

Visual Appeal of Stacked Plating in Savory Dishes

Mason Wong

Rensselaer Polytechnic Institute, Troy NY 12180, USA wongm8@rpi.edu

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1 Introduction

1.1 Abstract

Everyone is familiar with the saying, "You eat with your eyes first." This means how food looks can influence the perception of its taste. Previous research has studied the effect of plating on a diner's overall experience, finding that more visually appealing plates tend to have a better taste. [12] However, these studies did not consider using stacked plating. This study observes whether traditional balanced plating principles, which state that balanced plates are more aesthetically pleasing than unbalanced plates, hold while using stacked plating. In addition, this plans to lay the groundwork for future research that could apply this type of work.

1.2 Motivation

The psychology of plating is always something that's been interesting. There exist so many different cooking/baking shows, such as MasterChef, Hell's Kitchen, Chopped, and Great British Baking Show. In all of these shows, contestants, and especially judges, place a heavy emphasis on plating, and it's interesting how plating could have an effect on taste. If the visual aspect of food positively affects taste, there are huge implications, specifically in health. If a version of plating increases the diners' taste perception, this could lead to healthier lifestyles, as this could increase motivation to eat healthier foods, which generally taste worse. Similarly, unhealthy food can purposefully be plated differently, to reduce overeating of such foods. Another interesting way this could be applied is in the restaurant industry. A more attractive plating with a corresponding better taste could lead to more positive reviews, which would bring more business to the restaurant. There are so many other ways this can be applied, and it has yet to be seen exactly how this should be used.

1.3 Literature Review

While there has been no previous research specifically studying stacked plating, researchers previously have studied many similar ideas which can be applied

here. Balanced plating is generally preferred over unbalanced plating.[12] In addition, balanced plates are more positively associated than unbalanced plates, and the context in which food is plated (casual or high end) has no significant effect on preference.[6] Balanced and colorful plates are seen as more creative than unbalanced, monotone plates.[10] Plating aesthetics can influence a diner's overall thoughts about a dish, which is somewhat dependent on culture.[5]. Even rotating how items on a plate, or changing its distribution in the same areas can vastly affect diners' perceptions. [7, 9]

Many different elements are shown to affect the taste of a dish. A dish's overall visual aesthetics have impacts on its taste.[4] Attractive presentations have been found to taste better than unattractive presentations.[14] Even simply changing one element about the plate, such as its size, material, or color, can have change perceived taste.[11] For instance, the size of a plate can influence its perceived portion size, and the "rule" of plating an odd number of items for viewing pleasure isn't necessarily true.[13] Something as insignificant as the material of the utensil that food is eaten with can heavily impact its taste [8].

In addition, the link between sight and taste can be traced to the brain. All other senses of hearing, touch, sight, and smell are found to have varying impacts on taste. The color of food or drink specifically can cause the brain to associate a certain taste with it, which can impact the perceived taste once it hits the tongue.[2] In an experiment done on monkeys, it was found that hunger and sight are both controlled by the hypothalamus, and that this shared region can explain the link between sight and taste.[1]

2 Research Question

This research project aims determine how the position of food on a plate affect its visual appeal when using stacked plating in savory dishes. More specifically, this focuses on whether centered or offset plating is preferred. This project hopefully will encourage more research in this field, revolutionizing how food is plated.

3 Methods

This study was conducted first by gathering photos of the necessary dishes. Using these, an online survey was constructed to collect responses in a simple, easily accessible way. Once all survey responses were collected, the data was analyzed.

3.1 Pictures

2 different dishes, a chicken wing over white rice and sirloin steak slices over spinach and mashed potatoes, were prepared. Chicken wings were ordered from a

restaurant, while all other foods were cooked in house. Prepared ingredients were then divided into equal portions, to use for plating. For each dish, eight different plates were constructed using stacked plating, keeping portion size consistent while varying only in the position and orientation of the food. Half of the plates were centered, with variations in food orientation/rotation. The other half of the plates were corresponding offset versions of the centered dishes, with offsets upward, downward, rightward, and leftward. Dishes were presented on white porcelain plates for consistency, as well as being very common in presenting savory dishes, with a dark wooden background, as a contrast for the plates. Two Photos were taken of each plate with the camera of an iPhone 12 mini, and a cell phone clip was used to keep a consistent angle and distance for the pictures. Of 32 total photos, eight of the best photos were selected for use, keeping in mind to include the corresponding offset and centered plates, as well as including four pictures of the chicken dish and the other four pictures of the steak dish.

3.2 Survey

The survey was set up via google forms, since it's a platform many people are familiar with, as well as having simple UI. Before filling out each survey, participants were notified that they would be taking part in a research survey, aiming to study the effects of stacked plating on the visual aesthetics of a dish. Each survey consisted 4 questions, asking participants, "Which of these dishes looks more visually appealing?". Accompanying each question were 2 dishes identical in presentation, with the only difference being the position of the food (centered or offset). Each question was meant to compare centered stacked plating with a corresponding upward, downward, rightward, and leftward offset plating. The order of questions was randomized for each participant via Google Forms, to minimize position bias. Once the survey was complete, it was posted to various RPI Discord and Webex channels, as well as a personal Instagram account that had 107 followers.

3.3 Statistical Analysis

Once all survey results were collected, an online binomial test calculator was used to analyze the data, to see if the preferences differed from that of random chance. The amount of people who chose the centered plating style was put into the calculator for K, along with 85 for n (the amount of participants) and 0.5 for p (the mean to compare against). Resulting P-values were compared to 0.05, a standard value used in statistical analysis, to determine possible statistical significance.

4 Results

Centered plates (Mean = 71.5/85, Standard Deviation = 7.05) were highly preferred over offset plates (Mean = 13.5/85, Standard Deviation = 7.05), as

seen in Table 1. Each plate is shown with the amount of people who picked that plate, and the corresponding P-value of that distribution.

Table 1. Survey Results

Offset	Frequency	Centered	Frequency	P-Value
	22		63	.00001
	15		70	<.000001
	5		80	<.000001
	12		73	<.000001

5 Evaluation

As seen in the results, each P-value leads to the conclusion that participants' choice between the 2 plates was not by random chance. By varying only the

position of the food on the plate, this must have some effect on the visual appeal of the dishes. Specifically, savory dishes plated with stacked plating look significantly better centered on a plate, as opposed to offset.

When looking at the results, it's interesting note the large difference in preferences between the steak dishes. First off, the offset of the steak dishes were meant to be upward and rightward offset, but they ended up trending more towards upper left and upper right offset. Nonetheless, 63 people preferred the centered over the upper left one, while 80 preferred centered over upper right. It's possible that since a majority of people are right-handed, they prefer food that needs to be cut on the left side of the plate, which would give them more room for cutting the steak. Another idea to explain this could be that steak is seen as a more high-end food, especially relative to the chicken wing, thus people could be swayed into thinking that the upper left offset is more artsy and creative, leading them to choose that plate, while the upper right offset plate is a little simpler. Another potential factor here could be the grain of the steak versus the grain of the wooden background. Since the grain of the steak in the upper right offset is almost parallel with the grain of the wooden background, this makes the steak itself look less appealing. Meanwhile, with the offset upper left, the grain is almost perpendicular to the grain of the table, which can be seen as emphasizing the steak even more. Another factor that could be influencing this is the hanging spinach. Similar to the grain of the steak, the offset upper left is more perpendicular to the grain of the table, while the offset upper right is almost parallel to the grain of the table. Both of these factors might matter more in the offset plates because the food's a lot closer to the edge of the plate, meaning there's less distance in the photos between the food and the background, so it stands out more.

In analyzing the chicken dishes, there isn't a huge difference between the two in terms of preferences. If anything, the chicken wing more parallel to the grain of the table is preferred slightly more offset than the perpendicular one. Maybe the reason for this is that chicken wings are, to most people, a finger food, so its orientation on a plate is less relevant because it's a lot easier to eat with hands than utensils.

6 Limitations

There were several things that this study could've done a lot better. These fall generally into 3 main categories of pictures, participants, and research design, all of which is cause not to generalize these results.

6.1 Pictures

When taking pictures and preparing the food, more precautions should have been taken to reduce bias. Firstly, these 2 dishes are definitely not indicative of all possible dishes. It's possible that some dishes work better plated a certain

way. Another note is that perhaps the choice of the plate was incorrect. While a circular white plate is very common, both of the starches in the dishes (mashed potatoes and rice) were white, so the contrast between the plate and the food is pretty low. A possible fix for this is to maybe choose a light blue plate, as it would contrast with both the food and background. Perhaps having a different angle with which the photo is taken could affect the results. Better yet, having multiple pictures with varied angles and distances could help simulate an in-person dining setting. It also would've been nice to have had good camera equipment. While the iPhone used definitely wasn't bad, a camera meant for just taking photos would've been ideal as the image quality those can produce looks much better. Similarly, the particular cell phone clip used wasn't the easiest piece of equipment to use, so having a tripod would've been ideal.

6.2 Participants

The sample size of the study should have been much greater, to get an overall better representation of the population. While with the time given the sample size makes sense, the initial goal was 150 participants, almost double what ended up happening. Another factor that limits the conclusions drawn is that the survey demographic is somewhat unknown. While the survey was primarily sent out to various RPI Communities, this doesn't mean that's the only age group. People could've sent this to others that they know that aren't around the college level, and there would be no way of knowing, since no identifying information was collected from participants. It is assumed that at least 90% of participants were between the ages of 18 and 22, which is important because people of different ages may differ in their opinions of plating and visual aesthetics. Similarly, it's highly likely that this sample is not a great representation of all people on Earth. In addition to age, other factors that can influence results could be race, ethnicity, culture, geographic location, gender, and wealth/social status. With regards to race, ethnicity, culture, and geographic location, food varies in different areas of the world, meaning that food presentation will most definitely not be the same everywhere. Thus, this might affect how people view other plates, as they might be more biased towards a dish that reminds them of their favorite cultural dish or food. Maybe males, females, and others have vary in their opinions of food presentation. After all, males and females tend to have different color perception[3], so a similar difference might occur with their views on food presentation. For wealth status, more wealthy people may tend to rate offset food higher, as many high-end restaurants are moving more towards offset plating, while this may not matter as much to lower/middle class folks. All of these factors are reasons not to generalize this data due to the participants surveyed.

6.3 Design

There are also some flaws with how this research was designed. One flaw that was easily fixable was with the survey. Google forms has a setting where answers to questions can be randomized for each participant, which should've been turned

on, as this would've theoretically removed position bias. This was the reason that question order was randomized, but this setting would've completely eliminated this bias. In addition to this, Google Forms has another setting where it privately collects, but doesn't reveal, email addresses, to prevent the same person from answering the survey more than once. This is important because it's theoretically possible that very few people actually answered the survey, meaning these results are irrelevant. Some people also like to troll others, and it's a possibility that some responses are filled out without the genuine mindset required for this research, and there would be no way of knowing this. Another possible factor was that participants were told that this would be a research study. If people are told that something is for a study, their mindset could change, which could skew results. In a similar fashion, participants may have noticed a pattern while filling out the survey, and felt pressured to pick all centered or offset pictures. This could've skewed some of the data, and could have been remedied by including some "dummy questions", asking preferences between offset dishes, so that there is no trend and people are more genuine. Building off that, this entire process had flaws from the start. The survey was originally designed as the first part of this research, where the second part would've been an in-person tasting. Thus, the survey wasn't as detailed and thorough as it would've been had the research only been the survey first. With more focus on the survey, many biases could've been eliminated and the results would've been more general.

7 Discussion

While there are many flaws with this, it's pretty unlikely that if removed, that a different conclusion would be able to be drawn from the results. These results hopefully will cause future research, with focuses being both in and out of the culinary field.

7.1 Culinary Field

These findings open up a lot of interesting ideas for future work. These results may differ if presented in-person, or if participants get to choose the angle their photo is taken from. Stacked plating may have more effects on the overall dining experience(taste, perceived healthiness, portion size, satisfaction, willingness to eat) that people have barely scratched the surface on. Maybe certain plate colors, shapes, sizes, and/or materials look better with stacked plating. Possibly changing the order in which items are stacked can completely shift a diner's thoughts on a dish. Maybe food generally tastes better with stacked plating, or there are specific dishes which taste significantly different with stacked plating. Stacked plated dishes might seem more expensive or creative. This research has only focused on savory dishes, so maybe with sweet dishes there will be different results.

7.2 Non-Culinary Field

A lot of potential studies also open up from this. It would be interesting to see how plating differs among cultures or locations around the world, and if there are any health implications this could have. In the biology field, animals might choose to consume food that looks better just like humans, since animals and humans do share a lot of different brain structures. This could be applied to organization, where maybe stacking items on top of each other makes areas look nicer than other forms of organization. Since this is also a Computer Science course, it feels vital to point out how this research could apply. Maybe it's possible to create an AI that could find the best way to plate a dish. Or similarly, it could theoretically be possible to use machine learning and a neural network to obtain the best way to plate a dish.

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References

1. Burton, M., Rolls, E., Mora, F.: Effects of hunger on the responses of neurons in the lateral hypothalamus to the sight and taste of food. *Experimental neurology* **51**(3), 668–677 (1976)
2. Ferguson, P.P.: The senses of taste. *The American Historical Review* **116**(2), 371–384 (2011)
3. Fider, N.A., Komarova, N.L.: Differences in color categorization manifested by males and females: a quantitative world color survey study. *Palgrave Communications* **5**(1) (2019)
4. Kokaji, N., Nakatani, M.: With a hint of sudachi: food plating can facilitate the fondness of food. *Frontiers in psychology* **12**, 699218 (2021)
5. Liu, M., Ji, S., Jiang, B., Huang, J.: Plating for health: A cross-cultural study of the influence of aesthetics characteristics on food evaluation. *International Journal of Gastronomy and Food Science* **33**, 100785 (2023)
6. Michel, C., Velasco, C., Fraemohs, P., Spence, C.: Studying the impact of plating on ratings of the food served in a naturalistic dining context. *Appetite* **90**, 45–50 (2015)
7. Michel, C., Woods, A.T., Neuhäuser, M., Landgraf, A., Spence, C.: Rotating plates: Online study demonstrates the importance of orientation in the plating of food. *Food Quality and Preference* **44**, 194–202 (2015)
8. Piqueras-Fiszman, B., Laughlin, Z., Miodownik, M., Spence, C.: Tasting spoons: Assessing how the material of a spoon affects the taste of the food. *Food Quality and Preference* **24**(1), 24–29 (2012)
9. Poon, L.: Serving the Right Plate: Spatial Biases in Food Plating Aesthetics. Ph.D. thesis, University of Saskatchewan (2022)

10. Roque, J., Guastavino, C., Lafraire, J., Fernandez, P.: Plating influences diner perception of culinary creativity. *International Journal of Gastronomy and Food Science* **11**, 55–62 (2018)
11. Spence, C., Piqueras-Fiszman, B., Michel, C., Deroy, O.: Plating manifesto (ii): the art and science of plating. *Flavour* **3**, 1–12 (2014)
12. Velasco, C., Michel, C., Woods, A.T., Spence, C.: On the importance of balance to aesthetic plating. *International Journal of Gastronomy and Food Science* **5**, 10–16 (2016)
13. Woods, A.T., Michel, C., Spence, C.: Odd versus even: A scientific study of the ‘rules’ of plating. *PeerJ* **4**, e1526 (2016)
14. Zellner, D.A., Loss, C.R., Zearfoss, J., Remolina, S.: It tastes as good as it looks! the effect of food presentation on liking for the flavor of food. *Appetite* **77**, 31–35 (2014)