Counteractive Control and the Dieter: The Role of Food
Cue Specificity in Food Selection and Eating Behavior

by

Christine Nguyen
A thesis submitted in conformity with the requirements
for the degree of Master of Arts
Department of Psychology
University of Toronto

© Copyright by Christine Nguyen 2011
Counteractive Control and the Dieter: The Role of Food Cue Specificity in Food Selection and Eating Behavior

Christine Nguyen

Master of Arts

University of Toronto

2011

Abstract

Research on counteractive control theory suggests that exposure to food cues should bolster the dieting goal in restrained individuals. However, other research has found food cues to increase eating. The present study investigates whether cue specificity influences whether counteractive control or hyper-responsiveness to food cues takes precedence in dieters’ food selection and eating behavior. Restrained eaters were assigned to view a cookie, cake, or flower cue, then they selected a snack to take (apple or cookie). Participants also had an opportunity to eat cookies. Results showed that restrained participants exposed to the cake cue chose the apple more often than those receiving any other cue; exposure to a tempting cue not specific to the snack offered elicited counteractive control. However, participants exposed to either food cue ate more cookies than those exposed to the neutral cue. The role of food cue specificity in counteractive control and its limits are examined.
**Table of Contents**

Chapter 1 Background………………………………………………….1  
  1.1 Food Cue & Eating Research………………………………………1  
  1.2 Counteractive Control Theory…………………………………3  
  1.3 Counteractive Control, Food Cues, & Food Selection………4  
  1.4 Counteractive Control, Food Cues, & Eating Behavior……6  
Chapter 2 Present Study………………………………………………...8  
  2.1 Objectives & Rationale………………………………………..8  
  2.2 Hypotheses……………………………………………………8  
Chapter 3 Method……………………………………………………….11  
  3.1 Recruitment………………………………………………….11  
  3.2 Materials…………………………………………………….11  
  3.3 Measures…………………………………………………..11  
  3.4 Procedures………………………………………………12  
Chapter 4 Results………………………………………………………...15  
  4.1 Participant Characteristics……………………………………..15  
  4.2 Snack Selection……………………………………………….15  
  4.3 Eating……………………………………………………16  
Chapter 5 Discussion……………………………………………………..18  
References………………………………………………………………..21
Tables

Table 1. Eating data: mean grams eaten and standard deviations.............25
Figures

Figure 1. Snack selection data........................................23

Figure 2. Eating data.....................................................24
Appendices

Cookie Rating Questionnaire…………………………………………………….26
Demographics……………………………………………………………………27
Restraint Scale……………………………………………………………………28
Consent Form……………………………………………………………………..29
Taste Test Consent Form…………………………………………………………31
Debriefing Script………………………………………………………………….32
1 Background

1.1 Food Cue & Eating Research

Exposure to food cues is generally regarded as a catalyst for eating. Some of the earliest food cue research indicates that food cues lead to increased desire to eat and subsequent eating, especially among dieters. Schachter (1971) found that obese individuals (who are usually dieters) ate in response to external food stimuli, whereas normal weight individuals ate in response to internal hunger signals. These findings suggest that the presence of food temptations (external stimuli) prime obese individuals to eat.

Painter, Wansink, and Hieggelke (2002) demonstrated the influence of food cues and accessibility by comparing the effects of visibility and convenience on eating. For three weeks, a jar of chocolate candy was placed on participating office workers’ desks (visible and convenient), in the desk (non-visible and convenient), or on a shelf two meters from the desk (visible and inconvenient). Every five days, the location was rotated. Between subjects analyses showed that when the candies were placed on the desk, participants ate more than when they were placed in the drawer or on the shelf. Moreover, when the candies were in the desk, the participants ate more than when they were on the shelf. These findings show that convenience contributes more to eating than visibility of the food cue, but the combination of the two factors affect eating most strongly.

Another important food cue stimulus involves portion size; larger portions entail more food being present for longer. Wansink, Painter, and North (2005) presented participants with a bowl of soup to taste. Unbeknownst to the participants, half of them ate out of self-refilling bowls. It was expected that participants in the self-refilling bowl condition would eat more than participants in the normal bowl condition, as the food cue would remain constantly present (and the portion would essentially become larger). Further, the authors predicted that participants in the self-refilling bowl condition would underestimate the amount of soup they consumed. Both hypotheses were supported. The findings of Wansink et al. illustrate the powerful influence of the continual presence of food (and thus food cues) on eating.
Rogers and Hill (1989) examined the effect of exposure to food cues on food intake of restrained and unrestrained individuals. Participants either viewed pictures of food and imagined eating one of the pictured foods (cue exposure) or were told they would taste food later in the experiment (control). All participants tasted and rated a variety of biscuits. In the control condition, there was a negative correlation between level of restraint and amount eaten. On the other hand, greater restraint in the cue exposure condition was related to greater intake. Participants with lower restraint scores actually tended to eat less after cue exposure than they did in the control condition. This experiment demonstrates the breakdown of dieting restraint in the presence of food cues.

Federoff, Polivy, and Herman (1997) expanded upon food cue research by investigating the influence of different types of food cues on eating behavior. The researchers randomly assigned dieters and nondieters to no cue, an olfactory cue (pizza smell), a cognitive cue (pizza thoughts), or a combination of the olfactory and cognitive cues. The participants were then asked to taste and rate pizza. Results showed that all participants were affected by food cues to some extent. Participants in the smell condition and the pizza thoughts condition ate more than did participants in the no smell and free thought condition. However, the presence of food cues, especially the olfactory cue, had a greater effect on restrained than unrestrained eaters. Restrained eaters also ate significantly more than unrestrained eaters in the combined cue condition.

Likewise, Federoff, Polivy, and Herman (2003) further explored the effects of food cues and dieters’ eating behavior. They found that food cues elicit eating of a specific food, not general eating. Federoff et al. randomly assigned restrained and unrestrained female participants to one of three cue conditions: no cue, pizza smell, or cookie smell. The participants were then given a plate of pizza or chocolate chip cookies to taste and rate. Then, a second plate of the opposite food (cookies or pizza, whichever the participant did not receive in the first taste test) was presented for tasting and rating. Results indicated that participants in the pizza cue condition ate more pizza, relative to cookies, and participants in the cookie cue condition ate more cookies. This effect was carried by the restrained eaters, who were especially likely to eat more of the cued food. These findings indicate that exposure to food cues does not elicit eating in general, but rather eating of the cued food.
Food cues are apparently powerful factors in promoting eating, especially among dieters. Research by Jansen, Theunissen, Slechten, Nederkoorn, Boon, Mulkens, and Roefs (2003) shows that the effect of food cues on eating behavior is present even in children. The researchers explained that food cue reactivity, defined as increased appetite in the presence of food cues, is a conditioned response. They examined whether overweight children experienced more cue reactivity and eating after cue exposure than normal weight children. All of the children tasted a variety of foods. Before tasting, they were randomized to a preload condition (tasted a little of each snack before the taste test), exposure condition (smelled each snack before tasting), or control condition (played with legos before tasting). Regardless of condition, overweight children had less appetite, as measured on a pictorial nine-point scale, than normal weight children. In the control condition, normal and overweight children did not differ in amount consumed. After eating a preload, overweight children did not reduce subsequent intake, while normal weight children did. Further, after smelling the foods, overweight children subsequently ate more, while the normal weight children ate less. These findings show that overweight children do not eat more than their normal weight counterparts in the absence of food cues; however, when food cues are present, overweight children increase their consumption.

Polivy, Herman, and Coelho (2008) reviewed the literature related to the priming effects of food cues on dieters’ eating behavior. As the sample studies cited above indicate, the presence of food cues has been implicated as one of the reasons food restriction is so difficult and often unsuccessful. Taken together, this research demonstrates the power of food cues in eliciting overeating in dieters and presents certain conditions (i.e. cue specificity) that are especially likely to predict overeating.

1.2 Counteractive Control Theory

Trope and Fishbach (2000) described temptation as a self-control dilemma in which an attractive short-term goal comes into conflict with a long-term goal. After repeated exposure to the conflict, the temptation elicits self-control. Counteractive control, as proposed by Trope and Fishbach, assumes that self-control works in favor of the long-term goal by bolstering the value of that goal, which then influences our choices and behaviors. For example, if a dieter has a long-term goal of losing weight, she may be tempted by the short-term goal of eating chocolate cake at a party. Counteractive control posits that this dieter, when tempted with the cake, will find her
goal of losing weight more valuable than she previously thought and would exert self-control, resisting the cake in favor of losing weight. Counteractive control is most likely to be present when the long-term goal is important, when the cost of giving in to the short-term goal is moderately high, and only before giving in (or not) to the short-term temptation, not after (Fishbach & Trope, 2000). Counteractive control, in short, allows us to resist temptations and pursue our long-term goals.

Counteractive control has been applied to numerous situations, including in the area of dieting and eating behaviors (Fishbach et al., 2003; Coelho et al., 2008; Geyskens et al., 2008; Papies et al., 2008; Coelho et al., 2009; Kroese et al., 2009, Myrseth et al., 2009, Zhang et al., 2010). These studies help us to understand the context in which counteractive control exists in our food-rich society. According to counteractive control theory, food temptations will elicit self-control in dieters and, thus, lead them to resist diet-breaking foods.

1.3 Counteractive Control, Food Cues, & Food Selection

Fishbach, Friedman, and Kruglanski (2003) published a series of studies examining and clarifying various aspects of counteractive control theory. In summary, they found that, in the face of temptation, long-term goals are activated and this goal activation can be learned to the point of being automatic (studies 1 and 2). Thus, when a dieter successfully resists a food temptation once, she becomes more likely to resist food temptations in the future. Fishbach and colleagues also identified two factors associated with better counteractive control: perceived self-regulatory success and goal importance. In short, people who perceive themselves as successful at pursuing their long-term goals were quicker to activate the long-term goal when faced with temptation compared with those who perceived themselves as unsuccessful at pursuing their long-term goals (study 3). Moreover, perceiving the long-term goal as highly important is associated with quicker goal activation when faced with temptation.

The final study in Fishbach et al. (2003) demonstrated the behavioral consequences of counteractive control. Participants were college-aged female dieters who received one of three cues when they arrived for the study: neutral, diet, or tempting food. The neutral cue consisted of magazines unrelated to food, such as geography magazines. The diet cue consisted of magazines devoted to exercise, fitness and dieting. The tempting food cue was the presence of Chocolatier magazines and of various fattening foods around the lab, including cookies and cakes. All
participants completed a lexical decision task used to assess dieting goal activation. Participants in the diet and the tempting food cue conditions were quicker to recognize the word “diet” than were those in the neutral condition, indicating that being primed to diet and being tempted by food cues are both associated with the participant accessing the dieting goal. At the end of the study, participants were given the opportunity to choose between a healthy snack (apple) or an unhealthy snack (Twix bar) to take with them as a thank-you. Fishbach et al. found that participants exposed to the food cue and those exposed to the diet cue were more likely to pick the apple than were those exposed to the neutral cue. In fact, participants in the food cue condition were just as likely as those in the diet cue condition to pick the apple. The study lent behavioral support to counteractive control theory, showing that exposure to a food temptation led to dieters choosing healthier foods.

Similarly, Kroese, Evers, and Ridder (2009) conducted a two-study investigation examining the effect of food cues on dieting goals and intentions and subsequent food selection. Participants were female dieters, who were exposed to one of two cue conditions: neutral or tempting food. All participants were told to view two pictures of the same object to find supposed differences between them. In the neutral cue condition, participants viewed pictures of flowers. In the food cue condition, participants viewed pictures of chocolate cake. In the first study, Kroese replicated Fishbach (2003)’s finding that food cues bolster dieting goals. He asked the participant after the cue exposure to indicate on a Likert scale how important dieting was to her. He found that participants in the tempting food cue condition rated dieting as more important than those in the neutral condition.

In study 2, Kroese (2009) repeated the procedures, this time examining goal-directed intentions and adding a behavioral measure. After the cue exposure, participants were asked whether they intended to eat healthier foods. Participants exposed to the food cue had greater intentions to eat healthy foods, compared to their counterparts in the neutral cue condition. Next, participants were given the option to take a healthy (whole grain cookie) or unhealthy (chocolate cookie) snack as a thank-you. Kroese found that participants in the chocolate cake condition were more likely to choose the healthy snack (whole grain cookie) than participants exposed to the neutral cue. Essentially, the study replicated Fishbach (2003) and provided support for counteractive control theory.
1.4 Counteractive Control, Food Cues, & Eating Behavior

Counteractive control studies have also examined the effect of food cues on eating. These studies have tried to tease apart the characteristics of food cues and dieters that make counteractive control possible in a situation in which there is an opportunity to eat. Papies, Stroebe, and Aarts (2008) investigated the role of perceived self-regulatory success in counteractive control. They suggest that perceived dieting success affects accessibility of dieting goals and elicits subsequent goal-congruent behavior when restrained eaters are exposed to a hedonic food cue. In the first of two studies, the researchers showed that when primed with tempting food words, participants who considered themselves successful dieters demonstrated quicker responses to dieting words than did those who did not consider themselves successful dieters. The second study investigated the relations between participants’ intention to avoid certain fattening foods (French fries, cookies, etc.) and self-reported consumption of the forbidden foods over the course of two weeks. It was found that restrained eaters who reported a strong intention not to eat fattening foods and considered themselves successful dieters were more likely to adhere to their plans than restrained eaters who did not consider themselves successful dieters. In their two-study report, Papies and colleagues demonstrated perceived self-regulatory success to be an important factor influencing counteractive control and dieting behavior.

Coelho, Polivy, Herman, and Pliner (2009) further explored counteractive control in the context of food consumption. They hypothesized that dieters exposed to an incidental food cue would resist the tempting food when given an opportunity to eat. Participants were dieters/restrained eaters and nondieters/unrestrained eaters who were exposed to either an incidental olfactory chocolate chip cookie cue (slight smell of chocolate chip cookies) or no cue. They were then given a plate of chocolate chip, double chocolate, and oatmeal raisin cookies to taste and rate. Restrained eaters in the cue condition ate fewer chocolate chip cookies than those in the no cue condition, or than did unrestrained eaters in the cue condition. Unrestrained eaters in the cue and no cue conditions did not differ significantly on number of chocolate chip cookies eaten. However, restrained participants in the no cue condition ate significantly more cookies than unrestrained eaters in the no cue condition (or restrained eaters in the cue condition). A cue by restraint interaction was not found when considering total cookie intake for all three kinds of cookies; exposure to the chocolate chip cookie smell decreased eating of chocolate chip cookies in restrained individuals, but did not reduce their overall cookie intake. These findings suggest
that exposure to a tempting food cue may lead dieters to decrease eating of that particular cued food, but not fattening foods overall.

Taken together, these studies support counteractive control theory by demonstrating that goal congruent behaviors follow exposure to a temptation. However, they also indicate potential factors that affect counteractive control, including the salience of the temptation, self-regulatory success and the specificity of the food cue.
2 The Present Study

2.1 Objectives & Rationale

The present study seeks to replicate and expand upon the seemingly contradictory literatures on counteractive control theory and the effects of food cues on eating. The counteractive control literature demonstrates a link between exposure to tempting food cues and diet-congruent behaviors (i.e., eating less or choosing less fattening foods) (Fishbach et al., 2003; Geyskens et al., 2008; Coelho et al., 2009; Kroese et al., 2009; Myrseth et al., 2009; Zhang et al., 2010). On the other hand, there are several studies that demonstrate an increase in eating when a food cue is presented to restrained eaters (Rogers & Hill, 1989; Federoff et al., 1997, Federoff et al., 2003; Jansen et al., 2003; see Polivy et al., 2008, for a review). The researchers propose a situation in which these findings may coexist.

The present researchers note that both Fishbach et al. (2003) and Kroese et al. (2009) used food cues that did not match the tempting food offered to the participant. Fishbach et al. presented participants with Chocolatier magazines and the presence of several tempting cakes, candies, and cookies around the room, then gave their participants an option to choose between a Twix chocolate bar and an apple. Similarly, Kroese et al. had participants view a picture of chocolate cake, then gave them an opportunity to choose between two types of cookies. The researchers propose that presenting dieters with a tempting food cue that matches the food offered at the end will affect the way participants respond to subsequently offered foods.

2.2 Hypotheses

The present research will examine the effects of food cues on restrained eaters’ food selection and eating behavior. First, the authors expected that food cue specificity would affect both amount eaten and food selection. Federoff et al. (2003) and Coelho et al. (2009) illustrated the importance of food cue specificity in dieters’ eating behavior. As discussed above, when confronted with a tempting food cue, the participants in the Federoff et al. study demonstrated increased eating of the cued food, but not of food in general. On the other hand, the participants in Coelho et al.’s study avoided eating the cued chocolate chip cookies, but did not refrain from eating other types of cookies. The researchers present two alternative hypotheses that account for the findings of both of the aforementioned studies.
H1A: It is possible that a dieter exposed to a tempting food cue may select the cued food, if given the chance. For example, if a dieter is exposed to a picture of cookies and is then offered the opportunity to select between a cookie and an apple, she may select the cookie since she was cued to eat cookies. On the other hand, if she is exposed to a picture of cake and is offered the opportunity to select between cookies or an apple, she may be more likely to select the apple because she has not been cued to eat the cookies, but a different, not available food; therefore, she sticks to her diet. A dieter exposed to the neutral cue would be the least likely to select the cookies as there was no prime to eat.

H1B: It is also conceivable that specificity of the food cue could influence food selection in the opposite direction. If counteractive control results in the selection of the healthier food option whenever the dieter is confronted with a food temptation whether or not it is specific to the tempting food offered, might it be that a food temptation that matches the food offered would actually strengthen counteractive control? Hypothetically, dieters may demonstrate a greater avoidance of the specific cued food, thereby, sticking to the diet. In other words, if a dieter is exposed to a cookie cue and later encounters the opportunity to choose between cookies or an apple, she may be specifically motivated to avoid the cookies, while those exposed to the cake cue may also be motivated to stick to the diet and select the apple, but possibly to a lesser extent.

Finally, participants exposed to a neutral cue would be the least likely to select the apple since no dieting goal was primed.

The researchers are interested in investigating counteractive control, food cues, and actual eating behavior. As discussed above, specificity of the food cue plays a role in what people eat. At the same time, although studies on counteractive self-control and food selection generally have not actually measured amount eaten, the assumption seems to be that activating the diet goal would not only lead to selection of less fattening food, but presumably also to reduced consumption of fattening foods. The researchers are thus interested in assessing how dieters respond when presented with a tempting food cue specific to the food being offered for tasting or not, in this case, chocolate chip cookies (following either a tempting chocolate chip cookie cue or a tempting cake cue). If dieters are presented with a chocolate chip cookie cue and then are given an opportunity to eat chocolate chip cookies (and only chocolate chip cookies), how many of the cookies would they eat? On the other hand, if they are presented with a chocolate cake cue and
are then offered cookies, how many of the cookies would they eat? The researchers again present
two alternative hypotheses to account for counteractive control theory and previous findings that
cue exposure leads to increased eating in dieters.

H2A: It would be plausible to think that dieters may break their diet and eat the chocolate chip
cookies due to the presence of the chocolate chip cookie cue. After all, Federoff et al. (2003)
showed that exposure to food cues increased desire for, and eating of, the specific cued food.
Therefore, dieters exposed to the cookie cue may eat more cookies than those exposed to any
other cue (fattening or neutral). Specifically, it is hypothesized that dieters exposed to a cookie
cue will eat more cookies than those exposed to a cake cue, who may or may not eat more than
those exposed to a neutral (flower) cue.

H2B: It is also possible that dieters cued to eat chocolate chip cookies may avoid the
chocolate chip cookies and not eat much of them at all, thereby supporting counteractive control
theory. If this is the case, dieters exposed to the cookie cue may eat fewer chocolate chip cookies
than those in any other cue condition. Specifically, dieters exposed to the cookie cue will eat less
than those exposed to the cake cue, who will eat less than those exposed to the flower cue. (Such
findings would, of course, contradict previous food cue studies such as those by Fedoroff et al.,
1997; 2003).

In brief, the present study expanded upon previous research conducted in the areas of
counteractive self-control and food cues. The researchers investigated the role of the specificity
of the food cue in subsequent selection of a snack. Furthermore, the researchers explored the
effect of the food cue on eating of the specific cued (or non-cued) food. By conducting this
study, the researchers hoped to provide a context in which counteractive control theory may be
reconciled with other food cue research by demonstrating that specific food cues promote eating
of that food by dieters, but tempting food cues for foods not subsequently offered produce
counteractive self-control behaviors.
3 Method

3.1 Recruitment

Participants were female students from the University of Toronto-Mississauga campus, recruited via the introductory psychology subject pool and paid subject pool. The experiment was posted as a perception and memories study on the experiment sign-up webpage in order to mask the true purpose of the study and to control for demand characteristics. Inclusion criteria included being female, possessing the goals of earning good grades, dieting, and learning new things, and being free of food allergies. Males were excluded from the present study since the researchers were interested in challenging and extending the findings of Fishbach et al. (2003), Kroese et al. (2009), and Coelho et al. (2009), all of whom recruited only female dieters. Furthermore, it is important that participants are dieters because the study investigates the influence of food cues on dieting goal-directed behavior. The other listed goal requirements were meant to conceal the true purpose of the study. Participants were awarded course credit or $10 for participation.

3.2 Materials

The cookies used in the taste test portion of the experiment were fresh-baked gourmet chocolate chip cookies (English Bay, Inc.). The foods offered in the snack selection part of the experiment were regular Chips Ahoy chocolate chip cookies and red delicious apples.

3.3 Measures

Cookie Rating Questionnaire

During the taste test, participants rated the gourmet chocolate chip cookies on several dimensions, including taste and liking. See Appendix A.

Demographics

A questionnaire was developed to capture background information about the participant, including age, year in college, ethnicity, and living situation. See Appendix B.

Restraint Scale
Eating restraint was assessed using the 11-item Restraint Scale (Polivy, Herman & Howard, 1988), which measures chronic dieting. Participants scoring 15 or above were considered restrained and those scoring less than 15 were excluded from the study. See Appendix C.

3.4 Procedures

The experiment took place in a lab located in the Davis Building on the UTM campus. All participants were run individually in separate rooms or partitioned areas to ensure that they could not see each other. Informed consent was obtained upon the participant’s arrival (Appendix D). The participant was told that she would be taking part in a study of perception and memory.

**Manipulation:** Participants were randomized to receive one of three food cues using a random number generator. The participant were exposed to a tempting food cue specific to the food offered (chocolate chip cookies), a tempting food cue not specific to the food offered (chocolate cake), or a neutral cue (flowers). The cue was presented in the form of pictures as part of a perception task in which the participant must examine two pictures of the same cue and find differences between them. Presentation of the cue in this manner ensured receipt of the manipulation. After examining the pictures, the participant recorded the differences she observed.

After completion of the perception task, the participant completed two more tasks that conformed to the cover story. The participant completed a fill-in-the-blank task in which she was presented with a worksheet of words with letters deleted. The experimenter explained that the participant was to fill in the missing letters to form a complete word. Next, the participant completed a list memorization task in which she studied a list of words for 30 seconds, then reproduced as much of that list as possible in another 30 seconds.¹

**Counterbalancing:** The researchers randomized the order in which participants did the snack selection and taste test in order to control for order effects. Participants randomized to the snack first condition were led through the experiment, as explained below. The participants in the taste

¹The tasks were originally intended to identify activation of dieting and eating goals. The words “diet” and “eat” were embedded in each task. Filling in the appropriate blanks to form these words in the fill-in-the-blank task or reproducing them in the memorization task should have indicated activation of the dieting and/or eating goal(s). Analyses revealed no significant findings. Therefore, the tasks will not be discussed further.
first condition were told that the cookie taste test was designed to measure taste perception on several dimensions. These participants were offered a snack to take away just before debriefing.

**Snack Choice:** At the end of the list memorization task, the experimenter informed the participant, “I’m still getting the next part of the experiment set up. In the meantime, please take one of these snacks as a token of our appreciation for coming in today.”

The experimenter placed a box containing an equal number of red delicious apples (healthy snack) and baggies of Chips Ahoy chocolate chip cookies (unhealthy snack) in front of the participant. The experimenter left the room and waited for the participant to make a snack choice.

**Surprise Cookie Taste Test:** After the participant chose a snack, the experimenter returned and informed her that the experiment did not take long enough to award course credit or the $10. Therefore, the participant was told she could participate in a separate, unrelated task to extend the experiment length in order to receive full credit or the $10.

The participant was told that she would be tasting and rating chocolate chip cookies to be used in another experiment in another lab. Before continuing, the experimenter asked the participant if she had any food allergies. If the participant had a relevant food allergy, she was excluded from the cookie taste task. If the participant did not have allergies, she gave consent (on a second consent form) for the taste test (Appendix E). The experimenter presented the participant with a pre-weighed plate heaped with fresh baked chocolate chip cookies. The experimenter told the participant, “Your task is to taste and rate these chocolate chip cookies on several dimensions, recorded on a taste scale. You may eat as many cookies as you would like; there are plenty in the lab, but do not change your initial ratings. You will have 10 minutes to complete the task.”

The experimenter left the room after explaining the task and timed the participant for 10 minutes.

**Packet of Questionnaires:** After the 10 minutes were up, the experimenter returned and removed the plate of cookies to be weighed in another room. In the meantime, the participant completed a packet of questionnaires that included the demographics questionnaire, the Restraint Scale and several exploratory measures.
Debriefing: After the participant completed the packet of questionnaires, the experimenter returned to conduct the debriefing. The experimenter read a debriefing script to the participant (Appendix F) and addressed any questions. The experimenter weighed the participant on a balance beam scale (in pounds) and measured height (in centimeters). The participant was thanked and given course credit or $10.
4 Results

4.1 Participant Characteristics

Eighty-eight female students enrolled at the University of Toronto-Mississauga completed the study. Two participants were excluded from analyses because they indicated they did not like cookies, another was excluded because she had previously participated in a similar study in the same lab, and one other participant was excluded due to food allergies. Snack selection and eating data were analyzed separately.

Participants were included in the analysis if they scored 15 or higher on the Restraint Scale (Polivy, Herman & Howard, 1988) and thus, were considered restrained eaters. Only restrained participants were included in the analyses because Fishbach et al. (2003) and Kroese et al. (2003) included only dieters in their studies. The majority of participants were 18 to 20 years old (73.9%), single (92%), and lived off-campus with a parent or caregiver (64.8%). Over half of the participants were first year college students (56.8%).

Eighty-eight participants were included in the eating analyses. There were 75 participants included in snack selection analyses. Participants who refused to take a snack or took both snacks were excluded from the snack selection analyses. Nine participants took both snacks (five from the cookie cue condition, three from the cake cue condition, and one from the flower cue condition) and four refused to take a snack (three from the cookie cue condition and one from the flower cue condition).

4.2 Snack Selection

All analyses were performed using SPSS. A logistical regression revealed that there was no effect of task order on snack selection. Therefore, order was collapsed and a chi square test of independence was conducted to determine if cue was related to snack selected. This test revealed a marginally significant effect of cue on snack selection ($\chi^2=5.248. \text{ df}=2, \ p=.072$). Post-hoc comparisons were conducted to determine which cue condition(s) was/were behind the effect. Participants exposed to the cake cue were significantly more likely to select an apple than were

---

2Seventy unrestrained eaters (Restraint score less than 15) slipped into the experiment. They are not included in the analyses because they did not have a dieting goal to be activated.
the participants exposed to the cookie cue ($\chi^2=4.461, \text{df}=1, p=.035$), and participants in the cake cue condition were marginally more likely to select an apple than were those in the flower cue condition ($\chi^2=3.276, \text{df}=1, p=.070$). There was no significant difference in snack selection between those in the cookie cue and flower cue conditions ($\chi^2=.088, \text{df}=1, p=.767$). See figure 1.

Snack selection was also analyzed using only those participants in the snack first condition. Although there was no significant effect of order on snack selection, it is logical to suppose that the cue may have had a greater effect on those in the snack first condition as they were allowed to select a snack soon after cue exposure and without knowledge that they would taste cookies. A chi square test of independence revealed a significant effect of cue condition on snack selection ($\chi^2=6.252, \text{df}=2, p=.044$). Post-hoc comparisons showed that dieters who were exposed to the cake cue were more likely to select the apple than were those who saw the cookie cue ($\chi^2=5.073, \text{df}=1, p=.024$). Likewise, participants in the cake cue condition were more likely to select an apple than were those in the flower cue condition ($\chi^2=4.144, \text{df}=1, p=.042$). There was no significant difference in snack selection between those exposed to the cookie cue and those exposed to the flower cue ($\chi^2=.074, \text{df}=1, p=.785$). These findings strengthen the notion that exposure to a tempting food cue elicits counteractive control, and thus, diet congruent behaviors, only when the tempting food cue does not match the snack offered.

### 4.3 Eating Behavior

ANOVA’s were used to determine whether cue exposure influenced amount of cookies eaten (measured in grams). In all cases in which homogeneity was violated, the data was log transformed and analyzed in that way. A cue x order ANOVA revealed no effect of order and a marginal effect of cue. Therefore, order was collapsed. The subsequent ANOVA proffered a significant effect of cue on eating, $F(2,85)=3.349, p=.040$. Post hoc comparisons showed that participants exposed to the cookie cue ate significantly more than those exposed to the flower cue ($p=.035$) and those exposed to the cake cue ate marginally more than those exposed to the flower cue ($p=.154$). Participants in the cookie and cake cue conditions did not differ in amount eaten. Since there was no significant difference between the two tempting food cue groups, they were collapsed and an ANOVA was conducted comparing the eating behavior of those exposed to a food cue and those exposed to a neutral cue. This ANOVA showed that participants exposed
to a food cue ate significantly more than those exposed to a neutral cue, F(1,86)=6.221, p=.015. All in all, dieters who received a tempting food cue ate more cookies than those exposed to a neutral food cue. These findings are consistent with research conducted in the area of restraint and food cues, which has consistently demonstrated overeating in dieters exposed to food cues (Polivy et al., 2008). See figure 2 and table 1.

Another finding among restrained eaters in the snack first condition warrants note. It is plausible that snack selection may have influenced eating behavior. To test the effect of snack selection on amount of cookies eaten, a cue (food cue vs neutral) x snack selection (apple vs cookies) ANOVA was conducted. There was a significant effect of snack selected on subsequent eating behavior, F (1, 42)=4.640, p=.038, and a marginally significant effect of cue exposure, F(1, 42)=3.630, p=.064. The interaction was not significant. As mentioned above restrained eaters exposed to a food cue ate more cookies than those exposed to the neutral cue (somewhat more, in the present analysis). It also appears that restrained eaters who selected an apple went on to eat fewer cookies than those who selected cookies. In other words, making diet-congruent food choices was related to diet-congruent eating behavior and making diet-non-congruent food choices was related to eating more.
5 Discussion

The present study examined counteractive control theory in the context of snack selection and eating behavior in order to determine whether these two responses are consistent with each other. This is important in order to understand the operation of counteractive self-control. Does it actually contribute to dieting behavior (i.e., not only choosing to take away a less fattening food, but actually consuming less when fattening food is offered), or does it represent a more limited short-term choice. The present study also sought to determine how cue specificity is related to counteractive control and eating. Does counteractive control operate for both similar and dissimilar temptation cues and food choices, or are dieters activated to choose a less fattening food only when the tempting cue is different from the fattening food being offered?

The food selection portion of the experiment demonstrated the importance of food cue specificity in the activation of counteractive control, confirming our hypothesis that dieters would choose the healthy food only when they were not actually offered the food that had tempted them initially. According to our findings, dieters exposed to a food cue (i.e., cake) that does not match the food offered for the food choice (i.e., cookies) do indeed exhibit counteractive control and, thus, select the healthy, diet-congruent snack. However, dieters exposed to a food cue specific to the food offered (in this case, pictures of chocolate chip cookies as the food cue, then small bags of chocolate chip cookies as one of the food options) are less likely to select the healthy snack and more likely to take what had tempted them, demonstrating a lack of counteractive control. It is possible that a moderate level of temptation elicits counteractive control (heightened diet goal), whereas a high level of temptation (cookies when cookies are available) elicits a more powerful eating goal.

Although counteractive control was present in food selection, it was not observed in the eating portion of the experiment. The cookie taste test presented an opportunity for participants to eat a tempting food, without the option to eat any other alternative foods. Contrary to our hypotheses, participants in the two food cues groups did not differ from each other in eating behavior. In fact, the present data indicated that exposure to a food cue (cookie or cake) resulted in restrained participants eating more cookies than those exposed to the neutral cue, as previous eating studies have found (see Polivy et al., 2008 for a review). Although Federoff et al.'s study seems to suggest that restrained participants eat more of the cued food, not food in general, she presented
her participants with a sweet cue and a savory cue (and vice versa), while the present study presented participants with two different sweet cues and a sweet food. It is possible that the participants in both food cue groups ate more of the cookies than the neutral group because the sweetness of the cue foods was generalizable, thus, creating a craving for sweets or desserts.

Taken together, the snack selection and eating findings present a more complete picture of counteractive control. In the present study, dieters demonstrate counteractive control when selecting foods, but not when actually eating, and do so only when the “temptation” food cue is dissimilar to the food choice to be made. These findings are relevant to everyday activities. Dieters may exert counteractive control when shopping for foods, but when confronted with the desired, unhealthy food, it appears to be more difficult for them to resist eating. In sum, counteractive control is present in some temptation situations, but not others.

There are certain limitations of the present study that must be addressed. First, this study did not use the lexical decision task (used in Fishbach et al., 2003 & Geyskens et al., 2008) to measure goal activation. Replications of this study should use the lexical decision task to get a clearer picture of dieting and eating goal activation. Further, the present study used only female students. Future studies should test counteractive control and its intricacies in males and community samples to increase generalizability of results. Moreover, the present study presented tempting food cues that were both sweet in taste. Future studies should replicate the experiment using sweet and savory cues. This change would possibly allow for greater detection and understanding of the effects of cue specificity.

The present study also has several strengths. First, the study considered cue specificity when examining food selection and counteractive control, and showed that this previously unnoted aspect of the existing research is an important factor that mediates the relation between temptation cues and food choices. Next, the present study allowed for an examination of both food selection and food consumption in the same experiment, providing a cohesive picture of situations dieters face in the real world. Finally, counterbalancing of conditions (snack first and taste test first) accounted for any order effects.

The present research contributes to the current literatures on counteractive control and on the effects of food cues on eating. It presents situations in which counteractive control is elicited and those in which it is more difficult to put into practice. It also demonstrates again that tempting
food cues do exert a significant effect on dieter’s consumption of diet-prohibited food when the temptation cue corresponds to food available to eat. Clearly, the effects of food cues on dieting attitudes and behaviors are complex.
References


Figure 1. Percentage of restrained participants in each cue condition selecting apples and cookies.
Figure 2. Restrained participants exposed to a food cue ate more cookies than those exposed to the neutral cue.
Table 1. Eating data: mean grams eaten and standard deviations.

<table>
<thead>
<tr>
<th>Snack First</th>
<th>Snack First</th>
<th>Snack First</th>
<th>Taste First</th>
<th>Taste First</th>
<th>Taste First</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cookie</td>
<td>Cake</td>
<td>Flower</td>
<td>Cookie</td>
<td>Cake</td>
<td>Flower</td>
<td></td>
</tr>
<tr>
<td>M=40.15</td>
<td>M=44.29</td>
<td>M=25.64</td>
<td>M=42.50</td>
<td>M=45.40</td>
<td>M=25.55</td>
<td>M=38.19</td>
</tr>
<tr>
<td>SD=28.44</td>
<td>SD=48.58</td>
<td>SD=20.82</td>
<td>SD=27.65</td>
<td>SD=40.65</td>
<td>SD=18</td>
<td>SD=33.65</td>
</tr>
<tr>
<td>n=13</td>
<td>n=17</td>
<td>n=14</td>
<td>n=18</td>
<td>n=15</td>
<td>n=11</td>
<td>N=88</td>
</tr>
</tbody>
</table>
Appendix A

Please circle the tick that best corresponds to your rating.

**Cookie Rating Questionnaire**

1. How salty is this cookie?

|________|________|________|________|________|________|________|_______|
|Not at all | Moderately | Totally |

2. How sweet is this cookie?

|________|________|________|________|________|________|________|_______|
|Not at all | Moderately | Totally |

3. How crunchy is this cookie?

|________|________|________|________|________|________|________|_______|
|Not at all | Moderately | Totally |

4. How bitter is this cookie?

|________|________|________|________|________|________|________|_______|
|Not at all | Moderately | Totally |

5. How sour is this cookie?

|________|________|________|________|________|________|________|_______|
|Not at all | Moderately | Totally |

6. How chocolatey is this cookie?

|________|________|________|________|________|________|________|_______|
|Not at all | Moderately | Totally |

7. How good-tasting is this cookie?

|________|________|________|________|________|________|________|_______|
|Not at all | Moderately | Totally |

8. How much do you like this cookie?

|________|________|________|________|________|________|________|_______|
|Not at all | Moderately | Totally |

9. How likely are you to purchase these cookies?

|________|________|________|________|________|________|________|_______|
|Not at all | Moderately | Totally |
Appendix B

Date: ____/____/____

Demographics

Date of birth: ____/____/____

Age: _______

Marital status:  
   _____ Married  
   _____ Living with a partner to whom I’m not married  
   _____ Single  
   _____ Separated  
   _____ Divorced  
   _____ Widowed

Current year in college:  
   _____ Freshman  
   _____ Sophomore  
   _____ Junior  
   _____ Senior  
   _____ Post-Baccalaureate

Ethnicity:  
   _____ African-American  
   _____ American Indian/Alaska Native  
   _____ Asian/Pacific Islander  
   _____ Hispanic  
   _____ Caucasian, not of Hispanic origin  
   _____ Middle Eastern  
   _____ Multi-ethnic  
   _____ Other: please describe_____________________________

Current residence:  
   _____ On campus  
   _____ Off campus  
   _____ Off campus with parent/caregiver

Number of persons living in your current household (including yourself): _____

Average estimated household income:

<table>
<thead>
<tr>
<th>Income Range</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0-$15,000</td>
<td>______</td>
</tr>
<tr>
<td>$16,000-$20,000</td>
<td>______</td>
</tr>
<tr>
<td>$21,000-$30,000</td>
<td>______</td>
</tr>
<tr>
<td>$31,000-$35,000</td>
<td>______</td>
</tr>
<tr>
<td>$36,000-$40,000</td>
<td>______</td>
</tr>
<tr>
<td>$41,000-$45,000</td>
<td>______</td>
</tr>
<tr>
<td>$46,000-$50,000</td>
<td>______</td>
</tr>
<tr>
<td>$51,000-$60,000</td>
<td>______</td>
</tr>
<tr>
<td>$61,000-$75,000</td>
<td>______</td>
</tr>
<tr>
<td>Over $75,000</td>
<td>______</td>
</tr>
</tbody>
</table>
Appendix C

Restraint Scale

The following questions refer to your normal eating pattern and weight fluctuations. Please answer accordingly.

Age ________        Height __________

Sex ________        Weight __________

1. How often are you dieting? (circle one)
   Never        Rarely       Sometimes     Usually      Always

2. What is the maximum amount of weight (in pounds) you have ever lost in one month? (Circle one)
   0-4             5-9            10-14            15-19          20+

3. What is your maximum weight gain within a week? (Circle one)
   0-1           1.1-2            2.1-3             3.1-5          5.1+

4. In a typical week, how much does your weight fluctuate? (Circle one)
   0-1           1.1-2             2.1-3             3.1-5          5.1+

5. Would a weight fluctuation of 5 lbs. affect the way you live your life? (Circle one)
   Not at all         Slightly           Moderately          Very much

6. Do you eat sensibly in front of others and splurge alone? (Circle one)
   Never             Rarely               Often                 Always

7. Do you give too much time and thought to food? (Circle one)
   Never             Rarely               Often                Always

8. Do you have feelings of guilt after overeating? (Circle one)
   Never             Rarely               Often                Always

9. How conscious are you of what you're eating? (Circle one)
   Not at all       Slightly            Moderately          Very much

10. What is your maximum weight ever? __________

11. How many pounds over your desired weight were you at your maximum weight? (Circle one)
   0-1           1-5             6-10             11-20          21+
Appendix D
Consent Form

Informed Consent Form
Department of Psychology, University of Toronto at Mississauga
Investigator: Christine Nguyen
Faculty Sponsor: Janet Polivy, Ph.D.
Perception and Memory Study

Please read this form and ask any questions you have before continuing in the research.

The present research is being conducted by Christine Nguyen, a graduate student at the University of Toronto under the supervision of Professor Janet Polivy. This experiment is investigating the relationship between perceptual ability and memory and will take between 45 and 60 minutes to complete.

Today, you will be performing three paper and pencil memory tasks and filling out questionnaires. You may ask questions at any point during the experiment. On this consent form, you are provided with the contact information of the investigator and you may contact the investigator if questions or concerns about your participation arise.

There are no physical risks of participation. However, you will be presented with several questionnaires that may contain questions that may or may not cause you psychological discomfort. You may refuse to answer any questions.

Benefits of participation include receipt of credit applied to your course and insight into the field of research.

Your participation in the present study is completely voluntary and you may withdraw yourself and your data at any time without penalty. You may also refuse to answer questions. Your data will be kept confidential and shared only with the investigator and research assistants involved in data collection. The investigator intends to present and publish the findings of this study. Your data will not be linked to your name.

If you have questions about your rights as a research participant, please contact the Office of Research Ethics at 416-946-3274 or email ethics.review@utoronto.ca. By signing this consent form, I, __________________________, agree to participate in this experiment.

Participant’s signature_______________________________ Date___________________
Appendix E
Taste Test Consent Form
Informed Consent Form
Department of Psychology, University of Toronto at Mississauga
Taste Perception Task

Please read this form and ask any questions you have before continuing in the research.

This taste perception task is being conducted by Christine Nguyen, a graduate student at the University of Toronto, under the supervision of Professor Janet Polivy. The task will involve tasting and rating chocolate chip cookies on a number of dimensions.

The taste perception task will entail tasting chocolate chip cookies that will be used in an upcoming experiment. You will taste the cookies and rate them on various dimensions. You are free to ask questions at any point during the experiment. On this consent form, you are provided with the contact information of the investigator and you may contact the investigator if questions or concerns about your participation arise.

You may not participate in this taste test if you have food allergies. Please inform the experimenter of any food allergies now.

There are no risks to participating in this taste test. Benefits of the taste test include receipt of credit applied to your course and the opportunity to taste cookies to be used in future research.

Your participation in the present taste task is voluntary and you may withdraw yourself and your data at any time without penalty. You may also refuse to answer questions. Your data will be kept confidential and shared only with the investigator and research assistants involved in data collection. The investigator intends to present and publish the findings of this study. Your data will not be linked to your name.

If you have questions about your rights as a research participant, please contact the Office of Research Ethics at 416-946-3274 or email ethics.review@utoronto.ca.

By signing this consent form, I, ___________________, understand what my participation will entail and I agree to participate in the present task.

Participant’s signature __________________________ Date __________________________
Appendix F

DEBRIEFING SCRIPT

We are getting ready to conclude the experiment. Do you have any questions about anything you did for the study today?

Now, I am going to fill you in about the details of this experiment. First, do you know the purpose of the present study?

You were told that you would be a participant in a perceptions and memory study. This was not the case. We are actually investigating the relationship between food cues, food choice, and eating behavior. There is evidence to suggest that food cues influence people’s dieting goals, their choice of food, and eating behavior. We hope to add to the studies that have already been done in this research area. It was important that you did not know the true purpose of the study because this knowledge may have caused you to respond differently than you did.

Participants were randomly assigned to one of three cue conditions, presented in the form of the pictures you viewed in the first memory task: a neutral cue, a food cue that did not match the food offered, and a food cue that did match the food offered. You were in the ________ condition. The cue condition is the independent variable.

We were interested in what type of snack the participants in each cue condition would choose (the apple or the chocolate chip cookies) and how they then rate the chocolate chip cookies. The chocolate chip cookies you rated will not be used in another experiment. We were only interested in how you, yourself, rated the cookies you tasted. The type of food chosen by the participant and the cookie ratings are the dependent variables.

The questionnaires you answered will help us to understand individual differences that may contribute to dieting goals, food selection, and food consumption after exposure to a food cue.

Does this make sense? Do you have any questions or concerns about the purpose of the study and/or the tasks you performed today?

Do you consent to have your data used and analyzed?

Here are hardcopies of the consent forms you signed at the start of the study and at the start of the taste task. I would like to draw your attention to the contact information of the investigator and her supervisor. If you have questions or concerns about your participation after you leave, please feel free to contact them.

Do you have any questions?

At this time, I would like to remind you how important it is not to discuss the details of this study with any students who may participate in this experiment. If other people are aware of the purposes of this study, it could invalidate their results. Do you have any concerns about this?

Thank you again for your time and participation!