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Differences in the Effects of Visual Cues on the Hunger of Men and Women

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Twenty men and 20 women from the University of Western Ontario and its affiliate colleges were recruited to complete a study regarding the effects that images of food have on hunger. It was hypothesized that women would have more increased feelings of hunger after being exposed to images of low-caloric foods than high-caloric foods, and men would have increased feelings of hunger after seeing images of high-caloric foods than low-caloric foods. Individuals completed a five-point scale of immediate hunger, and then were shown images of either high-caloric or low-caloric foods, which they wrote a descriptive paragraph about in order to ensure that the images were viewed adequately. Participants then reassessed their hunger on a five-point scale. The results found no main effect for gender (male/female) or food image condition (high-calorie/low-calorie), but an interaction effect was found between the independent variables, $F(1,36) = 7.72, p < 0.05$, partial $\eta^2 = 0.18$. Issues and improvements of the design were discussed, as well as suggestions for future studies.

A famous study by Cannon and Washburn (1912) was conducted in which a balloon was placed in a subject’s stomach, and the results showed that the stomach responds by contracting if it is empty and a person is hungry. It is also known that parts of the brain, specifically the hypothalamus, have an effect on hunger; hormones secreted can alter a person’s feelings of hunger or fullness, which can have an effect on one’s appetite (Goldstone, 2006). While some may assume that hunger is entirely biological because of this evidence and the fact that people experience obvious hunger pains, there is evidence that there is more than just a biological basis to appetite. It is possible to have feelings of hunger without having a need for actual food. This was confirmed by
Wangensteen and Carlson (1931), who observed that patients with no stomach due to a gastrectomy still experienced feelings of hunger. As well, obese individuals have been found to continuously eat even after becoming satiated, proving that there are factors other than the stomach that can have an effect on hunger (Schachter, 1968). In a study by Rolls, Morris, and Roe (2002), it was found that feelings of hunger and fullness did not differ even after eating larger portions of lasagne than had been consumed previously. Even Cannon and Washburn (1912) stated in their paper that although hunger and appetite are intimately related, they are two completely separate experiences. Therefore, while hunger may be controlled by biological systems, there may be external factors that affect one’s appetite.

While the brain’s function with regards to hunger is to regulate when and how much a person eats, there are many external factors that influence the satiety signals that are sent from the brain. According to Schachter (1968), a person may have eating behaviours that are under the control of external stimuli; for example, eating a delicious snack even though one has recently eaten and is no longer hungry. Smell, sight, and taste can have an effect on a person that may overpower self-control and make a full person eat (Schachter, 1968). In fact, in the case of obese individuals, there is almost no relationship between one’s internal state of fullness and his or her eating behaviour (Schachter, 1968). Interestingly, being further away from food may help prevent the onset of hunger; on the Jewish holiday of Yom Kippur, which involves fasting for 24 hours, obese Jewish individuals who spent the majority of the day in the synagogue (in which absolutely no food was available) felt less hunger than obese Jews who spent little time in the synagogue (Schachter, 1968). The amount of food available to a person, as well as one’s
body type, also has an effect on hunger, and it was found that obese individuals who had three sandwiches available to them ate more than individuals of normal weights (Nisbett, 1968).

It is fascinating that merely by looking at food, it is possible to trigger sensations of hunger, movement in the digestive system, and salivation (Penick, Prince, & Hinkle, 1966). This is due to a lessening in the amount of free fatty acids in blood plasma as a result of conditioning to the sight of food; when the level of free fatty acids is low, the body produces sensations of hunger (Penick et al., 1966). According to Rogers et al. (1989), just exposing dieters to images of appetizing food reduces the motivation to continue dieting. In an experiment regarding food-sated and food-restricted rats, it was found that both groups consumed the same amount of food with a high incentive value (chocolate flavoured cereal as opposed to normal food pellets), and the rats would run faster towards the food that tasted and smelled better (Barbano & Cador, 2005).

According to Stroebe (2008) with regards to images in the media and at supermarkets, when one is consistently presented with foods that are unhealthy but appealing, the goal of enjoying food overpowers the goal to maintain weight. It is possible for one’s dietary restraint to break down once palatable food stimuli (e.g. images or smells) are introduced (Rogers & Hill, 1989). With regards to women who have been fasting due to an eating disorder, deprivation increases the incentive value of food and can lead to stronger feelings of hunger when images of food are shown; this can lead to binge eating of unhealthy foods (Mauler, Hamm, Weike, & Tuschen-Caffier, 2006).

Men and women have distinct differences with regards to the way they view the incentive value of foods, and this was apparent in the study by Beardsworth et al. (2002).
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It was found that men believe red meat to be significantly healthier than women do, women were more likely to regulate their diets in order to live a healthier lifestyle, and women worry more than men about the foods they eat and do not always eat what they like (Beardsworth et al., 2002). Women were also more likely to try new foods, and include fruits and vegetables into their diets (Beardsworth et al., 2002). Rappoport, Peters, Downey, McCann, and Huff-Corzine (1993) also found that there was a significant difference in the types of food that men and women rated as pleasurable or healthy. Women rated healthy foods as more pleasurable than men, and they had a better sense of which foods were actually healthy (Rappoport et al., 1993).

When combining the fact that food of higher incentive value will increase motivation and consumption of that food (Barbano & Cador, 2005), and the fact that even looking at food creates feelings of hunger (Penick et al., 1966), it can be inferred that the sight of foods with a high incentive value will increase feelings of hunger more than the sight of foods with a low incentive value. It is hypothesized that, since men and women differ with regards to the incentive values of different foods (Beardsworth et al., 2002), men will become hungrier after being exposed to high-caloric images of food, and women will become hungrier after seeing images of low-caloric food.

Method

Participants

The participants in this study were 20 male and 20 female students from the University of Western Ontario and its affiliate colleges. The university is located in London, Ontario, and casual observation suggests that most of the participants were from a town other than London. Casual observation would also indicate that the students
involved were between the ages of 17-24. The individuals involved in the study were recruited from various libraries around campus, as well as in classrooms and in the University Community Centre, a building on campus that many students go to socialize with others. Every participant gave their consent to partake in the study before completion.

Materials

A booklet containing the materials of this study was assembled. The first page of the booklet was a letter of information that outlined any risks in the study, discussed confidentiality, explained that participation was voluntary, and provided contact information of the researcher and supervising professor. The second page of the booklet was a consent form that was detached after completion; in signing the form, the participants were able to continue on with completing the booklet. On the next page, participants were asked to evaluate their hunger at the moment on a five-point scale, with the number 1 being “not hungry at all” and the number 5 being “extremely hungry”; on the same page, participants were asked to circle yes or no indicating whether they were on a food restrictive diet (see Appendix A). For each condition in this study there was a page with different images of food that was shown to the participants, but was not included in the stapled booklet. Each page was an 8.5 X 11 inch piece of regular printer paper with four images of food printed directly onto it. The images were found by the researcher through a basic internet search. For the high-caloric condition, this page included images of cookies, fast food, a club sandwich and fries, and a chocolate cake (Figure 1). For the low-caloric condition, the images included were celery, sushi, a salad, and fruit (Figure 2). The next page in the booklet included instructions stating that
Figure 1: Images of food used in high-caloric condition
Figure 2: Images of food used in low-caloric condition
participants should write a brief description of one of the images they were just exposed to, and lines were provided on the page for the answer (Appendix B). The final page of the booklet was comprised of the same five-point scale that was included in the beginning of the booklet indicating momentary hunger. After completing the booklet, participants received a debriefing statement indicating the purpose of the study.

Because of the subjectivity of the researcher in selecting images for this study, it is impossible to determine the reliability and validity of these stimuli, although effort was made by the experimenter to choose images that reflected an obviously high calorie count. It is also not known whether a five-point scale is a reliable and valid measure of momentary hunger. The description of food provided by participants was used to ensure that individuals actually paid attention to the images that were shown to them, and it is unknown whether this was a reliable and valid method for ensuring attention.

Procedure

A student in a senior-level psychology class at Huron University College, a small liberal arts college affiliated with the University of Western Ontario, compiled and distributed the study materials to students around the university. Each booklet was distributed in a random order to the participants, as to eliminate any bias of the experimenter. The participants were told that there was no time limit in completing the study, but that it shouldn't take them more than fifteen minutes. They were also told to fill out the booklet in the order that it was given to them. The participants filled out each page until reaching the section where they had to describe the pictures of food. The researcher then showed them the images and allowed them to continue to look at the images while describing the food. Ten men in the study received images of high-caloric
food, and ten men received images of low-caloric food; the same occurred for the women in the study. When they had completed this, the researcher retrieved the images, and the participants assessed their own hunger for a second time. After completing the study, the researcher removed the consent form from each booklet to ensure confidentiality, and the results were assessed.

Results

A 2 X 2 between subjects ANOVA was conducted with the difference in hunger as the dependant variable and gender (male/female) and images of food (high-caloric/low-caloric) as the independent variables. The results indicated that there was no significant main effect for gender, $F(1,36) = 0.41, p > 0.05$, with males ($M = 0.70, SD = 0.92$) not reporting a significant change in hunger over females ($M = 0.55, SD = 0.69$). There was also no significant main effect for the different images of food, $F(1,36) = 2.24, p > 0.05$, with the high-caloric condition ($M = 0.80, SD = 0.89$) not being significantly different than the low-caloric condition ($M = 0.45, SD = 0.69$). There was a significant interaction effect between gender and the different images of food, $F(1,36) = 7.72, p < 0.05$, partial $\eta^2 = 0.18$. See Appendix C for an ANOVA summary table of the raw data and Figure 3 for a graph of the results.

Discussion

The purpose of this study was to compare the effects that images of food had on the hunger of men and women. The results showed that men and women do not differ in terms of their overall change in hunger, and the images of food do not significantly affect the hunger of people in general. However, men and women vary significantly in terms of the amount that the different conditions affect their hunger. Men are more influenced by
Figure 3: Differences in hunger for men and women in high-caloric and low-caloric image conditions
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images of high-caloric food, and women are more influenced by images of low-caloric food. These results mirror those obtained by Rappoport et al. (1993), showing that women find healthier foods more pleasurable. Because external stimuli such as visual cues are salient enough to affect a person's hunger (Penick et al., 1966), it is apparent that the images of low-caloric foods increased the hunger of the women in the study, as those foods were more palatable to them. The opposite can be said for the men, as the study by Rappoport et al. (1993) also pointed out that men do not understand the healthiness of foods as well as women, and they get more pleasure from unhealthy foods. Therefore, the images of high-caloric foods increased the hunger of the men more than the hunger of the women.

In addition to the variables that were tested in the study, the researcher was interested to see if the results were affected by individuals on food-restrictive diets. Only two women were found to be on these diets; one woman was in the high-caloric condition, and one was in the low-caloric condition. Neither of them reported any change in hunger. Perhaps this is because of the amount of discipline they have with regards to the allure of food since they can adhere to a diet; however it is impossible to tell for sure based on the negligible size of the obtained sample.

This study had many limitations, beginning with the quality of the sample. The sample size that was chosen was quite small, and only represented a fraction of the individuals at the university. The individuals that were chosen to participate in the study were university students of around the same age, creating a narrow sample that included many individuals who were not necessarily very health-conscious, and who could eat food without seeing negative consequences because of their youth. This could have
skewed the results of the study since the high-caloric foods more appealing for people of this age; therefore it is difficult to say whether these results could be applied to the general population. Many of the participants were approached by the researcher in the library and other common areas of the university while they were eating, studying, or socializing. Because of this, some participants may have been affected by the food around them instead of the images of food on the pictures, seeing as real food is probably more salient than images of food due to the combination of sight, smell, and proximity (Schachter, 1968). Participants may also have been influenced by their peers that were taking part in the study as well, and they may not have been truthful about their change in hunger due to the different images out of fear of embarrassment or judgement. The cultures, food preferences, and dietary restrictions of the individuals in the sample were not controlled, and some images of food may not have been appealing to these participants because of these reasons and not the food’s caloric content. It was also impossible to control for the weight of the participants, and this could affect the results if there were obese individuals involved in the study, seeing as a person who is obese may be more affected by external hunger cues (Schachter, 1968). In addition, there was no indication of which individuals had an eating disorder, which could have affected the results in unexpected ways.

It was difficult to assess whether the participants could guess the purpose of the study, and whether they changed their answers to try and adhere to the supposed hypothesis. Out of convenience, the researcher approached many of her friends to get them to participate in the study; thus, they may have been more extreme with their answers so that the researcher would obtain more significant results. Another issue that
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was not controlled was the time of day that the study was administered. The researcher approached individuals when they were in the common areas and cafeterias of the libraries, as well as the cafeteria of the University Community Centre; the times in which these places were the most populated were obviously around meal times. This may have had a great impact on the reported hunger of the participants, as they may have been more easily affected by images of food around the times that they were about to eat. As well, participants may have rushed to complete the study in order to return to the activities they were engaged in prior to being approached by the researcher. Participants that were in a rush to complete the study may have only spent a minimal amount of time concentrating on the pictures and may not have fully been affected by them.

The measurement of the study had obvious flaws, as the hunger scale and images of food were fabricated entirely by the researcher, who had very minimal previous knowledge of test construction regarding visual stimuli. The images chosen were selected solely based on the experiences of the researcher with regards to high and low-caloric foods, and these images did not include foods outside of North American culture. Although the researcher attempted to include foods that were well-liked by a majority of people, it is impossible to predict each participant’s food preferences. As well, because of convenience to the researcher, she did her best to place all of the images on one page; it is unknown whether the size of the images was adequate or not. The researcher also fabricated the five-point hunger scale, and it is unknown whether this was reliable or valid. As well, for individuals who chose the highest value on the scale on the initial test of hunger, there was no higher number to choose if their hunger did in fact increase after seeing the images. The only indication that the images were examined appropriately was
food into the film; in one condition a main character may go to a restaurant and order a burger and fries, and in the other the character orders a salad. Another study could be done to test the effectiveness of food advertisements in everyday life; perhaps by changing a billboard to different restaurants in an area and conducting a survey to see if people in that area have gone to that restaurant more than they usually do. The billboard could then be changed to a restaurant serving food that is entirely different than the previous advertisement, and researchers could survey people in that area again to see if merely the sight of food has affected their going to this restaurant as well. Another interesting study that could be done is one comparing dieters and non-dieters and the examining the different effects that visual food stimuli have on hunger. Other external stimuli could be tested as well, such as smell and proximity to food.

Because self-reports of hunger are not always reliable, researchers could obtain physiological evidence that hunger has affected participants. For example, stomach activity and saliva production could be measured when people are exposed to different images of food in different settings. Recently, there have been many technological advances in the realm of images and film, such as the incredible improvement of three-dimensional movies. If researchers could implement three-dimensional images of food in their studies, they can obtain a sense of realism without the confounding variable of smell impeding into the results. Virtual reality has also been improved tremendously, and it is possible to place participants in different scenarios and then introduce them to images of food. It would be interesting to see if different images are more salient when paired with different environments. For example, by using this technology to place participants in a simulated desert environment, different images of food can be introduced and their
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the written description of the food, and participants were not timed or asked to write more
than a few sentences. Some participants wrote one small sentence, and some even wrote
nothing at all; it was impossible to determine if this was enough time for the images to
have an effect on hunger, or if this was a reliable and valid method.

Clearly, there is room for improvement of this study. Obtaining a larger sample
size that includes people of a variety of age groups and cultural backgrounds may add a
generalizable element to the study. Additionally, obtaining an indication of whether the
individuals participating are a normal weight, underweight, or obese may add some more
insight into who is affected by visual food stimuli. Information about individuals with
eating disorders and whether or not participants are on diets may also contribute greatly
to analyzing results. The stimulus itself can also be changed to include an element of
realism; perhaps people are more affected by the sight of tangible food than by images.
The measurement of the study would have to be changed, seeing as a five-point scale
may be too small for participants to answer truthfully; by using a ten-point or hundred-
point scale, pinpointing one’s momentary hunger may be more exact. For some people,
being approached by someone for the purposes of completing a survey is annoying and
tedious; if individuals are subliminally affected by images of food without their initial
knowledge (e.g. with the use of media or advertisements), their responses may be more
genuine.

There are endless research opportunities for future studies in this area. People are
affected by advertisements every day by television and movies, the internet, magazines,
and billboards, to name a few. An interesting study could be to have students in a
classroom watch a movie about a topic unrelated to food, while subliminally introducing
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Salience can be assessed; a prediction could be that fruit would induce more hunger in the desert than salty potato chips.

Thirst can also be assessed with these methods. Researchers could show thirsty participants images of different drinks, comparing the amount of perceived satisfaction they think they will obtain from drinking them with the actual amount of thirst the drinks have quenched. It would also be interesting to see if people were more affected by hunger than by thirst, and if different images of drinks have the same saliency in affecting one’s thirst as images of food do in affecting one’s hunger. The possibilities for future studies in this field are endless, seeing as the hunger drive is affected by more than just the stomach and the brain, but also external stimuli (Schachter, 1968).
References


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Image References

Fruit - http://www.frontiernet.net/~sharpsburg/2064858589_d7b19bf6a9.jpg
Cake - http://www.bbcgoodfood.com/recipes/3092/images/3092_MEDIUM.jpg
Appendix A

First Hunger Scale and Diet Indication

Please indicate how hungry you are at this moment by circling the appropriate number on the scale below, with 1 being NOT HUNGRY AT ALL, and 5 being EXTREMELY HUNGRY:

<table>
<thead>
<tr>
<th>Not Hungry at All</th>
<th>Extremely Hungry</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

Are you on a food restrictive diet?

YES          NO
Appendix B

Food Description

Please describe, in as much detail as possible, one of the images you see on the page:

_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
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Appendix C

ANOVA Summary Table

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<th>p</th>
</tr>
</thead>
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<td>1</td>
<td>0.23</td>
<td>0.41</td>
<td>&gt; 0.05</td>
</tr>
<tr>
<td>Calories</td>
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<td>1</td>
<td>1.23</td>
<td>2.24</td>
<td>&gt; 0.05</td>
</tr>
<tr>
<td>Gender X Calories</td>
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<td>4.23</td>
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<tr>
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<td>36</td>
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