Two Kinds of Overeating: Can We Distinguish Between Disinhibited Eating in Restrained Eaters and Simple Overeating That Occurs in Everyone?

By

Laura Girz

A thesis submitted in conformity with the requirements for the degree of Doctor of Philosophy

Graduate Department of Psychology

University of Toronto

© Copyright by Laura Girz (2013)
Two Kinds of Overeating: Can We Distinguish Between Disinhibited Eating in
Restrained Eaters and Simple Overeating That Occurs in Everyone?

Doctor of Philosophy, 2013

Laura Girz

Department of Psychology
University of Toronto

Abstract

Four studies were conducted to examine whether disinhibited eating among restrained eaters can be differentiated from simple overeating, which occurs among both restrained and unrestrained eaters. We propose that disinhibited eating is caused by the conscious relaxation of inhibitions on food intake. In contrast, simple overeating is an umbrella term encompassing all forms of inadvertent overeating. This includes overeating in response to cues that redefine acceptable intake, and thus allow people to eat more than usual without viewing their food intake as excessive. Disinhibited eating in dieters should result in continued overeating in the absence of factors causing reinhibition, whereas simple overeating does not undermine dietary inhibition and should not result in continued overeating, and may not even be experienced as overeating. Furthermore, unlike simple overeating, disinhibited eating should be accompanied by perceptions that one has eaten too much. Study 1 examines whether restrained eaters who become disinhibited continue to overeat after the disinhibitor is removed. Restrained eaters who were disinhibited by expecting their diets to be broken, and only those restrained eaters, continued to overeat when presented with a second eating opportunity. Studies 2 and 3 assess whether simple
overeating in response to normative cues can be distinguished from disinhibited eating in response to cognitive cues related to thinking the diet is or will be broken. In Study 3, restrained eaters who became disinhibited by thinking that their diets would be broken viewed their food intake as excessive and continued to overeat after the disinhibitor was removed. In contrast, restrained eaters who ate a lot after being informed that other study participants had eaten a large amount did not view their food intake as excessive and did not go on to overeat during a second eating opportunity. Study 4 was designed to further examine the role of awareness of having overeaten in disinhibited eating, but no disinhibition effect was observed.

Overall, the results suggest that disinhibited eating can be distinguished from simple overeating on the basis of whether restrained eaters view their intake as excessive and whether they continue to overeat during a second eating opportunity.
### Table of Contents

Abstract ......................................................................................................................... ii

List of Tables ............................................................................................................... vii

List of Appendices ....................................................................................................... ix

Chapter 1 ..................................................................................................................... 1

  General Introduction .................................................................................................. 1

The relation of disinhibited eating to other constructs ............................................. 4

  Self-control ............................................................................................................... 4

  Impulsivity .............................................................................................................. 5

Individual difference variables that predict disinhibited eating ......................... 6

  Self-esteem ........................................................................................................... 6

  Successful dieting .................................................................................................. 7

Factors that lead restrained eaters (but not unrestrained eaters) to overeat .......... 7

  Cognitive factors .................................................................................................... 7

  Emotion .................................................................................................................. 10

  Exposure to sensory food cues ............................................................................... 11

Factors that lead both restrained and unrestrained eaters to overeat .................... 12

  Exposure to normative cues .................................................................................. 12

Do all of these factors lead to disinhibited eating? .............................................. 13
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does overeating continue after an initial episode of disinhibited eating</td>
<td>14</td>
</tr>
<tr>
<td>Processes that may contribute to disinhibited eating</td>
<td>15</td>
</tr>
<tr>
<td>Self-monitoring</td>
<td>15</td>
</tr>
<tr>
<td>Awareness of amount eaten</td>
<td>15</td>
</tr>
<tr>
<td>Expected characteristics of disinhibited and simple overeating</td>
<td>16</td>
</tr>
<tr>
<td>Summary</td>
<td>17</td>
</tr>
<tr>
<td>The present studies</td>
<td>18</td>
</tr>
<tr>
<td>Chapter 2</td>
<td>20</td>
</tr>
<tr>
<td>Study 1</td>
<td>20</td>
</tr>
<tr>
<td>Method</td>
<td>21</td>
</tr>
<tr>
<td>Results</td>
<td>25</td>
</tr>
<tr>
<td>Discussion</td>
<td>27</td>
</tr>
<tr>
<td>Chapter 3</td>
<td>29</td>
</tr>
<tr>
<td>Study 2</td>
<td>29</td>
</tr>
<tr>
<td>Method</td>
<td>30</td>
</tr>
<tr>
<td>Results</td>
<td>34</td>
</tr>
<tr>
<td>Discussion</td>
<td>38</td>
</tr>
<tr>
<td>Chapter 4</td>
<td>41</td>
</tr>
<tr>
<td>Study 3</td>
<td>41</td>
</tr>
<tr>
<td>Method</td>
<td>41</td>
</tr>
</tbody>
</table>
List of Tables

Table 1: Means and standard deviations for grams of pizza eaten (Study 1)
Table 2: Means and standard deviations for grams of ice cream eaten (Study 1)
Table 3: Means and standard deviations for grams of ice cream eaten (Study 1)
Table 4: Means and standard deviations for responses to the item, “How much of the taste-test food did you eat?” (Study 1)
Table 5: Means and standard deviations for estimations of the amount of pizza eaten by other participants (Study 2)
Table 6: Means and standard deviations for grams of pizza eaten (Study 2)
Table 7: Means and standard deviations for grams of cookies eaten (Study 2)
Table 8: Means and standard deviations for grams of cookies eaten (Study 2)
Table 9: Means and standard deviations for responses to the item, “I ate more pizza than I should have eaten” (Study 2)
Table 10: Means and standard deviations for accuracy of estimated pizza intake (estimated number – number actually eaten; Study 2)
Table 11: Means and standard deviations for estimations of the amount of pizza eaten by other participants (Study 3)
Table 12: Means and standard deviations for grams of pizza eaten (Study 3)
Table 13: Means and standard deviations for grams of cookies eaten (Study 3)
Table 14: Means and standard deviations for grams of cookies eaten (Study 3)
Table 15: Means and standard deviations for responses to the item, “I ate more pizza than I should have eaten” (Study 3)
Table 16: Means and standard deviations for accuracy of estimated pizza intake (estimated number – number actually eaten; Study 3)

Table 17: Means and standard deviations for grams of cookies eaten (Study 4)

Table 18: Means and standard deviations for responses to the item, “I ate more cookies than I should have eaten” (Study 4)

Table 19: Means and standard deviations for accuracy of estimated cookie intake (estimated number – number actually eaten; Study 4)

Table 20: Means and standard deviations for guilt (Study 4)
List of Appendices

Appendix A: Follow-up questionnaire for Study 1
Appendix B: Follow-up questionnaire for Studies 2 and 3
Appendix C: Follow-up questionnaire for Study 4
Chapter 1

General Introduction

Everyone overeats at times; for example, people tend to eat more than they usually would when they celebrate with friends or family, eat favorite or exceptionally palatable foods, are around others who are eating a lot, or are served large portions. These situations represent simple overeating in that people are eating more than they would were the celebration, favorite/palatable foods, or normative cues (others eating a lot, large portions) not present. Simple overeating is defined in this manner because it is very difficult, if not impossible, to determine the absolute amount of food that constitutes overeating (Herman, Polivy, & Leone, 2005). Simple overeating can be considered an umbrella term encompassing all forms of inadvertent overeating, and overeating in response to cues, such as large portions, that redefine acceptable intake, and thus allow people to eat more than usual without viewing their food intake as excessive.

Both restrained eaters (chronic dieters) and unrestrained eaters (non-dieters) are susceptible to simple overeating, as this type of overeating does not presuppose any sort of inhibition on the part of the eater. Unrestrained eaters, by definition, do not attempt to inhibit their eating, and are therefore vulnerable only to simple overeating. In contrast, because restrained eaters attempt to inhibit their food intake, in addition to simple overeating they are vulnerable to disinhibited eating, which occurs when they relax or abandon their dietary inhibitions, and eat an amount or type of food not “allowed” by their diet. Disinhibited eating is reflected in the tendency of restrained eaters to overeat after their diet has been broken (e.g., Herman & Mack, 1975), or when they have consumed forbidden foods or expect to break their diet in the near future (Knight & Boland, 1989; Ruderman, Belzer, & Halperin,
1985; Tomarken & Kirschenbaum, 1984). Simple overeating differs from disinhibited overeating in that simple overeating does not necessarily interfere with or reflect abandonment of the dietary inhibitions of restrained eaters, whereas disinhibited (over)eating results from the removal of these inhibitions.

Regardless of the types of eating inhibitions that restrained eaters impose upon themselves, it is possible for them to overeat without interfering with these inhibitions. One way that this happens is when restrained eaters overeat without realizing they have done so. Although they have technically broken their dietary rules, if they do not realize this, their inhibitions will remain intact. Another way that restrained eaters can overeat without interfering with their dietary inhibitions is when they are exposed to cues that make it acceptable to eat more than usual without viewing this increased intake as excessive.

Although restrained eaters have dietary rules, following these rules is probably ambiguous in many situations. For example, a restrained eater who sets out to eat small portions may not have an exact portion size in mind, but rather may limit portions by eating only half of what is on the plate or eating less food than her eating companions. If portion sizes are large or her companions eat a large amount, then the restrained eater may eat more than usual without construing this as overeating. In such a case, we would expect her dietary inhibitions to remain intact. Likewise, for restrained eaters who attempt to avoid forbidden, high-calorie foods, it may not always be obvious whether certain foods should be avoided, as marketing and nutritional claims may influence whether restrained eaters view a food as forbidden. For example, a restrained eater who would usually avoid eating cookies might not consider cookies labeled as high in whole grains and trans-fat free to be a forbidden food. In such a
case, the restrained eater might eat a lot of these “healthy” cookies without breaking her dietary inhibitions (Provencher, Polivy, & Herman, 2009).

Numerous studies have shown that restrained eaters overeat in response to a variety of factors that do not increase the amount eaten by unrestrained eaters. These factors include the consumption of high-calorie foods (e.g., Herman & Mack, 1975), emotional distress (e.g., Heatherton, Herman, & Polivy, 1991), and exposure to sensory food cues (e.g., Jansen & van den Hout, 1991). This phenomenon has been termed disinhibited eating because it is assumed that restrained eaters who overeat in these circumstances are no longer inhibiting their food intake, but it is possible that some of these factors induce simple overeating rather than disinhibited eating in restrained eaters. Although many studies have examined the factors that cause restrained eaters to overeat, the processes underlying disinhibited eating, and the association between disinhibited eating and other related constructs have not been fully explored. We propose that disinhibited eating is caused by the conscious relaxation of inhibitions on food intake. In contrast, we consider simple overeating to be an umbrella term encompassing all forms of inadvertent overeating, and/or overeating in response to normative cues, such as large portions, that redefine acceptable intake, and thus allow people to eat more than usual without viewing their food intake as excessive. This dissertation aims to explore the mechanisms underlying disinhibited eating and to experimentally differentiate disinhibited eating from simple overeating.

It is important to note that the term disinhibition has been used across disciplines and has multiple meanings. In the present dissertation, the terms disinhibition and disinhibited eating do not refer to disinhibition resulting from neurocognitive deficits or the consumption of substances such as alcohol. Rather these terms refer to a very circumscribed type of
disinhibition related to the conscious relaxation of eating inhibitions. This type of disinhibition is typified by the tendency of restrained eaters to overeat after their diet has been broken, but is also present when restrained eaters consume forbidden foods or expect to break their diet. All of these instances represent the abandonment of the diet upon the realization or expectation that the diet has been or is going to be violated anyway. Whether other factors, such as distraction, distress, or sensory food cues also elicit disinhibited eating remains unclear.

The relation of disinhibited eating to other constructs

The tendency to become disinhibited might be confused with impaired self-control or high levels of impulsivity; however, current evidence indicates that these constructs do not account for disinhibited eating.

Self-control

Although restraining one’s eating is clearly a form of self-control, the relation between global self-control and eating behavior is less clear. Self-control, as measured by the Self-Control Scale, has been shown to be associated with lower scores on the Eating Disorders Inventory, including lower drive for thinness and body dissatisfaction (Tangney, Baumeister, & Boone, 2004). However, restrained eaters with high levels of self-control, as measured by the Self-Control Schedule, have been shown to eat more after consuming high-calorie foods than both unrestrained eaters and restrained eaters with low levels of self-control (Kirschenbaum & Dykman, 1991). This counterintuitive finding should be replicated, but it is possible that restrained eaters who report high levels of self-control are more rigid about controlling their food intake. If this were the case, then they may be more likely to give up attempts to control their eating after consuming a high-calorie food breaks their diet
(Westenhoefer, Stunkard, & Pudel, 1999). Alternatively, it is possible that restrained eaters who exert high levels of control across a variety of domains may have diminished self-control strength to resist tempting food.

According to Muraven and Baumeister (2000), the exertion of self-control is analogous to muscular exertion. More specifically, an individual’s ability to self-regulate is a function of his or her level of self-control, and only a certain amount of strength is available for all forms of self-regulation at any given time. In the short-term this strength is depleted as it is used and replenished with rest, while in the long-term, exertion of self-control may increase self-control strength. Several studies of eating behavior also support this conceptualization of self-control strength. Restrained eaters have been shown to eat more after tasks that require self-control, such as resisting tempting food, inhibiting emotions while watching a sad video, or having to choose between answering correctly or conforming to the answers of others, than they do after control tasks that do not require self-control (Kahan, Polivy, & Herman, 2003; Soetens, Braet, Vlierberghe, & Roets, 2008; Vohs & Heatherton, 2000). However, depletion of self-control strength cannot explain why restrained eaters overeat after consuming high-calorie foods as it is unlikely that consuming these foods requires a great deal of self-control strength.

**Impulsivity**

Findings regarding the association between behavioral impulsivity and food intake have been mixed, with some studies showing that greater behavioral impulsivity, as measured by stop-signal reaction time or commission errors on go/no-go tasks, is linked to increased food intake for restrained eaters (Jansen et al., 2009; Meule, Lukito, Voegele, Kuebler, 2011) or all participants (Guerrieri et al., 2007b), and other studies showing no
association between behavioral impulsivity and food intake (Guerrieri, Nederkoorn, & Jansen, 2007, 2008). Self-reported impulsivity has also been associated with greater food intake (Guerrieri et al., 2007a; Guerrieri et al., 2007b). Furthermore, there is preliminary evidence that manipulations designed to induce impulsivity increase food intake for restrained eaters but not unrestrained eaters (Guerrieri, Nederkoorn, Schrooten, Martijn, & Jansen, 2009). However, Jansen et al. (2009) found that impulsivity was associated with overall food intake rather than with overeating in response to a disinhibitor. This suggests that high impulsivity may be more related to a general propensity to overeat than it is to disinhibited eating, but further research is needed to confirm this finding.

**Individual difference variables that predict disinhibited eating**

In discussing disinhibition, it is also important to note that not all restrained eaters are equally prone to disinhibited eating.

*Self-esteem*

Restrained eaters who have high self-esteem do not tend to overeat after consuming high-calorie foods or in response to negative emotion, whereas restrained eaters who have low self-esteem do tend overeat in response to these manipulations (Heatherton, Herman, & Polivy, 1991; Polivy, Heatherton, & Herman, 1988). Explanations of the processes that lead to disinhibition should, therefore, account for why low-self-esteem, but not high self-esteem, participants are more vulnerable to disinhibited eating. For example, restrained eaters with low self-esteem may lack confidence in their ability to withstand temptation (Polivy, Heatherton, & Herman, 1988). They may also be more adversely affected by ego-threats such that they have greater motivation to escape their negative emotions by overeating (Heatherton, Herman, & Polivy, 1991). Although these explanations are plausible, a more
thorough exploration of differences between low and high self-esteem restrained eaters could help to illuminate mechanisms underlying disinhibited eating.

Successful dieting

Successful dieting is a relatively new construct that may also account for the propensity to become disinhibited. Successful dieters have been shown to respond more quickly than unsuccessful dieters to diet-related words following fattening food primes (Fishbach, Friedman, & Kruglanski, 2003). This suggests that successful dieters are able to respond to temptation by focusing on their dieting goals, but successful dieters have not been found to eat less in response to food cues (Nguyen, in preparation). No studies to date have examined whether successful dieters eat less in response to a disinhibitor.

Factors that lead to restrained eaters (but not unrestrained eaters) to overeat

Cognitive factors

Manipulations that undermine restrained eaters’ motivation or ability to inhibit their food intake tend to increase the amount that they eat. In particular, restrained eaters tend to overeat when they believe that their diet has been broken or when they anticipate that it will be broken. In the classic experimental paradigm demonstrating this effect, participants are asked to consume a milkshake preload before tasting and rating a different high-calorie food (e.g., Herman & Mack, 1975). Unrestrained eaters regulate their eating such that they eat less after consuming the milkshake, whereas restrained eaters are said to counterregulate because they actually eat more after consuming the milkshake. This effect appears to be cognitive rather than physiological in nature, as restrained eaters counterregulate when they are merely told that a preload is high-calorie, but not when they are told that an identical preload is low-calorie (Polivy, 1976; Spencer & Fremouw, 1979; Woody, Costanzo, Liefer, & Conger,
Likewise, restrained eaters tend to become disinhibited after consuming forbidden foods, regardless of the number of calories they contain, but not after consuming high-calorie “health” foods (Knight & Boland, 1989). Furthermore, restrained eaters who expect to eat high-calorie or forbidden foods in the near future also exhibit disinhibited eating patterns (Knight & Boland, 1989; Ruderman, Belzer, & Halperin, 1985; Tomarken & Kirschenbaum, 1984).

The specific cognitions that cause or allow restrained eaters to overeat in response to these manipulations are not fully understood. In what they term the “what the hell effect”, Polivy and Herman (1985) suggested that restrained eaters counterregulate because they give up all attempts to control their food intake once their diet has been violated. Essentially, once a restrained eater has decided that his or her diet is broken for that day, further restraint is no longer necessary and the individual eats what he or she wants, at least until he or she becomes satiated (Herman, Polivy, & Esses, 1987). Several studies have examined the thought processes that restrained eaters report in response to manipulations designed to induce overeating. Restrained eaters have been shown to report lower perceived control after smelling palatable foods (Jansen & van den Hout, 1991), and more thoughts about intentions to exert control over eating, but not about a loss of control over eating, after consuming a preload (French, 1992). Other studies have failed to find evidence that disinhibitive cognitions (e.g., “My day is ruined now, I might as well continue to eat”, “I cannot control myself”) are more common among restrained eaters who have consumed a preload or have smelled palatable food (Jansen, Merckelbach, Oosterlaan, Tuiten, & van den Hout, 1988; Nederkoorn & Jansen, 2002). It is possible that restrained eaters’ cognitions are similar in content but more positive in tone than the disinhibitive cognitions that have been previously
measured. For example, restrained eaters who become disinhibited and overeat may not feel out of control, but rather, may feel confident that they can eat what they want in the present and make up for it later. Likewise, they may view this as an indulgence rather than viewing their day as being ruined. Alternatively, it may difficult to measure cognitions without changing them or forcing people to pay attention to thoughts they do not normally attend to (and might be embarrassed to report accurately).

Cognitive manipulations that do not necessarily break restrained eaters’ diets can also lead them to overeat. For example, restrained eaters who expect to go on a low-calorie diet eat more than do restrained eaters who do not expect to go on a diet (Urbszat, Herman, & Polivy, 2002). This effect may occur because restrained eaters take advantage of the opportunity to eat and enjoy the foods that will be forbidden on their diet (Urbszat et al., 2002) and, perhaps, because they have an excuse to eat a lot, as they know that they will compensate for this increased intake during their upcoming diet.

Distraction also increases the amount eaten by restrained eaters (e.g., Boon, Stroebe, Schut, & Ijntema, 2002; Ward & Mann, 2000). Distraction manipulations require cognitive resources and, therefore, leave fewer resources available for cognitive restraint. Restrained eaters rely on cognitive restraint to inhibit the amount that they eat, so, when this restraint is disrupted, they tend to eat freely rather than restricting their food intake. This process does not necessarily result from restrained eaters having knowingly broken their diets, but rather seems to result from their inability to allocate sufficient attention to restraining the amount that they are eating while under cognitive load. It is possible, then, that overeating in response to distraction is a form of inadvertent overeating rather than a form of disinhibited
eating. Whether restrained eaters become disinhibited following a distraction manipulation probably depends on whether they are aware that they have overeaten.

*Emotion*

Restrained eaters tend to overeat in response to anxiety caused by threats to their self-esteem, but not in response to anxiety caused by physical threats, such as electric shock (e.g., Heatherton, Herman, & Polivy, 1991). In what they term *escape theory*, Heatherton and Baumeister (1991) theorized that restrained eaters hold themselves to high standards and experience high levels of self-awareness and negative affect when they fail to meet these standards. To alleviate this aversive self-awareness and escape unpleasant emotions, they revert to a lower level of cognition and narrow their focus to the immediate environment. For example, they may focus on sensory aspects of the food that they are eating rather than on higher-level cognitions about weight loss goals. Although disengagement of higher-level cognition can protect restrained eaters from negative emotion, it also prevents them from inhibiting their eating and, thus, can cause (or allow) them to overeat.

There is some evidence that restrained eaters also overeat in response to manipulations that elicit positive emotion (Cools, Schotte, & McNally, 1992). According to Stroebe (2008), strong emotions, regardless of whether they are positive or negative, require cognitive resources and, therefore, diminish the resources available for the control of food intake. In essence, strong emotion serves as a form of distraction and increases eating among restrained eaters in the same manner as all other forms of distraction. With regard to negative emotion, this explanation differs from that of escape theory. The fact that restrained eaters are more likely to overeat in response to threats to self-esteem than they are in response to
physical threats appears to provide evidence for escape theory, but Stroebe (2008) argues that threats to self-esteem are more distracting than are physical threats.

It may be possible to disentangle these two hypotheses by examining whether restrained eaters are actually disinhibited when they overeat in response to negative emotion. According to escape theory, restrained eaters are focused on the food that they are eating and, therefore, are likely to have at least a general sense of whether they are eating a lot. Restrained eaters who realize they have eaten a lot may remain disinhibited and continue to overeat because they know that they have already broken their diet. In contrast, if restrained eaters are overeating because they are distracted by negative emotions, they may not realize that they have eaten a lot. If this were the case, then their inhibition would be intact and they would not continue to overeat. As discussed above in the cognitive factors section, it is not clear that distraction precludes awareness of having overeaten, but tests of non-emotional distractors could be used to show whether or not this is the case. Manipulations involving negative emotion could then be compared to manipulations involving distraction to see if they have the same effects on both awareness of having overeaten and subsequent overeating.

*Exposure to sensory food cues*

Restrained eaters have been shown to overeat after being exposed to the sight and/or smell of palatable food (Fedoroff, Polivy, & Herman, 1997, 2003; Jansen & van den Hout, 1991; Rogers & Hill, 1989). Cravings for cued foods have been proposed as a mediator of the relation between cue exposure and increased intake of the cued food (Fedoroff, Polivy, & Herman, 1997, 2003; Jansen & van den Hout, 1991). Specifically, restrained eaters may eat more because exposure to cues that are conditioned to a particular food elicits cravings for that food (Weingarten, 1985). In line with this explanation, there is some evidence that
restrained eaters report greater hunger and desire to eat cued foods compared to non-cued foods, and that cravings for a cued food are positively correlated with intake of that food for restrained eaters but not unrestrained eaters (Fedoroff, Polivy, and Herman, 2003). There is also evidence that exposure to palatable food cues increases attention to eating-related words and decreases attention to diet-related words for unsuccessful restrained eaters (Papies, Stroebe, & Aarts, 2008). Overall, then, increased cravings for cued foods and activation of eating-related goals may each play a role in the responsiveness of restrained eaters to sensory food cues. However, it is unclear why simply tasting and rating food, which exposes participants to the sight and smell of the food, does not lead restrained eaters to overeat. It appears that pre-exposure to palatable food cues (i.e., exposure to the food cue prior to access to the food) is required to increase the amount eaten by restrained eaters. Whether pre-exposure simply generates stronger cravings and greater activation of eating goals or whether a different process is involved has yet to be explored.

Factors that lead both restrained and unrestrained eaters to overeat

Exposure to normative cues

Various normative cues help to provide information about what or how much one should eat in a given situation. Such cues include portion size (e.g., Diliberti, Bordi, Conklin, Roe, & Rolls, 2004; Wansink & Kim, 2005) and the amount that others are eating (see Herman, Roth, & Polivy, 2003). Unlike sensory cues, however, normative cues appear to influence the consumption of both restrained and unrestrained eaters more or less equally (Herman & Polivy, 2008). Clearly, unrestrained eaters who eat more in response to normative cues will not become disinhibited, because they were never inhibited in the first
place. It less clear, however, whether normative cues can disrupt restrained eaters’ restraint and cause them to become disinhibited.

**Do all of these factors lead to disinhibited eating?**

When restrained eaters eat more than unrestrained eaters do in response to an experimental manipulation, they are generally described as being disinhibited. It is entirely possible, however, for restrained eaters to eat a lot without having become disinhibited. For example, it is possible that certain cues exert subtle influences on restrained eaters and, thus, lead them to eat more than they would otherwise eat without realizing that they have done so. Alternatively, cues may increase the amount that is acceptable to eat such that restrained eaters are aware of how much they are eating, but do not perceive themselves to be overeating. In these cases, it could be said that these cues cause “overeating,” but not disinhibition.

Herman, Polivy, and Leone (2005) proposed a distinction between overeating due to environmental factors, such as portion size and modeling, and overeating due to disinhibitory factors, such as emotional distress and consumption of high-calorie preloads. This distinction was based on the observation that both restrained and unrestrained eaters respond to environmental factors, whereas only restrained eaters respond to disinhibitory factors. Although this is a logical basis for distinguishing two types of overeating, it is not clear that emotional distress actually causes disinhibition or that overeating in response to environmental factors does not cause disinhibition. Further research is required to categorize factors that cause overeating according to whether they lead to disinhibited eating or simple overeating. Restrained eaters who realize that they have broken their diets are thought to become disinhibited and overeat because the broken diet renders further restraint futile.
Therefore, regardless of whether they have actually overeaten, restrained eaters who believe that they have overeaten should become disinhibited and continue to overeat, whereas restrained eaters who believe that their diet is intact should not become disinhibited.

According to this distinction between disinhibited eating and simple overeating, cognitive manipulations that involve preloads or anticipated preloads should lead to disinhibited eating because these manipulations lead restrained eaters to believe that their diet is broken or will be broken. Factors such as distraction, emotion, sensory cues, and normative cues all appear to increase eating for other reasons, but whether they also cause disinhibition and subsequent overeating should depend on whether restrained eaters are aware that they have overeaten or define their behavior as overeating.

**Does overeating continue after an initial episode of disinhibited eating?**

According to the “what the hell effect”, restrained eaters who have broken their diet during an initial eating episode should subsequently continue to overeat, at least for the rest of the day. Although several studies have shown that restrained eaters do not continue to overeat after an initial episode of disinhibited eating (Jansen, Swijgman, & van den Hout, 1990; Knight & Boland, 1989; Provencher, Polivy, & Herman, 2009; Tomiyama, Moskovich, Haltom, Ju, & Mann, 2009), each of these studies relied on self-reported eating behavior. It is possible that restrained eaters are less likely to overeat when they are required to self-monitor their food intake. Alternatively, restrained eaters may not accurately report episodes of overeating, either because they are embarrassed to do so or because they failed to keep track of the amount that they ate. The results of Knight and Boland’s studies (1989) raise a third possibility in showing that restrained eaters do not necessarily eat more after becoming disinhibited, but rather are more likely to eat forbidden foods. Laboratory studies
measuring food selection and consumption following an initial episode of disinhibited eating are required to determine whether restrained eaters continue to overeat and/or are more likely to eat forbidden foods once they are disinhibited.

**Processes that may contribute to disinhibited eating**

*Self-monitoring*

Restrained eaters cognitively control their food intake, which necessitates that they keep track of what they are eating so that they can determine whether they have eaten more than their diet allows. According to Kirschenbaum (1987), self-regulatory failure is likely to occur when people fail to pay systematic attention to the target behavior. In the case of dieting, failure to pay attention to how much one is eating may cause or allow for overeating to occur. Of course, some restrained eaters may avoid certain foods rather than limiting the quantity that they eat, which would not require the same amount of monitoring. Assuming, however, that many restrained eaters are attempting to limit the amount that they eat, we would expect disinhibited eating to be accompanied by a decrease in self-monitoring such that restrained eaters are less accurate in reporting their intake when disinhibited.

*Awareness of amount eaten*

Restrained eaters may overeat in response to a variety of cues, but it is unlikely that they will become disinhibited and continue to overeat unless they are aware that they have eaten more than their diet allows. Cues that lead restrained eaters to overeat without realizing that they have done so should not influence future eating behavior because these cues have not disrupted restrained eaters’ inhibition. On the other hand, one can be aware that one has eaten a larger amount but not define this as excessive (as when a model eats more so that the individual eats more than when alone, but still less than the model). This does not mean,
however, that restrained eaters must carefully self-monitor in order to realize they have overeaten. Instead, a sense of having eaten more than they should have could be enough to undermine their attempts at self-control.

It is not clear, however, whether restrained eaters must be aware that they are eating a high-calorie food while they are in the process of eating for disinhibition to occur, or whether finding out later that the food they ate was high in calories would be sufficient to cause disinhibition. Even if finding out that one has overeaten after the fact leads to disinhibition, it is reasonable to assume that there would be some sort of time limit on this effect. For example, it is unlikely that a restrained eater who finds out that she mistakenly consumed a high-calorie food a week ago would become disinhibited by this information.

**Expected characteristics of disinhibited and simple overeating**

Overall, we expect disinhibited eating to be characterized by an awareness of having overeaten or having broken one’s diet, accompanied by a lack of self-monitoring. Furthermore, once restrained eaters have become disinhibited, we expect that they will remain disinhibited and continue to overeat. Restrained eaters who become disinhibited are no longer trying to cognitively inhibit their food intake, so they would not be expected to keep careful track of how much they are eating. At the same time, their inhibition should be disrupted when they realize that they have eaten more than their diet allows or have eaten foods that are forbidden on their diet. Once restrained eaters conclude that their diet has been broken, this should undermine their motivation to control their eating for the remainder of the day as they have already surpassed their diet boundary.

We would expect simple overeating to be characterized by perceptions that one’s diet is intact. Cues that increase the amount that people eat outside of their awareness could lead
to simple overeating, as could cues that increase the amount that it is acceptable to eat. With regard to self-monitoring, restrained eaters who overeat in a non-disinhibited manner may or may not keep track of the amount that they are eating. It is unclear which factors lead to simple overeating, so it is difficult to determine whether self-monitoring plays a role in this type of overeating. For example, if distraction were found to lead to simple overeating, then the dearth of cognitive resources available to self-monitor could actually be said to have caused this overeating. In contrast, restrained eaters who are served large portions may be self-monitoring, but may overeat because they underestimate their intake or do not perceive their intake as excessive because a large amount of food remains on the plate (e.g., Wansink, Painter & North, 2005). As the literature presented earlier indicates, many different factors could potentially cause simple overeating and the mechanisms underlying each of these factors may be quite different, so it may not be possible to generalize about the role the processes such as self-monitoring play in this type of overeating. However, we do expect that all forms of simple overeating are similar in that they do not lead to further overeating. Restrained eaters who inadvertently overeat should view their diets as being intact, and, thus, should have no reason to continue to overeat.

Summary

Cognitive manipulations, including perceptions that one has overeaten or will soon overeat, anticipation of future overeating, and distraction, tend to increase the amount eaten by restrained eaters. Overeating in response to perceptions that one’s diet has been broken appears to typify disinhibited eating; however, it is less clear whether overeating in response to distraction represents disinhibited eating or inadvertent overeating. Restrained eaters also tend to overeat in response to threats to their self-esteem, either because in trying to escape
from aversive self-awareness and resultant negative emotion they focus on the food in front of them and (over)eat it, or because they are distracted by the strong emotions that they are experiencing. In addition, restrained eaters tend to overeat in response to sensory cues, such as the sight and smell of food, possibly because such cues induce cravings. Normative food cues, such as modeling or portion size, provide information about what and how much one should eat and tend to increase the amount eaten by both restrained and unrestrained eaters. Each of these factors appears to increase eating for a different reason, but this does not preclude the possibility that some of these factors may also elicit disinhibited eating.

The present studies

The following studies were designed to examine whether restrained eaters continue to overeat after becoming disinhibited, to differentiate disinhibited eating from simple overeating, and to explore the processes that underlie disinhibited eating.

Study 1 examines whether restrained eaters continue to overeat once they are disinhibited or whether their increased consumption is limited to a single eating episode. One of the proposed characteristics of disinhibited eating is the tendency to continue to overeat once disinhibited, but several studies have failed to find continued overeating following diet violations. All of these studies analyzed retrospective self-reported food intake, however, and it is quite possible that restrained eaters underreport their food intake when they overeat, or misremember what they ate when they were disinhibited.

Studies 2 and 3 assess whether (simple) overeating in response to normative cues can be distinguished from (disinhibited) overeating in response to cognitive cues related to thinking the diet is or will be broken. Specifically, it was hypothesized that restrained eaters would become disinhibited and continue to overeat when they expected to consume a
milkshake preload, but that they would eat more without becoming disinhibited when given
information showing that other participants ate a lot (i.e., eating a lot is normative). Studies 2
and 3 were also designed to test the hypothesis that disinhibited eating is characterized by an
awareness of having overeaten as well as a lack of self-monitoring of exactly how much one
has eaten.

Study 4 examines whether restrained eaters must be aware that they are consuming a
high-calorie food while eating it for disinhibition to occur, or whether finding out in
retrospect that they had consumed a high-calorie food also causes disinhibition. If restrained
eaters tend to become disinhibited because eating high-calorie foods breaks their diet, then it
should not matter at what point they find out that the food was high in calories. This study,
therefore, examines whether the patterns of disinhibition exhibited by restrained eaters are
consistent with the “what the hell” effect.
Chapter 2

Study 1

Restrained eaters are chronic dieters who attempt to cognitively control their food intake in order to lose weight or maintain their weight. When this cognitive control is intact, restrained eaters are able to inhibit their eating, but factors that interfere with this control can cause restrained eaters to become disinhibited and overeat. Restrained eaters who perceive that they have broken their diets tend to overeat (e.g., Herman & Mack, 1975). Polivy and Herman (1985) speculated that restrained eaters who have broken their diets have no further reason to inhibit their intake, and that they, therefore, continue to eat as much as they want during that episode, and possibly for the rest of the day. However, several studies have found that restrained eaters do not eat more than usual for the remainder of the day following a diet violation (Jansen, Swijgman, & van den Hout, 1990; Knight & Boland, 1989; Provencher, Polivy, & Herman, 2009; Tomiyama, Moskovitch, Haltom, Ju, & Mann, 2009). It is not clear how reliable these findings are, though, as the data in all three studies were based on retrospective self-reported food intake. Restrained eaters may be unable or unwilling to accurately recall or report food intake when they overeat, so the purpose of the present study was to experimentally examine whether restrained eaters continue to overeat in the laboratory after an initial episode of disinhibited eating.

In the following study, participants were assigned to either a control condition or a milkshake postload condition. The milkshake postload was expected to elicit disinhibited eating in restrained eaters, as previous studies have shown that expectations that they will break their diet in the near future cause restrained eaters to become disinhibited and overeat
(Knight & Boland, 1989; Ruderman, Belzer, & Halperin, 1985; Tomarken & Kirschenbaum, 1984). Specifically, we expected that restrained eaters in the milkshake condition would eat more than both unrestrained eaters in the milkshake condition and restrained eaters in the control condition. All participants were then given a surprise ice cream taste test. It was hypothesized that restrained eaters who became disinhibited and overate in the milkshake condition would continue to overeat during the ice cream taste test.

Method

Participants

Participants were 78 female students enrolled in the introductory psychology subject pool. The mean age of participants was 20.37 (SD = 3.54). The Restraint Scale (Herman, Polivy, & Silver, 1979) was used to categorize participants as restrained eaters (scoring 15 or higher) or unrestrained eaters (scoring below 15). Body mass index was significantly higher for restrained eaters (M = 25.73, SD = 5.12) than for unrestrained eaters (M = 21.82, SD = 3.93). No interactions with condition were observed for either restraint scores or body mass index.

Materials

Pizza. Participants were served a plate with 36 three-cheese flavored Bagel Bites brand pizza snacks for the first taste test. The pizza snacks were heated in the microwave and the top layer of pizza snacks was replaced for each participant. Each pizza snack weighed approximately 22 grams.

Ice cream. Participants were served three flavors of ice cream—chocolate, vanilla, and butterscotch—for the second taste test. Each flavor of ice cream was presented to the participant in a container holding seven cups. The ice cream was heaped and lumped over the
top of the container so that participants could eat a large amount without this being obvious
to the experimenter. Along with the three containers of ice cream, participants were given an
ice cream scoop and a bowl and spoon with which to eat.

**Measures**

*Affect and hunger ratings.* Participants responded to ten items regarding their current
emotions and hunger. These included ratings of happiness, anger, desire to eat, anxiety,
boredom, hunger, fullness, calmness, sadness, and estimates of how much they could
currently eat. Participants rated each item using a visual analog scale (e.g., “not at all happy”
to “very happy”).

*Taste ratings.* Participants filled out taste rating questionnaires for both the pizza
snacks and ice cream. Using a visual analog scale, they were asked to rate how salty, sweet,
crunchy, bitter, sour, and good-tasting each food was (from “not at all” to “totally”).

*Follow-up questionnaire.* Participants responded to a number of questions assessing
awareness of amount eaten and self-reported reasons for eating. This questionnaire included
the question “How much of the taste-test foods did you eat?” (from “the minimum possible
to do the task” to “as much as I could comfortably eat”), as well as questions about the
factors that influenced their pizza intake (taste, liking, hunger, mood, etc).

*Restraint Scale* (Herman, Polivy, & Silver, 1979). The Restraint Scale is an 11-item
measure, which includes items assessing concern about dieting (e.g., “How conscious are you
of what you’re eating?”) and weight fluctuations (e.g., “What is your maximum weight gain
within one week?”). Total scores range from 0 to 35, with higher scores indicating higher
levels of dietary restraint. *Procedure*
Participants were scheduled for 60-minute individual sessions between the hours of 11:00 am and 8:00 pm. In order to standardize hunger, all participants were told to refrain from eating for at least three hours before participating in the study. Upon arrival at the laboratory, the participant was seated at a table in a private room. After consenting to participate in the study, participants were told that they would be tasting and rating a potential new pizza product as part of a market research study. Participants in the control condition were told that they would be asked to fill out questionnaires following the pizza taste test. Participants in the milkshake condition were told that, following the pizza taste test, they would be asked to drink a large milkshake and complete a simple memory task in order to test the effects of sugar on memory.

Participants were asked to fill out the affect and hunger rating questionnaire before the pizza taste test. They were then presented with a plate of pizza snacks, a glass of water, and a taste-rating form for the pizza. Participants were informed that there was plenty of pizza and that they should feel free to eat as much as they would like to make the ratings. All participants were given ten minutes to complete the taste test. The plate of pizza was weighed out of sight of participants both before and after the taste test so that the total grams of pizza eaten could be calculated.

After the pizza taste test, participants in both the control and milkshake conditions were asked to fill out the affect and hunger rating questionnaire a second time. They were then presented with a surprise second taste test in which they were asked to taste and rate three flavors of ice cream (chocolate, vanilla, and butterscotch). Participants in the control condition were told that the experiment was not taking enough time for them to receive credit, so they would need to complete a second taste test. Participants in the milkshake
condition were told that the blender was broken and that they would be asked to taste and rate ice cream rather than drinking the large milkshake and completing the memory task.

For the ice cream taste test, participants were given three containers of ice cream, an ice cream scoop, a bowl and spoon, a glass of water, and a taste-rating form for each flavor of the ice cream. Participants were informed that there was plenty of ice cream and that they should feel free to eat as much as they would like to make the ratings. All participants were given ten minutes to complete the taste test. The containers of ice cream were weighed out of sight of participants both before and after the taste test so that the total grams of ice cream eaten could be calculated.

Following the ice cream taste test, participants filled out the Restraint Scale and the follow-up questionnaire. The experimenter then measured their height and weight. In order to probe for suspicion or to determine whether the participant was able to guess the actual purpose of the study, participants were then asked what they thought the true purpose of the study was. Finally, the experimenter debriefed the participant and provided her with the full details of the study.

Data analysis

Condition x Restraint analyses of covariance and variance were conducted for the dependent variables of interest, which included grams of pizza eaten, grams of ice cream eaten, and self-reported food intake. Hunger and liking for the food were controlled in the analyses for grams of pizza eaten, as hunger and taste/palatability are generally recognized as the prime drivers of food intake (Vartanian, Herman, & Wansink, 2008). Comparisons were conducted using the Sidak test. When data violated assumptions of homogeneity of variance, this was noted in the results section and log transformations of the dependent variable were
used to correct this. A discontinuity between the eating behavior of restrained and unrestrained eaters has been observed (Herman & Polivy, 1975, so restraint was treated as a dichotomous rather than a continuous variable in the analyses.

Results

Means and standard deviations for grams of pizza eaten are presented in Table 1. A Condition x Restraint ANCOVA with grams of pizza as the dependent variable, and with hunger and liking for the pizza as covariates, was conducted. No significant Condition, $F_{(1, 70)} = 2.144, p = 0.148$, Restraint, $F_{(1, 70)} = 2.924, p = 0.091$, or Condition x Restraint, $F_{(1, 70)} = 2.44, p = 0.123$, effects were observed. Although the overall ANOVA results were not significant, several differences between cells had been predicted. On the basis of these predictions, planned comparisons were conducted to compare the amount eaten by restrained eaters in the milkshake condition to the amount eaten by unrestrained eaters in the milkshake condition, as well as to the amount eaten by restrained eaters in the control condition. Restrained eaters in the milkshake condition ate significantly more pizza than did unrestrained eaters in the milkshake condition ($p = 0.03$). In addition, restrained eaters in the milkshake condition ate more pizza than did restrained eaters in the control condition ($p = 0.04$).

Means and standard deviations for grams of ice cream eaten are presented in Tables 2 and 3. A Condition x Restraint ANOVA with grams of ice cream (transformed using natural log) as the dependent variable was conducted. No Condition, $F_{(1, 65)} = 1.53, p = 0.22$, Restraint, $F_{(1, 65)} = 2.46, p = 0.12$, or Condition x Restraint, $F_{(1, 65)} = 0.06, p = 0.80$, effects were found. However, we were primarily interested in restrained eaters who became disinhibited by the milkshake manipulation, so we ran a median split on grams of pizza eaten
(133.85 grams) and used this to divide participants by the amount of pizza eaten (Amount). A Condition x Restraint x Amount ANOVA with grams of ice cream (transformed using natural log) as the dependent variable was conducted. A significant 3-way interaction between Condition, Restraint, and Amount, $F_{(1, 61)} = 5.32, p = 0.03$, was observed. Planned comparisons showed that, among participants in the milkshake condition, restrained eaters who ate a lot of pizza ate more ice cream than did unrestrained eaters who ate a lot of pizza ($p = 0.04$). In the control condition, no differences were observed between restrained eaters who ate a lot of pizza and unrestrained eaters who ate a lot of pizza ($p = 0.77$). For restrained eaters, grams of pizza eaten were marginally correlated with grams of ice cream eaten in the milkshake condition, $r = 0.50, p = 0.07$, but not in the control condition, $r = -0.16, p = 0.54$.

To examine whether awareness of having eaten a large amount was associated with disinhibited eating, a Condition x Restraint x Amount ANOVA with participant responses to the item, “How much of the taste-test foods did you eat?” (from 1 = “the minimum possible to do the task” to 7 = “as much as I could comfortably eat”) as the dependent variable (see Table 4). Participants who ate a lot of pizza reported having eaten more than did participants who ate little pizza, $F_{(1, 68)} = 51.59, p < 0.01$; however, this main effect was qualified by a three-way interaction between Condition, Restraint, and Amount, $F_{(1, 68)} = 8.34, p = 0.01$. Planned comparisons showed that, among participants who ate a lot of pizza, restrained eaters in the milkshake condition reported having eaten more than did unrestrained eaters in the milkshake condition ($p = 0.02$), whereas there was no significant difference between the reported amount eaten between restrained and unrestrained eaters in the control condition ($p = 0.29$).
Discussion

The purpose of the present study was to examine whether restrained eaters who become disinhibited and overeat continue to overeat after the disinhibitor is removed. The results showed that restrained eaters who expected to drink a large milkshake ate more pizza than either unrestrained eaters who expected to drink a large milkshake or restrained eaters in the control condition. This indicates that the milkshake manipulation was effective in eliciting disinhibited eating among restrained eaters. Restrained eaters who became disinhibited and ate a lot of pizza in the milkshake condition went on to eat more ice cream than did unrestrained eaters who ate a lot of pizza in the milkshake condition. Before the participants were asked to taste and rate the ice cream, they were told that they would no longer be expected to drink the milkshake. Thus, any subsequent overeating cannot be attributed to expectations about future overeating. Instead, it appears that restrained eaters continued to overeat once disinhibited because they had already broken their diets. These results suggest that restrained eaters do not resume their normal, inhibited eating patterns following an episode of disinhibited eating. The second taste test took place soon after the first, however, so it is not clear whether restrained eaters continue to overeat for the rest of the day or whether they are able to restore their restraint later in the day. This issue, however, is not theoretically important for discriminating disinhibited eating from simple overeating. The present data clearly indicate that restrained eaters who are disinhibited by thinking that their diets will be broken, and only those restrained eaters, continue to overeat when presented with a second eating opportunity.

In showing that restrained eaters who become disinhibited tend to remain disinhibited, the results provide a method by which disinhibited eating can be differentiated
from simple overeating. Manipulations that elicit disinhibited eating should lead to continued
overeating during a second taste test, whereas manipulations that increase the amount eaten
without causing disinhibition should not increase eating during a second taste test.

In addition, there was preliminary evidence that awareness of having eaten a large
amount is associated with disinhibited eating, as restrained eaters in the milkshake condition
viewed themselves as having eaten a larger amount than did unrestrained eaters, but no
difference was observed between restrained and unrestrained eaters in the control condition.
Although Study 1 did not examine self-monitoring of exactly how much was eaten, this was
addressed in the following studies.
A variety of factors, including emotional distress (e.g., Heatherton, Herman, & Polivy, 1991), sensory cues, such as the smell and sight of food (Fedoroff, Polivy, & Herman, 1997, 2003; Jansen & van den Hout, 1991; Rogers & Hill, 1989), and normative cues, such as portion size (e.g., Diliberti, Bordi, Conklin, Roe, & Rolls, 2004; Wansink & Kim, 2005), can increase the amount that restrained eaters consume, but it is unclear whether such increases in consumption represent disinhibited eating. It is possible that certain cues exert more subtle influences on restrained eaters and, thus, lead restrained eaters to overeat without realizing that they have done so, so they still believe that their diets are intact. If this were the case, then it could be said that these cues cause overeating, but not disinhibition. Distinguishing the factors that lead to disinhibited eating from those that lead to simple overeating would help to identify situations in which disinhibited eating is likely to occur. Additionally, differentiating disinhibited eating from simple overeating would allow for an examination of processes that lead to disinhibition, as well as the effects of disinhibited versus simple overeating on the individual.

Two different manipulations were used to increase eating in the present study. In one of the experimental conditions, participants expected to drink a large milkshake following a pizza taste test. This manipulation was shown to lead to disinhibited eating among restrained eaters in Study 1, and similar manipulations have increased the amount eaten by restrained eaters in past studies (Knight & Boland, 1989; Ruderman, Belzer, & Halperin, 1985; Tomarken & Kirschenbaum, 1984). In the other experimental condition, a remote
confederate was used to indicate that other participants had eaten a large amount of pizza. Remote confederate sheets serve the same purpose as having an actual confederate as a model and have been shown to influence the amount that participants eat in a similar manner (Feeney, Pliner, Polivy, & Sullivan, 2011; Leone, Pliner, Herman, 2007). We expected that this manipulation would allow restrained eaters to eat more than usual without feeling that they had overeaten. In other words, we expected that restrained eaters who ate less than the remote confederates would not think that they had broken their diets, even if they had eaten a large amount.

We hypothesized that restrained eaters who became disinhibited and overate in the milkshake condition would report that they had eaten more than they should have, but that they would not be able to accurately report how many pieces of pizza they ate. In contrast, we hypothesized that restrained eaters who ate a large amount in the remote confederate condition would not report that they had eaten more than they should have, and that they would be able to accurately report how many pieces of pizza they ate.

Method

Participants

Participants were 140 female students enrolled in the introductory psychology subject pool. The mean age of participants was 19.76 (SD = 2.28). The Restraint Scale (Herman, Polivy, & Silver, 1979) was used to categorize participants as restrained eaters (scoring 15 or higher) or unrestrained eaters (scoring below 15). Body mass index was significantly higher for restrained eaters (M = 25.21, SD = 4.59) than for unrestrained eaters (M = 21.32, SD = 2.94). No interactions with condition were observed for either restraint scores or body mass index.
**Materials**

*Pizza.* Participants were served a plate with six Pillsbury brand miniature cheese pizzas that were each cut into sixths for the first taste test. The pizzas were cooked in a toaster oven and the top layer of pizza slices was replaced with new pizzas for each participant. The lower layers of pizza were reheated in the microwave for each participant. Each piece of pizza weighed approximately 16 grams.

*Cookies.* Participants were served a plate with 60 Chips Ahoy brand soft chocolate chip cookies for the second taste test. Each cookie weighed approximately 11 grams.

**Measures**

*Affect and hunger ratings.* Participants responded to ten items regarding their current emotions and hunger. These included ratings of happiness, anger, desire to eat, anxiety, boredom, hunger, fullness, calmness, sadness, and estimates of how much they could currently eat. Participants rated each item using a seven-point Likert-type scale (e.g., 1 = “not at all happy” to 7 = “very happy”).

*Taste ratings.* Participants filled out taste rating questionnaires for both the pizza and cookies. They were asked to rate how salty, sweet, crunchy, bitter, sour, and good-tasting each food was using a seven-point Likert-type scale (e.g., “not at all salty” to “very salty”).

*Follow-up questionnaire.* Participants responded to a number of questions assessing awareness of amount eaten and self-reported reasons for eating. These questions addressed participants’ estimates of how many pieces of pizza and how many cookies they ate, whether they viewed their intake as excessive, the factors that influenced their pizza intake (taste, liking, hunger, mood, etc.), whether they felt conflicted when deciding how much to eat, and their estimates of the amount eaten by other participants (see Appendix A).
**Restraint Scale** (Herman, Polivy, & Silver, 1979). The Restraint Scale is an 11-item measure, which includes items assessing concern about dieting (e.g., “How conscious are you of what you’re eating?”) and weight fluctuations (e.g., “What is your maximum weight gain within one week?”). Total scores range from 0 to 35, with higher scores indicating higher levels of dietary restraint.

**Procedure**

Participants were scheduled for 60-minute individual sessions between the hours of 11:00 am and 8:00 pm. In order to standardize hunger, all participants were told to refrain from eating for at least three hours before participating in the study. Upon arrival at the laboratory, the participant was seated at a table in a private room. After consenting to participate in the study, participants were told that they would be tasting and rating a potential new pizza product as part of a market research study. Participants in the control and remote confederate conditions were told that they would be asked to fill out questionnaires following the pizza taste test. Participants in the milkshake condition were told that, following the pizza taste test, they would be asked to drink a large milkshake and complete a simple memory task in order to test the effects of sugar on memory. For participants in the remote confederate condition, a piece of paper showing the amount of pizza eaten by the first ten participants was affixed to the table. The amount of pizza eaten ranged between 11 and 15 pieces, with a mean of 13 pieces eaten. In order to draw participants’ attention to the remote confederate sheet and to inform them that would not need to report the amount that they ate, the experimenter said, “Don’t worry about that sheet—it was just for the first ten participants. We just needed to know how much pizza to stock.”
Participants were asked to fill out the affect and hunger rating questionnaire before the pizza taste test. They were then presented with a plate of pizza snacks, a glass of water, and a taste-rating form for the pizza. Participants were informed that there was plenty of pizza and that they should feel free to eat as much as they would like to make the ratings. All participants were given ten minutes to complete the taste test. The plate of pizza was weighed out of sight of participants both before and after the taste test so that the total grams of pizza eaten could be calculated.

Following the pizza taste test, all participants were asked to fill out the affect and hunger rating questionnaire a second time. They were then presented with a surprise second taste test in which they were asked to taste and rate chocolate chip cookies. Participants in the control and remote confederate conditions were told that the experiment was not taking enough time for them to receive credit, so they would need to complete a second taste test. Participants in the milkshake condition were told that the blender was broken and that they would be asked to taste and rate cookies rather than drinking the large milkshake and completing the memory task.

For the cookie taste test, participants were given a plate of chocolate chip cookies, a glass of water, and a taste-rating form for the cookies. Participants were informed that there were plenty of cookies and that they should feel free to eat as much as they would like to make the ratings. All participants were given ten minutes to complete the taste test. The plate of cookies was weighed out of sight of participants both before and after the taste test so that the total grams of cookies eaten could be calculated.

Following the cookie taste test, participants filled out the follow-up questionnaire and the Restraint Scale. The experimenter then measured their height and weight. In order to
probe for suspicion or to determine whether the participant was able to guess the actual purpose of the study, participants were then asked what they thought the true purpose of the study was. Finally, the experimenter debriefed the participant and provided her with the full details of the study.

Data analysis

Condition x Restraint analyses of variance and covariance were conducted for the dependent variables of interest, which included grams of estimates of the number of pizza pieces eaten by other participants, grams of pizza eaten, grams of ice cream eaten, responses to the item “I ate more pizza than I should have eaten”, and accuracy of estimates of pizza intake. Hunger and liking for the food were controlled in the analyses for grams of pizza eaten, as these are acknowledged to be the two primary drivers of eating behavior (Vartanian, Herman, & Wansink, 2008). Comparisons were conducted using the Sidak test. When data violated assumptions of homogeneity of variance, log transformations of the dependent variable were used to correct this.

Results

In order to examine whether the remote confederate manipulation was effective in increasing perceptions of the amount eaten by other participants, a Condition x Restraint ANOVA with estimates of number of pizza snacks eaten by other participants as the dependent variable was conducted (see Table 5). A significant main effect of Condition was observed, $F_{(2, 129)} = 9.80, p < 0.001$. Tukey posthoc analyses showed that participants in the remote confederate condition thought that other participants ate more pizza than did participants in the milkshake condition ($p < 0.01$) or the control condition ($p < 0.001$). No significant Restraint or Condition x Restraint effects were expected or observed.
Means and standard deviations for grams of pizza eaten are presented in Table 6. A Condition x Restraint ANCOVA with grams of pizza as the dependent variable, and with hunger and liking for the pizza as control variables, was conducted. No Condition, $F(2, 127) = 2.11, p = 0.13$, Restraint, $F(1, 127) = 0.08, p = 0.78$, or Condition x Restraint, $F(2, 127) = 1.02, p = 0.37$, effects were observed. Planned comparisons showed no significant differences between the amount of pizza eaten by unrestrained and restrained eaters in the milkshake ($p = 0.45$) and remote confederate ($p = 0.21$) conditions. In addition, no difference was observed between the amount of pizza eaten by restrained eaters in the milkshake and control conditions ($p = 0.35$). Likewise, no significant difference was observed between the amount of pizza eaten by restrained eaters or unrestrained eaters in the remote confederate and control conditions ($p = 0.90$ and $p = 0.14$, respectively)

Means and standard deviations for grams of cookies eaten are presented in Tables 7 and 8. A Condition x Restraint ANOVA with grams of cookies as the dependent variable was conducted. No Condition, $F(2, 129) = 0.68, p = 0.51$, Restraint, $F(1, 129) = 0.17, p = 0.68$, or Condition x Restraint, $F(2, 129) = 0.93, p = 0.40$, effects were observed. Planned comparisons showed no significant differences between grams of cookies eaten by unrestrained and restrained eaters in the milkshake ($p = 0.39$) and remote confederate conditions ($p = 0.35$). In addition, no significant difference was observed between grams of cookies eaten by restrained eaters in the milkshake and control conditions ($p = 0.99$). Likewise, no significant difference was observed between grams of cookies eaten by restrained eaters in the remote confederate and control conditions ($p = 0.99$).

As in Study 1, we ran a median split on grams of pizza eaten (127.50 grams) and used this to divide participants by the amount of pizza eaten (Amount). A Condition x Restraint x
Amount ANOVA with grams of cookies (transformed using natural log) as the dependent variable was conducted. Participants who ate a lot of pizza ate significantly more cookies than did participants who ate little pizza, $F_{(1, 122)} = 34.65, p < 0.001$. No other significant main effects or interactions were observed. Planned comparisons showed no significant differences between grams of cookies eaten by unrestrained eaters who ate a lot of pizza and restrained eaters who ate a lot of pizza in the milkshake ($p = 0.52$) and remote confederate ($p = 0.33$) conditions. Significant differences were observed between grams of cookies eaten by restrained eaters who ate a lot of pizza and restrained eaters who ate little pizza in the milkshake ($p = 0.004$) and remote confederate (0.03) conditions, but not in the control condition ($p = 0.12$).

Examination of the number of participants in each condition who ate a lot versus a little pizza showed that participants in the control condition were more likely to eat a little pizza than they were to eat a lot of pizza (see Table 8). In contrast, participants in the milkshake and remote confederate conditions were equally likely or more likely to eat a lot of pizza than they were to eat a little pizza. In order to determine whether these patterns were significant, a binary logistic regression with Condition, Restraint, and Condition x Restraint as the independent variables and amount of pizza eaten (a lot versus a little) as the dependent variable was conducted. A main effect was found for Condition, $X^2_{(2)} = 6.48, p = 0.04$. Participants in the remote confederate condition were 2.5 times as likely to eat a lot of pizza compared to participants in the control condition, $X^2_{(1)} = 4.65, p = 0.03$. No differences were observed between the control condition and the milkshake condition, $X^2_{(1)} = 1.44, p = 0.23$, or between the milkshake condition and the remote confederate condition, $X^2_{(1)} = 0.95, p = 0.33$. 
It was hypothesized that restrained eaters in the milkshake condition would report that they had eaten more than they should have, whereas restrained eaters in the remote confederate condition would not report that they had eaten more than they should have. To test this hypothesis, we conducted a Condition x Restraint ANOVA with participant responses to the item, “I ate more pizza than I should have eaten” (from 1 = Not at all true to 4 = Very true) as the dependent variable (see Table 9). Restrained eaters endorsed the item “I ate more than I should have” to a greater extent than did unrestrained eaters, $F_{(1, 130)} = 11.22$, $p < 0.01$. No Condition, $F_{(2, 130)} = 0.51$, $p = 0.60$, or Condition x Restraint, $F_{(2, 130)} = 0.16$, $p = 0.85$, effects were observed.

It was also hypothesized that restrained eaters in the milkshake condition would not accurately estimate the number of pizza pieces they ate, whereas restrained eaters in the remote confederate condition would accurately estimate the number of pizza pieces they ate. To test this hypothesis, we conducted a Condition x Restraint ANOVA with the accuracy of participant estimations of the number of pizza pieces they ate (estimated number – number actually eaten) as the dependent variable (see Table 10). No Condition, $F_{(2, 129)} = 0.90$, $p = 0.41$, Restraint, $F_{(1, 129)} = 0.01$, $p = 0.91$, or Condition x Restraint, $F_{(1, 129)} = 1.71$, $p = 0.19$, effects were observed. Restrained eaters in the milkshake condition would be expected to estimate inaccurately only if they ate a lot, so we conducted a Condition x Restraint x Amount ANOVA with the accuracy of participants’ estimations of the number of pizza pieces they ate as the dependent variable. No significant effects were observed (all $p$-values above 0.3).
Discussion

The purpose of the present study was to examine whether disinhibited eating can be differentiated from simple overeating. We expected that restrained eaters would eat more in the milkshake condition than in the control condition, and that all participants would eat more in the remote confederate condition than in the control condition. In contrast to our expectations, restrained eaters in the milkshake condition did not eat more than did restrained eaters in the control condition. Furthermore, no difference in amount eaten was observed between the remote confederate condition and the control condition for either restrained or unrestrained eaters. Overall, the remote confederate manipulation increased participants’ estimations of the intake of other participants, and participants in the remote confederate condition were more likely to eat a lot of pizza than were participants in the control condition. These results indicate that the milkshake manipulation was not effective and that the remote confederate manipulation exerted only a weak effect on amount eaten.

As both of these manipulations have been found to increase food consumption in previous studies (e.g., Feeney, Pliner, Polivy, & Sullivan, 2011; Knight & Boland, 1989), it is unclear why they were not effective in the current study. One possible explanation is that the conditions under which the study was run were not ideal. Participants completed the study in cubicles constructed from bookshelves and stacked boxes with shower curtains strung across the entrance to provide privacy. Three cubicles were housed in the same room, so, although participants could not see each other, they could hear everything said in the room, including the instructions given to other participants. Before or during the pizza taste-test, some participants may have overheard other participants being given the cookie taste-test instructions. Likewise, participants in the control and remote confederate conditions may
have overheard participants in the milkshake condition being told that they were expected to
drink a milkshake following the pizza taste-test. If, as a result of hearing instructions that
were not intended for them, some participants expected to eat another food after the pizza,
this may have affected their eating behavior. The cubicles were also quite small and some of
the participants could not fit easily between the table and the back of the cubicle. This layout
may have attracted participants’ attention to their body size and caused some participants to
feel self-conscious, which may also have altered their eating behavior. An additional problem
was that it was difficult to heat the pizza snacks sufficiently without causing them to become
stale from repeated heating and cooling. It appears that the pizza was sometimes not heated
enough, as several participants commented that it was cold. Receiving cold pizza may have
affected the amount that participants ate.

With regard to cookie consumption, we expected that restrained eaters who ate a lot
in the milkshake condition would continue to eat a lot during the cookie taste-test, but that
restrained eaters who ate a lot in the remote confederate condition would not continue to eat a
lot during the cookie taste-test. Among restrained eaters who ate a lot of pizza, there were no
differences across conditions in cookie consumption; however, in the milkshake and remote
confederate conditions, restrained eaters who ate a lot of pizza ate more cookies than did
restrained eaters who ate little pizza. This result suggests that restrained eaters in the
milkshake and remote confederate conditions were disinhibited. Although we expected that
restrained eaters who ate a lot of pizza in the milkshake condition would be disinhibited, we
did not expect restrained eaters who ate a lot of pizza in the remote confederate condition to
be disinhibited. It is not clear whether our hypothesis was incorrect, or whether the problems
outlined above regarding the laboratory layout also affected cookie consumption. For
example, if participants in the remote confederate condition expected to eat more food after
the pizza as a result of overhearing instructions for other participants, this may have caused
them to become disinhibited.

In light of this ambiguity, we decided to replicate the present study in a different
laboratory with large, private rooms for each participant. We also changed the type of pizza
used from thick pizza snacks, which were difficult to heat in the microwave, to small, thin
pizzas, which could be heated evenly in a toaster oven.
Chapter 4

Study 3

The purpose of the present study was to replicate Study 2 in order to retest our hypotheses regarding the differentiation of disinhibited eating from simple overeating. As in Study 2, we expected that restrained eaters who became disinhibited and overate in the milkshake condition would continue to overeat during the cookie taste-test. In contrast, we expected that restrained eaters who ate a large amount in the remote confederate condition would not continue to overeat during the cookie taste-test. Furthermore, we expected that restrained eaters who overate in the milkshake condition would report that they had eaten more than they should have, but would not be able to accurately report how many pieces of pizza they ate, whereas restrained eaters who overate in the remote confederate condition would not report that they had eaten more than they should have, and would be able to accurately report how many pieces of pizza they ate.

Method

Participants

Participants were 186 female students enrolled in the introductory psychology subject pool. The mean age of participants was 18.8 (SD = 1.5). The Restraint Scale (Herman, Polivy, & Silver, 1979) was used to categorize participants as restrained eaters (scoring 15 or higher) or unrestrained eaters (scoring below 15). Body mass index was also significantly higher for restrained eaters (M = 25.29, SD = 4.67) than for unrestrained eaters (M = 22.28, SD = 3.47). No interactions with condition were observed for either restraint scores or body mass index.
Procedure

The procedures for Study 3 were identical to those used in Study 2. Although participants were provided with small pizzas, which were cut into sixths, rather than pizza snacks, the number of pizza pieces supposedly eaten by other participants did not change. The remote confederate sheet showed that the amount of pizza eaten ranged between 11 and 15 pieces, with a mean of 13 pieces eaten.

Results

In order to examine whether the remote confederate manipulation was effective in increasing perceptions of the amount eaten by other participants, a Condition x Restraint ANOVA with estimates of number of pieces of pizza eaten by other participants as the dependent variable was conducted (see Table 1). A significant main effect of Condition was observed, $F(2, 176) = 7.84$, $p < 0.01$. Tukey posthoc analyses showed that participants in the remote confederate condition thought that other participants ate more pizza than did participants in the milkshake condition ($p < 0.01$) or the control condition ($p < 0.01$). No significant Restraint or Condition x Restraint effects were expected or observed.

Means and standard deviations for grams of pizza eaten are presented in Table 12. A Condition x Restraint ANCOVA with grams of pizza as the dependent variable, and with hunger and liking for the pizza as control variables, was conducted. No Condition, $F(2, 173) = 0.05$, $p = 0.96$, Restraint $F(1, 173) = 1.25$, $p = 0.27$, or Condition x Restraint $F(2, 173) = 0.15$, $p = 0.86$, effects were observed. Planned comparisons showed no significant differences between the amount of pizza eaten by unrestrained and restrained eaters in the milkshake ($p = 0.82$) and remote confederate ($p = 0.33$) conditions. In addition, no difference was observed between the amount of pizza eaten by restrained eaters in the milkshake and control
conditions ($p = 0.97$). Likewise, no significant difference was observed between the amount of pizza eaten by restrained eaters or unrestrained eaters in the remote confederate and control conditions ($p = 0.99$ and $p = 0.98$, respectively).

Means and standard deviations for grams of cookies eaten are presented in Tables 13 and 14. A Condition x Restraint ANOVA with grams of cookies (transformed using natural log) as the dependent variable was conducted. No significant Condition, $F(2, 179) = 0.25, p = 0.78$, Restraint, $F(1, 179) = 0.61, p = 0.44$, or Condition x Restraint, $F(2, 179) = 0.49, p = 0.61$, effects were observed. Planned comparisons showed no significant differences between grams of cookies eaten by unrestrained and restrained eaters in the milkshake ($p = 0.80$) and remote confederate conditions ($p = 0.91$). In addition, no significant difference was observed between grams of cookies eaten by restrained eaters in the milkshake and control conditions ($p = 0.95$). Likewise, no significant difference was observed between grams of cookies eaten by restrained eaters in the remote confederate and control conditions ($p = 0.65$).

As in Studies 1 and 2, we ran a median split on grams of pizza eaten (130.60 grams) and used this to divide participants by the amount of pizza eaten (Amount). A Condition x Restraint x Amount ANOVA with grams of cookies as the dependent variable was conducted. Significant Restraint, $F(1, 168) = 4.79, p = 0.03$, Amount, $F(1, 168) = 27.77, p < 0.001$, and Condition x Amount, $F(2, 168) = 3.84, p = 0.02$, effects were observed, but these findings were qualified by a significant three-way interaction, $F(2, 168) = 3.44, p = 0.03$. This analysis violated assumptions of homogeneity of variance, however, and no transformation could be found to remedy this, so planned comparisons were conducted using Welch’s t-test and the Games-Howell test, both of which are appropriate for use when variance is unequal between cells.
Planned comparisons showed that among restrained eaters who ate a lot of pizza, those in the remote confederate condition ate significantly fewer cookies than did those in the milkshake \((p = 0.04)\) or control conditions \((p < 0.01)\), but no difference in cookie consumption was observed between the milkshake and the control conditions \((p = 0.86)\). In the control and milkshake conditions, restrained eaters who ate a lot of pizza ate more cookies than did restrained eaters who ate little pizza \((p < 0.001 \text{ and } p = 0.04, \text{ respectively})\). In the remote confederate condition, no difference in cookie consumption was observed between restrained eaters who ate a lot of pizza and restrained eaters who ate little pizza \((p = 0.81)\).

It was hypothesized that restrained eaters in the milkshake condition would report that they had eaten more than they should have, whereas restrained eaters in the remote confederate condition would not report that they had eaten more than they should have. To test this hypothesis, we conducted a Condition x Restraint ANOVA with participant responses to the item, “I ate more pizza than I should have eaten” (from 1 = Not at all true to 4 = Very true; transformed using natural log for analysis) as the dependent variable (see Table 15). Overall, restrained eaters endorsed this item more than did unrestrained eaters, \(F_{(1, 180)} = 14.98, p < 0.001\); however, this result was qualified by a marginal Condition x Restraint interaction, \(F_{(2, 180)} = 2.88, p = 0.06\). In the control and milkshake conditions, restrained eaters endorsed the item, “I ate more than I should have” to a greater extent than did unrestrained eaters \((p = 0.04 \text{ and } p < 0.001, \text{ respectively})\), but no difference in the response to this item was observed between restrained and unrestrained eaters in the remote confederate condition \((p = 0.53)\). Among restrained eaters, a marginal positive correlation was observed between responses to the item “I ate more pizza than I should have eaten” and grams of cookie eaten.
in the control condition, \( r = 0.35, p = 0.06 \), and the milkshake condition, \( r = 0.42, p = 0.05 \), but not in the remote confederate condition, \( r = 0.24, p = 0.26 \).

It was also hypothesized that restrained eaters in the milkshake condition would not accurately estimate the number of pizza pieces they ate, whereas restrained eaters in the remote confederate condition would accurately estimate the number of pizza pieces they ate. To test this hypothesis, we conducted a Condition x Restraint ANOVA with the accuracy of participant estimations of the number of pizza pieces they ate (estimated number – number actually eaten) as the dependent variable (see Table 16). No significant Restraint, \( F_{1, 178} = 0.32, p = 0.58 \) or Condition x Restraint, \( F_{2, 178} = 0.58, p = 0.56 \), effects were observed, but a significant effect of Condition, \( F_{2, 178} = 3.68, p = 0.03 \), was observed. Participants in the remote confederate condition underestimated their pizza consumption significantly less than did participants in the control condition (\( p = 0.03 \)), and marginally less than did participants in the milkshake condition (\( p = 0.06 \)). No difference in accuracy of estimated pizza consumption was observed between the milkshake and the control conditions (\( p = 0.96 \)).

Discussion

The purpose of Study 3 was to examine whether disinhibited eating can be differentiated from simple overeating. We expected that restrained eaters would eat more pizza in the milkshake condition than in the control condition, and that all participants would eat more pizza in the remote confederate condition than in the control condition; however, we did not find any differences in the amount of pizza eaten across conditions. Although this result suggests that the milkshake and remote confederate manipulations were ineffective in eliciting overeating, one must consider that the effectiveness of these manipulations can be judged only in relation to the amount eaten in the control condition. Participants in the
control condition were exposed to sensory food cues, including the sight, smell, and taste of pizza. Restrained eaters have been found to eat more in response to sensory food cues (Fedoroff, Polivy, & Herman, 1997, 2003; Jansen & van den Hout, 1991; Rogers & Hill, 1989), but sensory cue manipulations typically involve exposure to food cues before the taste-test begins. There is no pre-exposure to food cues in the typical control condition; so, although control conditions in taste-test studies inherently involve exposure to food cues, it is assumed that restrained eaters do not usually overeat in control conditions. In reality, whether restrained eaters in control conditions succumb to the sensory cues present and overeat may depend largely on the type of food served and the strength of the cues associated with this food.

In the present study, participants were served hot, freshly baked pizza, which may have been particularly tempting as it had a strong smell. Some restrained eaters may have been able to eat a small amount and then sit for the remainder of the taste-test without giving in to the temptation to eat more. It would make sense to assume, however, that other restrained eaters had trouble resisting their desire to eat after they tasted the pizza and were exposed to its sight and smell for the duration of the ten-minute taste-test. Perhaps, then, the control condition in the present study should actually be considered to have been an olfactory cue exposure condition. In this case, all three conditions would have been expected to increase eating among restrained eaters, and we would not necessarily expect differences in pizza consumption between conditions.

It is not clear why unrestrained eaters in the modeling condition did not eat more than did unrestrained eaters in the control condition. One explanation for this finding may be that unrestrained eaters were eating as much pizza as they wanted in both conditions. It is
possible that the remote confederate manipulation only increases eating if participants are eating less than desired in the control condition. Perhaps modeling would have increased consumption had we used a live confederate instead of a remote confederate sheet because participants may then have had social motives to match the model, although Feeney et al. (2012) found no difference using live versus remote confederates.

With regard to cookie consumption, we expected that restrained eaters who ate a lot in the milkshake condition would continue to eat a lot during the cookie taste-test, but that restrained eaters who ate a lot in the remote confederate condition would not continue to eat a lot during the cookie taste-test. The results supported these hypotheses; however, restrained eaters who ate a lot in the control condition also continued to eat a lot during the cookie taste-test. According to the method for identifying disinhibited eating described in Study 1, manipulations that elicit disinhibited eating should lead to continued overeating during a second taste test, whereas manipulations that increase the amount eaten without causing disinhibition should not increase eating during a second taste test. Based on this definition, both olfactory food cue exposure (control condition) and expectations that one’s diet will be broken (milkshake condition) appear to have elicited disinhibited eating among some restrained eaters. In contrast, restrained eaters who ate a lot in the remote confederate condition did not go on to eat a lot of cookies. This indicates that restrained eaters who ate a lot in the remote confederate condition were not disinhibited, presumably because exposure to the remote confederate sheet allowed restrained eaters to eat more than usual without feeling that they had overeaten.

Other findings support the supposition that restrained eaters in the control and milkshake conditions were disinhibited whereas those in the remote confederate condition
were not. The amount of cookies eaten by restrained eaters in the control and milkshake conditions was positively correlated with responses to the item, “I ate more pizza than I should have eaten”, but these two variables were not significantly correlated for restrained eaters in the remote confederate condition. These results suggest that awareness of having eaten too much is associated with subsequent overeating. On the other hand, it appears that restrained eaters can eat a large amount without becoming disinhibited as long as they do not believe that they are eating more than they should.

We predicted that disinhibited eating would be associated with a lack of self-monitoring, so we expected that restrained eaters in the milkshake condition would underreport their pizza intake to a greater extent than would restrained eaters in the remote confederate condition. We did not expect differences in estimated pizza intake across conditions for unrestrained eaters, as they cannot become disinhibited. Contrary to our expectations, we did not observe differences in accuracy of estimated pizza intake between restrained and unrestrained eaters; however, participants in the remote confederate condition underreported their pizza intake less than did participants in the control and milkshake conditions. The fact that no differences were observed between restrained and unrestrained eaters suggests that underreporting of pizza intake was not associated with disinhibited eating. Rather, participants in the remote confederate condition may have reported their intake more accurately because the remote confederate sheet acted as a cue to monitor intake. Alternatively, participants in the remote confederate condition may have tracked their intake carefully to ensure that they did not exceed the amount reportedly eaten by other participants.

Results of the present study suggest that disinhibited eating can be differentiated from simple overeating on the basis of whether restrained eaters continue to overeat during a
second taste-test. Disinhibited eating appears to be associated with the belief that one has eaten too much, but it is less clear whether self-monitoring plays a role in disinhibited eating.
Chapter 5

Study 4

The purpose of Study 4 was to examine further the role of awareness in disinhibited eating by exploring whether knowingly overeating is a requisite of disinhibition or whether disinhibition can result from finding out in retrospect that one has inadvertently overeaten. Perceptions that one has eaten too much were associated with disinhibited eating among restrained eaters in Study 3, which accords with the supposition that restrained eaters become disinhibited because they believe that their diet has been broken (Herman & Polivy, 1985). If this “what the hell” effect is an accurate description of the process underlying disinhibited eating, then it should not matter whether restrained eaters realize they are overeating while doing so or whether they realize this after the fact. On the other hand, if only intentional overeating leads to disinhibition, then there may be other factors at play.

In the following study, participants were assigned to one of three conditions: a control condition (no milkshake), a high-calorie milkshake condition, or a low-calorie milkshake condition. In the high-calorie milkshake condition, participants were told that the milkshake was high-calorie before they consumed it, whereas in the low-calorie milkshake condition, participants were told that the milkshake was low-calorie before they consumed it, but were informed that it was actually high-calorie after they had consumed it. Participants were then asked to taste and rate cookies. We expected that restrained eaters in both the high-calorie and the low-calorie milkshake conditions would eat more cookies than would restrained eaters in the control condition, as restrained eaters in both milkshake conditions would be aware that they had overeaten.
Method

Participants

Participants were 108 female students enrolled in the introductory psychology subject pool. The mean age of participants was 20.1 years (SD = 4.4). The Restraint Scale (Herman, Polivy, & Silver, 1979) was used to categorize participants as restrained eaters (scoring 15 or higher) or unrestrained eaters (scoring below 15). Body mass index was also significantly higher for restrained eaters (M = 24.20, SD = 4.49) than for unrestrained eaters (M = 21.99, SD = 3.64). No interactions with condition were observed for either restraint scores or body mass index.

Materials

Milkshake. Participants in the milkshake conditions were asked to consume a 375-calorie (12 ounce) chocolate milkshake, which was made with 250 grams of chocolate ice cream, 125 grams of whole milk, and 15 grams of chocolate syrup.

Cookies. Participants were served a plate with 60 Chips Ahoy brand soft chocolate chip cookies, a plate with 60 Select brand chocolate graham cookies, and a plate with 60 Select brand maple leaf cookies for the second taste test. The chocolate chip cookies weighed approximately 11 grams each and the chocolate graham cookies weighed approximately 10 grams each, but the maple cookies were somewhat larger and weighed approximately 14 grams each.

Measures

Affect and hunger ratings. Participants responded to ten items regarding their current emotions and hunger. These included ratings of happiness, anger, desire to eat, anxiety,
boredom, hunger, fullness, calmness, sadness, and estimates of how much they could currently eat. Participants rated each item using a seven-point Likert-type scale (e.g., 1 = “not at all happy” to 7 = “very happy”).

*Taste ratings.* Participants filled out taste rating questionnaires for both the pizza and cookies. They were asked to rate how salty, sweet, crunchy, bitter, sour, and good-tasting each food was using a seven-point Likert-type scale (e.g., “not at all salty” to “very salty”).

*Follow-up questionnaire.* Participants responded to a number of questions assessing awareness of amount eaten and self-reported reasons for eating. These questions addressed participants’ estimates of how many pieces of pizza and how many cookies they ate, whether they viewed their intake as excessive, the factors that influenced their pizza intake (taste, liking, hunger, mood, etc.), whether they felt conflicted when deciding how much to eat, and their estimates of the amount eaten by other participants (see Appendix B).

*Restraint Scale* (Herman, Polivy, & Silver, 1979). The Restraint Scale is an 11-item measure, which includes items assessing concern about dieting (e.g., “How conscious are you of what you’re eating?”) and weight fluctuations (e.g., “What is your maximum weight gain within one week?”). Total scores range from 0 to 35, with higher scores indicating higher levels of dietary restraint.

*Procedure*

Participants were scheduled for 60-minute individual sessions between the hours of 11:00 am and 8:00 pm. In order to standardize hunger, all participants were told to refrain from eating for at least three hours before participating in the study. Upon arrival at the laboratory, the participant was seated at a table in a private room. After consenting to participate in the study, participants were assigned to one of three conditions: a control
condition, a high-calorie milkshake condition, or a low-calorie milkshake condition.

Participants assigned to the control condition were told that they would be tasting and rating three types of cookies (chocolate chip, fudge graham, and maple leaf) as part of a market research study. Participants assigned to the high-calorie milkshake condition were told that they would be consuming a high-calorie milkshake and then tasting and rating three types of cookies. Participants assigned to the low-calorie milkshake condition were told that they would be consuming a low-calorie milkshake and then tasting and rating three types of cookies; however, after consuming the milkshake and before tasting the cookies, they were informed that the experimenter had mistakenly given them a high-calorie milkshake.

Participants in both of the milkshake conditions were told that they were being asked to consume the milkshake to control for hunger as their level of hunger would influence their ratings of the cookies. The milkshakes served to participants assigned to the high-calorie and low-calorie milkshake conditions were identical.

After arriving in the lab and consenting to participating in the study, participants in the milkshake conditions were given ten minutes to consume the milkshake. They were required to drink all of the milkshake, and were encouraged by the experimenter to do so if they had not consumed all of the milkshake. All participants were then asked to fill out the affect and hunger rating questionnaire. After completing this questionnaire, participants were presented with a three-plates of cookies, a glass of water, and a separate taste-rating form for each type of cookie. They were informed that there were plenty of cookies and that they should feel free to eat as much as they would like after completing the ratings. The plates of cookies were weighed out of sight of participants both before and after they ate so that the total grams of cookies eaten could be calculated.
Following the cookie taste test, participants filled out the follow-up questions and the Restraint Scale (Herman, Polivy, & Silver, 1979). The experimenter then measured their height and weight. In order to probe for suspicion or to determine whether the participant was able to guess the actual purpose of the study, participants were then asked what they thought the true purpose of the study was. Finally, the experimenter debriefed the participant and provided her with the full details of the study.

Data analysis

Condition x Restraint analyses of variance were conducted for the dependent variables of interest, which included grams of ice cream eaten, responses to the item “I ate more cookies than I should have eaten”, accuracy of estimates of cookie intake, and ratings of guilt. Hunger was not included as a covariate in this analysis because ratings of hunger were collected after participants in the milkshake conditions had consumed the milkshake. This means that initial levels of hunger could not be controlled. Liking for the cookies was also not included as a covariate because three types of cookies were used, each of which was rated separately. Participants did not all eat equal amounts of each type of cookie, so mean ratings of liking were not included as a covariate. Analyses of variance for awareness of amount eaten, estimates of cookie intake, and guilt violated assumptions of homogeneity of variance and no transformation could be found to remedy this, so planned comparisons were conducted using Welch’s t-test and the Games-Howell test, both of which are appropriate for use when variance is unequal between cells.

Results

Means and standard deviations for grams of cookies eaten are presented in Table 17. A Condition x Restraint ANOVA with grams of cookies as the dependent variable was
conducted. A main effect of Condition was observed, $F_{(2, 102)} = 6.24, p < 0.01$; participants in the low-calorie and high-calorie milkshake conditions ate fewer cookies than did participants in the control condition. No Restraint, $F_{(1, 102)} = 0.44, p = 0.51$, or Condition x Restraint, $F_{(2, 102)} = 0.14, p = 0.87$, effects were observed.

To assess awareness of amount eaten, a Condition x Restraint ANOVA with participant responses to the item, “I ate more cookies than I should have eaten” (from 1 = Not at all true to 4 = Very true) as the dependent variable was conducted (see Table 18). No significant effects were observed (all $p$-values above 0.2). Planned comparisons that took into account unequal variance between cells also showed no significant effects. A Condition x Restraint ANOVA with the accuracy of participant estimations of the number of cookies they ate (estimated number – number actually eaten) as the dependent variable was also conducted (see Table 19). No significant effects were observed (all $p$-values above 0.2). Planned comparisons that took into account unequal variance between cells also showed no significant effects.

Means and standard deviations for participant ratings of guilt that were collected after participants consumed the milkshake (and after those in the low-calorie milkshake condition were informed that the milkshake was actually high in calories) are presented in Table 20. A Condition x Restraint ANOVA with guilt as the dependent variable was conducted. A main effect of Restraint, $F_{(1, 100)} = 15.35, p < 0.001$, was observed; however, this was qualified by a Restraint-by-Condition interaction, $F_{(2, 100)} = 3.51, p = 0.03$. Posthoc analyses using Welch’s t-test and the Games-Howell test showed that restrained eaters reported greater guilt than did unrestrained eaters in the low-calorie ($p < 0.01$) and high-calorie ($p < 0.01$) milkshake condition, but not in the control condition ($p = 0.87$). Restrained eaters in the low-calorie and
high-calorie milkshake conditions reported greater guilt than did restrained eaters in the control condition, p = 0.03 and p = 0.02, respectively. For unrestrained eaters, no differences in guilt were observed between conditions. Among restrained eaters, guilt about having consumed the milkshake was correlated with intentions to eat less on the day of the study in the low-calorie (r = 0.68, p < 0.01) and high-calorie (r = 0.46, p = 0.03) milkshake conditions. Guilt did not correlate significantly with amount of cookies eaten within restraint, across conditions, or within restraint and within condition.

Discussion

The purpose of Study 4 was to examine whether one must knowingly overeat for disinhibition to occur or whether finding out in retrospect that one has overeaten also leads to disinhibition. This question cannot be answered, however, because restrained eaters in the high-calorie milkshake condition did not increase their intake of cookies despite feeling guilty after having consumed the milkshake. It is not clear why a disinhibition effect was not found, but there was some indication that restrained participants who felt guilty about eating the milkshake intended to compensate for this by eating less on the day of the study. Guilt was not significantly correlated with number of cookies eaten, however, so it appears that guilt is associated with intentions to restrict food intake rather than actual eating behavior, although it is possible that restrained eaters who felt guilty ate less later in the day. There is no clear reason, however, why participants should intend to compensate for their intake in the present study rather than abandoning restraint, as the high-calorie milkshake condition in the present study was similar to the milkshake conditions that have been found to elicit disinhibition in past studies (i.e., Herman & Mack, 1975). One way of reconciling these findings is to assume that, in any disinhibition study, there are probably some restrained
eaters who compensate for their intake (or, at least, do not become disinhibited) and others who become disinhibited, with the relative proportions of these two groups determining the overall mean. These two groups cannot be differentiated, however, without the use of a second taste test to measure continued overeating. A second taste-test was not used in the present study because it was assumed that actually breaking one’s diet by consuming a milkshake would elicit a strong disinhibition effect that would increase the mean amount eaten by restrained eaters during the first taste test (i.e., we expected a high proportion of restrained eaters to become disinhibited by the milkshake and eat so much that they would not really be able to eat much in a second taste test following both the milkshake and first taste test). Had a second taste test been included in the present study, it might have been possible to determine whether restrained eaters who ate a lot of cookies in the milkshake conditions were disinhibited and continued to eat a lot of cookies (although, as has been suggested, they might have been too full after two eating episodes). No differences in awareness of amount eaten were observed across conditions, however, which indicates that participants in the milkshake conditions may not have been disinhibited.
Chapter 6
General Discussion

Although the goal of dieting is to control or limit one’s food intake, the act of dieting often makes restrained eaters vulnerable to overeating. Both restrained and unrestrained eaters tend to eat more when they are given large portions (e.g., Diliberti, Bordi, Conklin, Roe, & Rolls, 2004; Wansink & Kim, 2005) or when the people around them are eating a lot (see Herman, Roth, & Polivy, 2003), but restrained eaters also overeat in response to a variety of factors that do not affect unrestrained eaters. Such factors include the paradoxical tendency of restrained eaters to eat more after consuming a forbidden food, such as a milkshake, than after consuming no food (e.g., Herman & Mack, 1975). This tendency represents a form of disinhibited eating in that restrained eaters are no longer attempting to inhibit their food intake after consuming the forbidden food. Polivy and Herman (1985) have speculated that once restrained eaters perceive that their diet has been broken, they conclude that they might as well eat what they want, at least for the moment (or until they become too full). If this were the case, then restrained eaters would be expected to continue to overeat, as they would no longer be limiting their food intake. Previous studies based on self-reported food intake following disinhibition have not found reports of continued overeating following an initial bout of disinhibited eating (Jansen, Swijgman, & van den Hout, 1990; Knight & Boland, 1989; Provencher, Polivy, & Herman, 2009; Tomiyama, Moskovich, Haltom, Ju, & Mann, 2009), but self-reported food intake may be purposefully or inadvertently misreported. Therefore, one aim of the present dissertation was to examine, in the laboratory, whether restrained eaters who become disinhibited remain disinhibited. Moreover, it is not clear how
long the disinhibited state lasts following the initial disruption of restraint. It may last for the rest of the day, as suggested by the “what-the-hell” effect (Herman & Polivy, 1980) but it could be a more short-term phenomenon.

A second aim of this dissertation was to examine whether disinhibited eating can be differentiated from simple overeating. Factors such as distraction (e.g., Boon, Stroebe, Schut, & Ijntema, 2002; Ward & Mann, 2000), emotional distress (e.g., Heatherton, Herman, & Polivy, 1991), and exposure to the sight and smell of palatable food (Fedoroff, Polivy, & Herman, 1997, 2003; Jansen & van den Hout, 1991; Rogers & Hill, 1989) increase the amount eaten by restrained eaters, but it is not clear whether these factors elicit disinhibited eating or simple overeating. We propose that disinhibited eating is caused by the conscious relaxation of inhibitions on food intake. In contrast, we consider simple overeating an umbrella term encompassing all forms of inadvertent overeating, and overeating in response to cues, such as large portions, that redefine acceptable intake, and thus allow people to eat more than usual without viewing their food intake as excessive. Disinhibited eating should result in continued overeating in the absence of factors causing reinhibition, whereas simple overeating does not undermine dietary inhibition and, therefore, should not result in continued overeating and may not even be seen by overeating by the individual. Furthermore, disinhibited eating should be accompanied by perceptions that one has eaten too much, whereas simple overeating should not be accompanied by such perceptions.

A third aim of this dissertation was to further explore the role of perceptions of having overeaten in eliciting disinhibition. Specifically, we examined whether restrained eaters must know that they are overeating at the time the eating occurs to become
disinhibited or whether finding out in retrospect that one has overeaten also causes disinhibition.

With regard to the first aim of this dissertation, two of the three studies provided preliminary evidence that restrained eaters who become disinhibited remain disinhibited. In Studies 1 and 3, restrained eaters who ate a lot in response to the disinhibitor (the expected milkshake) went on to eat a lot during the second taste-test. Between the first and second taste-tests, participants were informed that the blender was broken and that they would no longer be expected to drink the milkshake, so increased intake during the second taste-test cannot be attributed to the disinhibitor. Rather, these results suggest that restrained eaters continue to overeat once they have become disinhibited. We did not find a similar result in Study 2, however, so these results need further replication. Issues with the laboratory layout may have affected the results of Study 2, but it is not possible to confirm whether this was actually the case.

Although restrained eaters in the milkshake conditions of Studies 1 and 3 continued to overeat during a second taste-test, there were discrepancies in the amount eaten by restrained eaters in the control conditions of these studies. Restrained eaters in the control condition of Study 1 ate less pizza, and marginally less ice cream, than did restrained eaters in the milkshake condition, whereas restrained eaters in the control condition of Study 2 ate the same amount of pizza and cookies as did restrained eaters in the milkshake condition. The restrained eaters who ate a lot of pizza in Study 3 went on to eat a lot of cookies, so it appears that they were disinhibited, but there was no evidence that the restrained eaters who ate a lot of pizza in Study 1 were disinhibited. One explanation for these findings is that participating in a control condition involves exposure to sensory cues, including the sight and
smell of food. In general, how much restrained eaters eat in response to these sensory cues probably depends on the strength of the cues and the duration of the taste-test. In the present dissertation, participants were always given ten minutes to taste and rate the pizza, but the type of pizza used varied across studies. In Studies 1 and 2, pizza snacks were heated in the microwave and served at room temperature, and therefore did not have a strong smell. In contrast, the pizza served in Study 3 was cooked in an oven and served hot, and had a strong smell. It is possible then that restrained eaters in the control condition of Study 3 were more likely to become disinhibited than were restrained eaters in the control condition of Study 1 because the food cues associated with the pizza were stronger and more attractive in Study 3. If this were the case, then the control condition of Study 3 may actually have been an olfactory cue exposure condition, which has been shown to increase consumption selectively in restrained eaters (e.g., Fedoroff et al., 1997; 2003). This would also explain why no differences were found in the amount of pizza eaten across conditions in Study 3, as all three conditions would be expected to increase the amount eaten by restrained eaters.

One problem with the designation of the control condition of Study 3 as a sensory food cue exposure condition is that participants in this condition did not appear to be more likely to eat a lot of pizza compared to restrained eaters in the control condition of Study 1 (see participants per cell in Tables 3 and 13). So, essentially the argument would be that restrained eaters were not more likely to eat a lot in response to strong sensory food cues, but rather that this exposure was more likely to cause restrained eaters to become disinhibited when they did eat more of the pizza. This raises the question, however, of why the participants who ate a lot in the control condition of Study 1 did not become disinhibited. Perhaps the restrained eaters who ate a lot in the control condition of Study 1 ate more than
the median amount, but did not eat excessively large amounts and, therefore, did view themselves as having eaten too much. Examination of the data shows that only one of the ten participants who ate a lot of pizza in control condition of Study 1 ate more than three servings of pizza (250 grams total), which could be considered an excessively large amount, whereas 6 of the 15 participants who ate a lot of pizza in the control condition of Study 3 ate more than three servings of pizza. Whether these are chance findings or whether they actually represent differences in responses to weaker versus stronger sensory food cues is unclear on the basis of only two studies and should be examined further in future studies.

With regard to the second aim of this dissertation, Study 3 provides some evidence that disinhibited eating can be differentiated from simple overeating. Restrained eaters who ate a lot of pizza in the milkshake condition, presumably because they expected to break their diet, went on to eat a lot of cookies. In contrast, restrained eaters who ate a lot of pizza in the remote confederate condition, presumably because the remote confederate sheet would allow them to eat more than usual without viewing their intake as excessive, did not go on to eat a lot of cookies. These findings suggest that restrained eaters who ate a lot of pizza in the milkshake condition were disinhibited, whereas restrained eaters who ate a lot of pizza in the remote confederate condition were not disinhibited. In further support of this conclusion was the finding that the amount of cookies eaten was positively correlated to restrained eaters’ responses to the item, “I ate more pizza than I should have eaten” in the milkshake condition, but not in the remote confederate condition. This indicates that awareness of having eaten too much is characteristic of disinhibited eating, but not simple overeating. There was no evidence, however, that disinhibition is related to less accurate self-monitoring of food
intake. As with the earlier results, these findings should be replicated since similar results were not found in Study 2.

The third aim of this dissertation could not be addressed because the high-calorie milkshake manipulation did not elicit disinhibition in Study 4. This result is similar to the findings during the initial taste test in Studies 2 and 3, as the milkshake threat did not increase consumption of pizza in these studies; however, restrained eaters in Study 3 were considered to be disinhibited because they went on to eat a lot of cookies. A second taste test was not included in Study 4 so it is not possible to determine whether participants who ate a lot in the milkshake conditions were disinhibited. Although it is possible that some restrained eaters became disinhibited in Study 4, the overall reduction in mean consumption suggests that the majority did not. The reasons for this are unclear. Failure to find the classic disinhibition effect in three of the four studies in this dissertation raises the question of whether the disinhibition effect that has been observed in past studies is as robust as it once was or whether the percentage of restrained eaters who tend to become disinhibited in response to this manipulation has waned over time. If the tendency to become disinhibited when one’s diet is broken has decreased, then possible reasons for this (e.g., dieting norms, compensatory behavior, etc.) should be explored in future studies. It is possible that the nature of dieting has changed since the 1970s when the disinhibition effect was first observed. For example, anecdotal evidence suggests that “lifestyle plans” and the adoption of ways of eating that exclude certain foods (e.g., vegan, paleo, etc.) have become a popular alternative to diets, and that adherence to these plans may not be viewed as dieting by the individual. It is unclear, however, how current forms of dieting differ from the forms of dieting that were prevalent many years ago, as, to my knowledge, there is currently no
literature on this topic. Qualitative studies on current dieting behaviors are warranted as these may help to uncover patterns of behavior that are not adequately captured by the Restraint Scale. Of interest would be the specific dietary rules that individuals follow, including whether they limit the amount of food they eat or avoid certain foods, as well as whether they regard these rules as flexible or rigid, whether “cheating” is allowed, whether individuals typically intend to compensate for dietary lapses, and whether exercise plays a role as an alternative or adjunct to controlling one’s eating. In addition, cultural influences on dieting behavior should be examined, as it is possible that the phenomenon of disinhibition was overgeneralized from early studies that used relatively homogenous Caucasian samples.

Several limitations should be kept in mind when considering the findings of this dissertation. First, no differences in amount of pizza eaten were observed across manipulated conditions for Studies 2, 3, or 4. Second, all analyses for Study 2 yielded non-significant results, which means that, although the method for Study 3 was identical to that of Study 2, the results across these two studies were discordant. The results of Study 2 may have been influenced by problems with the laboratory rooms, which might also explain why no differences were observed across conditions; however, this is merely speculation. No firm conclusions can be drawn from the results of Study 3 until these findings are replicated. Third, the studies were underpowered and the number of participants in some cells was very small, so these studies should be replicated with a much larger number of participants to verify the findings. Fourth, the cognitions that accompany disinhibited eating could not be measured directly. Instead these cognitions were assessed using self-report questionnaires that participants filled out after completing the taste-tests. Participants may not be able to accurately recall their thoughts after the fact, either because they were not attending carefully
to their thoughts during the taste-test or because the task itself, and the intervening questions, influenced their recall. In light of these limitations, all findings of the present dissertation should be viewed with caution and the conclusions drawn from this work should be regarded as tentative.

Despite these limitations, results of the present dissertation raise interesting questions about the phenomenon of disinhibited eating. There was preliminary evidence that disinhibited eating can be differentiated from simple overeating, as restrained eaters who ate a lot in the remote confederate condition did not become disinhibited. Modeling is a type of normative food cue in that the model serves as an indicator of appropriate food intake, but it is not clear whether other normative food cues, such as portion size, also increase eating without causing disinhibition. Furthermore, it is unclear whether other factors that increase eating, such as distraction, emotional distress, or exposure to sensory food cues, cause disinhibited eating, although, if the control condition of Study 3 actually did function as a sensory cue exposure condition, then there is reason to believe that exposure to sensory food cues does lead to disinhibited eating. Based on our earlier definition of disinhibition, the ability of these various factors to elicit disinhibited eating could be determined by examining whether restrained eaters who eat a lot in response to a given factor continue to overeat after that factor is removed. For example, do restrained eaters who eat a lot when distracted continue to eat a lot when they are no longer distracted? A second component of our definition of disinhibition, which was supported in Study 3, was that awareness of having overeaten is a characteristic of disinhibited eating. We would, therefore, expect restrained eaters to become disinhibited in response to distraction, distress, sensory food cues, or normative food cues, only if they perceived their food intake as excessive.
Results of the present dissertation suggest that restrained eaters who become disinhibited continue to overeat shortly after the disinhibitor is removed, but it is not clear how long they typically remain disinhibited, how easily they are reinhibited, or whether the simple passage of time is sufficient to cause reinhibition. Exploring the factors that lead to reinhibition and the consequences of reinhibition on outcomes such as mood and total caloric intake would provide a better understanding of the sequelae of disinhibition. Additional future directions include an examination of whether other factors known to induce overeating in dieters, such as distraction, emotional distress, and sensory cue exposure, cause disinhibited eating or simple overeating. Such studies could be conducted using methodology similar to that utilized in the present dissertation; however, much larger numbers of participants should be recruited. The consequences of disinhibited eating versus simple overeating on unhealthy dieting behavior, weight gain, and affect should also be examined. Furthermore, potential moderators of the disinhibition effect, including successful dieting, rigid vs. flexible control of eating, and self-licensing, should be explored in order to better understand the mechanisms underlying disinhibited eating.

Conclusion

Disinhibited eating was defined as the conscious relaxation of inhibitions on food intake leading to increased consumption. In contrast, simple overeating was considered an umbrella term encompassing all forms of inadvertent overeating, and overeating in response to cues, such as large portions, that redefine acceptable intake, and thus allow people to eat more than usual without viewing their food intake as excessive. The present dissertation provided preliminary evidence that disinhibited and simple overeating can be differentiated on the basis of whether restrained eaters continue to overeat during a second taste-test. This
method for differentiating disinhibited and simple overeating is useful in that it can be used to determine which types of overeating lead to disinhibition. Restrained eaters appear to become disinhibited in response to expectations that their diet will be broken in the near future or feeling like they have already eaten excessively. In contrast, restrained eaters appear to be able to eat a lot without becoming disinhibited when they are given information that other participants ate a lot. As expected, perceptions of having eaten more than one should appear to be associated with disinhibited eating but not with simple overeating.
References


Appetite, 9, 161-169.


Khan, U., & Dhar, R. (2007). Where the is a way, is there a will? The effect of future


Behaviors, 3(1), 61-72.


a diet violation: Disinhibition or compensation? Psychological Science, 20(10), 1275-1281.


Table 1. Means and standard deviations for grams of pizza eaten (Study 1)

<table>
<thead>
<tr>
<th></th>
<th>Unrestrained</th>
<th></th>
<th>Restrained</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>N</td>
<td>M (SD)</td>
<td>N</td>
</tr>
<tr>
<td>Control</td>
<td>134.53 (57.96)</td>
<td>24</td>
<td>143.53 (75.70)</td>
<td>18</td>
</tr>
<tr>
<td>Milkshake</td>
<td>137.09 (104.07)</td>
<td>18</td>
<td>205.71 (190.92)</td>
<td>17</td>
</tr>
</tbody>
</table>
Table 2. Means and standard deviations for grams of ice cream eaten (Study 1)

<table>
<thead>
<tr>
<th></th>
<th>Unrestrained</th>
<th>Restrained</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>(SD)</td>
</tr>
<tr>
<td>Control</td>
<td>95.42</td>
<td>(50.17)</td>
</tr>
<tr>
<td>Milkshake</td>
<td>79.24</td>
<td>(39.91)</td>
</tr>
</tbody>
</table>
Table 3. Means and standard deviations for grams of ice cream eaten (Study 1)

<table>
<thead>
<tr>
<th></th>
<th>Unrestrained</th>
<th>Restrainted</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ate little</td>
<td>Ate a lot</td>
<td>Ate little</td>
<td>Ate a lot</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>pizza</td>
<td>pizza</td>
<td>pizza</td>
<td>pizza</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>63.93 (29.05)</td>
<td>121.18 (49.84)</td>
<td>135.16 (74.09)</td>
<td>111.17 (44.10)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>11</td>
<td>8</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milkshake</td>
<td>84.22 (36.87)</td>
<td>72.11 (45.90)</td>
<td>85.30 (48.51)</td>
<td>150.73 (118.79)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>7</td>
<td>6</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 4. Means and standard deviations for responses to the item “How much of the taste-test foods did you eat?” (Study 1)

<table>
<thead>
<tr>
<th></th>
<th>Unrestrained</th>
<th>Restrained</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ate little pizza</td>
<td>Ate a lot of pizza</td>
</tr>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>1.73 (0.65)</td>
<td>4.75 (1.71)</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>Milkshake</td>
<td>2.55 (0.82)</td>
<td>3.29 (1.89)</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>7</td>
</tr>
</tbody>
</table>

1 = the minimum possible to do the task

2 = a little more than minimum

3 = somewhat more than minimum

4 = a fair bit more than minimum

5 = a lot more than minimum

6 = a whole lot more than minimum

7 = as much as I could comfortably eat
Table 5. Means and standard deviations for estimations of the amount of pizza eaten by other participants (Study 2)

<table>
<thead>
<tr>
<th></th>
<th>Unrestrained</th>
<th>Restrained</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Control</td>
<td>6.04 (2.77)</td>
<td>5.98 (3.30)</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>21</td>
</tr>
<tr>
<td>Milkshake</td>
<td>6.90 (4.66)</td>
<td>5.95 (2.97)</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>19</td>
</tr>
<tr>
<td>Remote confederate</td>
<td>9.35 (3.23)</td>
<td>8.86 (4.08)</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>21</td>
</tr>
</tbody>
</table>
Table 6. Means and standard deviations for grams of pizza eaten (Study 2)

<table>
<thead>
<tr>
<th></th>
<th>Unrestrained</th>
<th>Restrainted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td>Control</td>
<td>123.44 (57.97)</td>
<td>125.67 (69.40)</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>21</td>
</tr>
<tr>
<td>Milkshake</td>
<td>129.50 (92.39)</td>
<td>155.21 (103.93)</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>19</td>
</tr>
<tr>
<td>Remote confederate</td>
<td>178.30 (82.02)</td>
<td>139.62 (85.77)</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>21</td>
</tr>
</tbody>
</table>
Table 7. Means and standard deviations for grams of cookies eaten (Study 2)

<table>
<thead>
<tr>
<th></th>
<th>Unrestrained</th>
<th></th>
<th>Restrained</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>(SD)</td>
<td>M</td>
<td>(SD)</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td></td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>61.44</td>
<td>(47.70)</td>
<td>53.29</td>
<td>(32.84)</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td></td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Milkshake</td>
<td>45.04</td>
<td>(37.38)</td>
<td>56.16</td>
<td>(36.60)</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td></td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Remote confederate</td>
<td>67.04</td>
<td>(35.81)</td>
<td>55.00</td>
<td>(59.49)</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td></td>
<td>21</td>
<td></td>
</tr>
</tbody>
</table>
Table 8. Means and standard deviations for grams of cookies eaten (Study 2)

<table>
<thead>
<tr>
<th></th>
<th>Unrestrained</th>
<th></th>
<th>Restrained</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ate little</td>
<td>Ate a lot of</td>
<td>Ate little</td>
<td>Ate a lot of</td>
</tr>
<tr>
<td></td>
<td>pizza</td>
<td>pizza</td>
<td>pizza</td>
<td>pizza</td>
</tr>
<tr>
<td></td>
<td>M (SD) N</td>
<td>M (SD) N</td>
<td>M (SD) N</td>
<td>M (SD) N</td>
</tr>
<tr>
<td>Control</td>
<td>43.40 (24.80)</td>
<td>88.50 (61.27)</td>
<td>47.47 (33.42)</td>
<td>67.83 (28.82)</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>10</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>Milkshake</td>
<td>23.42 (16.84)</td>
<td>65.00 (40.44)</td>
<td>35.22 (24.24)</td>
<td>75.00 (36.39)</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>13</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Remote confederate</td>
<td>63.17 (55.05)</td>
<td>72.18 (24.63)</td>
<td>34.64 (22.06)</td>
<td>77.40 (79.12)</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>17</td>
<td>11</td>
<td>10</td>
</tr>
</tbody>
</table>
Table 9. Means and standard deviations for responses to the item, “I ate more pizza than I should have eaten” (Study 2)

<table>
<thead>
<tr>
<th></th>
<th>Unrestrained</th>
<th>Restrained</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Control</td>
<td>1.44 (0.58)</td>
<td>1.81 (0.93)</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>21</td>
</tr>
<tr>
<td>Milkshake</td>
<td>1.38 (0.70)</td>
<td>1.95 (0.97)</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>19</td>
</tr>
<tr>
<td>Remote confederate</td>
<td>1.54 (0.83)</td>
<td>2.05 (0.97)</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>21</td>
</tr>
</tbody>
</table>

1 = not at all true, 2 = somewhat true, 3 = mostly true, 4 = very true
Table 10. Means and standard deviations for accuracy of estimated pizza intake (estimated number – number actually eaten; Study 2)

<table>
<thead>
<tr>
<th>Group</th>
<th>Unrestrained M (SD)</th>
<th>N</th>
<th>Restrained M (SD)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>0.13 (2.34)</td>
<td>25</td>
<td>0.57 (1.87)</td>
<td>21</td>
</tr>
<tr>
<td>Milkshake</td>
<td>0.33 (2.77)</td>
<td>26</td>
<td>-0.95 (3.94)</td>
<td>19</td>
</tr>
<tr>
<td>Remote confederate</td>
<td>0.03 (2.30)</td>
<td>23</td>
<td>0.70 (2.80)</td>
<td>21</td>
</tr>
</tbody>
</table>
Table 11. Means and standard deviations for estimations of the amount of pizza eaten by other participants (Study 3)

<table>
<thead>
<tr>
<th></th>
<th>Unrestrained</th>
<th></th>
<th>Restained</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>N</td>
<td>M (SD)</td>
<td>N</td>
</tr>
<tr>
<td>Control</td>
<td>8.86 (4.13)</td>
<td>38</td>
<td>7.29 (3.56)</td>
<td>29</td>
</tr>
<tr>
<td>Milkshake</td>
<td>7.81 (4.40)</td>
<td>36</td>
<td>8.72 (5.41)</td>
<td>23</td>
</tr>
<tr>
<td>Remote confederate</td>
<td>11.65 (3.25)</td>
<td>33</td>
<td>9.93 (3.61)</td>
<td>23</td>
</tr>
</tbody>
</table>
Table 12. Means and standard deviations for grams of pizza eaten (Study 3)

<table>
<thead>
<tr>
<th></th>
<th>Unrestrained</th>
<th>Restrained</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Control</td>
<td>140.44 (73.73) 38</td>
<td>150.03 (90.35) 27</td>
</tr>
<tr>
<td>Milkshake</td>
<td>133.28 (80.63) 36</td>
<td>131.59 (85.03) 23</td>
</tr>
<tr>
<td>Remote confederate</td>
<td>138.16 (71.94) 34</td>
<td>129.67 (80.72) 23</td>
</tr>
</tbody>
</table>
Table 13. Means and standard deviations for grams of cookies eaten (Study 3)

<table>
<thead>
<tr>
<th></th>
<th>Unrestrained</th>
<th>Restrained</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Control</td>
<td>39.72 (23.64)</td>
<td>56.58 (40.01)</td>
</tr>
<tr>
<td></td>
<td>39</td>
<td>29</td>
</tr>
<tr>
<td>Milkshake</td>
<td>40.93 (19.26)</td>
<td>53.13 (41.74)</td>
</tr>
<tr>
<td></td>
<td>37</td>
<td>22</td>
</tr>
<tr>
<td>Remote confederate</td>
<td>42.22 (23.57)</td>
<td>39.04 (20.55)</td>
</tr>
<tr>
<td></td>
<td>34</td>
<td>24</td>
</tr>
</tbody>
</table>
Table 14. Means and standard deviations for grams of cookies eaten (Study 3)

<table>
<thead>
<tr>
<th></th>
<th>Unrestrained</th>
<th></th>
<th></th>
<th></th>
<th>Restained</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ate little</td>
<td>Ate a lot of</td>
<td>Ate little</td>
<td>Ate a lot of</td>
<td>pizza</td>
<td>pizza</td>
<td>pizza</td>
</tr>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Control</td>
<td>33.52 (17.76)</td>
<td>44.97 (26.74)</td>
<td>31.07 (17.96)</td>
<td>80.62 (40.75)</td>
<td>16</td>
<td>22</td>
<td>12</td>
</tr>
<tr>
<td>Milkshake</td>
<td>31.02 (16.54)</td>
<td>51.68 (16.50)</td>
<td>36.99 (38.72)</td>
<td>72.49 (38.31)</td>
<td>18</td>
<td>18</td>
<td>12</td>
</tr>
<tr>
<td>Remote confederate</td>
<td>35.89 (21.99)</td>
<td>47.86 (24.10)</td>
<td>39.19 (24.82)</td>
<td>37.54 (8.06)</td>
<td>16</td>
<td>18</td>
<td>16</td>
</tr>
</tbody>
</table>
Table 15. Means and standard deviations for responses to the item, “I ate more pizza than I should have eaten” (Study 3)

<table>
<thead>
<tr>
<th></th>
<th>Unrestrained</th>
<th>Restrained</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Control</td>
<td>1.59 (0.75)</td>
<td>2.03 (0.98)</td>
</tr>
<tr>
<td></td>
<td>39</td>
<td>29</td>
</tr>
<tr>
<td>Milkshake</td>
<td>1.49 (0.69)</td>
<td>2.43 (1.04)</td>
</tr>
<tr>
<td></td>
<td>37</td>
<td>23</td>
</tr>
<tr>
<td>Remote confederate</td>
<td>1.74 (0.67)</td>
<td>1.96 (0.95)</td>
</tr>
<tr>
<td></td>
<td>34</td>
<td>24</td>
</tr>
</tbody>
</table>

1 = not at all true, 2 = somewhat true, 3 = mostly true, 4 = very true
Table 16. Means and standard deviations for accuracy of estimated pizza intake (estimated number – number actually eaten; Study 3)

<table>
<thead>
<tr>
<th></th>
<th>Unrestrained</th>
<th>Restrained</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Control</td>
<td>-1.31 (3.60)</td>
<td>-1.94 (3.14)</td>
<td>39</td>
<td>27</td>
</tr>
<tr>
<td>Milkshake</td>
<td>-1.59 (2.56)</td>
<td>-1.13 (2.42)</td>
<td>37</td>
<td>23</td>
</tr>
<tr>
<td>Remote confederate</td>
<td>0.16 (3.41)</td>
<td>-0.46 (3.32)</td>
<td>34</td>
<td>24</td>
</tr>
</tbody>
</table>
Table 17. Means and standard deviations for grams of cookies eaten (Study 4)

<table>
<thead>
<tr>
<th></th>
<th>Unrestrained</th>
<th>Restrained</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Control</td>
<td>59.76 (18.56)</td>
<td>65.21 (47.02)</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>19</td>
</tr>
<tr>
<td>Low-calorie milkshake</td>
<td>38.36 (24.86)</td>
<td>43.96 (19.57)</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>22</td>
</tr>
<tr>
<td>High-calorie milkshake</td>
<td>43.83 (23.17)</td>
<td>43.43 (19.72)</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>23</td>
</tr>
</tbody>
</table>
Table 18. Means and standard deviations for responses to the item, “I ate more cookies than I should have eaten” (Study 4)

<table>
<thead>
<tr>
<th></th>
<th>Unrestrained</th>
<th>Restrained</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Control</td>
<td>1.44 (0.89)</td>
<td>1.58 (0.61)</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>19</td>
</tr>
<tr>
<td>Low-calorie milkshake</td>
<td>1.08 (0.28)</td>
<td>1.41 (0.67)</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>22</td>
</tr>
<tr>
<td>High-calorie milkshake</td>
<td>1.40 (0.74)</td>
<td>1.43 (0.66)</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>23</td>
</tr>
</tbody>
</table>

Scores range from 1 (not at all true) to 7 (very true).
Table 19. Means and standard deviations for accuracy of estimated cookie intake (estimated number – number actually eaten; Study 4)

<table>
<thead>
<tr>
<th></th>
<th>Unrestrained</th>
<th></th>
<th>Restrained</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>N</td>
<td>M (SD)</td>
<td>N</td>
</tr>
<tr>
<td>Control</td>
<td>-0.07 (1.28)</td>
<td>15</td>
<td>-0.82 (2.54)</td>
<td>19</td>
</tr>
<tr>
<td>Low-calorie milkshake</td>
<td>0.27 (1.83)</td>
<td>13</td>
<td>-0.42 (0.73)</td>
<td>21</td>
</tr>
<tr>
<td>High-calorie milkshake</td>
<td>-0.71 (1.68)</td>
<td>14</td>
<td>-0.26 (1.02)</td>
<td>23</td>
</tr>
</tbody>
</table>
Table 20. Means and standard deviations for guilt (Study 4)

<table>
<thead>
<tr>
<th></th>
<th>Unrestrained</th>
<th>Restrained</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Control</td>
<td>1.56 (1.09)</td>
<td>1.63 (1.42)</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>19</td>
</tr>
<tr>
<td>Low-calorie milkshake</td>
<td>1.15 (0.38)</td>
<td>3.24 (2.28)</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>21</td>
</tr>
<tr>
<td>High-calorie milkshake</td>
<td>1.60 (1.30)</td>
<td>3.41 (2.26)</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>22</td>
</tr>
</tbody>
</table>

Scores range from 1 (not at all guilty) to 7 (very guilty).
Appendix A

Follow-up questionnaire for Study 1

How much of the taste-test foods did you eat? (circle one response below)

1  The minimum possible to do the task
2  A little more than minimum
3  Somewhat more than minimum
4  A fair bit more than minimum
5  A lot more than minimum
6  A whole lot more than minimum
7  As much as I could comfortably eat

To what extent was the amount you ate based on...

the appearance of the food?

1  2  3  4  5  6  7

Not at all  Very much so

the taste of the food?

1  2  3  4  5  6  7

Not at all  Very much so
the smell of the food?

1 2 3 4 5 6 7

Not at all Very much so

your liking for that kind of food?

1 2 3 4 5 6 7

Not at all Very much so

being in the mood for that kind of food?

1 2 3 4 5 6 7

Not at all Very much so

the time allotted for the taste-test?

1 2 3 4 5 6 7

Not at all Very much so

your level of hunger?

1 2 3 4 5 6 7

Not at all Very much so

what you had eaten earlier that day?

1 2 3 4 5 6 7

Not at all Very much so
your expectations of what you would be eating later?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Not at all  

the amount of food served?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Not at all  

your mood?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Not at all  

Very much so
Appendix B

Follow-up questionnaire for Studies 2 and 3

How many pizza snacks do you think you ate? __________

How many cookies do you think you ate? __________

To what extent was the amount of pizza you ate based on...

the appearance of the pizza?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>Very much so</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

the taste of the pizza?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>Very much so</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

the smell of the pizza?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>Very much so</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

your liking for pizza?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>Very much so</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
being in the mood for pizza?

1 2 3 4 5 6 7

Not at all  Very much so

the time allotted for the taste-test?

1 2 3 4 5 6 7

Not at all  Very much so

your level of hunger?

1 2 3 4 5 6 7

Not at all  Very much so

feeling like your diet would be broken anyway

1 2 3 4 5 6 7

Not at all  Very much so

what you had eaten earlier that day?

1 2 3 4 5 6 7

Not at all  Very much so

your expectations of what you would be eating later?

1 2 3 4 5 6 7

Not at all  Very much so
the amount your diet allows you to eat

1 2 3 4 5 6 7
Not at all Very much so

the amount of pizza served?

1 2 3 4 5 6 7
Not at all Very much so

your mood?

1 2 3 4 5 6 7
Not at all Very much so

Other? (Please describe)____________________________________________________

To what extent did you have mixed feelings when deciding whether or not to have more pizza?

1 2 3 4 5 6 7
Not at all Very much so

To what extent did you have mixed feelings when deciding whether or not to have more cookies?

1 2 3 4 5 6 7
Not at all Very much so
To what extent did you feel conflicted when deciding whether or not to have more pizza?

1 2 3 4 5 6 7

Not at all     Very much so

To what extent did you feel conflicted when deciding whether or not to have more cookies?

1 2 3 4 5 6 7

Not at all     Very much so

The amount of pizza I ate was

Extremely small Small Moderate Large Extremely large

The amount of cookies I ate was

Extremely small Small Moderate Large Extremely large

I ate more pizza than I should have eaten

Not at all true Somewhat true Mostly true Very true

I ate more cookies than I should have eaten

Not at all true Somewhat true Mostly true Very true
Are you currently on a diet to lose weight? Yes____ No____

If yes, did the pizza you ate break your diet?

No, not at all No, almost Yes, a little Yes, totally

If yes, did the cookies you ate break your diet?

No, not at all No, almost Yes, a little Yes, totally

If yes, how strict do you expect your diet to be tomorrow?

1 2 3 4 5 6 7
Not at all strict Very strict

How much do you think other participants in this study liked the pizza snacks?

1 2 3 4 5 6 7
Not at all Very much

How much do you think other participants in this study liked the cookies?

1 2 3 4 5 6 7
Not at all Very much
How many pizza snacks do you think other participants ate? ______

How many cookies do you think other participants ate? ______
Appendix C

Follow-up questionnaire for Study 4

How many cookies do you think you ate? ____________

To what extent was the number of cookies you ate based on...

the appearance of the cookies?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>Very much so</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

the taste of the cookies?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>Very much so</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

the smell of the cookies?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>Very much so</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

your liking for cookies?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>Very much so</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
being in the mood for cookies?

1 2 3 4 5 6 7

Not at all  Very much so

the time allotted for the taste-test?

1 2 3 4 5 6 7

Not at all  Very much so

your level of hunger?

1 2 3 4 5 6 7

Not at all  Very much so

feeling like your diet was broken anyway

1 2 3 4 5 6 7

Not at all  Very much so

what you had eaten earlier that day?

1 2 3 4 5 6 7

Not at all  Very much so

your expectations of what you would be eating later?

1 2 3 4 5 6 7

Not at all  Very much so
the amount your diet allows you to eat

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>Very much so</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

the amount of cookies served?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>Very much so</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

your mood?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>Very much so</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Other? (Please describe)____________________________________________________

To what extent did you have mixed feelings when deciding whether or not to have more cookies?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>Very much so</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To what extent did you feel conflicted when deciding whether or not to have more cookies?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>Very much so</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
To what extent do you feel guilty about having consumed the milkshake?

1 2 3 4 5 6 7

Not at all Very much so

To what extent do you feel guilty about the number of cookies you ate?

1 2 3 4 5 6 7

Not at all Very much so

To what extent do you have a goal to eat less in order to lose weight?

1 2 3 4 5 6 7

Not at all Very much so

To what extent do you feel that this experiment interfered with this goal?

1 2 3 4 5 6 7

Not at all Very much so

To what extent do you plan to give up on this goal for today and start fresh later?

1 2 3 4 5 6 7

Not at all Very much so
To what extent do you plan to compensate for the amount you ate by eating less today?

1  2  3  4  5  6  7

Not at all  Very much so

To what extent do you plan to compensate for the amount you ate by eating less tomorrow or in the near future?

1  2  3  4  5  6  7

Not at all  Very much so

To what extent do you plan to compensate for the amount you ate by exercising today?

1  2  3  4  5  6  7

Not at all  Very much so

To what extent do you plan to compensate for the amount you ate by exercising tomorrow or in the near future?

1  2  3  4  5  6  7

Not at all  Very much so

The amount of cookies I ate was

Extremely small  Small  Moderate  Large  Extremely large
I ate more cookies than I should have eaten

**Not at all true**  **Somewhat true**  **Mostly true**  **Very true**

How much do you think other participants in this study liked the cookies?

1 2 3 4 5 6 7

**Not at all**  **Very much**

How many cookies do you think other participants ate? _______

Are you currently on a diet to lose weight?  **Yes_____  No_____**

If yes, did the milkshake you ate break your diet?

**No, not at all**  **No, almost**  **Yes, a little**  **Yes, totally**

If yes, did the cookies you ate break your diet?

**No, not at all**  **No, almost**  **Yes, a little**  **Yes, totally**

If yes, how strict do you expect your diet to be today?

1 2 3 4 5 6 7

**Not at all strict**  **Very strict**
If yes, how strict do you expect your diet to be tomorrow?

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

- Not at all strict
- Very strict