

Supplementary Materials

Thinking of Food: The Mental Representation of Healthy Foods as Unprepared

Table S1

Healthiness Ratings of Healthier and Less Healthy Versions of Food Stimuli in Study 1A

Healthier Version		Less Healthy Version		Difference (95% CI)	<i>t</i>	<i>p</i>
Item	Mean (SD)	Item	Mean (SD)			
salmon	5.10 (0.87)	steak	4.01 (1.20)	1.10 (0.85, 1.34)	$t(146) = 8.69$	<.001
veggie burger	4.78 (0.86)	burger	3.62 (1.42)	1.16 (0.91, 1.42)	$t(145) = 8.90$	<.001
cauliflower pizza	4.45 (0.96)	pizza	3.38 (1.50)	1.07 (0.83, 1.31)	$t(146) = 8.78$	<.001
lentils	4.93 (0.96)	grits	4.21 (1.08)	0.73 (0.51, 0.95)	$t(145) = 6.54$	<.001
brown rice	4.95 (0.85)	rice	4.39 (1.07)	0.56 (0.37, 0.74)	$t(146) = 5.92$	<.001
whole wheat pasta	4.63 (0.88)	pasta	3.98 (1.13)	0.65 (0.44, 0.86)	$t(145) = 6.20$	<.001
spinach salad	5.27 (0.84)	Caesar salad	4.74 (1.05)	0.53 (0.34, 0.72)	$t(146) = 5.57$	<.001
oatmeal	4.94 (0.97)	cookie cereal	3.58 (1.78)	1.36 (1.01, 1.70)	$t(145) = 7.82$	<.001
chicken breast	4.71 (1.05)	chicken wings	3.89 (1.39)	0.82 (0.55, 1.08)	$t(146) = 6.09$	<.001

Table S2*Mental Representations of Food Stimuli in Study 1A*

Healthier Version		Less Healthy Version		<i>b</i> (95% CI)	OR (95% CI)	<i>z</i>	<i>p</i>
Item	% choosing more prepared version	Item	% choosing more prepared version				
salmon	72.8%	steak	79.6%	-0.38 (-1.02, 0.25)	0.69 (0.36, 1.28)	-1.17	.242
veggie burger	77.6%	burger	96.4%	-2.04 (-3.29, -1.04)	0.13 (0.04, 0.35)	-3.64	<.001
cauliflower pizza	72.1%	pizza	91.4%	-1.42 (-2.27, -0.66)	0.24 (0.10, 0.52)	-3.48	<.001
lentils	53.6%	grits	77.4%	-1.08 (-1.68, -0.50)	0.34 (0.19, 0.60)	-3.60	<.001
brown rice	58.2%	rice	58.9%	-0.03 (-0.57, 0.51)	0.97 (0.57, 1.67)	-0.10	.917
whole wheat pasta	51.2%	pasta	72.0%	-0.87 (-1.44, -0.31)	0.42 (0.24, 0.73)	-3.02	.002
spinach salad	66.4%	Caesar salad	84.0%	-0.98 (-1.66, -0.33)	0.38 (0.19, 0.72)	-2.91	.004
oatmeal	69.2%	cookie cereal	70.0%	-0.04 (-0.62, 0.54)	0.96 (0.54, 1.72)	-0.12	.902
chicken breast	61.3%	chicken wing	90.6%	-1.80 (-2.61, -1.08)	0.16 (0.07, 0.34)	-4.68	<.001

Note. Model estimates and statistics are from a binary logistic regression predicting whether participants thought of the more or less prepared version of food as a function of condition (less healthy version = 0, healthier version = 1).

Table S3*Preparation Ratings of Basic and Descriptive Versions of Menu Item Stimuli in Study 5*

Item	Basic Mean Preparation Rating (SD)	Descriptive Mean Preparation Rating (SD)	Difference (95% CI)	<i>t</i>	<i>p</i>
chicken wing	4.06 (0.68)	4.22 (0.64)	0.16 (-0.13, 0.45)	<i>t</i> (80.0) = 1.10	.276
pasta	4.11 (0.72)	4.29 (0.62)	0.18 (-0.11, 0.48)	<i>t</i> (79.2) = 1.26	.212
burger	4.09 (0.74)	4.23 (0.73)	0.14 (-0.19, 0.46)	<i>t</i> (79.9) = 0.85	.400
pizza	4.22 (0.64)	4.17 (0.68)	-0.05 (-0.34, 0.24)	<i>t</i> (79.0) = 0.35	.726
artichoke	3.45 (0.94)	4.03 (0.70)	0.58 (0.21, 0.94)	<i>t</i> (75.8) = 3.13	.003
mushroom	3.52 (1.04)	4.28 (0.64)	0.76 (0.38, 1.14)	<i>t</i> (66.7) = 3.98	<.001
Brussels sprout	3.49 (0.86)	4.01 (0.79)	0.52 (0.15, 0.88)	<i>t</i> (79.9) = 2.82	.006
salad	3.83 (0.68)	4.34 (0.66)	0.51 (0.22, 0.81)	<i>t</i> (80.0) = 3.49	<.001

Note. Mean preparation ratings calculated as the mean rating across 4 preparation questions for each food: how likely *n* = 82 MTurk participants thought it was that each dish (a) has sauces or condiments added, (b) has herbs and spices added, (c) mixed different ingredients together, and (d) is cooked, roasted, grilled, or fried (1 = not at all likely, 5 = very likely). Expected preparation level was then calculated as the mean score of these four different preparation methods, except for the salad item which removed the question about being cooked.

Study 1S: Moderation of the healthy-is-unprepared effect

Similar to Study 3, this study (preregistered at https://aspredicted.org/R62_L2J) tested for moderation of the effect, although this time with the food items from Study 1B. We tested for moderation by perceived overlap between taste and health, and by health consciousness. We also measured several other potential moderators of the effect. The belief that healthy foods and tasty foods are overlapping categories is likely aided by experience. Having more exposure to prepared healthy foods teaches one that healthy foods can be flavorful. Learning the pairings of specific healthy foods with specific sauces, condiments, or preparation methods teaches one to think of healthy foods through a more culinary and pleasure-oriented lens instead of a strictly nutrition-oriented lens. This exposure may be due to personal exploration, such as foodies or restaurant-goers who seek new experiences, moral reasons (vegans and vegetarians) or habit (e.g., adhering to Mediterranean diet that is rich in vegetables). Accordingly, we predict that our effect will be attenuated for people in those groups.

Method

Participants. We opened the survey to 134 MTurk participants in exchange for \$0.35. We powered this sample using the following procedure. Twenty-six participants would be required to have 80% power to detect an effect half the size of the large effect size observed in Study 1B. Accounting for expected participant attrition, we recruited 134 participants. Our final sample of participants that passed all attention checks was 115 (43.4% female, 56.6% male; $M_{\text{age}} = 38$, $SD = 11$).

Procedure. Participants completed the same procedure as in Study 1B. In response to the question, “When you think of [food name], which picture looks more like the first thing that comes to mind?”, participants chose between a more prepared and a less prepared version of the same food for 12 healthy foods and 12 unhealthy foods. At the end of the survey, participants responded to the moderator measures, which were standardized for analyses.

Our main moderators, healthiness-tastiness overlap and health consciousness, were measured as in Study 1B. For the experience-based moderators, participants indicated (a) whether they consider themselves to be a “foodie” (a person with a strong interest in the latest food trends, fads, flavors, and restaurants? 1 = not at all, 5 = very much so), (b) whether they are vegan or vegetarian (0 = no, 1 = vegan or vegetarian), and (c) whether they habitually consume vegetables in more prepared forms. This was assessed in response to

the question, "When you do eat vegetables, how likely are you to: (a) add sauces or dip them (e.g., ranch, BBQ, melted cheese), (b) add spices, herbs, or garlic, (c) bake/roast them in the oven, (d) pan fry, deep fry, or air fry, and (e) mix them with other foods?" (1 = not at all and 5 = very likely, scores were averaged).

Results and Discussion

We used a generalized linear mixed effects regression model that predicted food choice (0 = less prepared version, 1 = more prepared version) as a function of food healthiness (0 = unhealthy, 1 = healthy) \times moderator variable, with random-intercept effects of participant and of food item (e.g., carrot, hot dog). First, results showed a replication of the healthy-is-less-prepared main effect from Study 1B, with a similar large effect size. Participants thought of healthy foods in their less prepared forms and unhealthy foods in their more prepared forms (OR = 0.12, 95% CI: [0.07, 0.21], $p < .001$), translating to 8.3 times higher odds of saying that they think of the more prepared version for unhealthy foods than for healthy foods. Regarding our moderator measures, means and standard deviations were as follows: healthiness-tastiness overlap ($M = 4.40$, $SD = 1.42$), health consciousness ($M = 4.09$, $SD = 0.81$), foodie ($M = 3.20$, $SD = 1.31$), and eat prepared vegetables ($M = 3.53$, $SD = 0.82$). Twenty-six participants (22.6%) indicated that they were vegan or vegetarian.

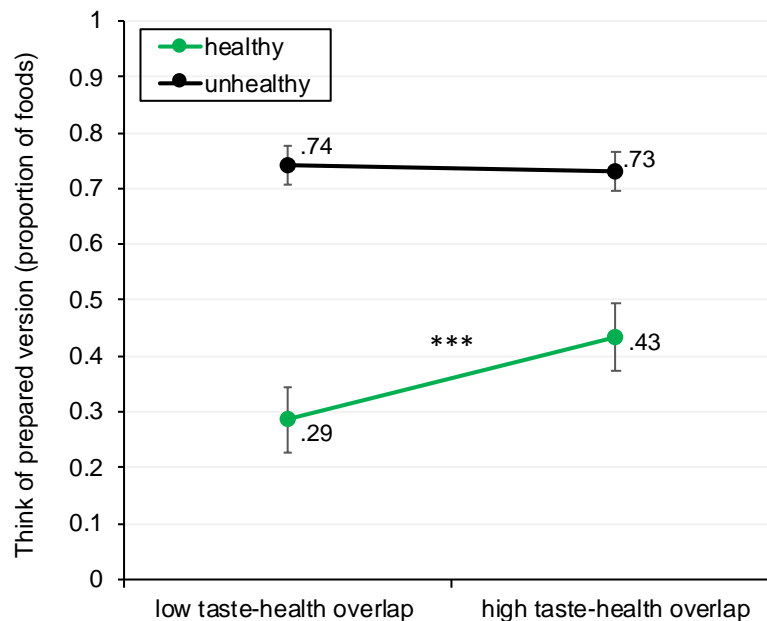
Supporting our main moderator hypothesis, healthiness-tastiness overlap (standardized) significantly interacted with food healthiness ($b = 0.46$, 95% CI: [0.27, 0.66], $p < .001$; Figure 1S). Simple effects tests showed that the interaction was fully driven by how participants think about healthy foods (with no effect for unhealthy foods). For healthy foods, the simple effect of healthiness-tastiness overlap ($b = 0.42$, 95% CI: [0.17, 0.68], $p < .001$) indicated that those with higher overlap (less goal conflict) thought of healthy foods in more prepared forms. Those low in healthiness-tastiness overlap (-1 SD) thought of approximately 29% of healthy foods in the more prepared form and those high in healthiness-tastiness (+1 SD) overlap thought of approximately 43% of healthy foods in the more prepared version. There was no simple effect of healthiness-tastiness overlap for unhealthy foods ($b = -.04$, 95% CI: [-0.30, 0.22], $p = .745$), indicating that participants think of unhealthy foods as mostly in their prepared forms regardless of taste-health goal conflict.

Health consciousness (standardized) also significantly moderated the effect of food healthiness on thinking of foods as less prepared ($b_{\text{interaction}} = 0.41$, 95% CI: [0.21, 0.62], $p < .001$). The moderation was

again driven by how people think about healthy foods only. For healthy foods, the simple effect of health consciousness ($b = 0.36$, 95% CI:[0.10, 0.62], $p = .007$) indicated that those higher in health consciousness thought of healthy foods in more prepared forms, whereas there was no simple effect of health consciousness for unhealthy foods ($b = -0.05$, 95% CI:[-0.31, 0.20], $p = .688$).

Also supporting our hypothesis, our three experiential measures of being a foodie, being a vegan or vegetarian, and eating prepared vegetables each significantly moderated the effect of food healthiness on thinking of foods as less prepared (all $b_{interaction} > 0.72$, all $p_{interaction} < .001$). As hypothesized, all of these interactions were driven by the simple effect for healthy foods (all $b > 0.92$, all $p < .001$). Foodies, vegans and vegetarians, and those that more frequently eat vegetables in more prepared forms thought of healthy foods as more prepared compared with non-foodies, individuals that consume meat and animal products, and those that less frequently eat vegetables in prepared forms, respectively.

Figure 1S. Taste-health overlap moderates the effect in Study 1S.



NOTE.—Plot depicts the proportion of healthy foods (green line) and unhealthy foods (black line) that participants thought of in their more prepared form, split by low versus high taste-health overlap (-1 SD, +1 SD).

Overall, we find that those who perceive less healthiness-tastiness conflict, who are higher in health consciousness, and who likely have more exposure to healthy foods in more prepared forms have a smaller gap in thinking of unhealthy foods in more prepared forms and healthy foods in less prepared forms. This moderation was due to these groups showing a weaker tendency to think of healthy foods as unprepared, with little difference in how commonly they think of unhealthy foods as prepared (high for all groups).

Stimuli in Study 1B

Brussels sprouts



Chickpeas (garbanzo beans)



Mushrooms



Corn



Zucchini



Salmon



Tofu



Eggplant



Beans



Carrots



Broccoli



Bell Peppers



Cake



Hot dog



Burger



Donut



Milkshake



BBQ ribs



Breadsticks



Cookie



Pasta



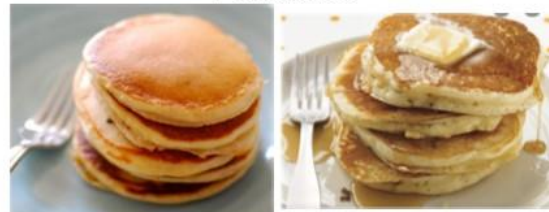
Nachos



Chicken wings



Pancakes



NOTE.— First page depicts the 12 healthy foods and second page depicts the 12 unhealthy foods in Study 1B (less prepared form on the left, more prepared form on the right).

Stimuli in Study 1C

Cabbage



Cucumber



Chickpeas (chana)



Corn



Eggplant (baingan)



Dal



Kidney beans



Okra (bhindi)



Cauliflower (gobi)



Capsicum



Cake



Gulab jamun



Samosas



Pakora



Vada



Naan



Jalebi



Papri (papdi)



Paneer



Kulfi



NOTE.— First page depicts the 10 healthy foods and second page depicts the 10 unhealthy foods in Study 1C (less prepared form on the left, more prepared form on the right).

