

Accepted Manuscript

Life is uncertain, eat dessert first: Uncertainty causes uncontrolled and unemotional eaters to consume more sweets

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PII: S0195-6663(18)30321-0

DOI: [10.1016/j.appet.2018.09.006](https://doi.org/10.1016/j.appet.2018.09.006)

Reference: APPET 4023

To appear in: *Appetite*

Received Date: 22 March 2018

Revised Date: 17 July 2018

Accepted Date: 4 September 2018

Please cite this article as: Core T.J., Price M.M., Alquist J.L., Baumeister R.F. & Tice D.M., Life is uncertain, eat dessert first: Uncertainty causes uncontrolled and unemotional eaters to consume more sweets, *Appetite* (2018), doi: 10.1016/j.appet.2018.09.006.

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Abstract

Sometimes even dieters with the best self-control overindulge. Uncertain situations may undermine the self-control of even well-controlled eaters. This study was designed to test the hypothesis that uncertainty increases unhealthy snacking. Participants were either told that they would be giving a speech, that they would be listening to a speech, or that they would find out later whether they were to give a speech or not. Among participants who typically reported good control over their eating or scored low on emotional eating, participants who were uncertain about whether they would be giving a speech ate more candy than participants who expected to not have to give a speech and even those who expected to have to give a speech. Participants who reported poor control over their eating or scored high on emotional eating did not eat significantly more when uncertain. These findings suggest that, for people who are typically able to control their eating, uncertainty increases snacking more than certainty of a negative outcome.

Life is Uncertain, Eat Dessert First: Uncertainty Causes Uncontrolled and Unemotional Eaters to
Consume More Sweets

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Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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Even individuals who typically have good self-control may overindulge in certain circumstances. Uncertain situations can be a cue that self-control, including controlling what one eats, may not pay off in the long run. The current study is designed to test the hypothesis that uncertainty increases unhealthy food consumption.

Self-control is the process by which people pursue abstract or distal goals instead of more immediate goals and desires (Fujita, 2011). Self-control plays an important role in choosing to eat healthy foods, resisting the temptation to indulge in unhealthy foods, and in refraining from overeating (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Crescioni et al., 2011; Vohs & Heatherton, 2000). The act of giving up current pleasures for future rewards is most likely to pay off in a relatively predictable environment. People who put money in the bank and eat healthily do so in part because they have some reasonable expectation that they can predict aspects of their financial situation and health in the future. Because uncertainty may reduce people's confidence that self-control will pay off, uncertainty may undermine people's likelihood of exercising self-control.

A situation can be described as uncertain if an individual lacks some important piece of information (Bar-Anan, Wilson, & Gilbert, 2009; Knight, 1921; Mittal & Griskevicius, 2014). Previous research has shown that uncertainty reduces people's likelihood of successfully executing self-control. Participants who were left uncertain about the timing of a reward were less likely to delay the reward than participants who were certain (Kidd, Palmeri, & Aslin, 2013; McGuire & Kable, 2012, 2013). In another study, participants who were given a vignette where they were asked to imagine being uncertain about what kind of pizza they would eat were more

likely to choose an immediately rewarding but less healthy food (i.e., a brownie) over less desirable but healthier food options (i.e., fruit salad) than participants who were asked to imagine they'd get a specific pizza (Milkman, 2012). Participants who were asked to write about a time when they were uncertain completed fewer solvable anagrams than participants who were asked to write about a time when they were certain, suggesting that uncertainty impairs performance (Alquist et al., 2018). Healthy eating choices sometimes rely on one's ability to exercise self-control, which may be impaired under conditions of uncertainty.

Whether individuals' eating behavior is affected by a situation can differ based on their typical eating behavior. The Three-Factor Eating Questionnaire was developed to measure three different facets of eating behavior – uncontrolled eating, emotional eating, and cognitive restraint (de Lauzon et al., 2004). Uncontrolled eating is the inability to inhibit the tendency to overeat. Uncontrolled eating is associated with eating foods higher in fat (de Lauzon et al., 2004). Emotional eating is characterized by overeating in response to negative moods. Emotional eating is associated eating foods high in sugar. Uncontrolled and emotional eating are associated with higher body weight (Lindroos et al., 1997; Provencher, Drapeau, Tremblay, Després, & Lemieux, 2003). Cognitive restraint is the deliberate restriction of food consumption. Cognitive restraint does not necessarily imply success at this restraint, and research has shown that it is a not always a reliable indicator of food intake (Stice, Cooper, Schoeller, Tappe, & Lowe, 2007; Stice, Sysko, Roberto, & Allison, 2010) or body weight (higher body weight, Anglé et al., 2009; lower body weight, Boschi, Iorio, Margiotta, D'Orsi, & Falconi, 2001; de Lauzon et al., 2004; no relationship with body weight, Provencher et al., 2003). To the extent that these factors predict eating behaviors more generally, they may predict whether people's unhealthy snacking is affected by uncertainty.

There are a few possible ways the effect of uncertainty on food intake could be moderated by eating behaviors. It might be that participants who reported typically struggling to control their eating would become even more likely to eat when faced with uncertainty than participants who do not report struggling to control what they eat. In this case, the effect of uncertainty on eating would be strongest among individuals who are emotional or uncontrolled eaters. However, it was also possible that participants who reported typically being unable to control their eating would struggle to exercise self-control on the eating task across conditions (Ouwens, van Strien, & van der Staak, 2003; Van Strien, Cleven, & Schippers, 2000). In this case, the effect of uncertainty on self-control might only be observed among participants who did not report typically struggling to control their eating. If participants dispositionally struggle to control their eating, a situation that reduces their ability to exercise self-control may have no additional effects.

The present study was designed to test the hypothesis that uncertainty would be associated with greater consumption of candy than certainty. To manipulate uncertainty, participants were randomly assigned to one of three conditions. Participants in the certainty condition were told that they were giving a speech. Participants in the control condition were told that they were not giving a speech. Participants in the uncertainty condition were told that the experimenter misplaced the condition sheet and that they would be informed if they were giving or listening to the speech later. After the uncertainty manipulation, participants were asked to participate in an ostensibly unrelated taste testing study. Participants' self-control was measured by how much candy they consumed during the taste test. Positive mood, negative mood, and perceived control were measured to assess alternative explanations for this effect.

Method

Participants

One hundred eighty-two participants (135 women, 47 men; $M_{age} = 19.82$, $SD_{age} = 4.15$; 29.10% Hispanic or Latino, 70.30% Not Hispanic or Latino; 71.40% White, 7.4% Black or African American, 4.0% Asian, 1.70% Native American, 9.10% more than once race, 6.32% Unknown or not reported) participated in this study in exchange for course credit for their introductory psychology class at Texas Tech University. Participants were recruited through the Texas Tech Department of Psychological Sciences participant pool. In line with department policy, participants were not given information about the nature of the study before they signed up to complete a study for course credit. Because students did not know the study involved eating behaviors before the signed up, they did not self-select in or out of the study based on the topic. Seven participants were excluded from the final sample because they reported knowing that they would not have to give a speech (e.g. one participant reported being informed by a roommate who had participated in the study), and 2 participants were excluded due to a data recording error that resulted in an impossible value (negative number) for the dependent variable. We planned to stop data collection at the end of the semester and did. Data were not analyzed until data collection was complete.

Procedure

Uncertainty manipulation. All participants were told that some participants would be giving speeches while other participants rated those speeches. They were told that they would be completing the communication task later in the study, but to save time, they would be assigned their condition now. In the speech and no speech conditions, participants were told, “You are participant number ____, and it says here that you are in the speech (no speech) condition. Let’s

start on the intelligence task, and when you're done, we'll move to another room for the communication task." In the uncertain condition, the experimenter acted flustered and said, "Hmm. You are supposed to be participant number ____, but I don't see your number on here anywhere. I have a master sheet in the other room with all the numbers on it. I'm going to start you on the next task, and I'll go get the sheet while you are working." This left the participants uncertain about whether they would be giving a speech later in the study.

Candy consumption. Following the uncertainty manipulation, participants were asked if they would be willing to do a second, unrelated study on taste preferences. To maintain the cover story, participants were asked to respond to a questionnaire regarding the taste of M&M candy (Hofmann, Rauch, & Gawronski, 2007). Participants were told that they could eat as many M&M candies from a bowl that contained 750g of M&Ms (about 375 M&Ms) while they filled out the questionnaire. The amount of M&M candies eaten (measured by the weight of the bowl after completion of the study) was used as a measure of self-control. Poor self-control was indicated by eating larger quantities of M&M candies.

Typical eating behaviors. Individual differences in eating behaviors were measured using the Three-Factor Eating Questionnaire – R18 (Karlsson, Persson, Sjöström, & Sullivan, 2000). This is a relatively short measure of eating behaviors that has been used with a general population (de Lauzon et al., 2004). It is comprised of three scales: uncontrolled eating, emotional eating, and cognitive restraint. The uncontrolled eating scale includes items such as, "Sometimes when I start eating, I just can't seem to stop" and "I am always hungry enough to eat at any time." The emotional eating scale includes items such as, "When I feel anxious, I find myself eating" and "When I feel blue, I often overeat." The cognitive restraint scale includes items, such as "I consciously hold back at meals in order not to weight gain" and "I do not eat

some foods because they make me fat.” Responses are made on a 4-point scale from 1 (definitely false) to 4 (definitely true).

Self-reported uncertainty. After working on the taste-preference task for five minutes, participants were asked to answer some questions before they began the speech task. Participants were asked to respond to the statement, “Earlier in the study, I was uncertain about whether or not I’d be giving a speech” on a scale of 1 (strongly disagree) to 9 (strongly agree).

Sense of control. The amount of control participants felt they had was assessed by asking participants to respond to the question, “How much control did you feel like you had during the study?” on a scale of 1 (not at all) to 9 (extremely).

Mood, stress, anxiety, and worry. Mood was assessed by asking participants to respond to the questions, “How positive was your mood during the M&M tasting task?” and “How negative was your mood during the M&M tasting task?” on a scale of 1 (not at all) to 9 (extremely). In order to measure participants’ stress, anxiety, and worry during the taste-testing task, participants were asked to respond to the following questions: “How stressed did you feel during the M&M tasting task?” “How anxious did you feel during the M&M tasting task?” and “How worried did you feel during the M&M tasting task?” Responses were made on a scale of 1 (not at all) to 9 (extremely).

After completing all the measures, participants were told that they would not be asked to give a speech. Participants were told the purpose of the study and thanked for their participation.

Results

Candy consumption. There was no significant main effect of speech condition on candy consumption, $F(2, 172) = .66, p = .519, \eta^2 = .01, 90\% \text{ CI} [.00, .03]$. Because we predicted an interaction between condition and different facets of eating behaviors, we then analyzed whether

the effect of condition on candy consumption was moderated by uncontrolled eating, emotional eating, and cognitive restraint.

Uncontrolled eating. There was a significant interaction between condition and uncontrolled eating on the amount of candy participants ate, $F(2, 169) = 3.45, p = .034, \eta^2 = .03$, 90% CI[.002, .08]. There was also a significant main effect of uncontrolled eating on the amount of candy participants ate, $F(1, 169) = 4.86, p = .029, \eta^2 = .04$, 95% CI[.002, .09]. Not surprisingly, uncontrolled eaters ate more candy than controlled eaters.

Follow-up analyses comparing participants in the uncertain condition to participants in the no speech and speech conditions were conducted at high (1 SD above the mean) and low (1 SD below the mean) levels of uncontrolled eating. Among participants who reported typically being able to control their eating, participants in the uncertain condition consumed significantly more candy than participants in the no speech condition, $F(1, 169) = 4.57, p = .034, \eta^2 = .03$, 95% CI[.73, 18.45] (see Figure 1). They also tended to eat more candy in the uncertain condition than the speech condition, though the effect was not significant, $F(1, 169) = 3.54, p = .062, \eta^2 = .02$, 95% CI[-.40, 16.91]. However, among participants who reported being chronically poor at controlling their eating, there were no significant differences in candy consumption between participants in the uncertain condition and participants in the no speech condition, $F(1, 169) = 2.79, p = .097, \eta^2 = .02$, 95% CI[-17.17, 1.43], or participants in the speech condition, $F(1, 169) = .02, p = .881, \eta^2 = .005$, 95% CI[-9.12, 7.83]. Thus, uncertainty increased candy consumption only among people who reported being typically able to control their eating.

Emotional eating. There was a significant interaction between condition and emotional eating on number of M&Ms eaten, $F(2, 169) = 4.38, p = .014, \eta^2 = .05$, 90% CI[.01, .10]. The main effect of emotional eating was not quite significant, $F(1, 169) = 3.91, p = .050, \eta^2 = .02$,

90% CI[.00, .07], with high emotional eating being positively related to the amount of M&Ms eaten.

Follow-up analyses comparing participants in the uncertain condition to participants in the no speech and speech conditions were conducted at high (1 SD above the mean) and low (1 SD below the mean) levels of emotional eating. Among participants in the uncertain condition ate significantly more candy than participants in the no speech condition, $F(1, 169) = 5.33, p = .022, \eta^2 = .03, 95\% \text{ CI}[1.54, 19.64]$, and significantly more candy than participants in the speech condition, $F(1, 169) = 5.35, p = .022, \eta^2 = .03, 95\% \text{ CI}[1.46, 18.41]$ (see Figure 2). These differences did not appear among participants high in emotional eating. Among participants high in emotional eating, participants in the uncertain condition actually ate less candy than participants in the no speech condition, though the effect was not significant, $F(1, 169) = 3.30, p = .071, \eta^2 = .02, 95\% \text{ CI}[-18.12, .76]$. Participants in the uncertain condition did not eat significantly more candy than participants in the speech condition, $F(1, 169) = .32, p = .571, \eta^2 = .002, 95\% \text{ CI}[-10.77, 5.95]$. Thus, we found a similar pattern for emotional eating and uncontrolled eating. Uncertainty increased candy consumption among people who reported typically good control over eating and those who reported not being prone to emotional eating.

Cognitive restraint. There was no significant interaction of condition and the cognitive restraint subscale for predicting the amount of candy participants ate, $F(2, 169) = .31, p = .736, \eta^2 = .004, 90\% \text{ CI}[.00, .02]$. There was also no significant main effect of cognitive restraint, $F(1, 169) = .25, p = .619, \eta^2 = .002, 90\% \text{ CI}[.00, .03]$ on the amount of candy participants ate.

Self-reported uncertainty. There was a significant difference between conditions in how uncertain participants reported feeling about whether or not they would be giving a speech, $F(2, 172) = 14.17, p < .001, \eta^2 = .14, 90\% \text{ CI} [.07, .22]$. Planned contrasts revealed that participants in

the uncertain condition ($M = 7.20$, $SD = 2.30$) reported feeling more uncertain than participants in the no speech condition ($M = 5.18$, $SD = 2.85$), $t(172) = 4.07$, $p < .001$, $d = .76$, 95% CI[1.05, 3.01], and speech condition ($M = 4.77$, $SD = 2.81$), $t(172) = 4.99$, $p < .001$, $d = .91$, 95% CI[1.47, 3.40]. Participants in the speech condition did not report feeling significantly more uncertain than participants in the no speech condition, $t(172) = -.83$, $p = .406$, $d = .15$, 95% CI[-1.39, .56]. This indicates that the uncertainty manipulation was successful.

Gender differences. It is possible that men and women respond differently to food tasks (Cuzzocrea, Larcan, & Lanzarone, 2012). There was no significant interaction between condition and gender on M&M consumption $F(2, 172) = .02$, $p = .98$, $\eta^2 = .01$. There were also no significant three-way interactions between condition, gender, and each of the Three Factor Eating subscales on M&M consumption (all $ps > .60$).

Alternative Explanations. There was no significant interaction between condition and uncontrolled eating or condition and emotional eating on a sense of control, negative mood, positive mood, stress, anxiety, or worry (all $ps > .073$ and $> .155$, respectively). The only tested mechanism that came close to significance was the interaction between uncontrolled eating and condition on positive mood, $F(2, 169) = 2.66$, $p = .073$, $\eta^2 = .03$, 90% CI[.00, .08]. There was one significant difference between the uncertain condition and the other conditions on positive mood. Among people who reported being able to control their eating, participants in the uncertain condition reported feeling significantly more positive than participants in the speech condition, $F(1, 169) = 6.72$, $p = .01$, $\eta^2 = .005$, 95% CI[.23, 1.89]. This pattern of results does not match the pattern of the interaction on the dependent variable, which suggests that positive affect is not driving the effect of uncertainty on self-control.

Discussion

The present study tested the effect of uncertainty on unhealthy food consumption. Participants ate more candy when uncertain about whether they would be giving a speech than participants who expected not to have to give a speech and in some cases, even those who expected to have to give a speech. This effect, however, was found only among people who reported typically good control over their eating consumption, that is, those who scored low on uncontrolled eating or scored low on emotional eating. These findings support the hypothesis that uncertainty (vs. certainty) about a possible stressful event impairs the successful self-control needed to regulate food consumption. People who reported that they engaged in emotional or uncontrolled eating did not eat more in the uncertain condition compared to the other conditions. For these people, self-control over food consumption was already habitually low and was unlikely to be diminished any further by the additional impairments in self-control caused by uncertainty.

The third subscale of the Three-Factor Eating Questionnaire measured cognitive restraint. It was unrelated to eating behaviors in the present study. This is consistent with previous findings that self-reported cognitive restraint often does not predict either objective eating behavior (Stice et al., 2007, 2010) or disinhibited eating (Dritschel, Cooper, & Charnock, 1993; Lowe & Kleifield, 1988; Morgan & Jeffrey, 1999; Ouwens et al., 2003; Van Strien et al., 2000). It is not surprising that this subscale did not predict eating in this study.

The implications of this study are somewhat limited due to our sample of university undergraduates and the fact that we conducted the study in the lab. Previous research shows that college students may eat differently than other populations. Specifically, college students tend to skip meals, consume a limited variety of foods, and frequently consume fast food (Cavallo et al.,

2012). College students (both men and women) are likely to diet to control their weight or improve their physique (Fayet, Petocz, & Samman, 2012). Our participants were mostly women, which may also limit our generalizability. However, at least in this sample, we did not find that gender moderated the effects. An additional limitation is that the study was completed in the controlled environment of the lab. Although lab studies and field studies typically have similar results in many domains of psychology (Anderson, Lindsay, & Bushman, 1999), researchers have found some differences between lab and field studies of eating behavior (Tomiya, Mann, & Comer, 2009). Research using techniques such as Ecological Momentary Assessment could expand on this research by testing the effects of uncertainty on eating behavior outside the lab (e.g. Hofmann & Dohle, 2014; McKee, Ntoumanis, & Taylor, 2014; Tomiyama, Mann, & Comer, 2009).

The finding that uncertainty increases unhealthy eating fits with previous research on the effects of situational factors on eating behaviors. Factors such as stress and perceived stigma are linked to increased unhealthy comfort food consumption (Finch & Tomiyama, 2015; Tomiyama, 2014). People also eat a greater amount of unhealthy food when cognitive resources are low, due to previous acts of self-regulation (Erskine, 2008; Vohs & Heatherton, 2000) or cognitive load (Ward & Mann, 2000) or related to poor executive function (de Ridder, Adriaanse, & Fujita, 2018; Hofmann, Gschwendner, Friese, Wiers, & Schmitt, 2008). Dohle, Diel, and Hofmann (2017) suggested that stress, alcohol intoxication, or preoccupation with task-irrelevant thoughts may impair control of eating similarly to cognitive load. The cognitive demands of uncertainty may also similarly impair people's willingness or ability to restrict their eating.

These findings suggest that self-control related to eating may only be impaired if people typically use self-control when eating. People who engage in emotional eating and uncontrolled

eating may struggle to apply self-control to their eating even under the best conditions. It may only be individuals who are typically willing and able to exercise self-control who are affected by circumstances that impair self-control. This may extend to other domains as well. The people most affected by situations that temporarily impair self-control may be people with typically moderate or good self-control. For example, gamblers who have very poor self-control may be likely to make risky bets regardless of temporary impairments to their self-control. However, people who typically control their gambling behaviors may be affected by situations that reduce their likelihood of controlling their behavior.

Measures of typical eating behavior such as the Three-Factor Eating Questionnaire may help identify people who are prone to overeating, and ultimately, may be at risk for obesity. Our findings suggest, however, that even people who are typically able to control their food consumption are vulnerable to disinhibited eating when they are feeling uncertain. Although additional research is needed to confirm this effect in non-student populations, this study suggests that those who are typically able to control their eating may be more sensitive to the effects of uncertainty on food consumption than those who are chronically unable to control their eating. This is consistent with Cluskey & Grobe (2009) who found that during their first semester of college, a time of considerable uncertainty, a larger percentage of students initially classified as underweight or healthy weight gained weight over the semester than their overweight or obese counterparts. During such times of uncertainty, weight management intervention and prevention efforts may be especially beneficial for people who are typically able to control their eating, a population that may have otherwise been overlooked.

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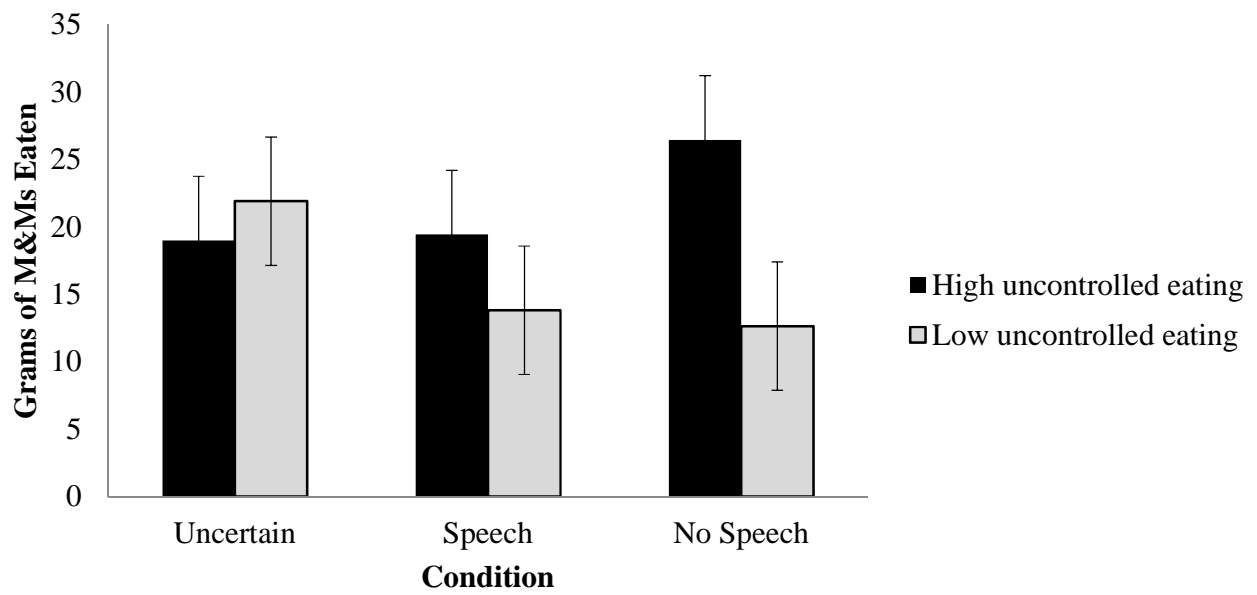


Figure 1. M&Ms eaten by condition and uncontrolled eating. Error bars represent standard deviation.

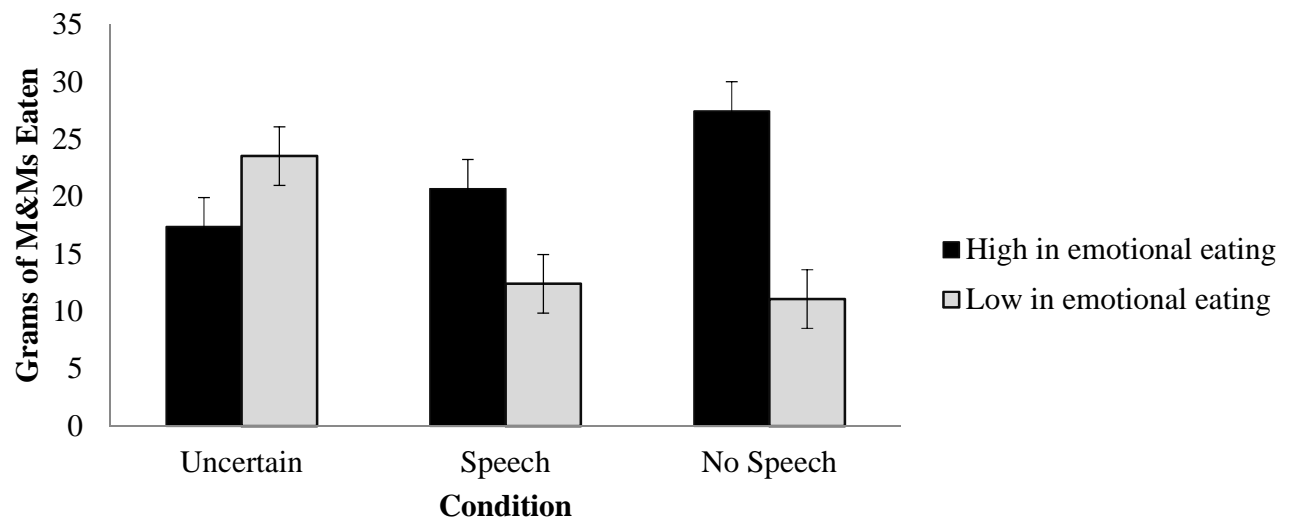


Figure 2. M&Ms eaten by condition and emotional eating. Error bars represent standard deviation.