

Running Title: Attentional Priming of Hot/Cool Cognitions and Food Consumption

Food Porn & A Snack:
Investigating the Effect of Mindset on a Taste Test

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Abstract

The hot/cool system framework represents a dichotomy within cognitive functioning that moderates the exertion of self-control. While the cool system can be described as a cognitive and emotionally stable construct that serves as the center for self-regulation and control, the hot system forms the basis for emotionality, passion, and impulsivity. Research evidence suggests that attentional priming towards hot or cool cognitions may have a direct and measureable influence on behavior in a variety of social psychological domains. The present study investigated the effect of attentional priming towards hot or cool systems on snack food consumption in 142 college students. Participants were randomly assigned to direct their attention towards the hot, appetitive or the cool, non-appetitive aspects of food presented in a selection of short food-porn videos or to a control condition with no additional instructions. Following viewing, participants were presented with a disguised taste test consisting of three snacks as well as evaluation forms for each food sampled. The total mass consumption of snack foods eaten during the test was measured in order to determine if attentional priming influenced total consumption. The obtained results suggest that attentional priming towards hot or cool cognitions does, in some instances, affect snack food consumption in college students. This finding holds important implications both for food advertising and application to potential weight loss techniques.

Food porn & a snack: Investigating the effect of mental construal on a taste test

Obesity and the quality of being overweight are growing endemics that currently afflict nearly two thirds of adults in the United States (Flegal, Carroll, Kit, & Ogden, 2012). Compared to previous generations, U.S. adults are not only gaining more weight but also becoming obese at an earlier age (McCrory, Suen, & Roberts, 2002); this is largely attributed to an overconsumption higher calorie snacks since the 1970s (Zizza, Siega-Riz, & Popkin, 2001). A population of specific interest in which to observe this trend is young adults who make the transition from high school to college. During this time period, significant changes in weight often occur and life-long dietary habits are formed (Gropper, Simmons, Gaines, Drawdy, Saunders, Ulrich, & Connell, 2008). In recent decades, these young adults have exhibited some of the greatest increases in the prevalence of obesity and overweight individuals, marking this population as a good candidate for research examining the factors involved in snacking behaviors.

This trend of increasing adult obesity has been attributed, in part, to implicit cues within our obesogenic food environment that trigger hunger and consequently, alter eating behaviors (Spence, Okajima, Cheok, Petit, & Michel, 2016). Generally, our ability to self-regulate is severely impaired in an environment that promotes the hedonic value of food and increased food intake in the absence of hunger (Chaput, Klingenberg, Astrup, & Sjödén, 2010). Specifically, greater exposure to images of desirable food items via social media and other digital interfaces may exacerbate the desire for food (Spence et al., 2016). Such exposure has more recently been described as “food porn”- images that intend to portray food in an appetizing, aesthetically pleasing, and overall desirable way (McBride, 2010). Thus, it is possible that the viewing of food

porn may trigger hunger, thus increasing snack intake in the absence of hunger and in facilitation of unhealthy weight gain.

Although the predictors of young adults' overconsumption in response to food imagery are likely multifactorial, the current study aims to examine one social-cognitive factor that might predict when people are more likely to eat greater quantities of unhealthy snack foods: how food cues in the environment are processed. Specifically, the hot/cool system framework is based upon the notion that hot and cool cognitions are representative of a dichotomy within cognitive functioning that moderates the exertion of self-control (Metcalf & Mischel, 1999). The cool system can be described as a cognitive and emotionally stable construct that serves as the center for self-regulation and control. On the other hand, the hot system forms the basis for emotionality, passion, and impulsivity. It is largely reflexive and combats efforts at self-control. While the slow and deliberate processing of cool cognitions allows for a comprehensive picture of the object of desire and the consequences of its pursuit, hot cognitions promote immediate gratification and surpass the additional processing elicited by the cool system. Incongruity between the hot and cool systems determines actions of successful or failed self-control.

The utilization of the hot/cool system framework has been applied to the behavioral health domain in studies that seek to enhance an individual's ability to resist impulsive responses that oppose set health goals. These studies are based upon a series of control strategies outlined by Metcalfe and Mischel (1999). One such strategy intends to obscure the tempting stimulus by decreasing its salience through the presentation of an external stimulus or cool cognitions. In other words, thinking of the object of desire in a "cool", non-appetitive way functions to reduce the impulsive, hot response, resulting in the overall behavior of enhanced self-control. For example, instead of thinking about how the food tastes or smells, one could instead consider how

it was packaged, what shape it comes in, or how long it had been since they last had it. This might then result in lower consumption of unhealthy, obesity-inducing snack foods.

An example of research evidence for these two processing systems comes from Both, Lann, and Everaerd's (2010) study regarding the experience of sexual emotions. In this work, participants' attention was drawn towards specific characteristics of an erotic film in order to elicit hot or cool processing, which subsequently influenced the participants' autonomic response. In the hot attentional prime condition, participants' focus was drawn towards the physical experience depicted in the film, resulting in arousal. In the cool attentional prime condition, participants' focus was drawn towards the semantic characteristics of the film—those that emphasized that it was merely a film—resulting in lower arousal. Though this study examined sexual arousal, an important lesson can be gained from its analysis: attentional priming can be used to draw focus to either hot or cool cognition, and this attentional priming results in a measureable change in behavioral responses.

In an application of the hot/cool system processing paradigm to the reduction of impulsive food choices, Veling, Aarts, and Stroebe (2013) presented participants with a multiple-choice paradigm in which behavioral stop signals were either presented (cool prime) or not presented (hot prime) with pictures of unhealthy snack foods. The absence of behavioral stop signals allowed for the processing of hot cognitions to occur uninterrupted, yet their presence in the cool prime condition evoked further processing that distracted from the appetitive characteristics of the food. Participants were subsequently asked to choose which snacks they would like to consume. The main findings showed that participants were less likely to choose pictures of unhealthy foods when primed with behavioral stop signals and chose healthier foods instead (Veling et al., 2013). It was concluded that such priming methods could reduce impulsive

food choices. A significant limitation of this study, however, was the discrepancy between selecting pictures of foods and actually consuming the food in question.

The current research study aims to fill gaps in the literature left by Veling, Aarts, and Stroebe (2013) by investigating the effect of attentional priming towards hot or cool systems on actual snack food consumption in a disguised taste test. It was hypothesized that participants primed towards the cool system would consume significantly less than those primed towards the hot system or not primed at all. Exploratory hypotheses sought to identify characteristics that would serve as additional predictors of consumption data. It was hypothesized that body mass index, current hunger, and dieting habits would predict consumption, and that taste and overall ratings, along with reported enjoyment, would predict specific snack type consumption.

Method

Participants

The initial sample consisted of 158 eligible participants. Criteria for exclusion were: no food allergies to dairy, peanuts (or other tree nuts), soy, wheat, or eggs. Ineligible participants were excused from the study upon presentation of the initial questionnaire. The study was approved by the Human Subjects Ethical Review Board of the Faculty of Psychology, Union College. Participants received either course credit or financial compensation (\$2 for every 15 minutes completed) for their participation. Screening resulted in the exclusion of 16 participants: 12 who did not consume any of at least one food item, two with potential bulimia, one as a result of video failure, and one who was an extreme outlier on time for completion (i.e., completed entire experiment in 10 minutes). The final sample consisted of 142 participants (age $M = 19.30$, $SD = 1.60$): 56 undergraduate men ($M_{BMI} = 24.58$, $SD = 4.23$; 78.9% reported not dieting vs. 21.1% endorsed at least one of three dieting behaviors), 84 undergraduate women ($M_{BMI} = 23.73$,

$SD = 4.28$; 55.3% reported not dieting vs. 44.7% endorsed at least one of three dieting behaviors), one transgender man, and one transgender woman. Ten participants identified as Hispanic or Latino, 129 identified as non-Hispanic, and three preferred not to answer.

The vast majority of the sample was White (69%); individuals belonging to racial categories other than White comprised 29% of the population, and 2% preferred not to answer.

Procedure

Convenience sampling was used to select participants to partake in the study. The total number of selected students was chosen on the basis of Veiling, Aarts, and Stroebe (2013), which examined the effect of cool system priming on the reduction of impulsive choices for unhealthy foods. Veiling et al. (2013) tested 79 participants in a between-subjects design that intended to compare a control group to an experimental group of participants primed towards the cool system. To increase the power needed to detect an effect with the additional, third condition of hot system priming, this research was designed to collect an additional 40 participants, bringing the planned total to at least 120. Prior to participation, food allergy concerns were comprehensively described. Those without food allergies who signed up for the experiment were instructed by experimenter not to eat anything in the three hours preceding the research study to control for appetite, consistent with Baumeister et al. (1998). Upon arrival, participants were told that they were participating in a study intending to evaluate the effect of mindset on food palatability. To assure compliance with ethical and safety-monitoring standards, informed consent was obtained prior to experimentation. Furthermore, participants were informed that they could leave at any point during experimentation if the need arose, without penalty. Experimental data were collected individually for each participant.

After receiving informed consent and completing an initial questionnaire, participants were randomly assigned to one of three groups: hot attentional focus ($n = 22$), cool attentional focus ($n = 27$), and control ($n = 93$). A programming error resulted in more participants in the control condition. For the manipulation of hot and cool cognitions, participants received specific instructions when watching two videos. Following the videos, participants completed a manipulation check, mood measure, and video evaluation questionnaire. In the next part of the experiment, participants completed a taste test, followed by several individual differences measures, a demographic form, and a debriefing questionnaire. At the end, participants were fully debriefed. The debriefing process involved both informing the participants of the true nature of the study and obtaining consent to allow use of their data regarding the measured weight of the food consumed during the taste test. Results remained completely anonymous through the designation of participant identification numbers and confidentiality was ensured, as the only individuals with access to the protected information were the researchers. On average, each individual testing session lasted approximately 35 minutes ($SD = 8.16$).

Materials and measures

Initial questionnaire. Before beginning the experiment, participants were presented with an initial questionnaire (22 items) enquiring about allergies, dietary preferences and restrictions, dieting habits, recent consumption, and hunger. The dieting habits questions were taken from Lowe (1993) and included three yes-or-no questions regarding current dieting behavior. Participants who reported relevant food allergies or dietary restrictions were excluded from the study. The full questionnaire is attached in Appendix A.

Participant instruction. Upon completion of the initial questionnaire, participants were randomly assigned to one of three conditions: a) hot system prime, b) cool system prime, or c) no

prime (control). Participants were asked to read a short set of instructions designed to direct their attention towards the appetitive or non-appetitive aspects of food (depending on experimental group), as presented in a selection of short videos. All experimenters were blind to the condition of the participant. The manipulation was based on the attentional direction methodology presented in Both, Lann and Everaerd (2010), which originally examined hot and cool attentional focus and its effects on sexual arousal to a short, heterosexual, erotic scene. For this study, in the hot attentional focus condition, participants received the following instruction: “During the film viewing, imagine that you are in the scene and about to eat the food being prepared. Imagine everything that you would see, smell, or taste, and concentrate on the bodily sensations you would feel while eating this food. In short, imagine yourself in the situation as much as possible, and try to imagine yourself there with the food.” In the cool attentional focus condition, the instruction was: “During film viewing, remind yourself that you are simply watching a film segment depicting an actor playing a role. Imagine that you are the director of the film. Focus on the physical characteristics of the setting like the lightning and color of the film set. Concentrate on the physical characteristics of the objects, their positions, and the quality of the camerawork. In short, take in the characteristics of the film set as much as possible and try to study each detail.” These instructions were designed to direct participant attention towards the appetitive or non-appetitive characteristics of the foods. In the no-instruction control condition, participants only received the message that a video segment would start. These instructions are found in Appendix B.

Video presentation. All participants were presented with two video segments. The video segments presented were taken from the YouTube channel “Tasty”, which presents food-based videos and recipes. One video featured a 59-second demonstration of the preparation of a pizza

bread bowl; the other was a 45-second demonstration of the preparation of ice cream donut holes. Following are hyperlinks to the presented videos:

https://www.youtube.com/watch?v=Eh5_ssE_BTY;

<https://www.youtube.com/watch?v=8KL21Dzjfec>.

Manipulation check. The manipulation check sought to evaluate the extent to which the experimental priming directed the participants' attention towards the specified systems. This evaluation was accomplished through a 26-item task questionnaire. While some items enquired as to the extent that the participant felt a certain way about the task, others were more directly relevant to the priming manipulation and enquired as to the extent that the participant, for example, "imagined the taste of the food being prepared." Responses were anchored on an eight-point scale with responses ranging from 1 (*very little/not at all*) to 8 (*very much*). The manipulation check questionnaire is attached in Appendix C.

Brief Mood Introspection Scale (BMIS). The BMIS is a mood scale consisting of 16 mood-based adjectives. Initially developed by Mayer and Gaschke (1988) and tested amongst college undergraduates, the original study distinguished between a pleasant-unpleasant dimension ($M = 5.05$, $SD = 7.40$, $\alpha = 0.83$) and an aroused-calm dimension ($M = 17.50$, $SD = 4.39$, $\alpha = 0.58$). In the current study, the participant was asked to report the extent to which he or she was feeling a given mood after completing the video viewing task. Responses were anchored on a seven-point scale with responses ranging from 1 (*definitely do not feel*) to 3 (*do not feel*) to 5 (*slightly feel*) to 7 (*definitely feel*).

Video evaluation. The video evaluation questionnaire served to reinforce the initial deception of measurement of the effect of mental construal on food palatability. The evaluation questionnaire consisted of seven video-relevant items asking participants how much they liked

each video, whether or not they would attempt to make the food prepared in each video, and whether or not they thought the video was effective. The video evaluation questionnaire is attached in Appendix D.

Taste test. After completing the video evaluation, participants were subject to a taste test. The foods selected for evaluation included nacho cheese-flavored corn chips, pretzels, and milk chocolate candies in a colorful sugar shell. The foods were presented to participants in bowls containing 1.5 servings of each food item (1.50 ounces Doritos, 1.90 ounces Snyder's mini pretzels, 2.50 ounces M&Ms).

Taste evaluation questionnaire. During tasting, participants were instructed to perform taste evaluations on each of the different food items separately and in a specific order and to completely fill out the taste evaluation questionnaires for the respective foods before moving on to the next food item. The taste evaluation questionnaire consisted of nine items asking participants to rate the appearance, taste, texture, and aroma of the food, as well as to provide an overall rating of the food. Participants were also asked to rate the food item in five different taste categories on a scale of 1 (not at all) to 5 (very much), how much they enjoyed the food item, if they would eat the food item again, and if they would recommend it to other people. The taste evaluation questionnaire is attached in Appendix E. Participants were welcomed to have as much food as necessary to make their ratings and were permitted to eat as much of any of the foods as they liked, as any food they did not finish would be thrown out for sanitary purposes and thus could not be re-used.

Individual difference measures. The food remained with the participants while they completed each of the four following individual difference measures, which were presented in a counter-balanced order.

Barratt Impulsiveness Scale (BIS). Adapted from Barratt (1965), the BIS is a 15-item questionnaire designed to assess the personality trait of impulsiveness—the behavioral characteristic of acting without forethought (Spinella, 2007). The original scale was administered to 700 community adults. It could either be computed as a total measure of impulsivity or broken down into the subscales of motor impulsivity ($M = 2.10$, $SD = .60$), non-planning ($M = 2.24$, $SD = .62$), and attention-impulsivity ($M = 2.16$, $SD = .60$). The subscale estimates for Cronbach's alpha were not reported, but across two studies, Spinella (2007) found acceptable internal consistency for the total scale, $\alpha = 0.79-0.81$. In the present study, items were scored on a four-point scale, ranging from 1 (*rarely/never*) and increasing in likelihood to 4 (*almost always*).

Brief Self-Control Scale (BCSC). The BCSC is a 13-item questionnaire designed to assess several measures of self-control, including the ability to resist temptation, regulate performance, break habits, and control thoughts, emotions, and impulses (Tangney, Baumeister, & Boone, 2004). In the original study on undergraduate students ($M = 3.02$, $SD = 0.66$, $\alpha = .83$), items designed to indicate how well statements regarding self-control applied to the participant were scored on a five-point scale, ranging from 1 (*not at all like me*) and increasing in likelihood to 5 (*very much like me*). In the present study, items were scored on an expanded seven-point scale, ranging from 1 (*not at all like me*), increasing to 4 (*somewhat like me*) and subsequently 7 (*very much like me*).

Bulimia Test-Revised (BULIT-R). The BULIT-R is a 36-item multiple-choice questionnaire designed to evaluate the presence of bulimic symptoms (Thelen, Mintz & Wal, 1996). The items, which assess personal eating behaviors and how the participant views his or her body, result in an overall measure of bulimic tendencies. The original scale was administered to female undergraduate students both with and without diagnosed bulimia. The total BULIT-R

scores of the bulimic ($M = 119.26$) and non-bulimic ($M = 53.31$) differed significantly from one another. More specifically, the means of the two groups were found to differ significantly on each of the 28 individual measures. The BULIT-R has since also been applied to males. In the present study, items were scored as they were in the original, and the measure was used to exclude those who fell above the cut-off of 104, specified by Thelen et al. (1996) as indicative of bulimic pathology.

Power of Food Scale (PoFS). The PoFS is a 15-item questionnaire designed to evaluate the psychological impact of food on an individual (Lowe et al., 2009). The original 21-item scale was administered to a large sample of more than 560 men ($M = 44.4$, $SD = 12.7$) and women ($M = 47.4$, $SD = 15.6$; Lowe et al., 2009). Although women scored slightly higher than men, this difference was not found to be significant in the original study. Internal consistency estimates for the 21-item scale were excellent, $\alpha = 0.94$. A large, non-obese web-based sample supported three categories representing levels of food proximity and revealed the psychological impact for food readily available in the environment ($M = 1.48$, $SE = 0.06$, $\alpha = 0.91$), for food present but not tasted ($M = 1.90$, $SD = 0.07$, $\alpha = 0.90$), and for food when first tasted but not consumed ($M = 1.80$, $SD = 0.05$, $\alpha = 0.82$; Cappelleri, Bushmakin, Gerber, Leidy, Sexton, Karlsson, & Lowe, 2009). Much like in the original study, the present study implements a five-point scale with anchored responses of 1 (*I do not agree at all*) to 5 (*I strongly agree*).

Demographic questionnaire. Following the presentation of the individual difference measures, participants were presented with a general information questionnaire consisting of 15 demographic items, enquiring about the participant's age, biological sex, gender identity, ethnicity, racial/national-origin group, native language, religious background, sports

involvement, height, and weight. The final question evaluated how seriously the participant took the experiment. This questionnaire is attached in Appendix F.

Debriefing questionnaire. Prior to the experimental debriefing, a survey was presented to participants asking for their personal interpretation of the study and its intention. This survey is attached in Appendix G.

Post-test measurement. Following debriefing, the experimenter measured the mass of food remaining in each of the bowls. This number was subtracted from the original mass of the food plus bowl to obtain total mass consumption for each of the three snack foods.

Results

Manipulation check

To determine the efficacy of the video manipulation, an independent samples t-test was conducted comparing those in the hot and those in the cool conditions. This analysis revealed no significant differences between the hot and cool groups for 15 items on the Manipulation Check Questionnaire, including task difficulty, confusion, effort, self-awareness, and enjoyment (Appendix C). Significant differences between groups were found for 11 items (see Table 1). A one-way between groups ANOVA also revealed no significant difference between groups for Pleasant-Unpleasant, $F(2, 139) = 0.68, p = .51$, and Arousal-Calm, $F(2, 139) = 0.63, p = .53$, mood dimensions of the Brief-Mood Introspection Scale due to condition.

Descriptive statistics

Participants displayed a normal BMI range and, on average, had consumed approximately 1016 calories on the day of testing. The mean time since last caloric intake was approximately four hours, suggesting that participants conformed to the instructions not to eat for at least three hours before the start of the experiment. Current hunger was reported as 3.19 out of

a possible 5 (see Table 2). While 65% of the sample endorsed none of the three behavioral dieting items, 35% of the sample endorsed one or more. Consumption data showed that on average, participants consumed approximately half a serving of pretzels, three-quarters of a serving of Doritos, and half a serving of M&Ms (see Figure 1). This equated to roughly 280 calories and 11.38 grams of fat. Food ratings obtained during the taste test revealed that participants rated the taste of the Doritos more highly than that of the pretzels or M&Ms.

Accordingly, participants also reported liking the Doritos, overall, more than the pretzels or the M&Ms (see Table 2). Scores on standardized measures, including the BSCS and three sub-scales of the BIS, were relatively consistent with the original data (see Table 3). For example, participants in this sample reported moderate levels of trait self-control, falling slightly above the scale midpoint. Participants also exhibited moderate impulsiveness in each of the three measured domains, falling slightly above the scale midpoint for motor-impulsivity, non-planning, and action-impulsivity. An overall measure of bulimic tendencies revealed that the sample was far below the cut-off value indicative of bulimic pathology, though two participants were removed for potential bulimia in line with the recommendations of Thelen et al. (1996). Furthermore, the psychological impact of foods readily available in the environment, present but not tasted, and food when first tasted but not consumed were at or above the scale midpoint and were thus higher than those reported in the original study. This might be due to the use of a different sample (i.e., college student vs. web-based) or to the fact that participants completed this measure after presentation of the appetizing food videos and the snack food taste test.

Main analysis

A one-way, between-groups ANOVA revealed no significant difference between groups for mass consumption for any of the three snack foods: Pretzels, $F(2, 137) = 1.52, p = .22, \eta^2 =$

0.02; Doritos, $F(2, 137) = 3.04, p = 0.05, \eta^2 = 0.04$; M&M, $F(2, 137) = 0.04, p = 0.96, \eta^2 = 0.01$ (Figure 2). However, because it was hypothesized that the cool condition would significantly differ from the hot and control conditions, specific comparisons between these groups were made using contrast coding. When comparing pretzel consumption for those in the cool condition versus those in the combined hot and control conditions, no significant difference was found, $t(137) = 1.17, p = .25$. When comparing Dorito consumption for those in the cool condition versus those in the combined hot and control conditions, a significant difference was found, $t(137) = 2.30, p = .02$; such that, participants in the hot and control conditions consumed significantly more Doritos than those in the cool condition. When comparing M&M consumption for those in the cool condition versus those in the combined hot and control conditions, no significant difference was found, $t(137) = 0.28, p = .78$.

Correlations

Correlational analyses revealed that BMI, current hunger, and dieting were not significant predictors of consumption for any of the three snack items (Table 4). The individual difference measure for impulsiveness, trait self-control, and the power of food were also not shown to be predictive of consumption (Table 5). Conversely, food-specific taste ratings, overall rating, and self-reported enjoyment of the specific food were good predictors of total consumption (Table 4).

Discussion

In the present study, a hot attentional prime during viewing of a food preparation video did not result in greater consumption of snack foods during a disguised taste test for the presented foods. Analysis of the Dorito snack type via contrast coding, however, did reveal, as expected, that participants oriented towards the appetitive aspects of the stimulus (hot prime) or who were not primed at all (control condition) did consume significantly more than those who

were oriented towards the non-appetitive aspects of the stimulus (cool prime). This suggests that experimental manipulation, to some extent, did influence consumption and that attentional priming towards cool cognitions may serve to enhance self-control efforts. Furthermore, a programming error during experimentation resulted in far more control participants than hot or cool participants. Ideally, these cells would be filled to get a better understanding of the effect of condition on snack food consumption.

The pairing of the hot and control conditions was also reflected in the results of the manipulation check, which showed that participants primed toward hot cognitions and those who were not primed at all reported significantly more often imagining themselves as part of the scene and significantly less often imagining themselves as the director of the videos as well as paying attention to the lighting and color of the film set, camera work, and positioning of objects. It is not surprising to see such a pattern emerge, as unprimed, the natural response to watching a food video may be to pay attention to the appetitive, rather than the non-appetitive aspects of food. This is especially relevant in the context of the obesogenic environment that many college students find themselves in. Conversely, it took the experimental manipulation to focus participant attention towards more abstract and particular aspects of the video, like color and lighting. Interestingly, participants primed towards hot cognitions and those who were not primed at all also reported greater task importance, perhaps as a result of the aforementioned greater salience of the appetitive aspects of food. These results indicate that the independent variable manipulation did, in fact, work as desired, and that natural viewing of food porn videos elicits processing in line with the hot system.

The consumption data obtained from the taste test are particularly profound given the initial hypotheses regarding the covariates that would serve as good predictors of consumption.

Interestingly, body mass index, current hunger, and dieting behaviors were not found to be good predictors of consumption. Rather, taste and overall ratings, along with reported enjoyment, were far more adequate predictors. Importantly, the size and significance of the main results is similar, even when these covariates are included in the analysis, indicating that condition was also an adequate predictor of consumption. Although this pattern of consumption by condition only emerged for the Dorito snack type, the pattern of mean consumption by condition for pretzels thus far suggests potential significance upon expanding the sample size. Furthermore, the non-significant effect observed for pretzels may be due to the generally low consumption and reported lower liking by participants. Thus, it is important that future research focus on selecting foods that elicit similar levels of liking and preference in the sample collected to ensure that the manipulation of hot/cool processing has a more consistent effect on consumption.

Along with generally low liking for one of the chosen snack types, one possible limitation involves the sample chosen for study, which came from a college population with a largely normal BMI range. As approximately 2/3 of the United States falls above the normal BMI range and the great majority of Americans fall outside the age range of 18-22, this is unlikely to be the most representative sample for an examination of consumption habits. However, given the significant changes in weight that occur and life-long dietary habits that are formed during this transitional period, and the substantial increase in the prevalence of obesity and overweight individuals in this demographic, the sample was considered appropriate for the present investigation. In addition, meta-analytic evidence suggests that both “lean” and overweight samples show moderate food-cue induced effects on eating behavior (Boswell & Kober, 2015). Thus, although the sample may not be representative of the American public, it still represents an important group in which to study consumption. This is also a group whose

consumption may, in part, not be vastly different than more diverse groups, though this warrants further investigation.

The present study did employ a number of strengths. To begin, the study had strong internal validity. Participants were randomly assigned to experimental conditions, and the experimenter was blind to which condition they were assigned. Furthermore, the study also held moderate external validity for the sample of college students. The foods chosen for tasting are ones that college students are exposed to on a daily basis. Furthermore, the incongruity between foods shown in the video and those presented is representative of a common phenomenon during the viewing of food advertising. Oftentimes, the food portrayed by the advertisement is not that which is at hand, yet consumption behaviors are still affected (e.g., Harris, Bargh & Brownell, 2009).

The results of this study and others like it hold many potential applications. As an example, the fact that experimental evidence for the existence of the hot/cool system framework exists and that priming attention towards such cognitions has a measurable effect on behavior holds important implications for advertising. By monitoring behavioral responses to food preparation videos, food marketers can get a better understanding of what works and what does not—what makes consumers crave their products and what may turn them off. Furthermore, another large potential area for extension is application to weight loss techniques. Many individuals who seek to lose weight have a difficult time adhering to diets calling for the consumption of more healthy foods. As such, future research should attempt to get people to process healthy food images in such a way that is “hot”, thus increasing consumption, and helping them lose weight.

The current food environment of the United States is one in which hedonism dominates. Fueled by thoughts of desire and need and borne largely from advertising and its attractive portrayal of marketable products, cognitions towards foods are hot in nature, likely contributing to the increasing prevalence of obesity seen in the United States. Through attentional priming towards cool cognitions, potential exists to counteract these hot cognitions, and fortify efforts of self-control in a seemingly ever-tempting environment to make America healthy again.

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Appendix A

Initial Questionnaire

Before beginning the experiment, please answer the following questions.

1. Are you allergic to dairy (e.g., milk)?
 - a. Yes
 - b. No

2. How often do you eat dairy products?
 - a. More than once per day
 - b. More than once per week
 - c. Less than once per week
 - d. Never
 - e. Unsure

3. Are you allergic to peanuts or other tree nuts (e.g., almonds, cashews, walnuts)?
 - a. Yes
 - b. No

4. How often do you eat peanuts, tree nuts, or products containing nuts?
 - a. More than once per day
 - b. More than once per week
 - c. Less than once per week
 - d. Never
 - e. Unsure

5. Are you allergic to soy?
 - a. Yes
 - b. No

6. How often do you eat soy products (e.g., tofu, soy milk, edamame)?
 - a. More than once per day
 - b. More than once per week
 - c. Less than once per week
 - d. Never
 - e. Unsure

7. Are you allergic to wheat?
 - a. Yes
 - b. No

8. How often do you eat products containing wheat?
 - a. More than once per day
 - b. More than once per week

- c. Less than once per week
- d. Never
- e. Unsure

9. Are you allergic to eggs?

- a. Yes
- b. No

10. How often do you eat eggs or products containing eggs?

- a. More than once per day
- b. More than once per week
- c. Less than once per week
- d. Never
- e. Unsure

11. Do you have any other dietary restrictions (e.g., allergies, intolerances, or any other foods/beverages that you avoid for any reason)?

- a. Yes
- b. No

12. If yes, please explain:

13. If you responded yes to #11, what is the reason that you do not consume this food (select all that apply)?

- a. allergy/intolerance
- b. religious/ideological
- c. moral/ethical
- d. personal health/nutrition
- e. weight/calories
- f. cost
- g. sensory/disgust/dislike
- h. other:

14. Are you now watching what you eat in order to lose weight?

- a. Yes
- b. No

15. Are you trying to lose weight by eating less?

- a. Yes
- b. No

Appendix B

Participant Instruction

1. In the hot attentional focus condition, participants received the following instruction:

“During the film viewing, imagine that you are in the scene and about to eat the food being prepared. Imagine everything that you would see, smell, or taste, and concentrate on the bodily sensations you would feel while eating this food. In short, imagine yourself in the situation as much as possible, and try to imagine yourself there with the food.”

2. In the cool attentional focus condition, participants received the following instruction:

“During film viewing, remind yourself that you are simply watching a film segment depicting an actor playing a role. Imagine that you are the director of the film. Focus on the physical characteristics of the setting like the lightning and color of the film set. Concentrate on the physical characteristics of the objects, their positions, and the quality of the camerawork. In short, take in the characteristics of the film set as much as possible and try to study each detail”.

3. In the no-instruction control condition, participants only received the message that a film segment would start.

Appendix C

Manipulation Check Questionnaire

1. How eager were you to work on the task?

X X X X X X X X X X X X X X X X X X X X X X X X X X X X
Not
At all

Very
Much

2. How much fun was this task?

X X X X X X X X X X X X X X X X X X X X X X X X X X X X
Very
Little

Very
Much

3. How difficult was the task?

X X X X X X X X X X X X X X X X X X X X X X X X X X X X
Very
Easy

Very
Hard

4. How confused were you during the task?

X X X X X X X X X X X X X X X X X X X X X X X X X X X X
Not
At all

Very
Much

5. How hard did you try on the task?

X X X X X X X X X X X X X X X X X X X X X X X X X X X X
Very
Little

Very
Much

6. How much did you feel the task was important?

X X X X X X X X X X X X X X X X X X X X X X X X X X X X
Not
At all

Very
Much

7. How emotional were you during this task?

X X X X X X X X X X X X X X X X X X X X X X X X X X X X
Very
Little

Very
Much

17. To what extent did you imagine yourself as a part of the scene?

X X X X X X X X X X X X X X X X X X X X X X X X X X X

Very
Little

Very
Much

18. To what extent did you imagine the smell of the food being prepared?

X X X X X X X X X X X X X X X X X X X X X X X X X X X

Very
Little

Very
Much

19. To what extent did you taste the food being prepared?

X X X X X X X X X X X X X X X X X X X X X X X X X X X

Very
Little

Very
Much

20. To what extent did you imagine yourself as the director of this film?

X X X X X X X X X X X X X X X X X X X X X X X X X X X

Very
Little

Very
Much

21. To what extent did you imagine the texture of the food in your mouth?

X X X X X X X X X X X X X X X X X X X X X X X X X X X

Very
Little

Very
Much

22. To what extent did you pay attention to the lighting of the film set?

X X X X X X X X X X X X X X X X X X X X X X X X X X X

Very
Little

Very
Much

23. To what extent did you pay attention to the color of the film set?

X X X X X X X X X X X X X X X X X X X X X X X X X X X

Very
Little

Very
Much

24. To what extent did you pay attention to the positioning of objects on the film set?

X X X X X X X X X X X X X X X X X X X X X X X X X X X

Very
Little

Very
Much

25. To what extent did you pay attention to camera work utilized in the film?

X X X X X X X X X X X X X X X X X X X X X X X X X X X

Very
Little

Very
Much

Appendix E

Taste Test Questionnaire

Please complete one taste test questionnaire for each food item.
It is important that you taste the food and complete the questionnaire before moving on to the next food.

1. How would you rate the appearance of this food?

	1	2	3	4	5
Extremely Unattractive	Unattractive	Neutral	Attractive	Extremely Attractive	

2. How would you rate the taste of this food?

	1	2	3	4	5
Very poor	Poor	Acceptable	Good	Very good	

3. How would you rate the texture of this food?

	1	2	3	4	5
Very poor	Poor	Acceptable	Good	Very good	

4. How would you rate the aroma/smell of this food?

	1	2	3	4	5
Very Unappealing	Unappealing	Neutral	Appealing	Very appealing	

5. How would you rate this food overall?

	1	2	3	4	5
Very bad	Bad	Acceptable	Good	Very good	

6. On a scale of 1 (not at all) to 5 (very much), rate the food item in each taste category:

___ Bitter
___ Salty
___ Savory
___ Sweet
___ Sour

7. How much did you enjoy this food item?

Not at all 1 2 3 4 5
Very much

8. Would you eat this food item again?

- a. Yes
- b. No

9. Would you recommend this food item to other people?

- a. Yes
- b. No

Appendix F

Demographic Questionnaire

- 1) What is your age? _____**

- 2) What is your biological sex?**
 - (1) Male
 - (2) Female
 - (3) Intersex
 - (4) Prefer not to answer

- 3) What is your gender identity?**
 - (1) Male
 - (2) Female
 - (3) Non-Binary
 - (4) Prefer not to answer

- 4) What ethnicity do you consider yourself to be?**
 - (1) Hispanic or Latino
 - (2) NOT Hispanic or Latino
 - (3) Prefer not to answer

- 5) In which racial or national-origin group do you consider yourself to be included? Select one or more of the following.**
 - (1) American Indian or Alaskan Native
 - (2) Asian
 - (3) Black or African-American
 - (4) Native Hawaiian or other Pacific Islander
 - (5) White
 - (6) Other (Please specify) _____
 - (7) I prefer not to answer this question

- 6) Is English your native language?**
 - (1) Yes
 - (2) No

7) How would you describe your religious background?

- (1) Catholic (Christian)
- (2) Orthodox Eastern (Christian)
- (3) Protestant (Christian - e.g., Baptist, Methodist, Lutheran)
- (4) Mormon (Christian)
- (5) Jewish
- (6) Muslim/Islamic
- (7) Buddhist
- (8) Hindu
- (9) Other
- (10) No religion
- (11) Prefer not to answer

8) Please indicate how committed you are to your religious beliefs:

- (1) Devout (Strong)
- (2) Moderate
- (3) Inactive
- (4) Not applicable

9) Are you on a sports team?

- (1) Yes
- (2) No

10) If yes, please circle which type of team you are a part of:

- (1) Intercollegiate
- (2) Intramural
- (3) Club
- (4) Recreational

11) What is your height? ___ feet ___ inches

12) What is your current weight? _____ pounds

13) What is your ideal weight? _____ pounds

14) What is the most that you have ever weighed? _____ pounds

15) People take surveys for a lot of reasons. Were you completely honest and serious in responding to this survey? Or were you joking around or giving less-than-honest responses?

- (1) I answered the survey seriously and honestly.
- (2) I provided joking or less-than-honest responses to the survey.

Appendix G

Debriefing Questionnaire

1. What do you think the purpose of this experiment was?

2. Do you think that any of the tasks that you did were related in any way?
- a. Yes
 - b. No

3. If yes, in what way were they related?

4. People take surveys for a lot of reasons. Were you completely honest and serious in responding to this survey? Or were you joking around or giving less-than-honest responses?
- a. I answered the survey seriously and honestly.
 - b. I provided joking or less-than-honest responses to the survey.

Table 1.

Comparison of Manipulation Check Questions by Condition

Item	M _{Cool}	M _{Hot}	<i>t</i>
How important	3.85	4.82	-2.15*
Imagine part of scene	3.89	5.68	-3.31*
Imagine smell	4.85	6.09	-2.16*
Imagine taste	5.93	6.82	-1.74
Imagine director	5.30	2.50	5.13*
Imagine texture	4.96	6.27	-2.40*
Attention to lighting	4.59	2.50	4.31*
Attention to color	5.67	3.64	4.14*
Attention to positioning	5.93	3.77	4.07*
Attention to camera work	5.81	4.09	3.16*

Note: N_{Cool} = 27, N_{Hot} = 22; * $p < .05$.

Table 2.

Descriptive statistics for sample characteristics and food ratings

Item	M	SD
BMI	24.07	4.26
Calories Consumed Today*	1016.27	924.13
Time Since Last Calories*	225.36	313.60
Current Hunger	3.19	0.97
Pretzel Taste	3.42	0.73
Pretzel Overall	3.64	0.67
Dorito Taste	4.41	0.74
Dorito Overall	4.31	0.75
M&M Taste	4.15	0.87
M&M Overall	4.15	0.80

*Note: N = 142, * means N = 141*

Table 3.

Descriptive Statistics for Standardized Measures

Item	M	SD	α
BCSC	4.02	0.91	.45
BULIT	54.86	16.47	-.06
BIS Motor-Impulsivity	2.28	0.40	.73
BIS Non-Planning	2.03	0.57	.73
BIS Attention-Impulsivity	2.32	0.59	.25
POFS Food Present	3.60	0.88	.75
POFS Food Available	2.85	0.85	.81
POFS Food Tasted	3.48	0.66	.55

Note: N = 142

Table 4.

Correlations: Analysis for Potential Covariates

Food Consumed	Taste	Overall	Enjoyment	BMI	Hunger	Dieting
Pretzel	.16	.17*	.27*	.14	.10	-.05
Dorito	.21*	.16	.25*	.07	.11	-.09
M&M	.24*	.20*	.32*	.06	.03	-.22

Note: N = 140; * $p < .05$.

Table 5.

Correlations: Analysis for Potential Personality Covariates

Food Consumed	M _{BSCS}
Pretzel	.06
Dorito	.20*
M&M	-.06

Food Consumed	M _{POFS} Food Present	M _{POFS} Food Available	M _{POFS} Food Tasted
Pretzel	.01	.09	-.07
Dorito	.06	.02	-.07
M&M	.09	.05	-.11

Food Consumed	M _{BIS} Motor-Impulsivity	M _{BIS} Non-Planning	M _{BIS} Attention-Impulsivity
Pretzel	-.10	.08	.04
Dorito	-.12	-.02	-.07
M&M	-.03	.09	.13

Note: N = 142; * $p < .05$.

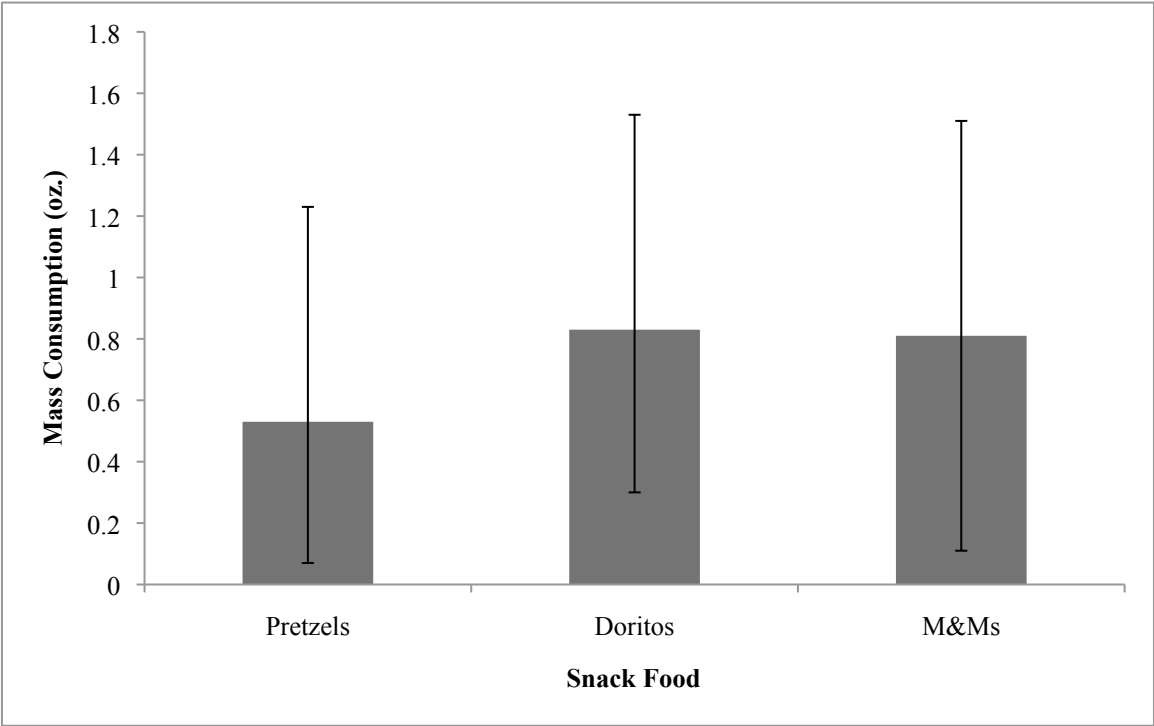


Figure 1. Average consumption data for each snack food.

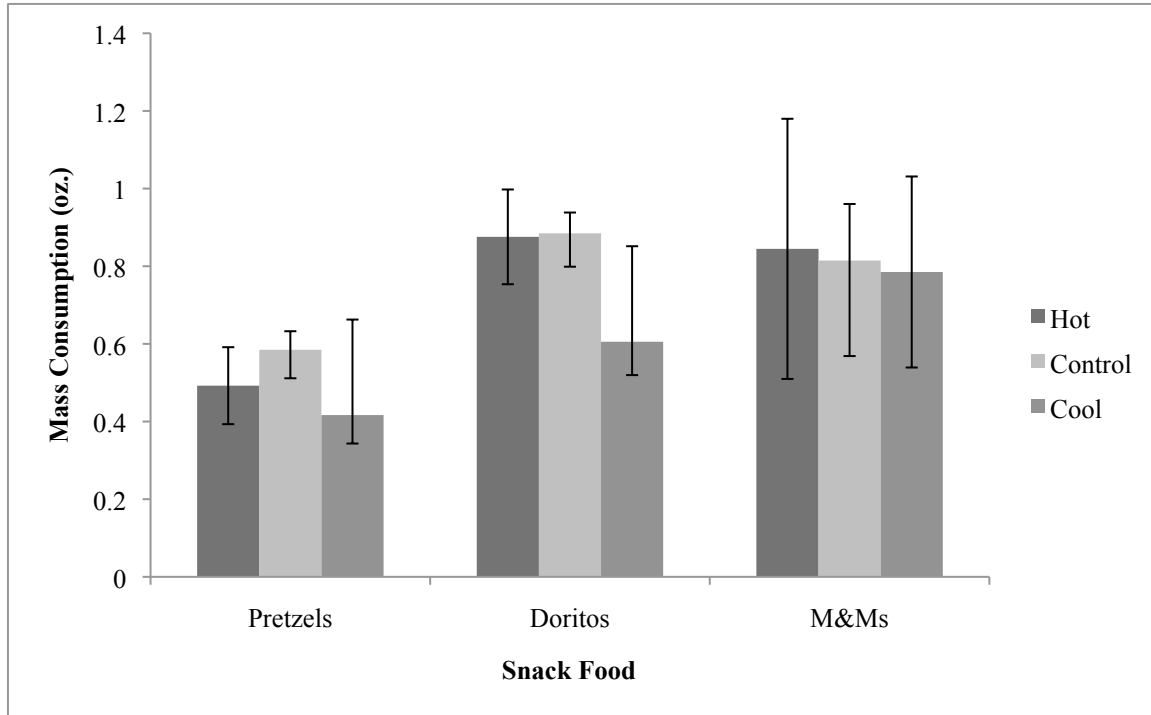


Figure 2. Average consumption data for each snack food by condition.