analyses were completed using the objective BMIs or derived weight status, based on height and weight measurements taken in the lab. Previous research has identified self-report height and weight estimates to be somewhat unreliable, particularly in the direction of weight underestimates (Gorber, Tremblay, Moher & Gorber, 2007). Importantly, however, in the present study's pair conditions, participants were not made aware of the co-participant's objective BMI, and therefore their individual perceptions of BMI status may have varied by individual. As such, a measure of perceived weight status, discussed below, was added as a measure after data collection had begun.

Weight was assessed using a Tanita™ Body Composition scale Model BC-551 and was measured in pounds to the nearest tenth. Height was assessed using a SECA™ portable stadiometer Model 213-1821009 and was measured in inches to the nearest tenth.

Caloric Consumption.

Cookie consumption was measured by counting how many cookies were consumed (number left subtracted from initial count) and then adding the caloric values based on the averages given above together to determine total energy consumption for each participant. In the event that a cookie was partially eaten, the percent consumed was approximated by the research assistant to the nearest 10% and recorded as a decimal.

Familiarity.

Familiarity of the other participants was assessed using a single-item scale for each of the other co-participants (except in the case of the "alone" condition). This item assessed familiarity by asking "On the following scale from 1 to 5, how well did you know this person prior to coming to this study today?" Responses were recorded on an anchored likert scale, with 1 being "I did not know her at all" and 5 being "I knew her very well."

Perceived Weight Status**.**

Perceived weight status of the partner participant was also assessed in the pair condition with a single-item likert scale by asking "Do you consider the weight of your partner in this study to be (circle one):" Possible responses included "skinner than average weight", "average weight" and "heavier than average weight".

Sociability.

Sociability of the research assistant was also assessed using a single-item scale, asking "On a scale from 1 to 5, how would you rate the researcher you interacted with today?" Responses were coded on an anchored likert scale from 1 to 5, with 1 being "She was very rude" and 5 being "She was very nice."

Hunger.

Hunger was assessed using a single item on an anchored likert scale from 1 to 5, asking "On the following scale from 1 to 5, how hungry were you when you first arrived at this study?" 1 was anchored with "Not at all hungry" and 5 was anchored with "Very hungry."

Dietary Restraint.

Current dietary restraint was measured in all participants using the Three-Factor Eating Questionnaire, or TFEQ (Stunkard & Messick, 1985). This particular scale was recently evaluated alongside the Revised Restraint Scale, the Current Dieting Questionnaire (CDQ) and the Dutch Eating Behavior Questionnaire (DEBQ) and was found to be a more valid denotation of the construct of dietary restraint than the other three (Williamson et al., 2007). Williamson and colleagues noted that the TFEQ-R, the restraint subscale of the TFEQ, not only properly indicated a "dieting" condition by way of intent, but was also correlated with dieting behaviors that result in suppressed weight. Although the DEBQ, CDQ and TFEQ were all good indicators of intention to diet, only the TFEQ validly measured actual caloric restriction (Williamson et al., 2007).

Internal consistencies within the scale's three factors of dietary restraint, disinhibition and perceived hunger in the literature are acceptable and range from .85 to .92 (Stunkard & Messick, 1985). In the current study, imputation of missing values was used for cases missing fewer than 25% of the total responses on the TFEQ. Scores were averaged and then multiplied by the total number of questions resulting in an imputed score for every case. Internal consistency for each TFEQ subscale was calculated independently. The restraint subscale consisted of 21 items ($\alpha = .90$), the disinhibition

subscale consisted of 16 items (α = .75), and the hunger subscale consisted of 14 items (α = .73).

Manipulation Checks.

Lastly, an item to assess the manipulation of average intake by the research assistant was used. Three items were used to assess the manipulation. The first assessed whether or not the participant was aware of the manipulation and asked "Did the researcher tell you how many cookies most people eat?" The second question addressed whether the participant attended to this information by asking, "The researcher said that most people eat approximately how many cookies?" and the participant was asked to circle the appropriate number. The third question addressed believability, and asked "How many cookies do you believe most people really ate during this study?" The last item assessed whether this is consistent with the participant's knowledge of other first year women, and will ask "How many cookies would you guess an average Freshman woman would eat during this study?" A summary of measures is included in Table 1.

Table 1: Measures in data collection

Construct	Measure	Use
Weight status	BMI calculator at http://www.nhlbisupport.com/bmi	Determine weight status
Weight	Tanita™ Body Composition scale	Calculate BMI
Height	SECA™ portable stadiometer	Calculate BMI
Caloric Consumption	Cookies eaten multiplied by caloric content of cookie	Outcome variable
Familiarity	Single-item likert	Control variable
Sociability	Single-item likert	Control variable
In-group status	Single-item likert	Control variable
Hunger	Single-item likert	Control variable
Dietary Restrained	Three Factor Eating Questionaire - Restraint	Control variable
Manipulation check	Three-item likert	Manipulation check

Analytic Strategy

Potential predictor variables from the post-experiment survey were analyzed to reveal any potential complicating factors such as poor sociability of the research assistant, disbelief of the manipulation and viewing the research group as outside of the UNCC in-group. Correlations, as shown in table 2, were analyzed to determine multicollinearity among predictor variables. Particularly, randomization checks were performed to test for differences among norm and group conditions with respect to reported levels of familiarity with the co-participant, sociability of the research assistant, and subjective hunger. Sociability was found to be associated with observation condition (1=alone and observed; 0=other) ($r=.23$, $p=.04$). As such, sociability was entered into the first step of the regressions. No significant relationship was found among weight status, manipulation check and familiarity, subjectively-reported hunger, or calories consumed.

Regression models were analyzed, then re-analyzed a second time using BMI as a continuous variable, rather than as a categorical weight status variable. Below are the four proposed regression models:

Aim 1, Hypothesis 1

In the "alone" social condition, participants who knew they were being directly observed by researchers were expected to adjust intake to be similar to set consumption norms, whereas participants who were not being observed were expected to display a greater variance in food consumption. Thus, participants exposed to the "low" norm should eat significantly less than those exposed to the "medium" norm, and the "medium" norm participants should eat significantly less than the "high" norm group. If this pattern was indeed observed, results would

indicate that norms matching, rather than social facilitation, is at work, since Social Facilitation Theory would predict no augmentation of eating in any "alone" condition participant.

This hypothesis was tested using a hierarchical multiple regression, with subjective hunger, restriction and sociability entered as step one, observation entered as step two and norm condition entered as step three with cookie consumption as the criterion variable. Included in the observation conditions analyzed were the paired groups, who were expected to behave similarly to the "observed" individuals, since the presence of the partner may act as an inhibiting force on caloric consumption, much as the video camera presence was expected to.

Aim 2, Hypothesis 1

In the "alone" condition, overweight and obese participants were expected to eat more than the normal weight participants overall. This hypothesis was tested via regression analyses. A hierarchical multiple regression was used with hunger, weight and restriction as step one, observation condition entered as step two and norm condition entered as step three with caloric consumption as the criterion variable. In the first coding, participant BMI was coded as a dichotomized variable in which BMIs over 25.0 are considered "overweight/obese" and BMIs beneath this cutoff were considered "normal/underweight." In the second coding, a hierarchical multiple regression was used with the same steps, though BMI was entered in its original form as a continuous variable. Results of these analyses were compared to determine whether they vary significantly.

Aim 2, Hypothesis 2

In the “pair” social condition, normal weight participants paired with an overweight or obese partner were expected to adjust intake to be similar to set consumption norms, but overweight participants paired with an overweight partner were expected to adjust intake to consumption norms but consume significantly more than their normal weight counterparts.

This hypothesis was unable to be tested due to the small number of overweight-overweight partnered participants.

Aim 2, Hypothesis 3

Normal weight participants paired with normal weight partners were expected to adhere to consumptions norms to the same degree as normal participants paired with an overweight partner.

This hypothesis was tested using the same regressions described in Aim 2, Hypothesis 1.

RESULTS

Descriptive Statistics

The study sample consisted of 92 participants, of which 86 self-reported their weight and height, which was then used to calculate subjective BMI for purposes of group assignment only. BMIs under 18.5 were considered underweight, BMIs between 18.5 and 24.9 were considered normal weight, BMIs between 25 and 29.9 were considered overweight, and BMIs greater than 30 were considered obese. Eighteen participants reported being overweight (20.9%) and 68 reported being normal or underweight (79.1%). Following objective height and weight measurements, 7 participants were characterized as underweight, 58 as normal weight, 18 as overweight and 9 as obese. The measured mean BMI for the sample was 23.6 kg/m^2 (SD = 4.32). After further review of the sample, regression analyses included only 55 of the original 92 participants. Cases were included only if the participant passed manipulation check questions, and was deemed by the primary investigator to have consumed a subjectively reasonable "snack." Some participants reported themselves having eaten only a "snack" prior to the investigation, but upon the primary investigator's review of their reported consumption, many "snacks" were deemed to be excessively large, bordering on meal-sized. Though exact caloric consumption of these snacks was not able to be measured, the smaller sample of 55, rather than 92 participants was determined to be a more conservative sample for the purposes of the current study.

Descriptive statistics and initial correlations were computed to analyze existing differences in and basic linear relationships between predictor and outcome variables. As indicated in Table 2, caloric consumption was positively associated with subjective

hunger, as measured by a single-item likert (r=.52, p<.001). Caloric consumption was not significantly associated with the duration of time participants spent filling out the questionnaire (*r* = .15, p = .18). Caloric consumption was not related to any other predictor variable.

Next, levels of associations among predictor variables were assessed. Particularly, randomization checks were performed to test for differences among norm and group conditions with respect to reported levels of familiarity with the co-participant, sociability of the research assistant, and subjective hunger. Sociability was found to be associated with the observational condition (1=alone and unobserved; 0=other) (r=.23, p=.04). As such, sociability was entered into the first step of the regressions. No significant relationship was found among weight status, manipulation check and familiarity, subjectively-reported hunger, or calories consumed. No other observation group had any significant correlations with calories consumed, including the overweight-normal, overweight-overweight, and normal-normal group conditions. Accordingly, these conditions were collapsed into one "pair" condition. Finally, the high norm condition was negatively associated with the manipulation check variable (r=-.25, p=.02), indicating that those participants receiving the high norm manipulation were more likely to fail the manipulation check.

Other correlations among predictor variables were also explored. As expected, the weight status dummy code was strongly, positively correlated with BMI (r=.79, p<.001). BMI was found to be positively associated with dietary restraint (r=.31, p<.01). Weight status, dummy-coded such that normal or underweight was the reference group and overweight the other, was also found to be significantly related to dietary restraint score

($r=.21$ $p<.05$), indicating that being in the overweight category was associated with higher levels of dietary restraint. This relationship was not found when participants were separated into smaller groups by BMI, including underweight, normal weight, overweight and obese. There were no significant associations among weight statuses and dietary restraint when participants were subdivided into these four groups, which also had significantly smaller group sizes. Being in the underweight category, however, was found to be significantly and positively associated with rating of familiarity when participants were broken into these four smaller categories ($r=.52$, $p<.01$), though this same relationship was not apparent when body weight was measured either as a dichotomous overweight/normal variable nor as the continuous BMI variable. As such, given the small number of participants in the underweight category, familiarity was determined to not be necessary to include in the first steps of regressions. Importantly, relative to an unofficial cutoff of 6 in the literature, the present sample's measured mean (SD) of 9.35 (5.84) on restraint can be categorized as "high" relative to prior samples (Yeomans, Tovey, Tinley & Haynes, 2004). Descriptive statistics and correlations are presented in Table 2.

Table 2: Descriptive statistics and zero-order correlations

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12
1.Sociability	1.11	0.49												
2.Familiarity	1.2	0.61	0.15											
3.Hunger (likert)	2.6	1.3	-0.14	-0.12										
4. Dietary Restraint (TFEQ-R)	9.35	5.84	0.06	0.14	0.18									
5. BMI	23.6	4.32	-0.12	0.03	-0.08	0.31								
6. Overweight Status	0.3	0.46	0.05	0.13	-0.04	.21*	.79**							
7. Alone and Observed	0.14	0.35	.23*	N/A	0.01	0.07	0.07	0.02						
8. Normal-Normal Pair	0.24	0.43	-0.14	-.23*	0.06	0.06	-0.16	-.31**	-.23*					
9. Overweight-Normal Pair	0.31	0.47	0	-.27*	-0.07	0.09	.24*	.31**	-.28**	-.32**				
10. High Norm	0.52	0.5	-0.12	0.16	-0.17	-0.01	0.03	-0.01	0.02	0.04	-0.02			
11. Medium Norm	0.27	0.44	-0.03	-0.19	0.2	-0.15	-0.15	-0.07	0.03	0.12	-0.2	-.63**		
12. Calories	98.02	111.88	-0.09	-0.12	.52**	0.01	0.02	0.02	-0.2	0.03	0.02	-0.03	0.07	
13. Manipulation Check	0.23	0.42	0.05	0.19	-0.19	0.11	0.05	0.11	0.07	-0.16	0.12	0.03	-0.05	-0.15

Note. * p<.05. ** p<.01

Regression Analyses

The following results are organized into two broad sections. The first section presents analyses pertinent to Aim 1, Hypothesis 1. The second section presents analyses related to the Aim 2 hypothesis. Both sets of hypotheses are included for the reader's reference. In all regressions, cases were included in analysis only if the participant correctly answered the manipulation check question and consumed either no snack, or a subjectively small snack prior to the study, per the discretion of the researcher (n = 55).

Aim 1, Hypothesis 1.

This first hypothesis was tested using the collapsed "paired" groups. As such, there were three possible observational conditions: alone and unobserved, alone and observed, and paired. Hunger, TFEQ-R score and sociability were entered in step one, observation condition (paired, alone and observed, and alone and unobserved) were entered in step two, and norm condition was entered in step three with caloric consumption as the dependent variable. As stated previously, paired groups were included in the analysis of observational condition along with alone and unobserved and alone and observed, as the presence of the co-participant could represent a type of observation as well.

The first model in this regression was found to be significant, and a large effect size (R^2=.31) was found for the model overall, indicating that about 31% of the variance in caloric consumption was accounted for by this model. The second model was likewise significant. A large and improved effect size (R =.41) was found for model 2 overall, indicating that about 41% of the variance in caloric consumption was accounted for by this model. Model 3 was not a significant improvement over model 2 (change in R^2=.09,

R^2=.42), though model 3 overall maintained significance, indicating that about 42% of the variance in caloric consumption was accounted for by this final model. In this final model, the unstandardized regression coefficient for being in the alone and observed condition as opposed to being in an observed condition (*b*=-106.58) indicates that compared with participants in the alone and unobserved group, participants in the observed condition consume 106.58 fewer calories on average after controlling for hunger, sociability and dietary restraint when exposed to the low norm manipulation. The unstandardized regression coefficient for being in the paired condition (*b*=-64.69) indicates that compared with participants in the alone and unobserved group, the model predicts that participants consume an approximate 64.69 fewer calories after controlling for hunger, sociability and dietary restraint when exposed to the low norm manipulation. The unstandardized regression coefficient for hunger (*b*=63.41) indicates that compared with participants in the alone and unobserved group, the model predicts that for each one-unit increase in reported hunger along the likert hunger scale, participants consume an approximate 63.41additional calories after controlling for sociability and dietary restraint when exposed to the low norm manipulation. Results of this regression are presented in Table 3.

Table 3: Hierarchical linear regression coefficients for Aim 1, Hypothesis 1

Model		*B*	*S.E.*	*β*	R^2	*F*
1					.31**	7.66**
	(Intercept)	-42.77	57.54			
	Hunger (likert)	60.75**	13.12	.59		
	Dietary Restraint	-2.56	2.62	-.12		
	Sociability	5.73	37.26	.02		

Table 3: (Continued)

2					.41**	6.66*
	(Intercept)	-24.32	57.01			
	Hunger (likert)	59.65**	12.44	.58		
	Dietary Restraint	-.71	2.57	-.03		
	Sociability	21.66	36.51	.07		
	Alone x Observed	-110.62*	41.60	-.35		
	Paired	-60.26	30.81	-.25		
3					.42**	4.91
	(Intercept)	-56.97	68.23			
	Hunger (likert)	63.41**	12.90	.61		
	Dietary Restraint	-.70	2.59	-.03		
	Sociability	17.51	36.88	.06		
	Alone x Observed	-106.58*	41.98	-.34		
	Paired	-64.69*	31.20	-.27		
	High Norm	41.36	40.92	.17		
	Medium Norm	10.41	45.24	.04		

Note. ** indicates significance at p<.01; * indicates significance at p<05. N=55.

Importantly, across all iterations of the above regressions, including those not reported using less stringent manipulation check and prior meal consumption criteria, in no model did norm condition reach significance, indicating that in this sample, norm condition did not account for a significant proportion of the variance in caloric consumption, contrary to Aim 1, Hypothesis 1. To further clarify the lack of observed relationship between norm condition and consumption, a one-way analysis of variance was performed to check group differences in adherence to set norms by observational condition. ANOVA results showed that the effect of norm condition was not significant, $F(4,85) = 1.54$, $p = .20$, confirming the regression analysis suggestion that adherence to the norms did not vary by observational group as hypothesized. A graphical depiction of

caloric consumption by norm condition is presented in Figure 3 for juxtaposition with predicted cookie consumption.

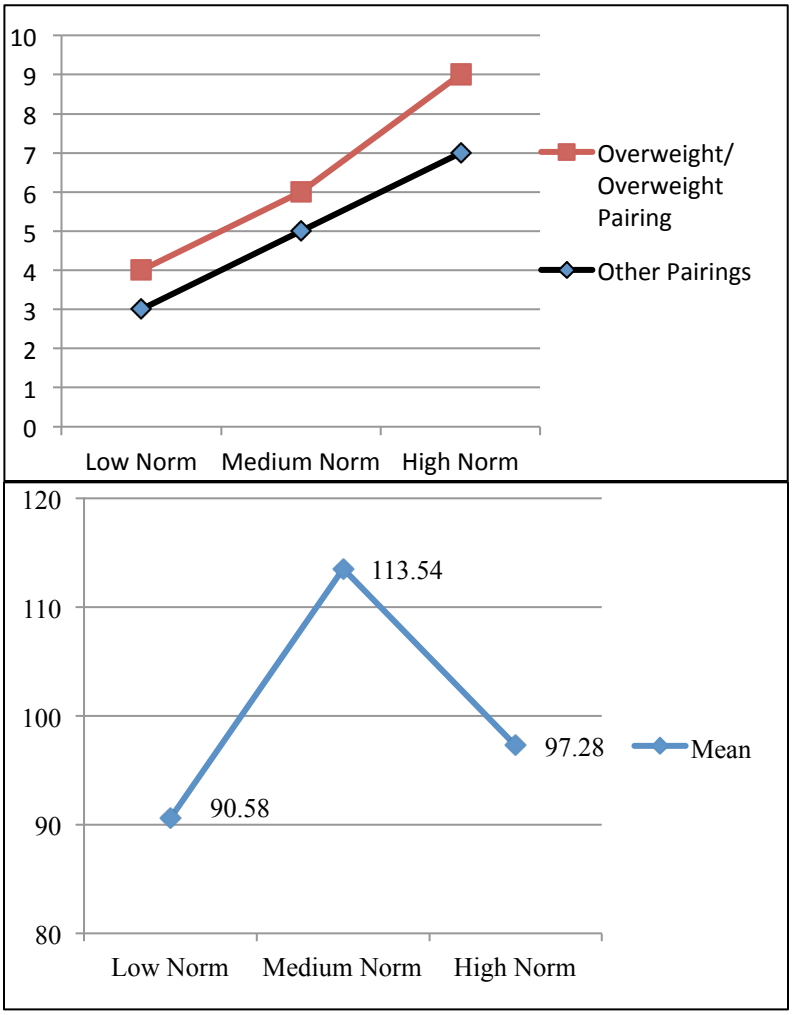

Figure 3: Mean Caloric Consumption by Norm Condition Compared to Predicted Consumption
Note: Predicted consumption in cookies (left) compared to measured consumption in calories (right) as a function of norm condition. Overweight-Overweight group means not analyzed due to small group N.

Aim 2 Hypothesis 1.

To test to the hypotheses related to the second aim of this study, prior to re-grouping participants, regressions were used with hunger, TFEQ-R, sociability and

weight status (1=overweight, 0=normal) entered as step one. Observational condition was entered as step two (with alone and unobserved as the reference group), and norm condition entered as step three. Caloric consumption was the dependent variable. Weight status was calculated using objective height and weight measurements taken in the lab. As with Aim 1 Hypothesis 1, cases were included in analysis only if the participant correctly answered the manipulation check question and consumed either no snack, or a subjectively small snack prior to the study, per the discretion of the researcher (*n*=55).

The first step of the regression was found to be significant (R^2=.32, p <.01), though steps two and three were not significant improvements over the initial model. All three models were significant overall (p<.01). A large effect size was found for the final model, accounting for approximately 43% of the variance in caloric consumption (R^2=.43). The unstandardized regression coefficient for being in the alone and observed condition in the final model (*b*=-108.35) indicates that compared with participants in the alone and unobserved group, the model predicts that participants consume an approximate 108.35 fewer calories after controlling for hunger, weight status, sociability and dietary restraint when exposed to the low norm manipulation. As in the other regressions, hunger was found to be a significant predictor of consumption in the final model. In this final model, the unstandardized regression coefficient for hunger (*b*=66.30) indicates that compared with participants in the alone and unobserved group, the model predicts that for each one-unit increase in reported hunger along the likert hunger scale, participants consume an approximate 66.30 additional calories after controlling for sociability, body weight and dietary restraint when exposed to the low norm

manipulation. No other coefficient was significant in this regression. Results of this regression are presented in Table 4.

Table 4: Hierarchical linear regression coefficients for Aim 2, Hypothesis 1 reversed, using categorical weight status variable

Model		*B*	*S.E.*	*β*	R^2	*F*
1					.32**	5.84**
	(Intercept)	-57.40	60.99			
	Hunger (likert)	63.34**	13.62	.61		
	Dietary restraint	-3.11	2.73	-.15		
	Overweight Status	25.39	33.82	.09		
	Sociability	10.97	38.07	.04		
2					.42**	4.79
	(Intercept)	-42.22	60.56			
	Hunger (likert)	63.27**	13.22	.61		
	Dietary restraint	-1.33	2.69	-.06		
	BMI	28.08	33.78	.10		
	Sociability	28.11	37.54	.09		
	Alone and Observed	-112.23*	42.11	.36		
	Normal-Normal Pair	-67.02	38.46	-.23		
	Overweight-Normal Pair	-57.27	37.24	-.20		
3					.43**	3.82
	(Intercept)	-72.76	71.33			
	Hunger (likert)	66.30**	13.58	.64		
	Dietary restraint	-1.31	2.71	-.06		
	BMI	29.38	34.05	.11		
	Sociability	23.76	38.01	.08		
	Alone and Observed	-108.35*	42.57	-.34		
	Normal-Normal Pair	-66.15	38.81	-.22		
	Overweight-Normal Pair	-66.24	38.39	-.24		
	High Norm	40.74	41.73	.16		
	Medium Norm	10.51	45.90	.04		

Note. ** indicates significance at p<.01; * indicates significance at p<05. N=55.

This hypothesis was analyzed via regression using the continuous BMI weight variable as well. The first step of the regression was found to be significant (R^2=.31, p <.01). The other steps were not statistically significant improvements. All three models

were significant overall ($p<.01$), with the final model accounting for about 43% of the variance in consumption. Like previous models, hunger was found to be a significant predictor of consumption. In this final model, the unstandardized regression coefficient for being in the alone and observed condition (*b*=-115.96) indicates that compared with participants in the alone and unobserved group, the model predicts that participants consume an approximate 115.96 fewer calories after controlling for hunger, BMI, sociability and dietary when exposed to the low norm manipulation. The unstandardized regression coefficient for hunger (*b*=66.62) indicates that compared with participants in the alone and unobserved group, the model predicts that for each one-unit increase in reported hunger along the likert hunger scale, participants consume an approximate 66.62 additional calories after controlling for sociability, BMI and dietary restraint when exposed to the low norm manipulation. No other regression coefficient was significant in this regression. Results of this regression are presented in Table 5.

Table 5: Hierarchical linear regression coefficients for Aim 2, Hypothesis 1reversed, using continuous BMI variable

Model		*B*	*S.E.*	*β*	R^2	*F*
1					.31**	5.68**
	(Intercept)	-76.58	114.29			
	Hunger (likert)	61.97**	13.71	.60		
	Restraint	-2.93	2.86	-.14		
	BMI	1.28	3.73	.04		
	Sociability	9.10	38.85	.03		

Table 5: (Continued)

2					.42**	4.83*
	(Intercept)	-116.67	111.55			
	Hunger (likert)	63.83**	13.27	.62		
	Restraint	-1.63	2.76	-.08		
	BMI	3.41	3.71	.12		
	Sociability	32.93	38.53	.11		
	Alone and Observed	-119.76**	43.16	-.38		
	Normal-Normal Pair	-70.61	38.10	--.24		
	Oveweight-Normal Pair	-58.03	37.20	-.21		
3					.43**	3.83
	(Intercept)	-147.24	120.22			
	Hunger (likert)	66.62**	13.62	.64		
	Restraint	-1.56	2.78	-.08		
	BMI	3.38	3.75	.12		
	Sociability	28.47	39.11	.09		
	Alone and Observed	-115.96*	43.70	.-.37		
	Normal-Normal Pair	-70.14	38.47	-.24		
	Overweight-Normal Pair	-66.11	38.27	-.24		
	High Norm	41.37	41.72	.17		
	Medium Norm	14.56	46.02	.05		

Note. ** indicates significance at p<.01; * indicates significance at p<05. N=55.

Finally, the theoretical mediation model presented in Figure 1, reproduced below, was tested using path analysis.

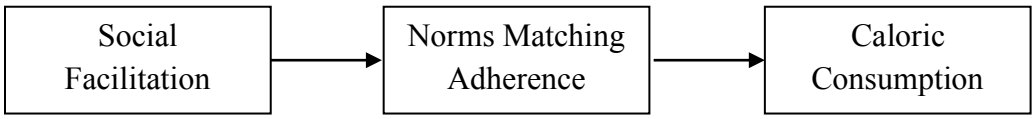

Figure 1: Theoretical model with norms matching adherence as a mediator of social facilitation's effect on consumption

Two regression analyses provided path weights and standard error values. The social facilitation variable was dummy coded such that it yielded two separate indirect effects, one for participants who were paired with a co-participant, and one for those who were alone and observed with alone and unobserved participants as the reference group. This model and the associated path weights are presented in Figure 4.

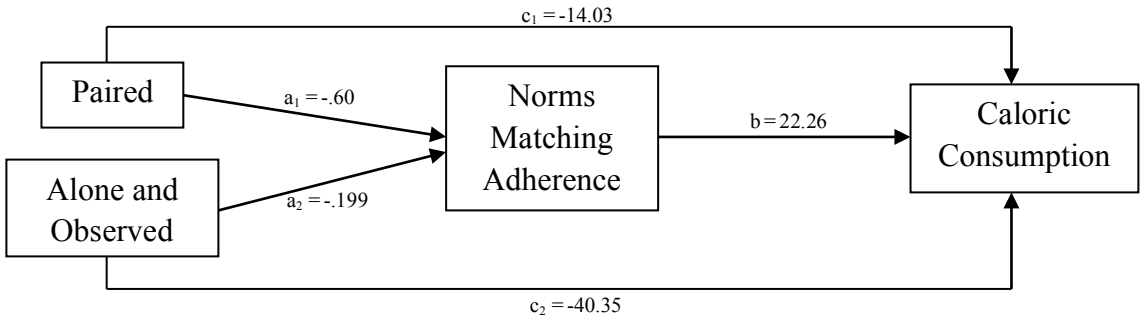

Figure 4: Path analysis of meditational model testing norms matching as a mediator of the effect of social facilitation on consumption

Being in the paired condition was slightly negatively related to norms matching adherence (unstandardized coefficient = -.60) and being in the alone and observed condition was also negatively related to norms matching adherence (unstandardized coefficient = -.199). The indirect effect of being in the paired condition on caloric consumption was found to be -13.36 calories. Norms matching adherence was positively related to caloric consumption (unstandardized coefficient = 22.26). The indirect effect of being in the alone and observed condition was found to be -44.30 calories. The total effect of being in the paired condition on caloric consumption was -27.39 calories, with roughly half of that effect being attributed to the indirect effect, and roughly half due to the direct effect of social facilitation. In the alone and observed condition, likewise roughly half of the total effect of -84.65 calories was due to the indirect effect, and

roughly half due to the direct effect. Although neither indirect effect was found to be statistically significant following Sobel testing ($z_1 = -.76$, $z_2 = -1.75$), the total effect found for being in the alone and observed condition may be practically significant, with a total reduction of 84.65 calories associated with that observational group.

DISCUSSION

The present study was designed to resolve two apparently conflicting theories relevant to eating behavior in first-year female college students: Social Facilitation Theory and the Social Norms Approach. Due to the heightened risk of excessive weight gain for first-year college women (Levitsky, Halbmaier, & Mrdjenovic, 2004; Webb & Hardin, 2012), this study sought to clarify the potential role of social eating behavior as a source of caloric intake augmentation, and potentially identify preventative measures and treatments that could help individuals and groups of first-year females reduce risk of unhealthy body composition changes during their initial transitional college year and manage current overweight and obesity through awareness of social eating tendencies. Under this new theoretical framework, social facilitation was expected to affect eating behavior by augmenting norm matching behavior. Thus, norm-matching was conceptualized as a mediator between Social Facilitation and eating augmentation.

The first aim of this study was to test this new theoretical perspective. The second aim of the present study was to investigate weight status as a predicted moderator of this new integrated approach while holding constant the other potential moderators presented above, such as familiarity, in-group status and sociability. Finally, the mediational theoretical model was tested using path analysis.

As expected, participants who were alone but told they were being observed by a video camera decreased their consumption by about 107-116 calories, depending on the model, compared to those participants who were alone and unobserved after controlling for hunger, sociability and dietary restraint. Contrary to predictions, however, paired individuals also decreased consumption but to a lesser extent than those alone but

observed by video camera, by about 65 calories. Consistent with expectations, hunger predicted an increase in consumption of about 63-67 calories per 1-unit increase in subjective hunger. Importantly, the model did not support the hypothesis that norms set by the research assistants affected consumption at all. Different observational groups did not adhere differently to the norms as expected. It is notable that those receiving the highest norm manipulation were more likely to fail the manipulation check, indicating that perhaps the efficacy of the manipulation in those cases was questionable.

Given the array of potential mediators for norms matching, it is possible that a variable not measured in this study could be explaining the lack of relationship among norm condition and consumption in the present sample. For instance, new information on norms matching from Bevelander, Meiselman, Anschutz and Engels (2013) suggests that in addition to the potential moderators of norms matching discussed in this paper, emotionality of the context may also impact norms matching behaviors. The authors found a significant interaction between emotionality of a movie that was playing during snacking and intake. When watching a happy or sad, but not neutral movie, children matched their intake to that of a peer, perhaps due to the increase in mindlessness of eating that accompanied the emotional context (Bevelander, Meiselman, Anschutz & Engels, 2013). Given that the current study used an intentionally neutral activity during the snacking, it could be that the lack of emotionality of the context depressed potential norms matching behavior.

Contrary to Aim 2 hypotheses, weight status, either measured as BMI or as a categorical weight status variable, did not predict caloric consumption in contrast to its expected role as a mediator. It is important to note, however, that in this sample weight

was significantly associated with levels of dietary restraint, indicating that participants of greater weights endorsed higher levels of dietary restraint, likely affecting their consumption of calories in the lab. Though there are no official cutoff scores for the TFEQ, previous research has categorized female college participants into "low" and "high" groups based on their score on the TFEQ-R subscale compared to median score of 6 from previous samples (Yeomans, Tovey, Tinley & Haynes, 2004). Relative to this unofficial cutoff, the present sample's measured mean (SD) of 9.35 (5.84) can be categorized as "high" relative to prior samples.

Although the assertion that social facilitation of eating works entirely through the augmentation of norms matching, rather than directly through consumption, was not supported in this study, this study did provide further evidence to question the direct relationship between social facilitation and food intake. Importantly, though the indirect effect of being in the alone and observed condition on consumption was not significant, the total effect of for that observational condition could be practically significant, reflecting a decrease in caloric intake of 84.65 calories. And, this total effect was comprised of roughly half indirect and half direct effects.

Consistent with Pliner and colleagues' (2006) findings, the current study found that being paired did not increase consumption relative to being alone, and in fact in the current sample being paired decreased consumption, though to a lesser extent than being observed by video camera. This finding is in direct contrast to Hetherington and colleagues (2005), who found that those who were alone ate the least. This evidence that being around others does not necessarily increase consumption, as predicted by social facilitation theory, may be more closely related to participant perceptions of evaluative

threat depending on the source of the observation (video versus peer), rather than to norm adherence.

One possible explanation for this observation is that the participants perceived the video camera as a more intimidating form of observation than that of the peer co-participant, though she was still perceived as an observer and therefore a potential source of judgment. This is supported by the fact that those participants who had complete privacy did consume significantly more calories than those who were observed by video camera. Indeed, Somerville and colleagues (2013) investigated adolescent's behavior in social-evaluative contexts, and found that just knowing someone was looking at them via a live video feed increased self-reported embarrassment compared to children, and this effect was only partially abated in adults. Importantly, the present study utilized a sample of young, first-year, first-time college women, whose developmental stage is likely similar to that of the transitional adolescents in Somerville and colleagues' study. Likewise, Dickerson and Kemeny's (2004) investigation of social evaluative threats, such as public speaking, found that in contexts in which performance could be captured permanently (e.g. on videotape), participants experienced an increased physiological stress reaction to the task. Both studies point to social self-preservation theory as the driving factor; individuals monitor threats to self-esteem or social status and then coordinate a response. In the context of the current study, though individuals were informed that the faux-videotapes would be destroyed after the session, it is possible that the mere threat of the permanent recording of their consumption could trigger a coordinated response to the threat manifesting in decreased consumption. In contrast, though in the pair condition the co-participant was indeed an observer, her observation

was neither permanent nor evaluative in nature, and perhaps the threat of social evaluation by the co-participant was perceived as less threatening than the possibility of a permanent videotape or unknown judgments by researchers.

Clegg (2012) investigated college students placed in socially awkward situations with social evaluative components, and found that factors leading to increased perception of a context as awkward included social evaluative components and counter-normative situations, whereas sharing common interests sharply decreased perceptions of the context as awkward. In the case of the current study, it is possible that the pair's work together on the survey of interests and activities led to a sharing of familiar and common interests that decreased the overall awkwardness of the situation, counteracting some of the social evaluative components and thus resulting in a smaller decrease in caloric consumption.

Demographic limitations of this study include a sample of women, limiting the generalizability of these findings. Likewise, because this study utilized only first-year, first-time college women, older adults and women at different developmental stages may experience differing patterns of norms matching behaviors. Mixed-gender groups may also display very different patterns of consumption.

Limitations in this study also included a sample size likely insufficient to provide enough power to find certain results. Future studies should include a large enough sample size to provide sufficient power for multiple regressions of this type. Additionally, the small sample size prevented the overweight-overweight group from being analyzed on its own, despite important previous observations of this type of group (Salvy, Vartanian, Coelho, Jarrin, & Pliner, 2008). And, though perceived weight status of the co-participant

was hoped to be analyzed as well, the addition of this variable late during data collection combined with the small sample size made that analysis impossible. It may be relevant to explore the potential role of perceived weight status in future studies of norms matching. Second, this study included only a few obese participants and fewer than expected overweight participants. This made it impossible to analyze the overweight-overweight paired group as expected. Future studies should include larger samples of overweight individuals in order to analyze the likely possibility of an overweight-overweight paired effect of augmented consumption, as observed by Salvy and colleagues (2008). Third, in this study, those receiving the highest norm manipulation were more likely to fail the manipulation check, indicating that perhaps the efficacy of the manipulation in those cases was questionable. Finally, this study was limited in its scope of group size. Because this study had a maximum group size of two, larger group sizes and dynamics were not investigated. Yet, these types of larger groups are also relevant to fully understanding social facilitating of eating, particularly in natural settings with groups larger than two.

In conclusion, this study provided further insight into the theoretical models impacting social eating contexts in first-year college students. These findings may be valuable in further understanding palatable food consumption during the first year of college when students are vulnerable to weight gain. Given that this study shows that social facilitation itself may not be responsible for augmented eating in social situations, future research should focus on creating a new model of social eating which includes not only group size but social evaluative processes and interactions with possible moderators like those measured in this study such as weight status, dietary restraint, sociability and moderators not measured here, such as emotional context.

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