

4-2014

# I'll Drink to That: Differential Effect of Fat Labeling, Weight Salience and Dietary Restraint on Consumption

Blina Kruja  
*College of William and Mary*

Follow this and additional works at: <http://publish.wm.edu/honorsthesis>

---

## Recommended Citation

Kruja, Blina, "I'll Drink to That: Differential Effect of Fat Labeling, Weight Salience and Dietary Restraint on Consumption" (2014).  
*College of William & Mary Undergraduate Honors Theses*. Paper 97.  
<http://publish.wm.edu/honorsthesis/97>

This Honors Thesis is brought to you for free and open access by the Theses, Dissertations, & Master Projects at W&M Publish. It has been accepted for inclusion in College of William & Mary Undergraduate Honors Theses by an authorized administrator of W&M Publish. For more information, please contact [wmpublish@wm.edu](mailto:wmpublish@wm.edu).

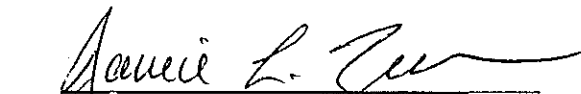
I'll Drink to That: Differential Effect of Fat Labeling,  
Weight Salience and Dietary Restraint on Consumption

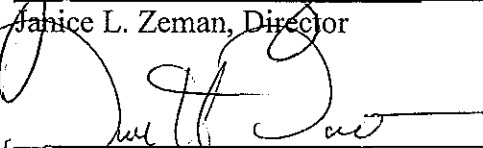
A thesis submitted in partial fulfillment of the requirement  
for the degree of Bachelor of Arts in Psychology from  
The College of William and Mary

by

Blina Kruja

Accepted for \_\_\_\_\_ Honors \_\_\_\_\_

  
\_\_\_\_\_  
Janice L. Zeman, Director

  
\_\_\_\_\_  
Danielle H. Dallaire

  
\_\_\_\_\_  
Douglas A. DeBerry

Williamsburg, VA  
April 25, 2014

I'll Drink to That: Differential Effect of Fat Labeling,  
Weight Salience and Dietary Restraint on Consumption

Blina Kruja

College of William and Mary

## Abstract

The current study investigated how fat information presented with a beverage affects perception ratings and consumption. Participants consisted of a sample of female restrained ( $n = 53$ ) and unrestrained eaters ( $n = 62$ ) who were either weighed before (weight salient) or after (weight non-salient) the experimental session. During the experimental session, participants tasted and rated chocolate milk that was labeled as full fat or low fat in counterbalanced order. While unrestrained eaters perceived the drink labeled full fat as smelling better than the drink labeled as low fat, restrained eaters did not differ in their ratings of the full and low fat labeled drinks. In contrast, restrained eaters consumed more of the beverage when it had a low fat label than a full fat label. Additionally, regardless of restraint classification, when made aware of their weight prior to the taste test, participants consumed more of the beverage labeled as low fat relative to the drink labeled full fat, whereas there was no differential consumption of the drinks for participants in the weight non-salient condition. Overall participants underestimated the caloric content of low fat chocolate milk while overestimating the beverage's serving size. Findings from the current study suggest that restrained eaters' consumption is more sensitive to fat labeling than that of unrestrained eaters. Moreover, it appears that regardless of their dieting habits, college age females' consumption is affected by a reminder of their weight.

*Keywords:* fat labeling, health claims, restrained eating, weight salience, food intake

I'll drink to that: Differential effect of fat labeling,  
weight salience and dietary restraint on consumption

Extensive research has linked healthful eating habits to better cardiovascular health (Hooper et. al., 2001), lower obesity rates (Epstein, Gordy, Raynor, Beddome, Kilanowski, & Paluch, 2001) and lower cancer rates (Block, Patterson, & Subar, 1992). Despite the clear link between poor diet and health, approximately a third of the US population over the age of 20 years is overweight, and an additional third is obese (National Center of Health Statistics, 2012). Based on these findings, it is imperative that people become more aware of their food choices if they are to achieve better health.

### **Food Labels and their Effect on Consumers**

In an attempt to better inform consumers about their food choices and assist them in improving their eating behaviors, Congress passed the Nutrition Labeling and Education Act (NELA) of 1990. Food labeling regulations stemming from this act require manufacturers to provide a "Nutrition Facts" label on their products that provides customers with information regarding the nutritional value of the products. This label lists serving size, calories per serving, total servings per container (Pennington & Hubbard, 1997), and it also includes the percentage of daily values (DV) of total fat, saturated fat, cholesterol, sodium, total carbohydrates, dietary fiber, Vitamins A and C, calcium, and iron, based on a 2000-calorie daily diet (NLEA, 1990a). In addition to standardized Nutrition Fact labels the Food and Drug Administration (FDA) also regulates the use of health claims on food packages. These claims provide information about the healthfulness of foods and beverages. For example, "sugar free" claims indicate the product contains less than 0.5 g of sugar per serving (NLEA, 1990b), whereas "low fat" claims indicate

that 100 g of product contain three grams fat or less, and 30% or fewer calories come from fat (NLEA, 1990c).

The degree to which people pay attention to nutritional labels and health claims depends on a number of factors. For example, women are more likely than men, and those under the age of 35 years old are more likely than older individuals to consider nutritional information when choosing a meal (Drichoutis, Lazaridis, & Nayga, 2006; Gerend, 2009; Neuhouser, Kristal, & Patterson, 1999). Although “Nutrition Fact” labels are intended to provide understandable information to assist consumers in making healthful choices (Pennington & Hubbard, 1997; Wiesenfeld, 1995), a systematic literature review suggests that in general, individuals find nutrition labeling confusing, especially when it involves numerical information and the package contains multiple servings per container (Cowburn & Stockley, 2004).

### **The Use of Heuristics in Food Choice and Consumption**

In an attempt to choose more healthful foods, consumers often rely on simple heuristics such as health claims (Wansink, Ittersum, & Painter, 2004), the presence or absence of particular ingredients (Wansink, Park, Sonka, & Morganosky, 2003), and product descriptions (Okada, 2005, Provencher, Polivy, & Herman, 2009). For example, heart-healthy claims led consumers to mistakenly perceive both packaged goods and restaurant dishes as being overall healthier and report stronger purchase intentions (Kozup, Creyer, & Burton, 2003). Similarly, when comparing different meal options, restaurant patrons perceive dishes to be more healthful if they are described as a “light” alternative, such as “Cheesecake deLite” (Okada, 2005). Wansink and his colleagues suggest that while health labels might improve the perceived taste of less healthful, hedonic foods (such as desserts) they are less likely to influence the taste of more healthy utilitarian foods (such as entrées or possibly yogurt and soy foods). This may explain

why Provencher et al. (2009) found that college age females ate more cookies when the product was verbally described to them in a healthful rather than an unhealthful manner. Such differential eating patterns may occur because consumers tend to underestimate healthful foods' caloric content (Carels, Harper, & Konrad, 2006), and consequently, their capacity to cause weight gain.

### **Restrained Eating and Weight Salience**

Evidence suggests that compared to normal consumers, chronic dieters or restrained eaters, are more likely to favor products that they believe to be low calorie (Forestell & Cavanagh, 2013). These individuals are weight conscious and attempt to cognitively limit the amount of food they consume in order to lose or prevent further weight gain (Herman & Mack, 1975). As a result, they are constantly preoccupied with thoughts about food and overeating (Polivy, 1998), which place a load on their cognitive resources (Ward & Mann, 2000). Previous studies have demonstrated that when restrained eaters were presented with a cognitively demanding task, such as memorizing art slides, their attention shifted away from monitoring their food intake, which led them to overeat more of a calorie dense snack food (Ward & Mann, 2000). Similarly, Boon, Stroebe, Schut, and Intema, (2002) demonstrated that when distracted by a cognitive task, restrained eaters consumed more calorie-dense products compared to when they were not distracted. Taken together these findings suggest that restrained eaters are often unsuccessful in cognitively restraining their consumption and following their self-set dieting rules, especially when they are distracted from their goal of losing weight. As a result they often engage in a cyclical pattern of dieting and disinhibited overeating (for a review see Ruderman, 1986) without losing weight over the long term (Heatherton, Polivy, & Herman, 1991).

Some studies suggest that their inability to lose weight over the long term might actually *increase* consumption in restrained eaters. When instructed to weigh themselves and record their weight daily, restrained eaters' consumption increased and they gained on average 1.36 kg. As predicted this effect was not found in unrestrained eaters (Strimas & Dionne, 2010). The authors suggested that because daily weight reminders might not reflect a large enough weight decrease, this leads to greater dissatisfaction and ultimately disinhibited eating among restrained eaters. Along these lines, McFarlane, Polivy and Herman (1998) found that when restrained eaters were led to believe that they weighed an additional 5 lbs (2.27 kg) they ate significantly more during a subsequent "taste test" compared to unrestrained eaters. The researchers proposed that the negative affect brought on by the weight manipulation lowered the participants' inhibition, which in turn lead them to eat more during the taste test.

### **The Effect of Food Labeling on Restrained Eaters' Consumption**

In the absence of caloric information, restrained eaters are especially vulnerable to following certain heuristics and contextual cues to regulate their food intake (e.g., Coelho doVale, Pieters, & Zeelenberg, 2008; Scott, Nowlis, Mandel, & Morales, 2008). Several studies have produced results suggesting that restrained eaters assume that healthful foods are low calorie and therefore less likely to lead to weight gain. For example, they consume more of a snack food (jelly beans) when described in a healthful ('fruit chews') than an unhealthy ('candy chews') manner (Irmak, Vallen, & Robinson 2011). They also appear to be more vulnerable than unrestrained eaters to branding claims. When presented with a cookie brand which they perceive to be healthy, Cavanagh and Forestell (2013) found that restrained eaters consumed significantly more than when the same cookie was associated with an unhealthy brand. In contrast, unrestrained eaters' consumption does not appear to be affected by these manipulations.



Research also suggests that fat-related claims also play a particularly important role when assessing the caloric content and healthfulness of a product (Carels et al., 2006; Carels, Harper, & Konrad, 2007). Wansink and Chandon (2006) found that participants underestimated the caloric content of two snack foods (M&M's chocolates and granola bites) by an average of 260 calories and overestimated their serving size by 1 oz. when the products were presented as "low fat". Interestingly the researchers further found that this difference in consumption was significantly larger for overweight participants compared to normal weight individuals. Because evidence suggests that overweight individuals are more likely to cognitively restrain their caloric intake (e.g., Jansen & van den Hout, 1991; Trottier, Polivy, & Herman, 2007; van Strien, Herman, Engels, Larsen, & van Leeuwe, 2007) it is reasonable to suggest that low fat labels may have a similar effect on normal weight restrained eaters. However, this hypothesis has not been supported in previous work; Aaron, Mela, and Evans (1994) found that labeling a cheese spread as either "reduced fat (40% fat)" or "full fat (80% fat)" did not affect restrained or unrestrained eaters' consumption or perception of the product.

### **Goals and Hypotheses of the Current Study**

The primary goal of the present study was to tease apart these seemingly inconsistent findings by further investigating the role of fat labeling on restrained eaters' liking and consumption. A secondary goal, was to determine whether the labeling effects reported with solid foods in previous research would generalize to beverages, which consumers may not perceive in the same fashion as solid snacks (Almiron-Roy, Chen, & Drewnowski, 2003). Finally, the third goal of the present study was to determine whether manipulating weight salience in restrained and unrestrained eaters would interact with the fat label manipulation on perceptions of liking and consumption of the beverage.

Towards these aims, half of the participants were weighed and informed of their weight before the experimental procedure, whereas the remaining participants were weighed after the session. During each session, participants were provided with a chocolate milk beverage, which was labeled either full fat or low fat on two trials, in counterbalanced order, and told that they could drink as much or as little as they needed to accurately rate the products' quality.

Consistent with previous research (Cavanagh & Forestell, 2013; Provencher et al., 2009), we predicted that restrained and unrestrained eaters would not differ in their liking of the high and low fat milk beverages; rather, both groups would indicate that they prefer the low fat milk to the high fat milk. We further expected all participants to overestimate the appropriate serving size for the low fat chocolate milk beverages, and underestimate the product's caloric content as suggested by earlier work (Carels et al., 2006, 2007; Wansink & Chandon, 2006). However, with respect to consumption, we predicted different patterns for restrained and unrestrained eaters. Specifically, we predicted that restrained eaters, but not unrestrained eaters, would consume more of the beverage when it was described as low fat compared to one that was described as full fat. Lastly, we predicted a three-way interaction to occur between fat labels, restraint classification, and weight salience. That is, given the previously discussed findings on weight salience and restrained eating (McFarlane et al., 1998; Strimas & Dionne, 2010) we expected restrained eaters who were made aware of their weight would disinhibit, that is, they would consume more of the high fat drink relative to the low fat drink compared to those who were not made aware of their weight. However, unrestrained eaters' intake of the chocolate milk would not change regardless of the experimental sessions.

## **Method**

### **Participants**

One hundred and fifty five undergraduate women between the ages of 18 to 25 years old were recruited at a medium sized liberal arts university in Virginia from February to August of 2013. They were recruited either through their introductory psychology course or flyers posted around campus. In exchange for their time, the participants received either course credit or were paid a small fee (\$6). All participants were asked to refrain from consuming anything but water for 3 hours prior to arriving at their scheduled research appointment. The procedures were approved by the school's Protection of Human Subjects Committee, and written informed consent was obtained from each participant.

### **Design**

In order to determine whether fat content labeling differentially affects restrained and unrestrained eaters' consumption of a beverage, participants were invited in the research center to participate in a taste test and asked to rate their preference for two beverages, whose order was counterbalanced. Additionally, for half of the participants their weight was measured prior to the taste test (weight Salient), and the second half of the participants were weighed at the end of the experimental session (weight non-salient). This manipulation allowed us to examine whether a reminder of one's weight affected consumption. Based on the participants' responses on the Restraint Scale (Herman & Polivy, 1980) they were further classified as either restrained or unrestrained eaters. Therefore, this study was a 2 by 2 by 2 mixed factorial design with drink label (fat-free, full-fat) as a within-subjects factor, and Weight condition (weighed Salient, weighed Non-Salient), and restraint status(restrained, unrestrained) as between-subjects variables. The amount of chocolate milk consumed and hedonic ratings were used as dependent variables.

### **Materials**

**Chocolate milk.** The beverage used in this experiment was Nesquick® calcium fortified, low-fat chocolate milk. This product was chosen because the cocoa ingredient provides enough ambiguity for the beverage to be perceived as both high and low in fat. Participants received a red Solo cup® labeled “Fat Free” and a second cup labeled “Full Fat” each containing 275 grams of chocolate milk.

**Questionnaires.** In addition to general demographic information (e.g., race, age), participants answered a questionnaire regarding their dietary habits and rated the beverages’ palatability.

**Restraint Status.** All participants completed the Restraint Scale (RS) developed by Herman and Polivy (1980). The scale is used to measure individuals’ cognitive restraint of caloric intake, in order to maintain their desired weight or prevent future weight gain. The questionnaire contains two subscales which assess a history of weight fluctuation (WF) and concern for dieting (CD), that is, the degree to which one is preoccupied with thoughts about food and overeating (Lowe & Thomas, 2009; Polivy, Herman, & Howard, 1988). A score of 15 points was used as the cutoff point to categorize the participants as restrained (scores of 15 or higher) or unrestrained eaters (scores below 15). This value is based on previous research which used the RS scale to determine dietary restraint (Goldman, Herman, & Polivy, 1991; Provencher et al., 2009) (See Appendix A).

**Taste-Test Questionnaire.** Participants’ completed a series of questions as they consumed each of the test stimuli in which they rated their liking for both samples of chocolate milk. They used a 7-point Likert-scale (1 = *Strongly Dislike*, 7 = *Strongly Like*) to indicate their perception of each products’ taste, odor, flavor, and rating of satisfaction (See Appendix B).

*Calorie and Serving Estimations Pictures.*: To assess participants' knowledge regarding the caloric content and the volume of one serving of both low and high fat chocolate milk, we compiled a poster containing 10 pictures of servings of the beverage. The amount photographed in each picture increased in 59.14 ml (2 fl oz) increments, and the displayed beverages ranged from a minimum of 59.14 ml (2 fl oz) to a maximum of 591.47 ml (20 fl oz) (See Appendix C).

### **Procedure**

Prior to their arrival at the research center participants were randomly assigned to one of two weight salience conditions. For those in the weight salient condition, weight and height measurement was taken prior to the experimental session. In order to ensure that participants in this group were aware of their weight, the researchers read the measurement out loud as they recorded the data. The participants were then individually escorted to the experimental room, where they were told the study consisted of a marketing research project and involved a taste test. They were presented with a pre-weighed cup of chocolate-flavored milk, which was paired with a nutritional claim indicating the drink was either fat free or full fat in counterbalanced order. With each beverage, participants were given the taste test questionnaire and told they could drink as much as they needed in order to most accurately rate the products' palatability. The participants were left alone in the experimental room during each trial for five minutes. The researcher then came in and collected the questionnaire and the test stimulus, and the procedure was repeated for the second beverage. For both beverages the experimenter recorded the final weight at later time. Upon completion of the taste test task participants were presented with the calorie and serving size poster and asked to indicate which pictures they believe held one serving of the fat free and of the full fat chocolate milk beverages and estimate each drink's caloric content per serving. Lastly participants completed questionnaires about their eating behaviors

and attitudes towards high and low caloric foods. These questionnaires were administered using the Qualtrics survey software (Qualtrics Labs Inc., Provo, UT). Upon completion of this task, weight and height measurements were taken for the participants in the weight non-salient condition. All participants were debriefed and asked to keep the experiment's procedures and purpose to themselves.

## Results

### Participant Characteristics

A total of 155 college-age females completed the current study. Twenty-seven participants were excluded from the analyses because they were outside the age range of a typical college student ( $n = 3$ ), did not understand or comply with the instructions of the study ( $n = 6$ ), were lactose intolerant ( $n = 1$ ), were obese ( $n = 5$ ), smoked more than 20 cigarettes per week ( $n = 3$ ), or were aware that the two drinks provided were identical ( $n = 9$ ). Of the 128 remaining participants, 29 identified their ethnic background as Hispanic or Latino. Seventy-seven of participants were Caucasian (67 %), 16 were Asian (13.9 %), 10 were African-American (8.7 %), 12 were unknown or other (10.4 %). As Table 1 demonstrates, there were no significant differences between the groups in terms of their age, time elapsed since they last ate, and how much they like consuming chocolate milk in general. However, as expected, there were main effects of Restraint score,  $F(1, 111) = 250.25, p < 0.0001$ , Weight Fluctuation,  $F(1, 111) = 91.15, p < 0.0001$ , Concern of Dieting,  $F(1, 111) = 123.85, p < 0.0001$ , and Body Mass Index (BMI),  $F(1, 111) = 21.33, p < 0.0001$ .

### Flavor Perception

To determine whether weight and restraint classification affected ratings of the beverage in the two label conditions, a three-way mixed Analyses of Variance (ANOVA) was conducted

with weight condition (weight salient, weight non-salient) and restraint status (restrained, unrestrained) as between subject independent factors and drink label (low fat, high fat) as the within-subject factor for each of the palatability criteria. In order to control for differences between the restraint groups, participants' BMI was included as a covariate. As demonstrated in Figure 1, these analyses revealed that restraint status did not influence ratings of visual appeal, taste, flavor, and overall liking of the beverage (all  $p > 0.05$ ). However, these analyses revealed a main effect of drink label for smell perception,  $F(1, 110) = 3.82, p < 0.05$  such that participants indicated that they liked the smell of the high fat beverage ( $5.18 \pm 1.10$ ) better than the low fat beverage ( $4.98 \pm 1.14$ ). There was also a restraint status by drink label interaction,  $F(1, 110) = 7.83, p < 0.01$ . Subsequent simple main effect analyses indicate that unrestrained participants rated the high fat labeled beverage as smelling better than the low fat labeled beverage,  $t(61) = 3.89, p < 0.0001$ .

### **Beverage Consumption**

Similar analyses were conducted to determine whether there was differential consumption of the high and low fat labeled drinks between the groups. These analyses revealed that there were no main effects of restraint status or drink label on consumption (both  $p > 0.05$ ). However, there was a restraint status x drink label interaction,  $F(1, 110) = 5.86, p < 0.02$ , and a Weight Condition x Drink Label interaction,  $F(1, 110) = 3.91, p = 0.05$ .

Simple main effects analyses were performed to determine how the restraint groups differed in their consumption of the labeled drinks. Separate paired-samples t-tests were conducted for each of the restraint groups to compare consumption of the high and low fat labeled drinks. As shown in Figure 2, these analyses revealed that the restrained eaters consumed more ( $115.64 \pm 10.13$  g) of the low fat labeled milk than the high fat labeled milk

(93.17 ± 8.63 g);  $t(52) = 2.56, p < 0.02$ . In contrast, the unrestrained eaters consumed similar amounts of the low fat labeled milk (86.05 ± 8.77g) and the high fat labeled milk (91.74 ± 9.10 g);  $t(61) = 0.71, p > 0.45$ .

Next, simple main effects analyses were conducted to determine how being weighed before or after the taste test affected participants' consumption of the high and low fat labeled drinks. Paired t-tests were conducted for each of the weight conditions to compare their consumption of the high and low fat labeled drinks. As shown in Figure 3, these analyses revealed that participants in the weight salient condition consumed marginally more of the low fat labeled drink (102.76 ± 10.02 g) than the high fat labeled drink (84.91 ± 8.44g);  $t(57) = 1.91, p > 0.06$ . In contrast, participants weighed after the taste test did not differentially consume the low fat labeled (96.57 ± 9.12) and high fat labeled drinks (100.03 ± 9.31),  $t(56) = .47, ns$ .

### **Caloric Content and Serving Size Estimations**

Separate 2 x 2 univariate ANOVAs were conducted to assess group differences in their estimation of the caloric content and volume of one serving of either the low or high fat-labeled chocolate milk beverage. The results indicated that neither restraint groups nor the weight conditions differed in their estimates of caloric content or the volume of one serving of the low and high fat-labeled drinks (all  $p > 0.05$ ). Next, we compared participants estimations to actual caloric content and volume of one serving of full and low fat Nesquik® chocolate milk using one-sample t-tests. These analyses revealed that all participants overestimated the volume of one serving of low fat chocolate milk by an average of 83.32 ml,  $t(114) = 10.88, p < 0.0001$ , and marginally underestimated the caloric content by 10.03 calories,  $t(114) = 1.86, p < 0.07$ . With regard to high fat chocolate milk, participants overestimated the appropriate serving size by an average of 46.29 ml,  $t(114) = 5.14, p < 0.0001$ ; however they were accurate in estimating its



caloric content per serving,  $t(114) = 0.33$ ,  $p = ns$ . These findings suggest that if the participants consumed what they believed to be one serving size of the low and high fat beverages they would drink about 52.83 more calories of low fat chocolate milk and 40.04 more calories of full fat chocolate milk.

### Discussion

The results of the current study demonstrated that fat content claims interact with dieting status to influence food perception and intake. Although unrestrained eaters thought the smell of the chocolate milk was significantly better when paired with a high fat relative to a low fat label, they did not differentially consume the two beverages. In contrast, despite perceiving the smell of the high and low fat labeled beverages to be similar, restrained eaters subsequently consumed significantly more of the low fat labeled beverage than of the high fat labeled beverage. In contrast to our predictions, we failed to find that restrained eaters who were weighed before the session disinhibited their eating. Rather, we found that all participants, when weighed before the session, consumed more of the low fat labeled milk than the high fat labeled milk. Moreover, all participants overestimated the volume of one serving of the chocolate milk (regardless of its label) and underestimated the calories in one serving of low fat milk.

Consistent with previous work in our laboratory (Cavanagh, Kruja, & Forestell, in press), the current study demonstrates that restrained eaters are sensitive to nutritional labels. In Cavanagh et al., (in press) participants were presented with a healthful (i.e., Kashi) or an unhealthful branded cookie (i.e., Nabisco). These cookies were also labeled with either a high calorie label, a low calorie label, or no label. In this study, restrained eaters consumed more of the healthful brand when no nutrition label was presented, whereas those who were presented with the low calorie label consumed more of the unhealthful branded cookie. In contrast,

unrestrained eaters ate more of the healthful brand regardless of the caloric information provided. These findings suggest that restrained eaters are focused on reducing the amount of fat and calories they consume, rather than the healthfulness of their snack. The present study expands upon the findings of Cavanagh et al., by demonstrating that in addition to calories, fat content affects restrained eaters' intake.

These findings are similar to a study in which undergraduate females were provided with food over a 24-hour period (Rideout, McLean, & Barr, 2004). Participants were instructed to choose their meals from a menu, which contained foods and beverages that were offered in both regular and reduced fat versions. Rideout and her colleagues (2004) found that compared to unrestrained eaters, restrained eaters chose significantly more reduced fat milk, cream cheese, mayonnaise, and salad dressing. They also consumed significantly more white (turkey) than red (ham or beef) sandwich meats. Interestingly, Rideout et al. (2004) found that restrained eaters did not choose more high fiber foods, despite the known health benefits resulting from increased fiber intake (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2010). Thus it appears that restrained eaters' use of reduced fat products may result from their desire to maintain a low body weight rather than healthful eating goals (Alexander & Tepper, 1995; Putterman & Linden, 2004; Rideout et al., 2004).

Despite their attempts to use low calorie and reduced fat foods to manage their weight, the current study shows that restrained eaters tend to consume more of these products than they would of a high fat drink, thereby reducing the number of calories saved by choosing the low calorie drink. Evidence suggests that because consumers underestimate the caloric content of healthful foods they perceive these products as less satiating (Finkelstein & Fishback, 2010; Vadiveloo, Morwitz, & Chandon, 2013). Indeed, in the current study, all participants

underestimated the number of calories in the low calorie milk. These findings are similar to Wansink and Chandon (2006), who found that low fat labels lead participants to overestimate the serving size of low fat chocolate milk, and marginally underestimate the beverage's caloric content. Given that restrained eaters focus more on external cues rather than internal cues of satiety when determining how much to eat or drink (Bolles, 1990; Carels et al., 2007; Fedoroff et al., 1997; Heatherton, Polivy, & Herman 1989; Pinel, Assanand, & Lehman, 2000), their consumption was more affected by the low fat claim than that of unrestrained eaters who are motivated by internal cues.

Although restraint classification predicted beverage intake, it did not affect participants' rating of the drinks' taste or flavor. This is in contrast to previous studies that have provided participants with varying descriptions (Provencher et. al, 2009) or brands (Cavanagh & Forestell, 2013). These studies have found that, in general, participants report liking the taste and flavor of the food better if it is labeled as more healthful. A possible explanation for such differential findings may be accounted by our labeling manipulation. Fat content plays a particularly important role in determining perceived product palatability (Drewnowski, 1997), with high fat foods generally rated as better tasting relative to low fat ones (Tuorila, Cardello, & Leshner, 1994; Tuorila, Kramer, & Engell, 2001; Wardle & Solomons, 1994). It is possible that participants expected the flavor and texture of the two drinks to be very different, and when this difference was not perceived, it might have produced a contrast effect, thereby reducing their hedonic evaluation of the flavor of the high fat drink. However, in a similar paradigm to ours, Westcombe and Wardle (1997) found that dairy foods labeled as high fat were rated as more pleasant than those labeled as low fat. Interestingly, they also found that those who perceived their general health concerns as having a greater influence on their food choice, rated the higher

fat labeled foods as less pleasant than those who reported a lower perceived influence. It is possible that in the current study our participants perceived their general health concerns as having a greater influence on their food choice. Interestingly, the unrestrained eaters rated the smell of the high fat drink to be better than that of the low fat drink. However, it is not clear why these participants perceived a difference in smell, and the restrained eaters did not.

Contrary to previous research suggesting that restrained eaters weighed prior to a taste-test task rate food products as less flavorful (Provencher et al., 2009), our work did not find a significant effect of weight salience on flavor perception. Rather, weight salience interacted with fat labels to influence intake for all participants. Similar to Senturz and Bushman (1998), we found that regardless of restraint classification, all participants made aware of their weight at the beginning of the study consumed less of the beverage that was labeled as full fat compared to the beverage labeled as low fat. These findings suggest that college-age females who are not restrained may periodically limit their fat intake, especially after they have been reminded about their weight. This interpretation is supported by a revised model of the self-awareness theory proposed by Gibbons (1990), which proposes that people are motivated to behave in accordance with their ideal self. Within the context of eating behaviors, this theory suggests that self-focusing situations, such as being weighed, might lead individuals who strive to reduce their intake of high fat foods, regardless of their restraint status, to consume more reduced fat products.

Previous work on weight salience and restraint eating suggests that restrained eaters are more likely to overeat only when they believe their weight loss efforts are futile (McFarlane et al., 1998; Strimas & Dionne, 2010). Given the nature of these studies however, restrained eaters' disinhibited consumption may have resulted from the negative feelings brought on by the

experimental procedures rather than weight salience per se. In fact, earlier research has demonstrated the moderating role of mood on food intake; restrained eaters are more likely to increase their intake when experiencing negative emotions such as sadness and anxiety (Schotte, Cools, & McNally, 1990). It is possible that a percentage of the restrained eaters recruited for the current study may have felt pleased with their weight or dieting efforts and consequently were not motivated to drink the beverage labeled as full fat in large quantities.

Conclusions of the current study are somewhat limited because consistent with previous literature (e.g., Cavanagh & Forestell, 2013; Provencher et al., 2009), only college age females were recruited as participants. This subset of the population may not necessarily be representative of the general consumer group. For example, evidence suggests that males' and females' food choices are motivated by different goals. Western societies idealize a slender physique in women (Mills, Polivy, Herman, & Tiggemann, 2002; Vartanian, Herman, & Polivy, 2005), which may be responsible for the high prevalence of dieting and restraint eating found among females. Males on the other hand, strive to build muscle tissue, and rely on exercise, rather than diets to control their weight (De Souza & Ciclitira, 2005). Because restrained eating in males is currently understudied, future research should investigate whether the same mechanisms hold true for males. A second limitation of the current study was that we did not measure the perceived texture of the low fat and high fat labeled drinks. The beverages were rated on flavor, taste, odor, and overall liking. However, when evaluating the palatability of high and low fat products, texture is particularly important because fat molecules play a key role in determining foods' texture, creaminess, appearance, palatability, and lubricity (Akoh, 1998). This limitation could account for the lack of differential ratings between the two beverages. Future studies investigating the impact of fat labeling on taste perception should be mindful of

the importance of texture. Additionally, as the literature on perceived healthfulness and fullness is less developed, subsequent work should further investigate the moderating role of expected satiety and hunger in restrained eaters' food intake.

Despite these limitations, the current study provides additional insight into the factors that interact to affect consumers' food perceptions and intake. In particular, it adds to the limited body of literature examining the effects of weight salience on consumption in restrained and unrestrained eaters. Our results suggest that weight feedback affects the intake of not only restrained but also of unrestrained eaters. Additionally, the present study expands the findings of Wansink and Chandon (2006) demonstrating that similar to overweight individuals, restrained eaters are also more prone to over-consume products labeled as low fat. Finally, given our participants' tendency to underestimate the number of calories and overestimate the volume of serving sizes, women should be wary of overconsumption of foods, especially those that are labeled as low fat.

## References

- Aaron, J. I., Mela, D. J., & Evans, R. E. (1994). The influences of attitudes, beliefs and label information on perceptions of reduced-fat spread. *Appetite*, 22, 25–37.
- Akoh, C. C. (1998). *Fat Replacers*. Retrieved from the Institute of Food Technologists' Expert Panel on Food Safety and Nutrition website:  
[http://www.ift.org/~media/Knowledge%20Center/Science%20Reports/Scientific%20Status%20Summaries/fatreplacers\\_0398.pdf](http://www.ift.org/~media/Knowledge%20Center/Science%20Reports/Scientific%20Status%20Summaries/fatreplacers_0398.pdf)
- Alexander, J. M., & Tepper, B. J. (1995). Use of reduced-calorie/reduced-fat foods by young adults: Influence of gender and restraint. *Appetite*, 25(3), 217-230.
- Almiron-Roy, E., Chen, Y., & Drewnowski, A. (2003). Liquid calories and the failure of satiety: how good is the evidence? *Obesity Reviews*, 4, 201-12.
- Block, G., Patterson, B., & Subar, A. (1992). Fruit, vegetables, and cancer prevention: A review of the epidemiological evidence. *Nutrition and Cancer*, 18(1), 1-29.
- Bolles, R.C. (1990). A functionalistic approach to feeding. In E.D. Cipaldi & T.L. Powley (Eds.). *Taste, experience, and feeding* (3-13). Washington, DC: American Psychological Association
- Boon, B., Stroebe, W., Schut, H., & Intema, R. (2002). Ironic processes in the eating behaviour of restrained eaters. *British Journal of Health Psychology*, 7(1), 1-10.
- Carels, R. A., Harper, J., & Konrad, K. (2006). Qualitative perceptions and caloric estimations of healthy and unhealthy foods by behavioral weight loss participants. *Appetite*, 46, 199-206.

- Carels, R. A., Konrad, K., & Harper, J. (2007). Individual differences in food perceptions and calorie estimation: an examination of dieting status, weight, and gender. *Appetite, 49*, 450–458.
- Cavanagh, K. V., & Forestell, C. A. (2013). The effect of brand names on flavor perception and consumption in restrained and unrestrained eaters. *Food Quality & Preference, 28*(2), 505–509.
- Cavanagh, K. V., Kruja, B., & Forestell, C. A. (in press). *The effect of brand and caloric information on flavor perception and food consumption in restrained and unrestrained eaters.*
- Coelho doVale, R., Pieters, R., & Zeelenberg, M. (2008). Flying under the radar: Perverse package size effects on consumption self-regulation. *Journal of Consumer Research, 35*(3), 380–390.
- Cowburn, G., & Stockley, L. (2005). Consumer understanding and use of nutrition labeling: A systematic review. *Public Health Nutrition, 8*(01), 21-28.
- De Souza, P., & Ciclitira, K. E. (2005). Men and dieting: A qualitative analysis. *Journal of Health Psychology, 10*(6), 793-804.
- de Witt Huberts, J. C., Evers, C., & de Ridder, D. T. (2013). Double trouble: Restrained eaters do not eat less and feel worse. *Psychology & Health, 28*(6), 686-700.
- U.S. Department of Agriculture and U.S. Department of Health and Human Services. (2010). *Dietary Guidelines for Americans, 2010*. 7th Edition, Washington, DC: U.S. Government



Printing Office. Retrieved from

<http://www.health.gov/dietaryguidelines/dga2010/DietaryGuidelines2010.pdf>

Drewnowski, A. (1997). Taste preferences and food intake. *Annual Review of Nutrition*, 17(1), 237-253.

Drichoutis, A., Lazaridis, P., & Nayga, R. M. (2006). Consumers' use of nutritional labels: A review of research studies and issues. *Academy of Marketing Science Review*, 10(9).

Epstein, L. H., Gordy, C. C., Raynor, H. A., Beddome, M., Kilanowski, C. K., & Paluch, R. (2001). Increasing fruit and vegetable intake and decreasing fat and sugar intake in families at risk for childhood obesity. *Obesity Research*, 9(3), 171-178.

Fedoroff, I. C., Polivy J., & Herman, C. P. (1997). The effect of pre-exposure to food cues on the eating behavior of restrained and unrestrained raters. *Appetite*, 28(1), 33-47.

Finkelstein, S. R., & Fishbach, A. (2010). When healthy food makes you hungry. *Journal of Consumer Research*, 37(3), 357-367.

Gerend, M. A. (2009). Does calorie information promote lower calorie fast food choices among college students? *Journal of Adolescent Health*, 44(1), 84-86.

Gibbons, F. X. (1990). Self-attention and behavior: A review and theoretical update. In M. P. Zanna (Ed.), *Advances in Experimental Social Psychology*, 23, 249-303.

Goldman, S. J., Herman, C. P., Polivy, J. (1991). Is the effect of a social model attenuated by hunger? *Appetite*, 17, 129-140.

Heatherton, T. F., Herman, C. P., & Polivy, J. (1991). Effects of physical threat and ego threat on eating behavior. *Journal of Personality and Social Psychology*, 60(1), 138.

- Heatherton, T. F., Polivy, J., Herman, C. P. (1989). Restraint and internal responsiveness: Effects of placebo manipulations of hunger state on eating. *Journal of Abnormal Psychology, 98*, 89-92.
- Herman, C. P., & Mack, D. (1975). Restrained and unrestrained eating. *Journal of Personality, 43*(4), 647-660.
- Herman, C. P., & Polivy, I. (1980). Restrained eating. In A. Stunkard (Ed.), *Obesity* (pp. 208-225). Philadelphia: Saunders
- Hooper, L., Summerbell, C. D., Higgins, J., Thompson, R. L., Capps, N. E., Smith, G. D...  
Ebrahim, S. (2001). Dietary fat intake and prevention of cardiovascular disease: Systematic review. *Bmj, 322*(7289), 757-763.
- Irmak, C., Vallen, B., & Robinson, S. R. (2011). The impact of product name on dieters' and nondieters' food evaluations and consumption. *Journal of Consumer Research, 38*(2), 390-405.
- Jansen, A., & van den Hout, M. A. (1991). On being led into temptation: "Counterregulation" of dieters after smelling a "preload". *Addictive Behaviors, 16*, 247-253.
- Kozup, J. C., Creyer, E. H., & Burton, S. (2003). Making healthful food choices: The influence of health claims and nutrition information on consumers' evaluations of packaged food products and restaurant menu items. *Journal of Marketing, 67*(2), 19-34.
- Lowe, M. R., & Thomas, J. G. (2009). Measures of Restrained Eating. In D. B. Allison & M. L. Baskin (Eds.), *Handbook of assessment methods for eating behaviors and weight-related problems: Measures, theory and research*. Thousand Oaks, CA: SAGE Publications, Inc.

McFarlane, T., Polivy, J., & Herman, C. P. (1998). Effects of false weight feedback on mood, self-evaluation, and food intake in restrained and unrestrained eaters. *Journal of Abnormal Psychology, 107*(2), 312.

Mills, J. S., Polivy, J., Herman, C. P., & Tiggemann, M. (2002). Effects of exposure to thin media images: Evidence of self-enhancement among restrained eaters. *Personality and Social Psychology Bulletin, 28*(12), 1687-1699.

National Center for Health Statistics. Health, United States, 2011. (2012). *With Special Feature on Socioeconomic Status and Health*. Hyattsville, MD. Retrieved from:  
<http://www.cdc.gov/nchs/data/hus/hus11.pdf>

Neuhouser, M. L., Kristal, A. R., & Patterson, R. E. (1999). Use of food nutrition labels is associated with lower fat intake. *Journal of the American Dietetic Association, 99*(1): 45–53.

Nutrition Labeling and Education Act of 1990. Pub No. 101-535, 104 Stat 2353 (1990a).  
Codified at 21 U.S.C. §343(q) and (r).

Nutrition Labeling and Education Act of 1990. Pub No. 101-535, 104 Stat 2353 (1990b).  
Codified at 21 U.S.C. § 101.60(c) and 101.9(c) and (6)(ii).

Nutrition Labeling and Education Act of 1990. Pub No. 101-535, 104 Stat 2353 (1990c).  
Codified at 21 U.S.C. §101.62(2)(i)(A) and (B).

Okada, E. M. (2005). Justification effects on consumer choice of hedonic and utilitarian goods. *Journal of Marketing Research, 42*(1), 43-53

- Pennington, J. A., & Hubbard, V. S. (1997). Derivation of Daily Values used for nutrition labeling. *Journal of the American Dietetic Association*, 97(12), 1407-1412.
- Polivy, J. (1998). The effects of behavioral inhibition: Integrating internal cues, cognition, behavior, and affect. *Psychological Inquiry*, 9(3), 181-204.
- Pinel, J. P., Assanand, S., & Lehman, D. R. (2000). Hunger, eating, and ill health. *American Psychologist*, 55(10), 1105.
- Polivy, J., Herman, C. P., & Howard, K. I. (1988). The restraint scale: Assessment of dieting. *Dictionary of Behavioral Assessment Techniques*, 377-380.
- Polivy, J., Herman, C. P., & Howard, K. I. (1988). The restraint scale: Assessment of dieting. *Dictionary of Behavioral Assessment Techniques*, 377-380.
- Provencher, V., Polivy, J., & Herman, C. P. (2009). Perceived healthiness of food. If it's healthy, you can eat more! *Appetite*, 52(2), 340-344.
- Putterman, E., & Linden, W. (2004). Appearance versus health: Does the reason for dieting affect dieting behavior? *Journal of Behavioral Medicine*, 27(2), 185-204.
- Qualtrics Labs Inc., (Version 12,018). [Software]. (2005). Provo, Utah, USA.
- Rideout, C. A., McLean, J. A., & Barr, S. I. (2004). Women with high scores for cognitive dietary restraint choose foods lower in fat and energy. *Journal of the American Dietetic Association*, 104(7), 1154-1157.
- Ruderman, A. J. (1986). Dietary restraint: A theoretical and empirical review. *Psychological Bulletin*, 99, 247-262.

- Schotte, D. E., Cools, J., & McNally, R. J. (1990). Film-induced negative affect triggers overeating in restrained eaters. *Journal of Abnormal Psychology, 99*(3), 317.
- Scott, M. L., Nowlis, S. M., Mandel, N., & Morales, A. C. (2008). Effects of reduced food size and package size on the consumption behavior of restrained and unrestrained eaters. *Journal of Consumer Research, 35*(3), 391–405.
- Sentyrz, S.M., & Bushman, B. J. (1998). Mirror, mirror on the wall, who's the thinnest one of all? Effects of self-awareness on consumption of full-fat, reduced-fat, and no-fat products. *Journal of Applied Psychology, 83*(6), 944-949.
- Strimas, R., & Dionne, M. M. (2010). Differential effects of self-weighing in restrained and unrestrained eaters. *Personality and Individual Differences, 49* (8), 1011-1014.
- Trottier, K., Polivy, J., & Herman, C.P. (2007). Effects of exposure to thin and overweight peers: Evidence of social Comparison in restrained and unrestrained eaters. *Journal of Social and Clinical Psychology 26:2*, 155-172.
- Tuorila, H., Kramer, F. M., & Engell, D. (2001). The choice of fat-free vs. regular-fat fudge: the Effects of liking for the alternative and the restraint status. *Appetite, 37*(1), 27-32.
- Tuorila, H.M., Cardello, A.V., & Leshner, L.L. (1994). Antecedents and consequences of expectations related to fat-free and regular-fat foods. *Appetite, 23*, 247-263.
- Vadiveloo, M., Morwitz, V., & Chandon, P. (2013). The interplay of health claims and taste importance on food consumption and self-reported satiety. *Appetite, 71*, 349-356.
- van Strien, T., Herman, C.P., Engels, R., Larsen, J., van Leeuwe, J. (2007). Construct validation of the restraint scale in normal weight and overweight females. *Appetite, 49*, 109–121.

- Vartanian, L. R., Peter Herman, C., & Polivy, J. (2005). Implicit and explicit attitudes toward fatness and thinness: The role of the internalization of societal standards. *Body Image, 2*(4), 373-381.
- Wansink, B., Chandon, P. (2006). Can “low-fat” nutrition labels lead to obesity? *Journal of Marketing Research, 43*, 607–617.
- Wansink, B., Park, S. B., Sonka, S., & Morganosky, M. (2000). How soy labeling influences preference and taste. *The International Food and Agribusiness Management Review, 3*(1), 85-94.
- Wansink, B., Van Ittersum, K., & Painter, J. E. (2005). How descriptive food names bias sensory perceptions in restaurants. *Food Quality and Preference, 16*(5), 393-400.
- Ward, A., & Mann, T. (2000). Don't mind if I do: Disinhibited eating under cognitive load. *Journal of Personality and Social Psychology, 78*(4), 753.
- Wardle, J., & Solomons, W. (1994). Naughty but nice: A laboratory study of health information and food preferences in a community sample. *Health Psychology, 13*(2), 180-183.
- Westcombe, A., & Wardle, J. (1997). Influence of relative fat content information on responses to three foods. *Appetite, 28*(1), 49-62.
- Wiesenfeld, P. L. (1995). Nutrition labeling: Energy values of foods and fat substitutes. *The American Journal of Clinical Nutrition, 62*(5), 1143S-46S.

Table 1

*Participant characteristic*

	Weight salient		Weight non-salient	
	<u>Restrained</u> ( <i>n</i> = 25)	<u>Unrestrained</u> ( <i>n</i> = 33)	<u>Restrained</u> ( <i>n</i> = 28)	<u>Unrestrained</u> ( <i>n</i> = 29)
Age (years)	19.76 ± .35	19.06 ± .31	19.75 ± .33	19.41 ± 3.25
BMI (kg/m <sup>2</sup> )	23.46 ± .60	20.91 ± .53*	23.35 ± .57	20.66 ± .56*
Restraint Score (Range: 0-35)	18.12 ± .63	10.06 ± .55*	19.36 ± .60	8.69 ± .59*
Weight Fluctuation (Range: 0-16)	6.8 ± .46	3.46 ± .40*	8.07 ± .43	3.24 ± .42*
Concern for Dieting (Range: 0-19)	11.32 ± .51	6.61 ± .44*	11.29 ± .48	5.45 ± .47*
Time since last ate (h)	5.06 ± .92	5.59 ± .78	5.88 ± .87	5.38 ± .85
Overall drink liking (Range: 1-7)	4.98 ± .30	4.86 ± .26	5.05 ± .28	4.93 ± .28

Note:  $p < 0.0001$  relative to restrained eaters

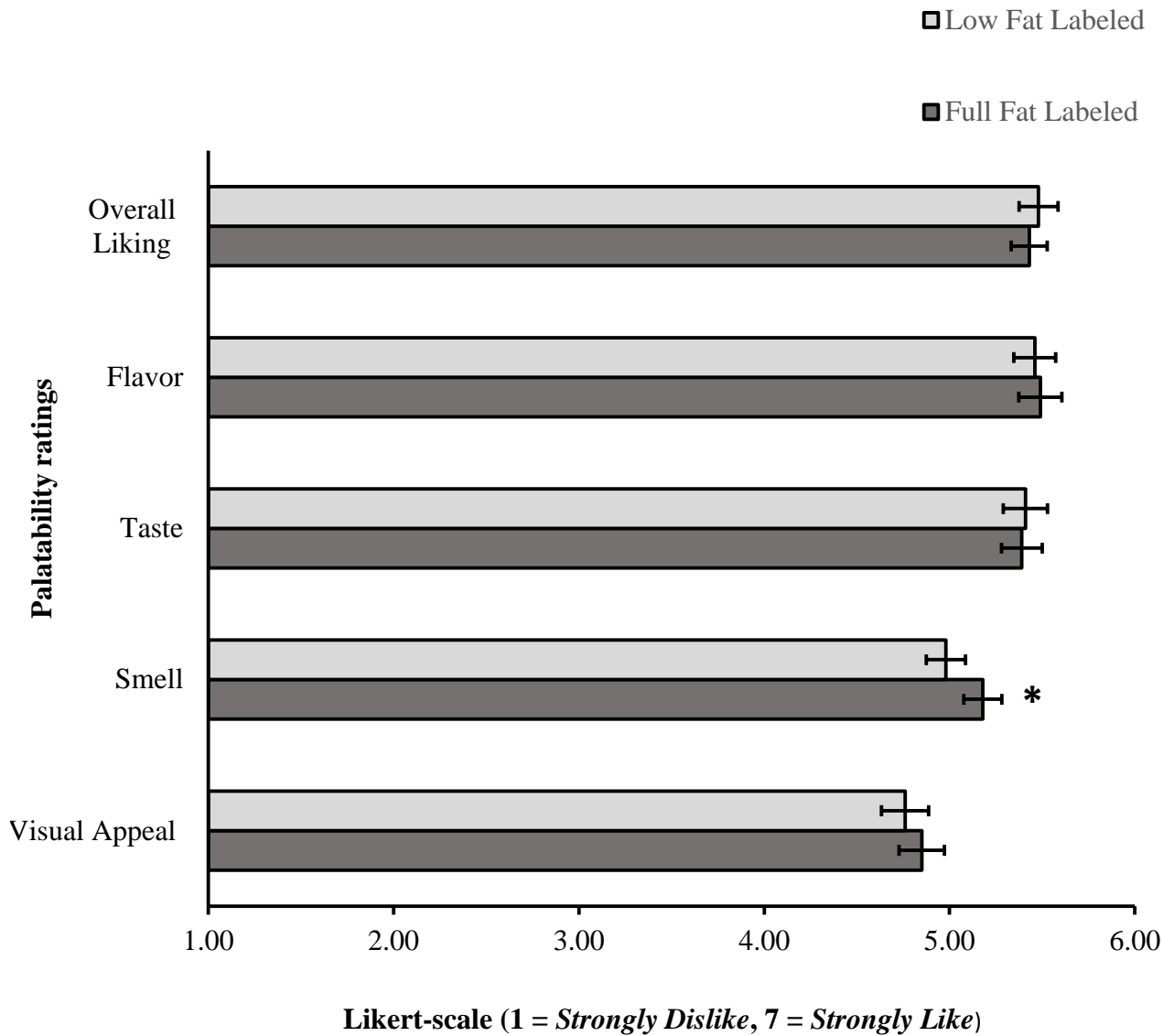
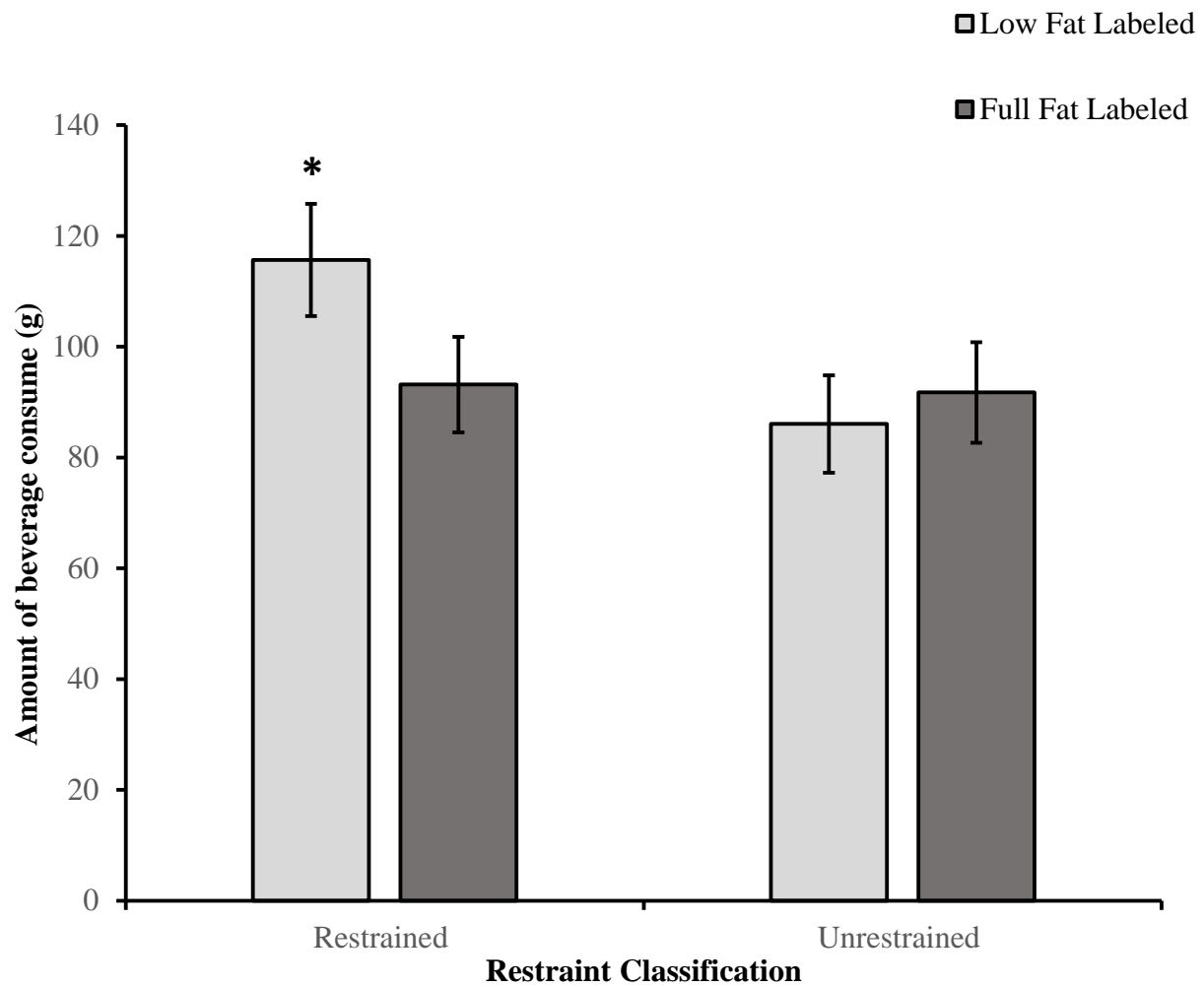
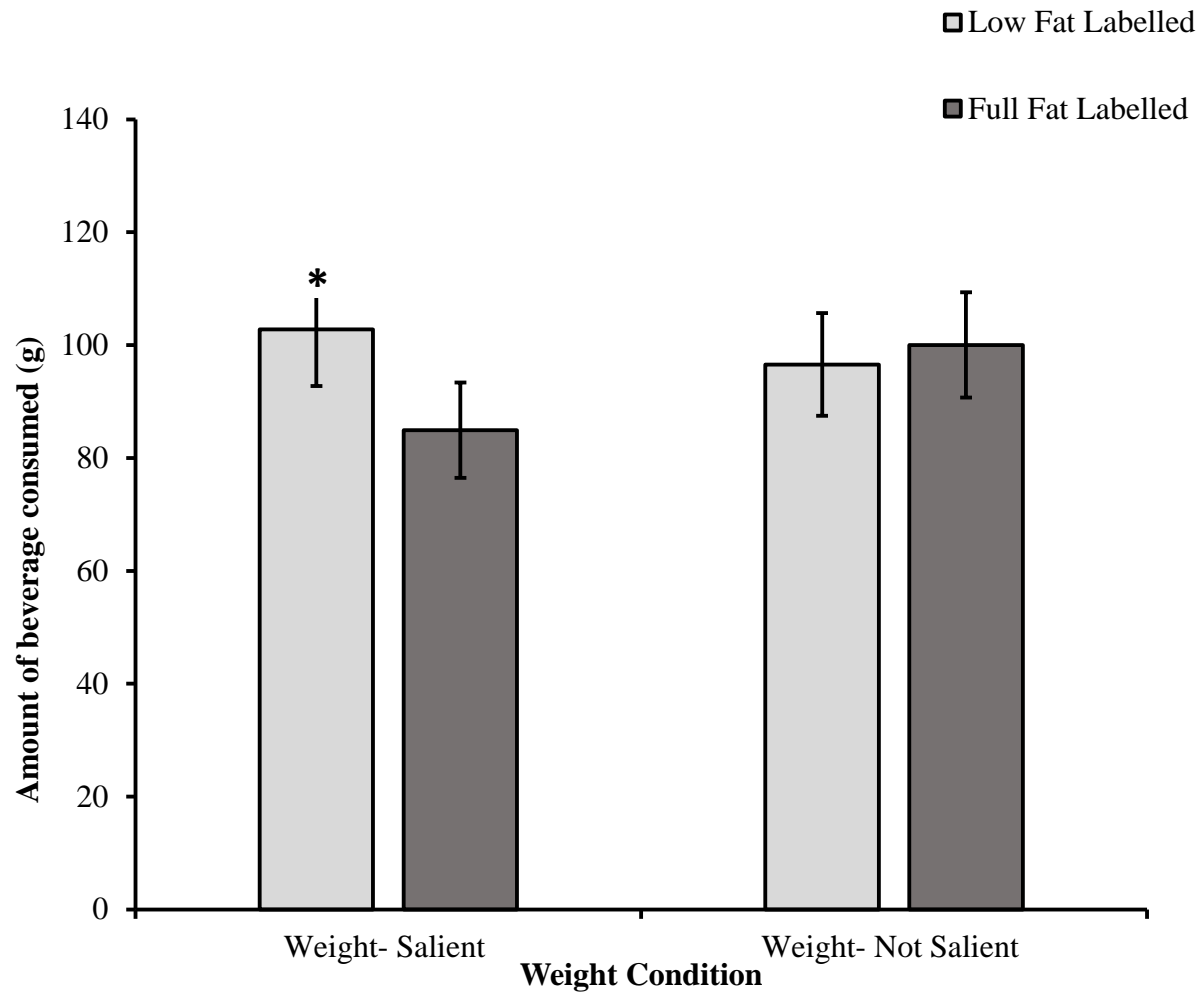


Figure 1. Mean palatability ratings of chocolate milk beverage presented in a cup labeled as Low Fat or Full Fat (\* indicates significantly higher rating,  $p < 0.05$ ).





*Figure 2.* Mean amount of a chocolate milk beverage consumed by restrained and unrestrained eaters when presented with a cup labeled as Low Fat or Full Fat (\*indicates significantly greater intake,  $p < 0.05$ ).



*Figure 3.* Mean amount of a chocolate milk beverage consumed by participant weighted before or after the taste test when presented with a cup labeled as Low Fat or Full Fat (\*indicates significantly greater intake,  $p < 0.05$ ).

## Appendix A

## Restraint Scale

*Instructions. Please, carefully read the following questions and select the response that best applies to you.*

1. How often are you dieting?

Never                      Rarely                      Sometimes                      Often                      Always

2. What is the maximum amount of weight you have ever lost within one month?

0-4.0 lbs                      5.0-9.0 lbs                      10.0-14.0 lbs                      15.0-19.0 lbs                      20+ lbs

3. What is your maximum weight gain within a week?

0-1.0 lbs                      1.1-2.0 lbs                      2.1-3.0 lbs                      3.1-5.0 lbs                      5.1+ lbs

4. In a typical week, how much does your weight fluctuate?

0-1.0 lbs                      1.0-2.0 lbs                      2.0-3.0 lbs                      3.0-5.0 lbs                      5+ lbs

5. Would a weight fluctuation of 5.0 lbs. affect the way you live your life?

Not at all                      Slightly                      Moderately                      Very much

6. Do you eat sensibly in front of others and splurge alone?

Never                      Rarely                      Often                      Always

7. Do you give too much time and thought to food?

Never                      Rarely                      Often                      Always

8. Do you have feelings of guilt after overeating?

Never                      Rarely                      Often                      Always

9. How conscious are you of what you are eating?

Not at all                      Slightly                      Moderately                      Extremely

10. How many pounds over your desired weight were you at your maximum weight?

0-1.0 lbs                      1.1-5.0 lbs                      6.0-10.0 lbs                      11.0-20.0 lbs                      20+ lbs

## Appendix B

## Palatability Rating Forms used during the taste test

**LOW FAT****CHOCOLATE MILK**

*Instructions: Before answering the following questions, please try a sip of the chocolate milk that you have been assigned. You may have as much or as little of the beverage as you would like while you complete this questionnaire.*

1. Using a scale from 1-7 (1=**Very Bad**, 7=**Very Good**) please rate the following statements:

A) How visual appealing does the beverage look?

Very Bad    1    2    3    4    5    6    7    Very Good

B) How much do you like the taste of this beverage?

Very Bad    1    2    3    4    5    6    7    Very Good

C) How is the flavor?

Very Bad    1    2    3    4    5    6    7    Very Good

D) How does the beverage smell?

Very Bad    1    2    3    4    5    6    7    Very Good

2. Using a scale from 1-7 (1=**Extreme Dislike**, 7=**Extreme Like**) please rate:

A) How much did you like the beverage that you sampled today?

Extreme Dislike    1    2    3    4    5    6    7    Extreme Like

**FULL FAT**  
**CHOCOLATE MILK**

*Instructions: Before answering the following questions, please try a sip of the chocolate milk that you have been assigned. You may have as much or as little of the beverage as you would like while you complete this questionnaire.*

1. Using a scale from 1-7 (1=**Very Bad**, 7=**Very Good**) please rate the following statements:

A) How visual appealing does the beverage look?

Very Bad    1    2    3    4    5    6    7    Very Good

B) How much do you like the taste of this beverage?

Very Bad    1    2    3    4    5    6    7    Very Good

C) How is the flavor?

Very Bad    1    2    3    4    5    6    7    Very Good

D) How does the beverage smell?

Very Bad    1    2    3    4    5    6    7    Very Good

2. Using a scale from 1-7 (1=**Extreme Dislike**, 7=**Extreme Like**) please rate:

A) How much did you like the beverage that you sampled today?

Extreme Dislike    1    2    3    4    5    6    7    Extreme Like

Appendix C

Chocolate milk serving size chart



