2022

Human Chefs Cook More Calories: The Impact of Human (vs. Robotic) Food Producer on Calorie Estimation

Wenyan Yin
Drexel University, wy82@drexel.edu

Yanliu Huang
Drexel University, yh364@drexel.edu

Cait Lamberton
University of Pennsylvania, catlam@wharton.upenn.edu

Human Chefs Cook More Calories: The Impact of Human (vs. Robotic) Food Producer on Calorie Estimation

Wenyan Yin
Drexel University

Yanliu Huang
Drexel University

Cait Lamberton
University of Pennsylvania

EXTENDED ABSTRACT

Robots have been replacing human labor and changing consumer behavior radically in recent years. In the food industry, robots have cooked meals and served as waiters in different countries (Ballard, 2020; Inagaki, 2017). Given the emerging trend of robot service and consumers' increased concern about healthy eating (e.g., Provencher&Jacob. 2016), it is important to explore how the use of AI in food production impacts consumers' healthiness perception. Although extensive literature has explored factors affecting people's preference for robotic or human labors (e.g., Granulo et al., 2021; Longoni et al., 2022), little is known about how the production mode shapes the way people evaluate food. We aim to assess how consumers estimate calories in food items produced by robots vs. humans, and how this healthiness perception subsequently impacts their food choice.

Robot-made products have the advantage of delivering uniform quality (Liebl & Roy, 2013), which should lead to identical products. By contrast, human producers might create more variations without affecting product quality (Huang et al., 2017). People also have lay beliefs that robots (vs. humans) lack experiential interactions with the world and thus do not understand what consumers expect from a product. Therefore, we propose that in the food context, when consumers have a goal of consuming an unhealthy food, human (vs. robots) producers will be perceived to be more capable of understanding this goal by making tastier unhealthy food containing higher calories. Similarly, when the goal is to consume healthy food, human (vs. robots) producers could understand this goal better and thus deliver healthier foods with lower calories.

We have conducted three studies so far. In **Study 1**, 372 Mturkers were randomly assigned to a 2 (production mode: robot vs. human) × 2 (food: healthy vs. unhealthy) between-subject design. We presented participants with a picture of either Fish & Chips or a steamed vegetable salad and described the dish as either made by a robot chef or a chef. Then, participants completed calorie

estimation measurement. As predicted, there was a significant interaction of the production mode and the food type on calorie estimation where for the steamed vegetable salad, the production mode had no impact on calorie estimation, whereas participants estimated the Fish & Chips cooked by a chef to have marginally more calories than that cooked by a robot chef. We speculate that the effect was insignificant for healthy food was because the word "steamed" implied "hot or warm" which subsequently induced high-calorie perception (Yamim et al., 2020).

Study 2 aimed to replicate the effect found in **study 1**. 389 Mturk participants were randomly assigned to a 2 (production mode: robot vs. human) × 2 (food: chocolate cake vs. vegetable soup) between-subjects design. The procedure was similar with that of Study 1. As in Study 1, there was a significant interaction of the food type and the production mode on calorie estimation where participants perceived the chocolate cake cooked by a human (vs. robot) pastry chef contained more calories whereas the vegetable soup cooked by a human (vs. robot) chef was seen as having fewer calories.

In **Study 3,** we directly manipulated consumer health goals. Participants (n=317) were shown a picture of either a chocolate cake or a vegetable soup. They were asked to indicate whether a target person with or without a weight-loss goal would have the chocolate cake or the vegetable soup cooked by a robot or a human. As predicted, a significant interaction emerged between health goals and the type of food where when the health goal is activated (vs. control), the vegetable soup made by human is slightly preferred while the chocolate cake made by a robot is preferred.

Table 1. Study Results Summary

Studies	Variables	Conditions	Means	F	p
Study 1. N=372	Calorie estimation	Healthy	M_{human} = 3.24 vs. M_{robot} = 3.47	F (1, 368)=1.82	.18
		Unhealthy	M_{human} = 4.56 vs. M_{robot} = 4.27	F (1, 368)=2.91	<.10
Study 2. N=389	Calorie estimation	Healthy	M_{human} = 3.45 vs. M_{robot} = 3.77	F(1,385) = 4.27	<.05
		Unhealthy	M_{human} = 5.49 vs. M_{robot} = 4.64	F(1,385) = 28.56	<.001
Study 3. N=317	Preference of production mode	Healthy	M_{health} = 2.41 vs. $M_{control}$ = 2.89	F(1,313) = 2.79	<.10
		Unhealthy	M_{health} = 3.11 vs. $M_{control}$ = 2.62	F(1,313) = 2.94	<.10

In summary, across 3 studies, we find that people perceive healthy food cooked by robot as having more calories than that cooked by human while the effect is reversed for unhealthy food. Consumers should be aware of the bias on calories caused by the production mode.

Managerially, our findings provide implications to public policy decision makers on how to encourage healthy eating as service robots are becoming more popular.

Keywords: *new technology; food consumption; calorie estimation*

REFERENCES

Ballard, S. (2020, May 28). Robotic chefs are set to transform restaurant kitchens around the world. GLOBETRENDER. https://globetrender.com/2020/05/28/robotic-chefs-restaurants/

Inagaki, K. (2017, February 1). Japan's robot chefs aim to show how far automation can go. Financial
Times. https://www.ft.com/content/9b72c5a6-d680-11e6-944b-e7eb37a6aa8e

Granulo, A., Fuchs, C., & Puntoni, S. (2021). Preference for Human (vs. Robotic) Labor is Stronger in Symbolic Consumption Contexts. *Journal of Consumer Psychology*, *31*(1), 72–80. https://doi.org/10.1002/jcpy.1181

Huang, J. Y., Ackerman, J. M., & Newman, G. E. (2017). Catching (up with) magical contagion: A review of contagion effects in consumer contexts. *Journal of the Association for Consumer Research*, 2(4), 430–43.

Longoni, C., & Cian, L. (2022). Artificial Intelligence in Utilitarian vs. Hedonic Contexts: The "Word-of-Machine" Effect. *Journal of Marketing*, *86*(1), 91–108. https://doi.org/10.1177/0022242920957347

Liebl, M., & Roy, T. (2003). Handmade in India: Preliminary analysis of crafts producers and crafts production. *Economic and Political Weekly*, 5366–76.

Provencher, V., & Jacob, R. (2016). Impact of Perceived Healthiness of Food on Food Choices and Intake. *Current Obesity Reports*, *5*(1), 65–71. https://doi.org/10.1007/s13679-016-0192-0

Yamim, A. P., Mai, R., & Werle, C. O. C. (2020). Make It Hot? How Food Temperature (Mis)Guides Product Judgments. *Journal of Consumer Research*, *47*(4), 523–543. https://doi.org/10.1093/jcr/ucaa017

ABOUT THE AUTHORS

Wenyan Yin is a Ph.D. candidate in marketing at Drexel University. Her research focuses on new technology, consumer well-being and WOM.

Yanliu Huang is an Associate Professor of Marketing at Drexel University. Her expertise is in consumer in-store decision making, consumer planning, consumer welfare and new technology in marketing.

Cait Lamberton is Alberto I. Duran Presidential Distinguished Professor of Marketing at the University of Pennsylvania. Her research interests include consumption behavior, marketing practice and marketplace dignity.