

Expressing Food through Art: Evidence for a Nutrient-Specific Effect on Mood

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Received March 8, 2013; revised April 9, 2013; accepted May 9, 2013

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ABSTRACT

Background: Brain imaging studies show evidence of selective brain reward responses to high calorie foods. Behavioral studies extend this research by showing that such foods can enhance emotions, even for sweet-tasting low calorie foods (*i.e.*, fruits). In the present study, we tested the hypothesis that participants will show more positive emotional change when drawing pictures of foods that are high fat or taste sweet compared to bitter-tasting foods—as a possible behavioral intervention for enhancing mood. **Method:** Participants were randomly assigned to one of four art groups: high fat-high sugar (HFHS; stimulus food: cupcakes), high fat-low sugar (HFSL; stimulus food: pizza), low fat-high sugar (LFHS; stimulus food: strawberries), or low fat-low sugar (LFSL; stimulus food: peppers). Participants used three colors (red, green, black) in their art, were required to use all three colors, and told that the colors they use must reflect actual colors that are natural for the food depicted. Participants drew images of a stimulus food and prepost measures of mood and arousal were recorded. **Results:** Consistent with the hypothesis, the results show that drawing pictures of high fat foods (cupcakes, pizzas) and a food that tastes sweet (strawberries) results in greater increases in mood compared to drawing a bitter-tasting food (peppers). Changes in mood were independent of BMI, daily sugar intake, daily fat intake, arousal, and hunger. **Conclusion:** These results extend a growing body of biobehavioral research on the positive impact of food images on mood by showing that this impact can be applied to enhance mood when expressing food images through art.

Keywords: Art; Sugar; Fat; Mood Enhancement; Arousal

1. Introduction

A growing body of research has investigated how people regulate emotion and negative mood [1-3] to achieve greater subjective well-being [4]. A variety of cognitive and behavioral strategies can be used to effortfully or unconsciously modify mood [3,5]. While there are strong individual differences in how people regulate mood [6,7], the need to feel good and to enhance mood is a universal goal [8]. Among clinical and nonclinical populations, evidence suggests that expressing emotion in art can significantly enhance mood [9,10], with many effects of enhanced mood attributed to the visual aesthetics of the images depicted [11]. Because the visual aesthetics of food can increase brain reward responses [12] food intake [13] and enhance emotion [14], it appears possible, but yet-to-be-tested, that expressions of foods in art can also serve to enhance mood.

Emotional regulation and eating behavior are indubitably related [15,16], with consumption of high fat and high sugar foods being associated with enhanced positive mood [17,18], although intake of these “comfort” foods is linked to the rising rates in obesity [19,20]. While studies have largely been focused on the links between emotion and eating, more recent studies have investigated how the visual aesthetics of foods (without intake of those foods) can enhance mood [21,22].

Brain imaging studies show clear evidence that reward-related areas in the human brain respond preferentially (*i.e.*, are more active) during the visual presentation of high calorie vs. low calorie foods [12,21-23]. Behavioral data show similar patterns of over-responsiveness to images of “forbidden” foods, such as chocolates and other appetizing foods [24,25]. Visual images of sweet-tasting foods can also enhance consumption [13,26], ratings of deliciousness of foods [27], and positive emotion, even for healthy foods that taste sweet, *i.e.*, fruits [14]. These findings suggest that without consuming food, men and

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women respond positively to the mere sight of many foods, which has implications for research on the effects of food on mood.

Of particular interest to the present study are the findings of Privitera, Antonelli and Creary (2013) who showed that viewing images of high fat and sweet-tasting foods enhanced emotion more so than viewing images of vegetables (low fat, low sugar foods). These findings, and those from neuroimaging studies, suggest that expressing/drawing visual images of high fat and sweet-tasting foods should have a positive effect on mood more so than expressions of bitter-tasting foods, such as vegetables. In the present study, we therefore tested for the first time the hypothesis that expressing visual images of high fat and sweet-tasting foods in art will enhance emotion more so than expressing images of a bitter-tasting low fat, low sugar food.

2. Method

2.1. Participants

A sample of 61 participants (22 men, 39 women) was recruited through university classroom visits and sign-up sheets. Participant sample characteristics were ($M \pm SD$) age (19.9 ± 1.1 years), weight (171.7 ± 19.9 pounds), height (67.8 ± 2.4 inches), and BMI (25.4 ± 2.9 kg/m²). In an initial screening phase, participants reported being in general good health with no physical or doctor diagnosed food allergies, medical conditions including pregnancy, or dietary restrictions. Only participants who did not eat within two hours of the study were included in data analyses because hunger states can influence responsiveness to food images [12,28].

2.2. Measures

Affect Grid. Participants reported changes in mood and arousal using the Affect Grid [29], which is a valid and reliable self-report, single-item scale that assesses two dimensions of affect states: mood (positive feelings vs. negative feelings) and arousal (excitement vs. sleepiness or calmness). The scale is completed at two times and the difference in ratings from Time 1 to Time 2 is recorded. Negative difference scores indicate a decrease in mood/arousal; positive difference scores indicate an increase in mood/arousal.

EDIS-S. The estimated daily intake scale for sugar (EDIS-S [30]) is a valid and reliable 11-item scale to estimate daily intake of sugar in one's diet. Participants indicate their level of agreement to each item from 1 (completely disagree) to 7 (completely agree). Higher scores indicate greater daily intake of sugar. Scores on this scale were included as a covariate in data analyses.

EDIS-F. The estimated daily intake scale for fat (EDIS-F [31]) is a valid and reliable 13-item scale to estimate daily intake of fat in one's diet. Participants indicate their level of agreement to each item from 1 (completely disagree) to 7 (completely agree). Higher scores indicate greater daily intake of fat. Scores on this scale were included as a covariate in data analyses.

2.3. Measures

Participants were observed in an art room setting in small groups of five to ten at a time. All participants signed an informed consent and completed demographic, EDIS surveys, and hunger rating scales prior to group assignment. Participants were randomly assigned to one of four art groups that varied based on the type of food stimulus participants were asked to draw: high fat-high sugar (HFHS, $n = 16$; stimulus food: cupcakes), high fat-low sugar (HFLS, $n = 14$; stimulus food: pizza), low fat-high sugar (LFHS, $n = 18$; stimulus food: strawberries), or low fat-low sugar (LFLS, $n = 13$; stimulus food: peppers). To begin, participants were given an established exercise to prime a neutral emotional state [14], by closing their eyes and imagining a place or situation that was neither positive nor negative. After 10 s participants opened their eyes and rated their current level of mood and arousal on the affect grid. This exercise was completed to keep pre-test mood and arousal scores about the same between groups. Participants were then given 5 min to draw a picture of the stimulus food for the group assigned. Because the color of images can influence emotional responsiveness [12,32], participants were given three colors to use (red, green, black) in their art, required to use all three colors in their drawings, and were told that the colors they use must reflect actual colors that are natural for the food depicted. All participants followed these instructions. After 5 min they were asked to place down their colored pencils and to again rate their mood and arousal on the affect grid. Once all measures were recorded, participants were debriefed, thanked for their time, and dismissed. A sample drawing of each stimulus food by group as depicted by a participant is given in **Figure 1**.

2.4. Statistical Analyses

A one-way between-subjects analysis of covariance was computed with groups (HFHS, HFLS, LFHS, LFLS) as the factor, and BMI and daily intake of sugar (EDIS-S) and fat (EDIS-F) as covariates. Mood and arousal difference scores were the dependent variables. If significant, 95% confidence intervals (CIs) were drawn to determine if mood and arousal ratings significantly changed pre-post in each group. All tests were conducted at a 0.05 level of significance.

3. Results

No significant differences between groups were evident for pretest scores of mood and arousal ($p > 0.50$ for each measure between groups); hence, initial ratings on these measures were statistically similar prior to the art session. After the art session, a significant main effect of mood was evident, $F(3,53) = 3.00$, $p = 0.04$, $R^2 = 0.15$. As shown in **Figure 2**, Groups HFHS, HFLS, and HSLF showed significantly greater increases in mood compared to Group LFLS (Tukey's HSD, $p < 0.05$). Within-group comparisons showed that mood significantly increased following the art session for the HFHS food (95% CI 1.14, 3.28), HFLS food (95% CI 1.10, 3.30), LFHS food (95% CI 0.72, 2.68), but not the LFLS food (95% CI -1.05, 1.28). Ratings of arousal ($p = 0.45$) and ratings of hunger ($p = 0.60$) did not significantly differ between groups with or without the inclusion of covariates in the analysis.

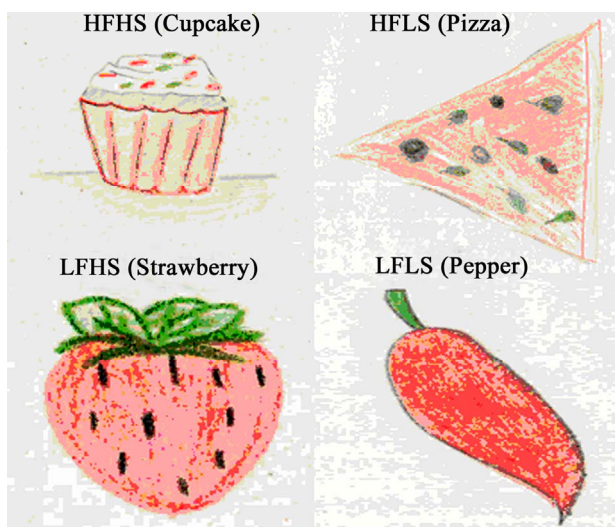


Figure 1. A sample participant drawing of each stimulus food for each group.

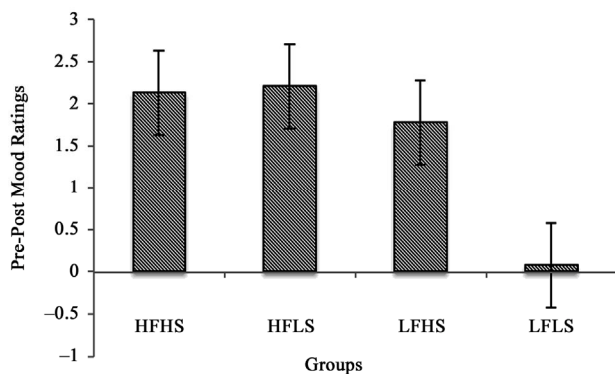


Figure 2. Mean difference by groups in mood ratings following the art session. Results show significantly positive changes in mood following the art session for all groups, except Group LFLS. Error bars indicate SEM.

4. General Discussion

The hypothesis that expressing visual images of high fat and sweet-tasting foods in an art session will enhance emotion more so than expressing images of a bitter-tasting low fat, low sugar food was tested. These results corroborate brain-imaging studies and extend behavioral findings by showing, consistent with the hypothesis, that drawing pictures of high fat foods (cupcakes, pizzas) and a food that tastes sweet (strawberries) results in greater increases in mood compared to drawing a bitter-tasting food (peppers). Peppers were chosen as a bitter-tasting food because even “sweet” peppers are often reported as tasting bitter [33] and also because it was one of the few bitter-tasting foods in which the three colored pencils chosen for this study could be used with colors inherent to the food itself.

Some alternative explanations can be eliminated because of experimental controls included in the research design. Changes in mood enhancement due to differences in the colors used are unlikely because the same three colors were used in each group. In addition, the colors that were chosen allowed participants to color each food image with colors that were inherent to the food depicted, meaning that the results are most likely due to the objective depiction of the food itself, and not the participant's abstract interpretation of the image. In addition, changes in arousal, which can be correlated with changes in mood [14], also did not differ between groups. Hence, the positive effects of creating artistic images of high fat and sweet-tasting foods was likely specific to the actual concrete depiction of these foods, which are known to stimulate a human brain reward response [12,21].

A particularly interesting outcome in the present study is the finding that the observed changes in mood were statistically independent of BMI, daily sugar intake, daily fat intake, and hunger. An implication of this outcome is that creating images of high fat and sweet-tasting foods to enhance mood should be an effective strategy to enhance mood for all types of people across the spectrum of BMI categories and dietary histories. The extent to which depicting high fat, high sugar, and sweet-tasting foods in an art session can result in long-term benefits in mood enhancement or the extent to which combining the present strategy with interventions to further enhance treatment of mood among clinical populations cannot be determined here, but should and can be tested in future studies.

5. Conclusion

The results presented here demonstrate that artistic expressions of high fat, high sugar, and sweet-tasting foods in an art session can be used as an effective short-term intervention to enhance mood, and these results further

extend a growing body of neurobiological and behavioral research showing a significant impact of the visibility of high fat, high sugar, and sweet-tasting foods on positive mood changes [12,14,21-24]. These findings further suggest that interventions used to enhance mood can focus on depicting images of high fat, high sugar, and sweet-tasting foods to produce the largest positive changes in mood when foods are used as the stimulus image.

6. Acknowledgements

This research was partly supported by an internal faculty research grant awarded to the first author.

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