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Effects of Food Primes and Thought Suppression on Eating Habits

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Abstract

Food primes and thought suppression have been identified as factors influencing poor eating choices. Primes affect people non-consciously by activating thoughts of food. Suppression of food thoughts leads to a preoccupation with food that is often followed by a hyperaccessibility of food thoughts and increased binging. The current study paired these two processes to examine their interactional effects. We manipulated exposure to food primes and instructions to suppress thoughts of a tasty snack food (M&Ms) for 76 college-aged women. We hypothesized that participants both primed with food images and asked to suppress would consume the most M&Ms at the end of the study. Contrary to predictions, results showed no effects for the manipulations. Perceived weight category, however, did interact with the manipulations, with overweight participants eating more when they got either the food prime or the suppression (but not both together). These findings have important implications for weight-loss strategies.

Effects of Food Primes and Thought Suppression on Eating Habits

According to the United States Department of Health and Human Services [HHS] (Call to Action, 2001), 61% of adults were overweight or obese in 1999. This figure is more than double that of obese adults in the 1980s (HHS News, 2001). The obesity rate has drastically increased for people of all ages, genders, and racial groups. At the current rate of increased obesity, by 2040, just 32 years from now, it is estimated that 100% of adults will be obese (Lambert, 2004). The Surgeon General has called obesity an epidemic in the United States and has determined that it is very probable it could soon "cause as much preventable disease and death as cigarettes and smoking" (Call to Action, 2001).

The Center for Disease Control [CDC] has investigated the relationships between obesity and chronic diseases. They attribute increases in heart disease, stroke, hypertension, and both types of diabetes to obesity. The CDC has stated that the obesity epidemic can be easily controlled and eradicated through "good nutrition and physical activity." They have also reported on the impact obesity has on the nation's economy. Obesity costs totaled approximately $117 billion dollars in 2000 for medical attention. The CDC estimates that if 10% of adults began a walking program, a total of $5.6 billion could be saved in expenses related to heart disease (2005). It is clear that obesity epidemic has both monetary and health consequences that are crucial to this nation.

In 2004, Harvard Magazine published a cover story proposing some possible origins for obesity. One possibility is a dramatic change in average portion sizes. For example, in the 1950s, Pepsi was marketing 12 ounce sodas as their largest size. Today, single servings are considered as large as 33.8 ounces. In addition, Americans have been increasingly eating at fast-food restaurants in the past two decades. Today, between 20 and 25% of all Americans eat at a

fast food restaurant *each day*, where the portions are larger, caloric intake is much higher, and the food is packed with trans-fats; contrast that to fifty years ago when almost all meals were eaten at home. Furthermore, the advent of new technology such as microwaves, for easy preparation for food, and television, that has promoted sedentary lifestyles, have also been factors in the obesity increases, especially since the mid-1970s. Finally, since the Industrial Revolution, there has been a move away from physically intense jobs that most people held, mainly on farms, towards work that has been increasingly limited to office jobs that encourage Americans to be inactive (Lambert, 2004).

In the Department of Health and Human Service's Call to Action to Prevent and Decrease Overweight and Obesity (2001), a clear 15 point "vision of the future" is laid out, as immediately actionable steps against obesity. Some of the important ones are changing the perception of obesity and transforming people's thinking to that of a health focus, offering healthier food choices in schools and in the workplace, and conduct more research on, specifically, the behavioral and environmental factors that cause obesity. A fundamental activity that is recommended in this report and has direct implications for this thesis paper is the "reduction of time spent watching television and in other similar sedentary behaviors."

Recently, The Henry J. Kaiser Family Foundation (2004) released a report on the "role of media in childhood obesity," with a meta-analysis of forty studies on the media's role in the increasing obesity problem in the United States. Their findings show a correlation between the amount of time spent television watching and childhood obesity. The study qualifies this, however, with findings that this time spent watching television does not replace time that is spent participating in physical activity. While common thought may be that media use is related to obesity because it takes the place of time normally spent on activities that would promote weight

loss or maintenance, this is actually not the case. This research suggests that there is a more complex link between media use and obesity.

Similar findings have been shown for adults. Boyce found that there is only a weak relationship between media use and decrease of physical activity (2007). However, it is clear that media use does promote an unhealthy lifestyle: results show that those who watch less than one hour a day of television are the least likely to be overweight or obese (Boyce, 2007). The general consensus in the research is that there is a relationship between media use and obesity; however, that relationship is complex. Many researchers have proposed that it is the images that viewers are *seeing* that are leading to higher rates of obesity (e.g., Boyce, 2007; Kuribayashi, 2001; Shrum, 1999).

Food Primes

Advertising has powerful effects on individuals. A testimony to this effect is the fact that tobacco advertising is banned from television advertising and that alcohol companies have chosen not to advertise liquor on television (Shrum, 1999). The fact that these products are not advertised on television, but allowed to be advertised in other forms, such as magazines, speaks to the powerful influence that televised images possess. Images can be used to *prime* individuals and embed an image or thought within the viewer's head, sometimes without them being aware of this occurring. Priming occurs when a particular relationship or idea is activated in a person's memory, without conscious knowledge. Psychologists have found that primed ideas are more accessible and applied more frequently than other thoughts or beliefs (Bargh, Lombardi, & Higgins, 1988). Researchers have shown, for example, that priming one concept can affect participants' behavior on the second task without their awareness (Bargh & Pietromonaco, 1982). Several studies have demonstrated the effects of priming by first presenting participants

with either positive or negative trait terms. Then, as an unrelated task, participants read an ambiguous behavior description about a person and make a judgment based on the description. Participants have very different judgments about the same behavior description based on whether or not they were primed with positive or negative schemas previously (Higgins, Rholes, & Jones 1977; Bargh, Bond, Lombardi, & Tota, 1986).

Priming can have effects on behavior as well. Bargh, Chen, and Burrows (1996) demonstrated that priming participants for the elderly stereotype using scrambled words (i.e. Florida, bingo, etc.), led to the subjects walking slower down a hallway as compared to subjects who were not primed for the elderly stereotype. These participants were not aware that they were affected by this stereotype. This suggests that individuals can be primed, and this prime can affect their behavior, all without awareness. Therefore, people who view food primes through television commercials can unconsciously be affected by them, resulting in increased calorie consumption.

Food primes exist everywhere in the American culture—newspapers, billboards, magazines, movies, television, and the internet. Because food is depicted in the media continually—as high as 27% of all commercials are about food (Kuribayashi, 2001)—the activation of the food schema is likely to be quite frequent and could be a source of unintended eating. Bryd-Bredbenner (2003) determined that television viewers see food images once every four minutes. Therefore, there is very little time that these viewers do not have food concepts activated, on some level, when they are watching television.

In Shrum's (1999) cognitive model of television, one of his main proposals is that "television viewing influences accessibility." He states that watching television increases recency and frequency of a mental construct. In his research, he found that television has little

time to captivate viewers and tell the story, causing advertisers and program writers to exaggerate constructs, thus, exposing the viewer to more dramatic mental constructs than someone who is exposed to less television. Extrapolating from Shrum's findings, it is possible that people who watch a lot of television have highly chronic and potentially exaggerated positive images of food on their minds.

Studies have shown (Byrd-Bredbenner, Finckenor, & Grasso, 2003; Kuribayashi, 2001; Story & Faulkner, 1990) that not only are media consumers primed for food at a high rate, but they are primed for *unhealthy* food. For example, a total of 97.5% of the food-related commercials shown on four major network stations during Saturday morning television shows geared towards children were for unhealthy products—higher in sodium, sugar, cholesterol, and fat—compared to the total of 78.3% of unhealthy food commercials shown during the evening. The average caloric value in the products advertised was 400 calories per serving (Kuribayashi, 2001). This extreme exposure to nutritionally-void foods is very likely part of the explanation to the link between media use and obesity, especially when considering that media use does not displace physical activity. Story and Faulkner (1990) determined that the "prime time diet," or the foods advertised between 8:00 pm-11:00 pm, is consistent with the average American's normal diet—high in sugar, fat, and sodium, and low in fruits, vegetables, and fiber. Research (Henderson & Kelly, 2005) suggests that one way to prevent unhealthy eating and reverse the effects of these advertisements is to teach critical thinking skills to consumers, so that they effectively analyze unhealthy food commercials when they see them. The problem, however, remains that when people are primed for a particular construct, they do not realize how much it is influencing their behavior.

Thought Suppression

While food primes through media outlets, especially television, may be part of the problem, it cannot be the whole story about obesity. Indeed, people who strive to lose weight can do so—at least in the short term. Research has shown that when people are extremely motivated to overcome a primed construct, they can do it (Bargh, Lombardi, & Higgins, 1988). However, many people who want to lose weight or change their eating patterns attempt to restrict their thoughts about food (Polivy & Herman, 1985; Wegner, Schneider, Carter, & White, 1987). A common lay belief is that suppressing thoughts about food, as well as restricting eating itself, is a way to lose weight. Unfortunately for dieters, research has shown that thought suppression is actually a very difficult process.

Thought suppression occurs when a person actively to tries stop thinking about a particular thought (Wegner, 1989). Ironically, asking someone not to think about something actually leads him or her to think about it more. People often become obsessed or preoccupied by these thoughts. Thought suppression is considered a "paradoxical process" because of the processes that it requires to work. By nature, thought suppression calls for the individual to not think about the unwanted thought, however, in order to be successful in doing so, he or she must also develop a plan to avoid the thought. This means that he or she must know *and* not know about the thought at the same time, which is done through a combination of controlled and automatic thinking. Using automatic, or non-conscious, processes, part of the mind is constantly working, waiting to act on the unwanted thought that tries to sneak into the foreground of one's mind. If the thought does get detected, then more controlled or conscious processes are used to push the thought away or distract the self. Thus, when one is engaging in thought suppression, that person is always thinking about whatever it is that he or she should not be thinking about

(Wegner, 1989). Consequently, if a person is trying not to think about food, then he or she has food thoughts chronically activated, at least at the non-conscious level.

Research by Wegner (1989) over a variety of different domains has shown that the more people try to suppress thoughts about a topic, the more time their minds spend thinking about it. For instance, in Wegner's "white bear" experiment, half the participants were asked not to think about a white bear, but if they did so, they were instructed to ring a bell. When asked not to think about the white bear, participants rang the bell more than once per minute. Those participants who were not asked to suppress their thoughts about white bears rang the bell significantly less times than participants who were asked to suppress.

After being asked to suppress their white bear thoughts, participants were then free to express their thoughts, speaking about whatever came to mind—this time without restrictions. This produced a rebound effect, or an extreme surge in the thoughts surrounding precisely what they were originally not supposed to be thinking about. A rebound effect or "thought hyperaccessibility" occurs when people are no longer suppressing and become fixated on the previously restricted topic (Wegner, Schneider, Carter, & White, 1987; Macrae, Bodenhausen, Milne, & Jetten, 1994). Participants who were originally asked to suppress provided answers that were entrenched with talk about the "white bear."

The act of thought suppression has direct implications for eating and dieting. Typically, women will try to put all thoughts of food outside their minds in order to diet, with the idea that if they do not think about food, then they will not eat it. However, as seen through the white bear study, this does not have the expected results. It can lead to a preoccupation and obsession with food and caloric intake. This preoccupation and restriction of food can only last so long, however. In fact, most people who are very determined to control their food cravings through

thought suppression, will often experience a backfire due to an unhealthy preoccupation with food (Wenzlaff & Wegner, 2000). This rebound effect leads to unintended binging that actually completely counters their original goals of suppressing food thoughts (Wegner, 1989). Thus, people actually eat more calories than they originally would have, which results in a weight gain.

Currently, thought suppression, specifically the restraint theory, is one of the top theories in obesity. The restraint theory states that people who approach food with a restraint attitude, thinking that they need to limit the amount of food that they will eat, are ironically more likely to overeat than those who do not (Wegner, 1989). This restraint is actually what can lead to an obsession with food and it is this obsession with food that causes a backfiring when the willpower is lost. For example, Herman and Mack (1975) demonstrated this phenomenon in their study on restrained and non-restrained eaters. They told participants that they would be given up to two flavor "tests" when they entered the lab. Participants were then preloaded with up to two 75 ounce milkshakes. Next, the participants were told that they would be tested on ice cream preference and given two bowls of ice cream. However, researchers were really interested in the amount of ice cream they would eat. Non-restrainers who were preloaded with the milkshakes ate only a little bit of ice cream and stopped when they were full. Restrainers who had not been preloaded with milkshakes ate the least amount of ice cream, being able to successfully restrain their eating. However, restrainers who had either sampled one or two milkshakes beforehand ate the most ice cream out of all the groups. They ate beyond the point where they were full. They had the mentality that they had already engaged in overeating, so they did not have to try to restrain their eating anymore—it was already ruined. The results show that eaters who naturally engage in thought suppression about food can limit their eating to a

certain extent, but once they "fail" or stop restraining, they can easily lose control and end up binging.

Polivy and Herman (1985) have also found that dieting, or restrained eating, often precedes binging, providing further support to the fact that suppressing and restraining have negative effects on dieting. Work by Polivy and Herman, as well as speculations by Wegner, Schneider, Carter, and White (1987), point to the conclusion that restricting food intake leads to over consumption because thought suppression eventually leads to rebound, or a hyperaccessibility of the suppressed thoughts. People can be successful at suppressing their thoughts for a little while, however, if their mental control breaks down, food thoughts will become hyperaccessible and people will be consciously thinking about food a lot; these thoughts regularly lead to eating (Johnston, Bulik, & Anstiss, 1997). This sequence of events is supported by several different lines of research. For example, O'Connell, Larkin, Mizes, and Fremouw (2005) found that while food-related thought suppression may result in immediate avoidance of food, this avoidance is simply temporary and that sooner, rather than later, a person will give into the food-related thoughts. Other research (Soetens & Braet, 2006) has compared thought suppression of food on obese and non-obese children. Results show that obese, high-restrained eaters had more food thoughts than any other subgroup tested and concluded that for specific subgroups, thoughts suppression can have the exact opposite effect, leading to more food-related thoughts. Therefore, dieters who try to suppress their thoughts about food are actually hurting their chances of weight loss, rather than improving them.

Although thought suppression and restrained eating work in the short term, people generally cannot maintain these processes over extended periods of time. Research has shown that thought suppression is taxing and uses up cognitive resources, which are limited. Because

of this, people who try to exert that suppression for an extended period of time will fail, when they use up this limited resource. That is, it takes conscious self-regulation and self-control to suppress thoughts. Therefore, thought suppression is a form of self-regulation (Wegner & Erber, 1992).

Self-Control

Self-regulation is the cognitive process of controlling ones thoughts and behaviors in a conscious manner (Oaten & Cheng, 2005). It is a global resource that is depleted when it is employed (Baumeister, Muraven, & Tice, 2000). Self-control, or ego depletion, is a major factor in weight loss and weight controllability because it deals with the minute-by-minute decisions about what to put into one's mouth. Deciding to pursue a "diet" is not a simple choice that a person just decides when he or she wakes up in the morning and it is done. It takes moment-by-moment decision making to determine what one is ingesting or planning ahead for how one will make healthy choices throughout the day. Control over one's eating takes an enormous amount of cognitive work and self-regulation.

According to research by Baumeister, Bratslavsky, Muraven, and Tice (1998) self-regulation is "ego depleting" because it draws upon limited cognitive resources. Throughout the day, that control is "depleted" as it is used up, through concentrating on difficult tasks, thinking about what one has to do, and dieting. Any process that does not engage automatic thought, anything that must be "controlled," can draw upon self-control. They state that a continuous exertion of self-regulation leads to, at some point, deterioration in performance. This means that a person can "use up" their self-regulation. Both dieting and thought suppression are examples of processes that reduce a person's self-regulation. In dieting, the individual is trying to resist the temptation of the food, and must use their controlled processes to do so. With thought

suppression, an individual has to "be on the look-out" for unwelcome thoughts and stop them from intruding into consciousness. This is overriding a person's automatic processes, and thus results in a reduction of self-control. Both involve extra effort and therefore have a cost.

Another reason that self-control—in particular trying to change a well-learned behavior such as eating tasty snacks—is so difficult is that it is deliberately disturbing a behavioral pattern, which is more than likely automatic. When energy is low, it is easier to submit to the automatic processes and revert to normal or well-learned behaviors rather than exert conscious control (Muraven & Baumeister, 2000). However, self-regulation can recover after rest (Muraven & Baumeister, 2000). This explains why, at the end of a long day a person is more likely to stray from their diet or engage in binging activities (ego depletion that has occurred throughout the day leads to very little self-control at night), but in the morning their self-control is back to its normal levels and they are able to control their eating.

Baumeister, Bratslavsky, Muraven, and Tice (1998) demonstrated that participants who were asked to restrain their eating gave up more quickly on a math activity than participants who were not asked to restrain their eating. Participants were told that they would be doing a taste perception test, with either radishes or chocolate. Both foods were placed on the table for all sessions. Participants were then assigned to conditions and asked to sample either the radishes or the chocolate and told not to eat the food that they were not assigned to. After they completed their taste test, the experimenter asked participants to complete a different measure while their sensory memory of the food faded. They were asked to solve a math problem. Unbeknownst to them, the math problem was impossible to solve. The experimenter measured how long the participants spent on the math problem. They found that subjects who wanted to eat the chocolate, but were asked to eat the radishes instead, depleted their self-control, which decreased

the amount of time they spent on the math problem. This supports the idea that self-regulation is a limited resource.

Vohs & Heatherton (2000) found similar results with self-regulation. They showed that forcing restrained eaters to exert self-control by not eating snack food placed in front of them lead to the participants having less control later in the study when they were free to eat as much as they wanted. In fact, they ate more ice cream that participants who were not asked to exert self-control in the first part of the study. With regards to thought suppression and self-regulation, researchers (Wenger, 1989; Herman & Mack, 1975) demonstrated that dieters are able to restrain their eating for a period of time, but that it usually backfires and leads to bingeing and overeating. The more energy put into controlling these unwanted thoughts, the more vulnerable a person is to experience this backfire. It is also true that dieters are most susceptible to the rebound effect from thought suppression, and therefore excessive eating, when resources are low (Wegner, 1994; Macrae, Bodenhausen, Milne, & Jetten, 1994). These results show that actively controlling one's intake does have psychic costs to it that can manifest in different ways, including eating snack foods.

Because thought suppression does have a cost to it, it makes sense why most experts and research recommend that dieters do not try to avoid foods that they enjoy all together, but eat them in moderation. Unfortunately, when this thought suppression is paired with food-primes that individuals seem to get bombarded with each day, the toll on a person's self-regulation is likely high. To be able to exert the level of self-control needed in order to maintain a healthy lifestyle is, simply put, difficult for most and seemingly impossible for some.

Current Study

This current study attempts to tie together the effects of the food primes and thought suppression on eating behavior of female college students. It is clear from the research that the American culture is saturated with images of unhealthy, yet highly delicious, food. At the same time, the obesity epidemic has caused many people to engage in dieting or monitoring of their food intake. Thus people are trying to diet while being bombarded with food images. People who cannot control their weight are often blamed for having a "lack of control" or "lack of willpower" (Quinn & Crocker, 1999), however, it may be that all these factors together result in a situation such that the amount of control a person needs is very hard to achieve. Despite good intentions, the combination of thought suppression and constant food priming is likely to lead to a break with self-regulatory control, taking the form of increasing eating behaviors. The current study is meant to mirror the psychological processes of a woman on a diet who is surrounded by food-primes on a daily basis, but continually tries to tell herself not to think about food. While she thinks that she is being effective, it is likely that she experiences reduction in self-control and eventually eats the very food that she is trying to avoid. This study is attempting to bring together these areas of research and examine the implication for food consumption, as no other research has examined their interactional effects.

In the current study we will manipulate whether participants are exposed to food primes or not; and whether or not participants are asked to suppress thoughts of a tasty snack (M&Ms). All participants will then be given a taste test of M&M's. Our hypotheses are that those participants who are primed for food-related thoughts through commercials and are engaging in thought suppression about food per the experimenter's instructions will experience a breakdown of self-regulatory control, which will result in increased eating behaviors. Because previous

research has shown that people who are dieting are the most susceptable to a breakdown of regulatory control we will also measure several potential moderators of our hypothesized effect, including current weight status and restrained eating. It may be that only people who are already restraining food intake or thoughts will be affected by the study manipulations. We will also collect a measure of thought accessbility. We predict that if suppression about food has been successful, then participants should show a greater food thought hyperaccessibility when they are free to express their thoughts at the end of the study.

Method

Participants and Design

Participants were female students registered in General Psychology classes at the University of Connecticut who received course credit for participating. There were 76 students in total and they ranged from ages 18-25. A total of 6.6% were African American, 3.9% were Asian American, 78.9% were Caucasian, 2.6% were Hispanic or Hispanic American, and 6.6% classified themselves as other. Each participant was randomly assigned to one of the four conditions—food prime and thought suppression, food prime and no thought suppression, no food prime and thought suppression, and no food prime and no thought suppression. There were 18 participants in the no food prime, no thought suppression condition (the baseline condition), 20 participants in the food prime, no thought suppression condition, 19 participants in the no food prime, thought suppression condition, and 19 participants in the food prime, thought suppression condition. The study was a between-subjects 2 x 2 factorial design.

Materials

Pen Evaluation. A bogus evaluation form was developed by the researchers in order to bolster the cover story that the participants were participating in consumer testing. This

evaluation form asked the participants test a pen by writing numbers on a line, drawing shapes and pictures, and checking whether or not the ink smudged. Participants answered questions relating to their likelihood to purchase this pen.

Commercial Evaluations. The researchers developed a basic evaluation form for the commercials that the participants viewed. They were asked to summarize the commercial in one sentence, asked what media form they felt that the commercial would be most powerful in (television, print, or radio), and then asked about their likelihood of purchasing the product that the commercial was advertising. The participants were told this was to be an overall rating of the effectiveness of the commercial. There were two sets of commercials—one that had food primes in it and one that did not. Both sets had a total of eight commercials to view. Five of the eight commercials were related to food in the food prime set. These included an Applebee's commercial featuring their new appetizers, a Lucky Charms cereal commercial, a commercial for chocolate pudding Snack Packs, a Chips Ahoy commercial, and the new single microwavable Hamburger Helper commercial. The food neutral commercials were paired to try to match the food commercials in all aspects, such as setting, look, environment, narration, and animation, except for content. These commercials included a Raymour and Flannigan furniture commercial, a commercial advertising the local Potter's Oil, a K-Mart bedding commercial, an animated Nasonex commercial, and a commercial for CB Richard Ellis real estate. The remaining three commercials were the same for both sets and were located in the same spots on the two DVD. These included a Citi bank credit card commercial, an advertisement for Toyota Camry, and a commercial for the osteoporosis medication Actonel. Therefore, the commercials were all things that the average American would be exposed to if they were watching television.

M&M Taste Test Form. A five-item questionnaire was developed by the researcher regarding their enjoyment of M&Ms in the experiment. Participants were also asked to rate how much they like M&Ms outside of the laboratory experiment.

Stream of Consciousness. In order to measure thought accessibility or "rebound," a stream of consciousness (Wegner, Schneider, Carter, & White, 1987) measure was used. Participants were given a sheet of paper with instructions that read "Please write down everything that comes to mind at the moment, be it a fantasy, memory, plan, feeling, image, idea, daydream, sensation, or anything else" (Lane & Wegner, 1995). They were told not to worry about punctuation or spelling and asked to continue to write until the experimenter returned to the room. The experimenter returned to the room after two and a half minutes.

Two independent coders classifed the subjects responses into twelve categories, consisting of M&M thoughts (including chocolate), food thoughts, thoughts about food featured in the commercials, non-food commercial thoughts, thoughts about school, spring break thoughts, boyfriend thoughts, thoughts about being hungry, thoughts about the experiment, friend thoughts, miscellanous thoughts, and total number of thoughts. The coders met independently to code the streams of consciousness, and then met together to discuss their answers and discuss the coding for each participant. Independently, the coders had good inter-rater reliability on most of the categories, ranging from a low of $r = .72$ to $r = 1.00$, with the exception of one category with a .20. Their average reliability was $r = .817$. For the current analyes, thoughts about M&M's were used as a measure of thought accessibility. The inter-rater reliability for this measure was .77.

Restrained Eating. The Revised Restrained Eating Scale was used to evaluate the participants' restrained eating habits (Polivy & Herman, 1979). This ten-item questionnaire

asked participants how much their weight fluctuated on a weekly basis, inquired about their dieting patterns, an asked about bingeing tendencies. Scores were found by summing the answers, with a higher score indicating more restrained eating behavior.

Demographics and Perceived Weight Status. Participants were asked their age, height, weight, and perceived weight status (very underweight, underweight, normal weight, somewhat overweight, and overweight). Perceived weight status has been shown in the past to predict how people respond to information about dieting (Quinn & Crocker, 1999). The perceived weight categories were very underweight (more than 15 pounds), somewhat underweight (6 to 15 pounds), normal (plus or minus 5 pounds), somewhat overweight (6 to 15 pounds), and very overweight (more than 15 pounds).

Eating Behavior. The dependent measure in this study was eating behavior. Eating behavior was measured in two ways. First, the amount of M&Ms eaten during the "taste test" was measured, in grams, on a food scale, which has shown to be an effective way to measure eating behavior for many years (Schachter, Goldman, & Gordon, 1968). Second, participants were given the opportunity to take minature chocolate bars at the end of the study. The number of chocolate bars taken was counted and recorded.

Procedure

Participants were recruited using the University of Connecticut's Participant Pool website. The study was open to all female students in introductory psychology classes for class credit. Participants were told when they signed up for the experiment that they would be participating in a study titled "Consumer Testing." They were asked not to eat for 90 minutes before the study. Participants were tested individually in sessions that lasted approximately 30 minutes. When they arrived at the experiment, they were greeted by the experimenter and told

that they could enter the room. Upon entering the room, they sat in front of a computer that had a box of pens, a randomly assigned DVD of either food related commercials or food neutral commercials, and a glass bowl of M&MS covered with plastic wrap. They were given their statements of informed consent and asked to read it over and sign it when they felt comfortable. The experimenter exited the room and asked the participants to open the door when they had completed this and were ready to start. When the experimenter entered the room, she asked the participant if there were any questions before they started. The experimenter remained the same for each session and each participant.

The participant was told that she would be testing a variety of consumer products, including a pen, commercials, and food. Participants were randomly assigned to two conditions. Half were told that they would be participating in a taste test with M&Ms as their last consumer testing product. The other half were also told that they would be participating in a taste test with the M&Ms, but asked not to think about M&Ms during the consumer testing. Specifically, they were told "it is important for you to focus on the tasks at hand. For this reason, we ask that you do not think about food for the remainder of the consumer testing. So, even though the bowl of M&Ms is right there in front of you, try not to think about it during your first two tasks." Participants with these extra instructions were in the suppression condition; those without these instructions were in the no-suppression condition.

Next, the participants completed the pen evaluation. They were instructed to examine the pen, which was labeled "Pen A" to bolster the cover story. The beginning of the evaluation form asked the participants to draw pictures and numbers. The second part asked them questions about the quality of the pen, such as "if reasonably priced, would you purchase this pen?" The pen was only used to support the cover story that they were participating in consumer testing.

After they completed the pen task, participants viewed one of the two sets of commercials. Participants were randomly assigned to see either the food prime commercials or the non-food commercials. The DVDs each had an identical sleeve inside the case. On the sleeve, the commercial condition was written ("F" for food and "NF" for no food). Before the participant arrived at that experiment, the DVDs were randomly shuffled and one DVD was left in the room for the participant. When the participant finished the experiment, the experimenter looked to see what condition she was in and recorded it. Thus, the experimenter remained unaware of which prime condition participants were in during the study.

Finally, participants were asked to do a taste test with M&Ms. The M&Ms were in a large bowl, so it appeared to obscure the amount that they ate from the experimenter. Each participant was told to each as many M&Ms as she would like in order to answer the questions. They were instructed to think about the taste and texture of the M&Ms in their mouth while answering the questions. The experimenter left the room and closed the door. The participants were asked to open the door when they were ready. Unbeknownst to the participants, the M&Ms were pre-measured before the experiment.

After the participants completed the consumer testing, they were told that they would be answering a few measures about their thoughts and feelings in the laboratory. The participants first completed the steam of consciousness measure (Wegner, Schneider, Carter, & White, 1987) described above. Next, they were asked to fill out a packet of measures. In this packet, each participant completed the restrained eating scale (1979), as well as a few other measures not relevant to the current results. Finally, the participants were asked to answer the demographic questions, included their percieved weight status.

After the participants finished the last measure, they were told that the study was over. The experiementer explained that it was for her Honors Thesis and that their participation was greatly appreciated. A bag of different kinds of candy bars were then place in front of the participants as a "thank you" from the experimenter. The experimenter then said that she forgot the debriefing form, told the participant that they were free to take candy, and left the room for about one minute. The candy was presented in its original bag and placed in front of the participant, so that it seemed to conceal the amount that they took from the experimenter, like the M&Ms. The candy was pre-counted as a second measure of eating behavior because participants can feel inhibited about eating in a labortory setting.

When the experimenter returned to the room, the participants were fully debriefed about the true nature of the experiment, told about the candy bars, and able to ask questions. They were also asked not to discuss the nature of the experiment with anyone else who may be participating in it.

When the participants left, the experimenter measured the remaining M&Ms using a food scale and counted the remaining candy bars. These were subtracted from the initial counts and recorded.

Results

Eating Behavior. If dieting is similar to other forms of thought suppression and priming, then priming for food and asking people to suppress thoughts about food should lead to a preoccupation of food and increased eating should emerge. The main dependent variable for eating was the amount of M&Ms, in grams, participants consumed. A two-way analysis of variance (ANOVA) did not show a significant main effect of prime, $F(7, 64) = .29$, *ns*, nor was there a main effect of suppression, $F(7, 64) = .00$, *ns*. Contrary to the hypothesis, there was no 2

(food prime) x 2 (thought suppression) interaction on the amount of M&Ms participants ate, $F(7, 64) = 1.95$, $p = .17$.

These findings were also consistent in regards to the amount of candy bars taken at the end of the experiment, the second dependent variable for eating behavior. There was no main effect of prime, $F(7, 64) = .85$, *ns*, and there was no main effect of suppression, $F(7, 64) = .01$, *ns*. No prime x suppression interaction for candy bars taken was not found either, $F(7, 64) = .72$, *ns*.

Perceived Weight. Research has shown that people who are already concerned with their weight are the most vulnerable to food and dieting information (Polivy & Herman, 1985). In order to examine whether the food primes and thought suppression instructions tended to affect those most concerned with their weight, we created a dichotomous variable in which people were either normal weight (n = 42) or overweight. The overweight category included people who perceived themselves to be either somewhat overweight (n = 22) or very overweight (n = 8). We then re-analyzed the eating variables using a 2 (weight category) x 2 (food prime) x 2 (thought suppression) ANOVA. There was a main effect of weight category on amount of M&Ms eaten, $F(7, 64) = 4.87$, $p < .05$, with participants categorizing themselves as normal weight ($M = 6.28$, $SD = 1.31$) eating less than those who categorized themselves as overweight ($M = 10.81$, $SD = 1.58$). There was not a prime x weight category interaction, $F(7, 64) = .82$, *ns*. Additionally, there was not a suppression x weight category interaction, $F(7, 64) = 1.83$, *ns*.

There was a significant prime x suppression x weight category interaction, $F(7, 64) = 4.65$, $p < .05$. As can be seen in Table 1, overweight participants who received the food prime but were not asked to suppress ate the most, followed by overweight participants who were asked

to suppress, but did not see the food prime. The rest of the groups did not significantly differ from each other, using Tukey's post hoc test at $p < .05$.

Similar, although weaker, results were found with the number of candy bars taken. There were no main effects or two-way interactions, all $p > .20$. There was a significant prime x suppression x weight category interaction found on candy bars taken, $F(7, 64) = 2.92$, $p < .01$, although Tukey's HSD post hoc testing did not find any of the cells to be significantly different from each other. See Table 2 for means and standard deviations.

Total Eating Behavior. One final possibility is that eating behavior is better understood as the total number of M&Ms plus the number of candy bars taken. That is, perhaps some participants were afraid to eat the M&M's, but felt free to take candy bars when they thought the study was over. To check for this possibility, the total eating behavior of participants was determined by first standardizing each eating measure and then summing them. There was no main effect for food prime on total eating behavior, $F(7, 64) = .55$, *ns*, nor was there a main effect for suppression on total eating behavior, $F(7, 64) = .03$, *ns*. There was also no main effect for weight category on total eating behavior, $F(7, 64) = 1.27$, *ns*. There was a significant three-way interaction for prime x suppression x weight category on total eating behavior, $F(7, 64) = 7.16$, $p < .01$, that mirrored the three-way interaction on M&M's eaten. Self-perceived overweight participants who were given the food prime ate the most, followed by overweight participants given the suppression manipulation. Again, Tukey's HSD test did not find any of the cells to be significantly different from each other, although the more liberal "Least Significant Difference" test did find that the overweight participants in the food prime only condition differed from each of the other groups except the overweight participants in the suppression only condition. See Table 3 for means and standard deviations.

Stream of Consciousness. To determine if any participants were experiencing the rebound effect of thought suppression, coding of the stream of consciousness measure was examined for thoughts about the M&Ms. If participants mentioned the candy, they were given a 1, if there was no mention, they were given a 0. Chi-square was used to examine whether there was a difference in the frequency with which participants mentioned M&Ms. When participants were not asked to suppress, there was no difference in the frequency of candy thoughts for participants in the no-food prime compared to the food prime conditions $\chi^2(1, 39) = 0.63$, *ns.* However, when participants were in the thought suppression condition, a significant effect emerged, $\chi^2(1, 37) = 4.36$, $p = .05$, such that participants who did not see the food prime were the most likely to mention M&M's and those who did see the food primes were the least likely to mention M&Ms. See Figures 1 and 2. Analyses including weight category were not significant. However, when including weight category several of the cells go below the expected count of 5, making the chi-square test less reliable.

Restrained Eating. It was anticipated that there could be a significant difference between conditions based on participants' restrained eating behavior. A median split (Median = 24) was used to determine participants' restrained eating patterns. Any participant scoring less than a 24, through their summed restrained eating answers, was considered low in restrained eating, while any participant scoring above a 24 was considered high in restrained eating. There was not a main effect for restrained eating, $F(7, 64) = .20$, *ns,* and there were no significant interactions of prime x restrained eating on eating behavior, $F(7, 64) = .44$, *ns*, nor a significant interaction of suppression x restrained eating, $F(7, 64) = .04$, *ns*. There was no significant interaction of 2 (food prime) x 2 (thought suppression) x 2 (restrained eating) on M&M consumption, $F(7, 64) =$

.01, *ns*. This indicates that restrained eating does not have the expected affects on eating behavior for this laboratory study.

While restrained eating did not produce effects for M&M intake, it did predict the number of candy bars participants took at the end of the study. There was a main effect for restrained eating on candy bars, $F(7, 64) = 4.49$, $p < .05$, resulting in participants low trait restrained eaters ($M = 2.55$, $SD = .28$) eating more than high trait restrained eaters ($M = 1.72$, $SD = .27$).

Discussion

The current study found no interaction between prime and thought suppression in any form, meaning that participants who were both suppressing thoughts about the M&Ms and saw food commercials on television did not, in fact, eat more M&Ms or take more candy bars than other participants, as we originally hypothesized. Other results were found for the manipulations, however. For example, normal weight and overweight participants differed on the amount of M&Ms they consumed, and we found that there were different eating patterns with the different conditions when self-perceived weight category was also taken into account. Specifically, for self-perceived overweight women have either the food prime or suppression led to more eating. When food prime and suppression were combined, eating levels dropped back down to baseline, looking similar to the no-prime, no-suppression condition.

It seems to be true that participants engage in increased eating in the presence of food primes and when they force themselves to suppress thoughts about food, however, when these two factors are paired together, they are able to exert self-control and restrain their eating. People can exert self-control for a short period of time, so what may be occurring here exceeds the bounds of a 30 minute laboratory experiment. Participants may be able to overcome food

primes and thought suppression, but when they return home they may eat more at that point. Another possibility is that participants in this condition may have been exposed to food, making them more aware of their environment and the food cues. Research has shown that when people are aware of the primes and suppression, they can overcome it, if motivated to do so (Bargh, Lombardi, & Higgins, 1988). Participants in this condition may have been overexposed to the food, leading to an awareness of it that other participants did not have, and allowing them to reject the temptation to engage in overeating. This speculation is supported by the fact that both overweight and normal weight women in the food prime, thought suppression conditions dropped to similar, baseline levels when present, even though they did originally differ so greatly in other conditions.

Self-perceived weight category was especially important for this study. The way people perceived themselves and their weight is often more important than what their true weight is. Participants in the overweight category ate more M&Ms in general than participants who categorized themselves as normal weight. Overweight participants did seem to be especially vulnerable to food primes. Overweight participants in the no food prime, no thought suppression condition actually ate significantly less than most of the other participants. This finding demonstrates that overweight participants in different conditions actually ate less than some normal weight participants. However, the main effect of weight category and overweight participants' consumption in the food prime, no thought suppression condition does show that they are susceptible to food primes more than normal weight women. This could have implications for obesity research, as it can be a vicious cycle. Overweight participants see the food primes on television or other media outlets, causing them to focus on food and eat more, which leads to more obesity. This extra sensitivity could also be an important key to why

overweight people do find it so hard to control their eating behaviors and restrict their food intake.

Previous research confirms these theories. Goldman, Jaffa, and Schachter (1968) and Schachter and Gross (1968) demonstrated that obese individuals are more influenced by external cues that appear in the environment. Normal weight people are more influenced by physiological cues, such as hunger. Thus, obese peoples' eating is heavily triggered by the world around them and they will eat more based on the time of day or what images they are seeing in their environment, even if they are not hungry, while normal weight people look internally to determine when to eat (i.e. when they feel a stomach pang of hunger). This research further supports that belief that overweight individuals are more vulnerable to food primes, in this case in the form of food commercials, than normal weight people, as increased M&M consumption was seen in the laboratory. While this phenomenon was seen in the current laboratory experiment, and in previous research, an in depth explanation is still not present. Further research is needed to determine why these two groups differ in their eating cues.

While the anticipated results on eating behavior did not emerge they did manifest in other ways. Participants completed a stream of consciousness, recording all the thoughts that they had. There was an interaction found for prime and suppression. As expected, participants had a surge of thoughts about M&Ms in the food neutral, thought suppression condition, more than those in the food neutral, no suppression condition. There was no measurable effect for the food prime conditions, supporting the idea that participants were aware of the food cues and actively exert self-control. This shows that while there was not a prime by suppression interaction, or even a suppression main effect on eating behavior, participants in the suppression condition were being affected in other ways, in this case, they were preoccupied by thoughts about the M&Ms. These

M&M thoughts included things, such as “I wish I had more M&Ms…”, “I can still taste the M&Ms in my mouth”, and “I think I will go buy some M&Ms after this experiment.” The results do show that there was a rebound effect occurring for participants engaging in suppression, even though there were no behavioral results showing a rebound effect. These results also support the idea that effects may have occurred after the participants left the laboratory since rebound effects have been shown to carryover into behaviors, as well (Johnston, Bulik, & Anstiss, 1997).

Unexpected results were found with restrained eating. It was anticipated that restrained eating would produce effects for M&M consumption, with high restrainers eating the most when they were exposed to the food prime and thought suppression because of their already increased food suppression. There were no effects measured in the laboratory, however, that supported this theory. It was still important to the current research because it was possible to control for restrained eaters and discount any possibility that restrained eating also had an effect on participants eating. The effects of the prime, thought suppression, and weight category were still present when restrained eating was controlled for. It also reinforced previous findings that overweight people are especially vulnerable to food primes on television.

The major limitation of the study was the time element. Since eating behavior can be controlled, especially for the short-term, it is likely that the results that were obtained in this 30 minute laboratory experiment do not tell the entire story. Participants could have been able to control their eating habits in the experiment, but then binged when they returned home. Additionally, participants were asked not to eat 90 minutes before coming to the experiment; however, there was no test to make sure that they really did. Therefore, participants could have

had different levels of hungriness when entering the laboratory, resulting in eating behaviors that were not solely based their assigned conditions.

These results of this study indicate that there is still research needed to be done in order to understand the external factors and internal processes that occur when a person is dieting and how these things relate to the obesity epidemic. Further research is needed to determine an explanation for the increase in consumption in the presence of food primes and presence of thought suppression, individually, but then a sharp, unexpected decrease of eating in the presence of both of these together. Studies that explore these topics could add to the understanding of environmental factors that contribute to obesity, specifically studies that explore the differences in overweight and normal weight women in the presence of food primes.

However, the results found in this current study are clearly important in understanding the obesity epidemic. Food primes clearly have a large effect on people, especially certain subgroups of the population. The role of the media in obesity has been unclear. There is an obvious link; however, simplistic explanations of media replaces physical activity time have not sufficed. This current study shows that in the presence of food images in the media, people's eating increases, especially overweight people. It is possible that this is a partial account for the relationship between television and obesity, particularly because people are so unaware of the unconscious effects that these images have on them. Also, the majority of food that is depicted on television and which people are primed for is extremely unhealthy, which is why obesity is an epidemic (Story & Faulkner, 1990).

The findings of thought suppression are also crucial for obesity. It was seen that thought suppression also resulted in an increase in eating, but, more importantly, it resulted in an increase in thoughts about food. As has been discussed, when people become preoccupied with food,

more than likely it will lead to a backfiring and complete loss of control, which results in a bingeing. Although we did not see significant results for this in the laboratory, only this trend, it is likely that after the experiment they did experience this backfiring because of the high frequency of thoughts about food they were experiencing. This study supports the findings of previous research (Polivy & Herman, 1985; Herman & Mack, 1975) and shows that thought suppression is not an effective strategy to lose weight. In fact, it counteracts one's efforts in weight loss.

Although a prime by suppression interaction was not found, it is clear that there is an interesting effect when they are paired and more research needs to be done to find an explanation for the decrease in eating for these participants. However, it is important to note that on an almost constant basis, people are most likely being exposed to either food primes or thought suppression. Therefore, people are chronically thinking about food in the wrong ways—either being unconsciously primed for unhealthy foods or engaging in suppression about food. As we have shown, neither of these things is healthy to be constantly immersed in, and, because of this it is understandable that unhealthy eating behaviors form, which result can in obesity.

Food primes and thought suppression warrant more study. They have a central role in the relationship people, both overweight and normal weight, have with food. Few studies have examined both processes together. Using this idea, we established that there were important implications for both. There are also interesting implications for them together, but exactly what remains to be seen.

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Table 1
Means (Standard Deviations) for the Effects of Prime by Suppression by Weight Category Interaction on M&M Consumption

	No Suppression	*Suppression*
No Food Prime		
Normal Weight	5.96 (5.12)	7.50 (5.68)
Overweight	6.98 (4.30)	11.81 (9.43)
Food Prime		
Normal Weight	4.04 (2.43)	7.63 (5.73)
Overweight	17.61 (18.19)	6.82 (4.66)

Table 2
Means (Standard Deviations) for the Effects of Prime by Suppression by Weight Category Interaction on Candy Bars Taken

	No Suppression	*Suppression*
No Food Prime		
Normal Weight	2.25 (1.82)	1.67 (1.12)
Overweight	1.00 (.82)	2.67 (2.00)
Food Prime		
Normal Weight	2.67 (2.35)	2.42 (1.51)
Overweight	2.33 (1.41)	1.60 (.89)

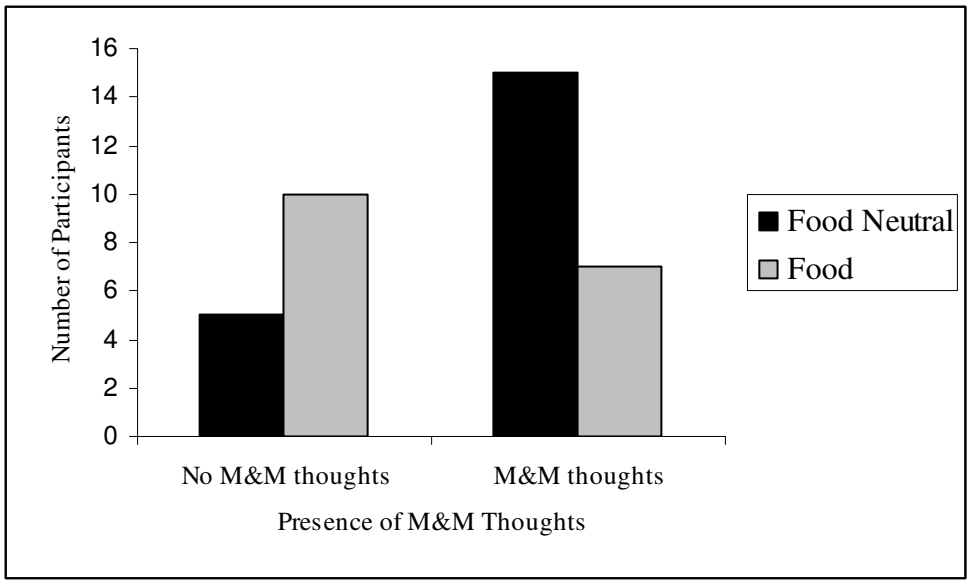
Table 3
Means (Standard Deviations) for the Effects of Prime by Suppression by Weight Category Interaction on Total Eating Behavior

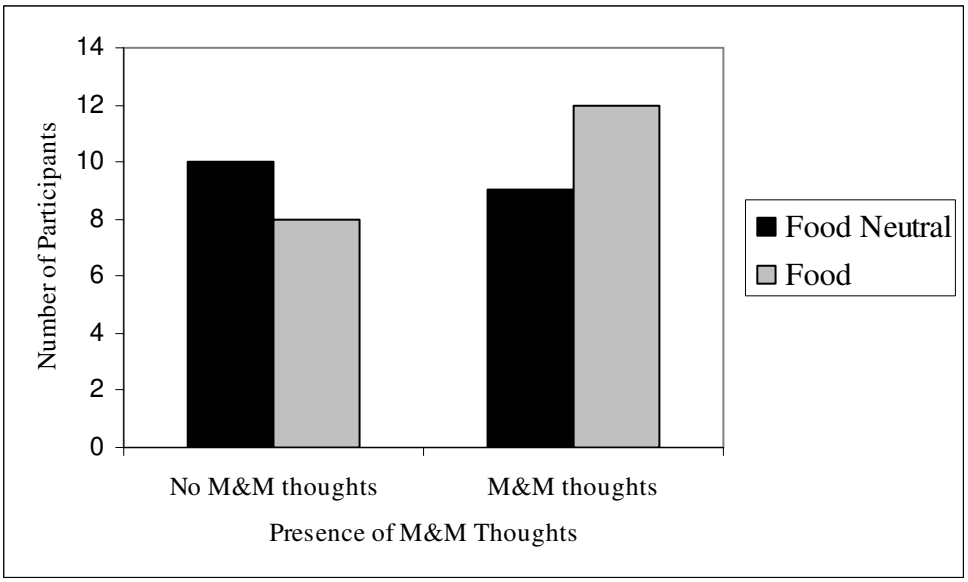
	No Suppression	*Suppression*
No Food Prime		
Normal Weight	-.20 (1.56)	-.31 (1.33)
Overweight	-.81 (.89)	1.03 (2.26)
Food Prime		
Normal Weight	-.26 (1.64)	.18 (1.45)
Overweight	1.46 (2.27)	-.46 (.58)

Figure Captions

Figure 1. Effects of Thought Suppression and Prime on M&Ms Thoughts in a Stream of Consciousness.

Figure 2. Effects of No Thought Suppression and Prime on M&Ms Thoughts in a Stream of Consciousness.


16
14
12
10
8
6
4
2
0
Number of Participants
Food Neutral
Food
No M&M thoughts
M&M thoughts
Presence of M&M Thoughts


14
12
10
8
6
4
2
0
Number of Participants
No M&M thoughts
M&M thoughts
Presence of M&M Thoughts
Food Neutral
Food