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Halo It's Meat! the Effect of the Vegetarian Label on Calorie Perception and Food Choices

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ABSTRACT

In the last few years, vegetarian products have become a widespread dietary option in food industry to the point that large retail chains such as McDonald's has offered a vegetarian burger to their customers (e.g., the Grand Veggie). In the present research, two studies investigated the influence of a vegetarian label on calorie perception, frequency consumption and food choices. In the first study (N = 211) participants were randomly assigned to an experimental design 2 (burger type: Grand Veggie vs Big Mac). In the second study (N = 915), participants were either exposed to a similar burger labeled vegetarian or a meat-based. Both studies show that vegetarian products are perceived as being less caloric than their non-vegetarian equivalents. However, participants do not report more intention to eat more vegetarian products and do not lead to differences in menu composition.

KEYWORDS

Health halo effect; calorie perception; food choices; vegetarian food

On October 10th, 2017, the fast food brand McDonald's launched a new vegetarien burger in france (the Grand Veggie). The company hopes to attract the new vegetarian and flexitarian[1] market rising in France (34% in 2016 compared to 25% in 2015; Kantar Worldpanel 2016). This rapid spread of the vegetarian diet is probably due to media coverage flaunting its health benefits, as red and processed meats have been classified as potential carcinogens to humans (World Health Organization, 2018).

However, it is known that foods are classified dichotomously and are considered either healthy or unhealthy (Chernev 2011; Oakes and Slotterback 2005; Raghunathan, Naylor, and Hoyer 2006; Rozin, Ashmore, and Markwith 1996) and that many studies have shown that food labels influence this classification (Chernev and Chandon 2010) through the health halo effect. Derived from the halo effect (Thorndike 1920), the health halo effect occurs when individuals infer from a positive health attribute others attributes. For example, sweets labeled as "low-fat" are considered to be less caloric than their unlabeled counterparts (Wansink and Chandon 2006). Similarly, products labeled "gluten-free" are

perceived as healthier, containing fewer calories and being less processed (Prada, Godinho, Rodrigues, Lopes, Garrido, in press). This effect has also been found on labels that do not focus on nutritional aspects, particularly on Fair Trade (Schuldt, Muller & Schwartz, 2012) or organic products (Ellison et al. 2016; Lee, Shimizu, Kniffin, & Wansink, 2013; Schuldt & Schwartz, 2010). It can therefore be assumed that the vegetarian label induces the same type of effect.

These labels – through the health halo effect – may be one contributor of overweight. The number of obese people in the world almost tripled between 1975 and 2016, from 9% in 2000 to 13% in 2016 (WHO, 2018). It is known that this raise is due both to an increase in the number of calories ingested (Cutler, Glaeser, and Shapiro 2003) and to a decrease in physical activity (WHO, 2018). Labels omnipresent in food choices might therefore lead to misjudgments leading to an overconsumption of food. For example, cookies (i.e., oreos) tend to be consumed more if they were labeled organic than if they were not (Schuldt and Schwarz 2010).

It has also been shown that the people most sensitive to this halo effect are those who have the most positive attitudes toward the label. Thus, the effect is more pronounced for participants with explicit attitudes or pro-environmental behaviors (e.g., Schuldt and Schwarz 2010; Sörqvist et al., 2015). This leads us to believe that people with favorable attitudes and behaviors toward vegetarian food (i.e., flexitarians; vegetarians; vegans) will be more sensitive to the health halo effect.

As labels, brands influence food categorization (Chernev and Chandon 2010). Sandwiches from a brand with a healthier brand image (i.e., Subway) were rated as having 35% fewer calories than those from the brand with an unhealthy brand image (i.e., McDonald's). On the other hand, participants chose drinks, side dishes and desserts with almost one and a half more calories when their main dish came from the brand considered healthy than when it was not (Chandon and Wansink 2007). Hence, studying food distributors in addition to fast food chains are a real health interest to the extent that they offer a diet that is usually rich in energy (Prentice and Jebb 2003).

We therefore hypothesized that the vegetarian label would negatively influence the caloric perception of foods. Thus, the Grand Veggie will be perceived as being less caloric than the Big Mac (i.e., a classic meat burger). Similarly, Grand Veggie will be perceived as being able to be consumed more frequently than Big Mac. Participants in the Grand Veggie condition will be more likely to say they want to accompany it with a soda and a ration of french fries than those in the Big Mac condition. Finally, we believe that the halo effect will be stronger among flexitarian, vegetarian and vegan participants.

Study 1: assessment of mcdonald's veggie burger

Method

Participants and design

Two hundred and eleven participants were recruited online (79.15% women, 20.37% men, M_{Age} = 26.3, SD_{Age} = 11.1) and randomly assigned to one group (burger type: Grand Veggie vs Big Mac).

Participants were asked to rate the caloric content and its recommended frequency of consumption compared to other McDonald's burgers. Then, they evaluated the probability that they would take the burger in a menu with soda and fries. Finally, they answered socio-demographic and diet-related questions.

Estimating the number of calories in burgers

Participants were shown a screen with the burger picture (i.e., Grand Veggie vs. Big Mac) and the list of ingredients used to make it. We made sure that the participants had read the information mentioned above by asking them « *Did you read the information above correctly?* ». On the next page, participants assessed the number of calories in the burger compared to another (*Compared to other burgers available at McDonald's, do you think Grand Veggie [Big Mac] contains more or less calories?*) Participants responded on a 7-points Likert scale (*1 = Fewer calories; 7 = More calories*).

Evaluation of the recommended frequency of consumption

Participants assessed the recommended frequency of consumption (*Do you think you can eat Grand Veggie [Big Mac] more or less often than other burgers available at McDonald's*) on a 7-points Likert scale (*1 = Less often; 7 = More often*).

Evaluation of the intention to order a menu

Finally, participants evaluated their intention to order this burger in a menu (*If you decided to order a Grand Veggie[Big Mac]), how much do you think you would accompany it with a menu including a soda and a serving of fries?*). They responded on a 7-points Likert scale (*1 = No intention; 7 = Strong intention*).

Demographic and dietary questions

Participants indicated their gender, age and socio-professional category. They specified their knowledge of McDonald's and for those who answered yes, also their frequency of use of the brand (i.e., *I never go there, Less than once a year, Once a year, Once every six months, Once a quarter, Once a month, Once a week, Several times a week*). They then indicated if they had ever consumed the Grand Veggie and the Big Mac. Finally, they specified their diet (i.e., *Omnivorous; Flexitarian; Vegetarian; Vegan*). All participants except

those who declared themselves omnivorous were then asked to rank from most important to least important the reasons why they had adopted such a diet (i.e., *Health; Ecology; Animal Welfare; Humans (famine & work)*)[2].

Statistical analyzes

We started by creating a hierarchical multiple linear regression model. First, we included the experimental condition and all control variables (i.e., gender, age, frequency of visits to McDonald's, previous consumption of a Grand Veggie, previous consumption of a Big Mac, and diet plan) to evaluate the effect of the vegetarian label on calorie assessment (Model 1a). Then, we added the interaction of the experimental condition and the diet plan inside the model (Model 1b). The same procedure was repeated for the other two dependent variables (i.e., recommended consumption frequency, intention to take a menu, respectively named Model 2a, 2b, 3a and 3b). All analyses were performed on Jamovi 0.9.5.16.

Results

Effect on caloric estimation

Model 1a (see Table 1): A first linear regression model including experimental condition (−1 = Grand Veggie; 1 = Big Mac), gender (−1 = woman; 1 = man), age, frequency of visits to McDonald's (1 = I never go there; 2 = less than once a year; 3 = once a year; 4 = once every six months; 5 = once every quarter; 6 = once a month; 7 = once a week; 8 = several times a week), Grand Veggie consumption (−1 = no; 1 = yes), Big Mac consumption (−1 = no; 1 = yes) and the diet plan (1 = vegan; 2 = vegetarian; 3 = flexitarian; 4 = omnivorous) was carried out with the caloric estimation score as a dependent variable (general model: $F(7,203) = 2.46$, $p = .019$, $R^{2adj} = 0.05$). The analysis revealed a significant main effect of the experimental condition, $b = 0.19$, $p = .007$ and gender, $b = -0.14$, $p = .049$. It

Table 1. Study 1 – Model 1a.

Model Coefficients							
						95% Confidence Interval	
Predictor	Estimate	SE	t	p	Stand. Estimate	Lower	Upper
Intercept	4.31812	0.54570	7.913	< .001			
Experimental condition	0.24607	0.09000	2.734	0.007	0.1872	0.05219	0.3221
Gender	−0.22107	0.11145	−1.984	0.049	−0.1367	−0.27268	−8.17e−4
Age	−0.00836	0.00814	−1.027	0.306	−0.0702	−0.20504	0.0646
Frequency of visits to McDonald's	0.10439	0.06276	1.663	0.098	0.1311	−0.02431	0.2865
Grand Veggie Consomption	0.06220	0.14435	0.431	0.667	0.0311	−0.11131	0.1736
Big Mac Consomption	0.19043	0.10359	1.838	0.067	0.1315	−0.00954	0.2724
Diet Plan	−0.10937	0.15700	−0.697	0.487	−0.0556	−0.21309	0.1018

Table 2. Study 1 – Model 1b.

Model Coefficients							
						95% Confidence Interval	
Predictor	Estimate	SE	t	p	Stand. Estimate	Lower	Upper
Intercept	4.41372	0.55838	7.904	< .001			
Experimental condition	−0.18872	0.53659	−0.352	0.725	−0.1435	−0.9483	0.53774
Gender	−0.22185	0.11154	−1.989	0.048	−0.1372	−0.2733	−0.01603
Age	−0.00821	0.00815	−1.006	0.315	−0.0689	−0.2039	0.00989
Frequency of visits to McDonald's	0.09819	0.06326	1.552	0.122	0.1233	−0.0333	0.11157
Grand Veggie Consomption	0.04612	0.14578	0.316	0.752	0.0231	−0.1208	0.23025
Big Mac Consomption	0.17460	0.10545	1.656	0.099	0.1205	−0.0230	0.19457
Diet Plan	−0.12856	0.15885	−0.809	0.419	−0.0654	−0.2247	0.14045
*Experimental condition*Diet Plan*	0.11661	0.14188	0.822	0.412	0.0887	−0.1241	0.24518

revealed a main trend effect of the frequency of visits to McDonald's, b = 0.13, p = .098 and Big Mac consumption, b = 0.13, p = .067. Finally, no effects were found for age, b = −0.07, p = .306; Grand Veggie consumption, b = 0.03, p = .667 and for diet plan, b = −0.06, p = .487.

Model 1b (see Table 2): we entered the interaction between diet plan and label condition (general model $F(8,202) = 2.23$, p = .026, R^2_{adj} = 0.08). The analysis revealed a significant effect of gender, b = −0.14, p = .048 and a tendential effect of Big Mac consumption, b = 0.12, p = .099. However, we found no effect of the label condition, b = −0.14, p = .725; diet plan, b = −0.07, p = .419; age, b = −0.07, p = .315; frequency of visits to McDonald's, b = 0.12, p = .122; Grand Veggie consumption, b = 0.02, p = .752 and no interaction effect between the experimental condition and diet plan, b = 0.09, p = .412.

Effect on the possible frequency of consumption

Model 2a (see Table 3): A first linear regression model including experimental condition (−1 = Grand Veggie; 1 = Big Mac), gender (−1 = woman;

Table 3. Study 1 – Model 2a.

Model Coefficients							
						95% Confidence Interval	
Predictor	Estimate	SE	t	p	Stand. Estimate	Lower	Upper
Intercept	4.17467	0.7045	5.9261	< .001			
Experimental condition	0.03770	0.1162	0.3245	0.746	0.02264	−0.1150	0.1602
Gender	−0.23089	0.1439	−1.6048	0.110	−0.11279	−0.2514	0.0258
Age	7.06e-4	0.0105	0.0672	0.947	0.00468	−0.1328	0.1421
Frequency of visits to McDonald's	0.00784	0.0810	0.0968	0.923	0.00778	−0.1507	0.1662
Grand Veggie Consomption	0.19583	0.1863	1.0509	0.295	0.07740	−0.0678	0.2226
Big Mac Consomption	0.28239	0.1337	2.1117	0.036	0.15393	0.0102	0.2977
Diet Plan	−0.24481	0.2027	−1.2079	0.228	−0.09834	−0.2589	0.0622

Table 4. Study 1 – Model 2b.

Model Coefficients							
						95% Confidence Interval	
Predictor	Estimate	SE	t	p	Stand. Estimate	Lower	Upper
Intercept	4.74609	0.6958	6.821	< .001			
Experimental condition	−2.56113	0.6686	−3.831	< .001	−1.5384	−2.3303	−0.6071
Gender	−0.23555	0.1390	−1.695	0.092	−0.1151	−0.2489	0.2552
Age	0.00166	0.0102	0.163	0.870	0.0110	−0.1218	0.0215
Frequency of visits to McDonald's	−0.02923	0.0788	−0.371	0.711	−0.0290	−0.1832	0.0499
Grand Veggie Consomption	0.09970	0.1816	0.549	0.584	0.0394	−0.1022	0.2496
Big Mac Consomption	0.18772	0.1314	1.429	0.155	0.1023	−0.0389	0.1795
Diet Plan	−0.35954	0.1979	−1.816	0.071	−0.1444	−0.3012	0.0185
*Experimental condition*Diet Plan*	0.69703	0.1768	3.943	< .001	0.4187	0.2093	0.5108

1 = man), age, frequency of visits to McDonald's (1 = I never go there; 2 = less than once a year; 3 = once a year; 4 = once every six months; 5 = once every quarter; 6 = once a month; 7 = once a week; 8 = several times a week), Grand Veggie consumption (−1 = no; 1 = yes), Big Mac consumption (−1 = no; 1 = yes) and diet(1 = vegan; 2 = vegetarian; 3 = flexitarian; 4 = omnivorous) was carried out with the caloric estimation score as a dependent variable (general model: $F(7,203) = 1.27$, $p = .27$, $R^{2adj} = 0.04$). The analysis revealed a significant effect of Big Mac consumption, $b = 0.15$, $p = .036$. However, we find no significant effects of the experimental condition, $b = 0.02$, $p = .746$; of the type, $b = -0.11$, $p = .11$; of the diet plan, $b = -0.10$, $p = .228$, age, $b = 0.01$, $p = .947$; frequency of visit to Mc Donald's, b = 0.01, $p = .923$; Grand Veggie consumption, $b = 0.08$, $p = .295$.

Model 2b (see Table 4): we added the interaction between diet plan and label condition (general model $F(8,202) = 3.14$, $p = .002$, $R^{2adj} = 0.11$). The analysis reveals a significant effect of the experimental condition, $b = -1.54$, $p < .001$ and the interaction of the experimental condition with diet plan, $b = 0.42$, $p < .001$. There is also a tendential effect of animal consumption patterns, $b = -0.14$, $p = .071$ and gender, $b = -0.12$, $p = .092$. However, there is no effect of age, $b = 0.01$, $p = .870$; frequency of visit to Mc Donald's, $b = -0.03$, $p = .711$; Grand Veggie consumption, $b = 0.04$, $p = .584$ and Big Mac consumption, $b = 0.10$, $p = .155$.

Effect on the intention to take a menu

Model 3a (see Table 5): A first linear regression model including experimental condition (−1 = Grand Veggie; 1 = Big Mac), gender (−1 = woman; 1 = man), age, frequency of visits to McDonald's (1 = I never go there; 2 = less than once a year; 3 = once a year; 4 = once every six months; 5 = once every quarter; 6 = once a month; 7 = once a week; 8 = several times a week), Grand Veggie consumption (−1 = no; 1 = yes), Big Mac consumption (−1 = no; 1 = yes) and diet plan (1 = vegan; 2 = vegetarian;

Table 5. Study 1 – Model 3a.

Model Coefficients							
						95% Confidence Interva	
Predictor	Estimate	SE	t	p	Stand. Estimate	Lower	Upper
Intercept	4.1319	0.6919	5.972	< .001			
Experimental condition	0.1324	0.1141	1.161	0.247	0.0706	−0.0493	0.191
Gender	0.1726	0.1413	1.221	0.223	0.0748	−0.0460	0.196
Age	−0.0678	0.0103	−6.565	< .001	−0.3989	−0.5186	−0.279
Frequency of visits to McDonald's	0.1033	0.0796	1.298	0.196	0.0909	−0.0472	0.229
Grand Veggie Consomption	0.1231	0.1830	0.673	0.502	0.0432	−0.0834	0.170
Big Mac Consomption	0.0428	0.1313	0.326	0.745	0.0207	−0.1046	0.146
Diet Plan	0.8033	0.1991	4.036	< .001	0.2864	0.1465	0.426

3 = flexitarian; 4 = omnivorous) was carried out with the caloric estimation score as a dependent variable (general model: $F(7,203) = 10.8$, $p < .001$, $R2adj = 0.247$). The analysis revealed a significant effect of age, $b = -0.40$, $p < .001$ and diet plan, $b = 0.29$, $p < .001$. However, no effects were found for the experimental condition, $b = 0.07$, $p = .247$; sex, $b = 0.08$, $p = .223$, frequency of visit to Mc Donald's, $b = 0.09$, $p = .196$, because of having already Grand Veggie consumption, $b = 0.04$, $p = .502$ and because of Big Mac consumption, $b = 0.02$, $p = .745$.

Model 3b (see Table 6): which adds to the first the interaction of the experimental condition with diet plan (general model $F(8,202) = 9.45$, $p < .001$, $R2adj = 0.27$). The analysis revealed a significant effect of age, $b = -0.40$, $p < .001$ and diet plan, $b = 0.29$, $p < .001$. However, we find no effect of the experimental condition, $b = 0.14$, $p = .697$; of the interaction of the experimental condition with meat consumption patterns, b = −0.02, $p = .843$; of the gender, $b = 0.08$, $p = .224$; the frequency of visits to Mc Donald's, $b = 0.09$, $p = .192$; Grand Veggie consumption, $b = 0.05$, $p = .49$ and Big Mac consumption, $b = 0.02$, $p = .722$.

Table 6. Study 1 – Model 3b.

Model Coefficients							
						95% Confidence Interval	
Predictor	Estimate	SE	t	p	Stand. Estimate	Lower	Upper
Intercept	4.1026	0.7091	5.786	< .001			
Experimental condition	0.2655	0.6814	0.390	0.697	0.1415	−0.5747	0.6976
Gender	0.1728	0.1416	1.220	0.224	0.0749	−0.0462	2.6602
Age	−0.0678	0.0104	−6.552	< .001	−0.3991	−0.5193	−0.0417
Frequency of visits to McDonald's	0.1052	0.0803	1.309	0.192	0.0926	−0.0469	0.0924
Grand Veggie Consomption	0.1280	0.1851	0.692	0.490	0.0449	−0.0831	0.2385
Big Mac Consomption	0.0477	0.1339	0.356	0.722	0.0231	−0.1047	0.1111
Diet Plan	0.8092	0.2017	4.012	< .001	0.2885	0.1467	0.6434
*Experimental condition*Diet Plan*	−0.0357	0.1802	−0.198	0.843	−0.0190	−0.2084	0.1385

Discussion of study 1

We hypothesized a health halo effect based on the vegetarian label: participants in the Grand Veggie condition rated it as less caloric than participants in the Big Mac condition. However, they do not believe that it can be consumed more frequently than Big Mac except when the moderating effect of animal consumption habits is taken into account. We can therefore assume that these habits are, as we have postulated, a moderator of the health halo effect based on vegetarian labels. People who consume the least amount of animal products would also be the ones who are most prone to the health halo effect based on the vegetarian label. However, the population of flexitarians, vegetarians and vegans is too small for us to have an acceptable power, so we cannot generalize the results obtained and further studies will be needed. In addition, it seems predictable that people who do not eat any meat at all (i.e., vegetarians and vegans) report being able to eat Grand Veggie more often than Big Mac.

Contrary to our hypotheses, we found no effect of the label on the intention to have the burger in a menu comprising a soda and a portion of French fries. In this case, it can be assumed that the halo effect induced by the vegetarian label – therefore on a single product – does not encourage more side dishes, unlike a halo effect based on a healthy brand image (i.e., Chandon and Wansink 2007), as the effect would in this case occur for all products. A study comparing food choices made in an all-vegetarian restaurant with those made in a conventional restaurant would certainly answer this question.

Interestingly, we find that women attribute more calories to burgers than men. This is probably because they focus more on fat content than other macronutrients when assessing whether a product is healthy or not than men (Oakes and Slotterback 2001). However, this result must be taken with hindsight given that our sample is only 20% male.

Nevertheless, this research has several methodological limitations in addition to the sampling. On the one hand, Big Mac is bigger than the Grand Veggie and contains two meat-based steaks while the Grand Veggie has only one vegetable steak. This size difference may have had an effect on the caloric estimate that participants made of it.

On the other hand, the Grand Veggie received extensive media coverage during the dissemination of this research and many press articles highlighted that it contained far more calories than the Big Mac (i.e., 763kcal vs 503kcal) and we did not control the participant's knowledge on this subject, which can nevertheless constitute a significant bias leading to a lower effect.

Study 2: experimental replication

We conducted a second experiment to address the limitations of the first. On one hand, we created a bogus burger presentation ad that did not exist at Burger King (i.e., New Whopper and Vege Whopper) and on the other hand, we tried to make it more ecological by fitting into the universe of a fast-food brand (i.e., Burger King), by reproducing the food selection flow of the control terminals and by using traditionally food sold at Burger King. Finally, we launched this study on the Internet by diversifying the means of dissemination as much as possible in order to have access to the largest possible population.

For this second study, we adjusted our hypotheses and proposed that the vegetarian label would negatively influence the caloric perception of foods. Thus, the Vege Whopper will be perceived as being less caloric than the New Whopper. Participants in the Vege Whopper condition will order more caloric foods than participants in the New Whopper condition. Finally, we believe that the halo effect will be all the more pronounced among flexitarian, vegetarian and vegan participants.

Method

Participants and design

Nine hundred and fifteen participants were recruited online (92.2% women, 6.8% men, M_{Age} = 23.5, SD_{Age} = 65.0) and randomly assigned to one group (burger type: Vegetarian vs Meat) and were asked to rate the calorie content compared to a classic Burger (i.e., the Whopper). Then, they choose the accompaniment (i.e., drink, side dish, dessert) they wanted to add for their meal and the menu size (i.e., Normal vs Maxi). Finally, they answered socio-demographic questions.

Estimating the number of calories in burgers

Participants read a text asking them to visualize themselves ordering from a fast food chain: *"Imagine that you are at Burger King (a fast food chain) and that you order your meal on a terminal"*. In Vegetarian condition, participants could read: *"You have already chosen your sandwich:* ***Vege Whopper*** *which is Burger King's new sandwich. Ingredients:* ***vegetarian steak****, cheese, pickles, salad, ketchup, onions, tomatoes, sesame seed bread, mayonnaise sauce "*. In the other condition (meat condition), participants could read this message: *"You have already chosen your sandwich: The* ***New Whopper*** *which is Burger King's new sandwich. Ingredients:* ***beef steak****, cheese, pickles, salad, ketchup, onions, tomatoes, sesame seed bread, mayonnaise sauce"* (Appendix 1). We made sure that the participants had read the information mentioned by asking them *"Did you read the information above?"*.

On the next page, participants estimated the calories contained in the burger compared to a traditional one in Burger King (*Knowing that the Whopper (classic burger) contains 660 Kcal, do you think that the [New] Vege Whopper is more or less caloric than the Whopper?*) Participants responded on a 7-point Likert scale (*1 = Much less caloric; 7 = Much more caloric*). We then asked them to rate their attractiveness for the burger (*How appetizing do you think this burger is?*). They answered on a 7-point Likert scale (*1 = Not at all appetizing; 7 = Very appetizing*).

Choice of complementary foods and menu

Following this first block, participants selected a number of accompaniments. A first page invited them to select a drink (e.g., Coca Cola; Volvic Juicy Strawberry; Nothing; Appendix 2), a side dish (e.g., Chili Cheese Nuggets filled with cheese; Fries; Garden Side Salad; Appendix 2) and a dessert (e.g., Donut; Waffle and vanilla ice cream; Muffin; Appendix 2). We took back the food offered at Burger King as well as the brand's visuals. They were presented on the screen as if they were on a control terminal in a restaurant. Finally, a last page asked participants if they would like to order a Medium menu (portions presented: 33cl drink, 114g side dish) or King Size (50cl drink and 160g side dish).

Calorie's estimations (i.e., per 100g) were based from the French and Swiss websites brands for each product

Behavioral intent

We asked participants to indicate their intention to consume the selected meal on a 5-point scale (*How likely (out of 5) would you be to order this meal as part of a real order?*).

Demographic and dietary questions

Participants indicated their gender, age and socio-professional category and the time elapsed since their last meal. They then specified diet plan (i.e., *I eat animal flesh and animal products; I avoid the consumption of animal flesh, but this sometimes happens to me; I do not eat animal flesh, I do not eat animal flesh or animal products*). We asked them if they knew the Burger King fast food chain and how much they frequented the store (i.e., *I never go there, Less than once a year, Once a year, Once every six months, Once a quarter, Once a month, Once a week, Several times a week*). Participants mentioned whether they had ever participated in similar studies and specified their content. Finally, they were invited to give their comments on the study.

Statistical analyses

We started by creating a hierarchical multiple linear regression model. First, we included the experimental condition and all controlled variables (i.e., finding the burger appetizing; the probability of actually ordering the burger; gender; age; the number of hours since the last meal; frequency of visits to the burger king[3] and meat consumption habits to evaluate the effect of the vegetarian label on calorie assessment (Model 1a). Then, we added the interaction of the experimental condition and the diet plan inside the model (Model 1b). The same procedure was repeated for the number of calories ordered (Model 2a and 2b). All analyses were performed on Jamovi 0.9.5.16.

Results

Effect on caloric estimation

Model 1a (see Table 7): A first linear regression model including the experimental condition (−1 = Vege Whopper; 1 = New Whopper) finding the burger appetizing; the probability of actually ordering this meal; gender (−1 = Female; 0 = Other; 1 = Male); age; the number of hours since the last meal; the frequency of visits to Burger King (1 = I never go there; 2 = Less than once a year; 3 = Once a year; 4 = Once every six months; 5 = Once every quarter; 6 = Once a month; 7 = Once a week 8 = Several times a week) and diet plan (1 = vegan; 2 = vegetarian; 3 = flexitarian; 4 = omnivorous) was achieved with the caloric estimation score as a dependent variable (general model: $F(8,894) = 12.3$, $p < .001$, $R^2adj = 0.09$). The analysis revealed a main effect of the experimental condition, $b = 0.28$, $p < .001$ and age, $b = -0.07$, $p = .033$. There is also a tendential effect of

Table 7. Study 2 – Model 1a.

Model Coefficients							
						95% Confidence Interval	
Predictor	Estimate	SE	t	p	Stand. Estimate	Lower	Upper
Intercept	4.47339	0.30835	14.508	< .001			
Experimental Condition	0.31894	0.03622	8.807	< .001	0.2819	0.2191	0.34477
Finding the Burger Appetizing	0.01990	0.02406	0.827	0.408	0.0288	−0.0396	0.09723
Probability of Actually Ordering This Meal	−0.02166	0.02725	−0.795	0.427	−0.0279	−0.0969	0.04103
Gender	−0.11987	0.07260	−1.651	0.099	−0.0547	−0.1198	0.01033
Age	−0.01552	0.00729	−2.130	0.033	−0.0689	−0.1323	−0.00541
Number of Hours Since the Last Meal	−0.00392	0.00819	−0.479	0.632	−0.0153	−0.0780	0.04741
Frequency of Visit to Burger King	−0.04332	0.02274	−1.905	0.057	−0.0646	−0.1312	0.00195
Diet Plan	0.03036	0.05742	0.529	0.597	0.0171	−0.0464	0.08058

Table 8. Study 2 – Model 1b.

Model Coefficients							
						95% Confidence Interval	
Predictor	Estimate	SE	t	p	Stand. Estimate	Lower	Upper
Intercept	4.45991	0.30943	14.413	< .001			
Experimental Condition	0.19991	0.21908	0.913	0.362	0.1767	−0.2034	0.91238
Finding the Burger Appetizing	0.01757	0.02444	0.719	0.472	0.0254	−0.0440	0.08453
Probability of Actually Ordering This Meal	−0.02285	0.02734	−0.836	0.404	−0.0295	−0.0987	0.01407
Gender	−0.12022	0.07263	−1.655	0.098	−0.0549	−0.1200	0.09901
Age	−0.01537	0.00730	−2.106	0.035	−0.0682	−0.1317	−0.00409
Number of Hours Since the Last Meal	−0.00383	0.00819	−0.467	0.641	−0.0149	−0.0777	0.01828
Frequency of Visit to Burger King	−0.04288	0.02276	−1.884	0.060	−0.0640	−0.1306	0.00101
Diet Plan	0.03611	0.05838	0.619	0.536	0.0203	−0.0442	0.13320
*Experimental Condition*Diet Plan*	0.03239	0.05880	0.551	0.582	0.0286	−0.0734	0.21409

the gender, $b = -0.06$, $p = .099$ and the frequency of visits to Burger King, $b = -0.07$, $p = .057$. However, we find no effect of finding the burger appetizing, $b = 0.03$, $p = .408$; the probability of actually ordering this meal, $b = -0.03$, $p = .427$; the time since the last meal, $b = -0.01$, $p = .632$ and diet plan, $b = 0.02$, $p = .597$.

Model 1b (see Table 8): Which adds to the first the interaction of the experimental condition with diet plan (general model $F(9,893) = 10.9$, $p < .001$, $R^2adj = 0.09$). The analysis revealed a significant effect of age, $b = -0.07$, $p = .035$ as well as tendential effects of the gender, $b = -0.06$, $p = .098$ and frequency of visit to Burger King, $b = -0.06$, $p = .060$. However, no effect was found of the experimental condition, $b = 0.18$, $p = .362$; due to finding the burger appetizing, $b = 0.02$, $p = .472$; time since the last meal, $b = -0.01$, $p = .641$; diet plan, $b = 0.02$, $p = .536$, the probability of actually ordering this meal, $b = -0.03$, $p = .404$ and the interaction between the experimental condition and diet plan, $b = 0.03$, $p = .582$.

Effect on the number of calories ordered

Model 2a (see Table 9): A first linear regression model including the experimental condition (−1 = Vege Whopper; 1 = New Whopper) finding the burger appetizing; the probability of actually ordering this meal; gender (−1 = Female; 0 = Other; 1 = Male) age; the number of hours since the last meal; the frequency of visits to burger king (1 = I never go there; 2 = Less than once a year; 3 = Once a year; 4 = Once every six months; 5 = Once every quarter; 6 = Once a month; 7 = Once a week 8 = Several times a week) and diet plan (1 = vegan; 2 = vegetarian; 3 = flexitarian; 4 = omnivorous) were achieved with the caloric estimation score as a dependent variable (general model: $F(8,894) = 7.53$, $p < .001$, $R^2adj = 0.06$). The analysis revealed a significant effect of diet plan, $b = 0.13$, $p < .001$; the probability of

Table 9. Study 2 – Model 2a.

Model Coefficients							
						95% Confidence Interval	
Predictor	Estimate	SE	t	p	Stand. Estimate	Lower	Upper
Intercept	421.70	91.50	4.609	< .001			
Experimental Condition	4.93	10.75	0.459	0.646	0.0150	−0.04908	0.0790
Finding the Burger Appetizing	8.74	7.14	1.224	0.221	0.0435	−0.02626	0.1132
Probability of Actually Ordering This Meal	21.32	8.08	2.638	0.008	0.0945	0.02419	0.1648
Gender	17.98	21.54	0.835	0.404	0.0282	−0.03813	0.0946
Age	−7.60	2.16	−3.514	< .001	−0.1158	−0.18051	−0.0511
Number of Hours Since the Last Meal	3.64	2.43	1.498	0.135	0.0488	−0.01515	0.1127
Frequency of Visit to Burger King	11.61	6.75	1.721	0.086	0.0595	−0.00835	0.1274
Diet Plan	67.13	17.04	3.940	< .001	0.1299	0.06522	0.1947

actually ordering this meal, $b = 0.09$, $p = .008$ and age, $b = -0.12$, $p < .001$. It also shows a tendential effect of the frequency of visits to Burger King, $b = 0.06$, $p = .086$. However, we find no effect of the experimental condition, $b = 0.01$, $p = .646$; of finding the burger appetizing, $b = 0.04$, $p = .221$; of the gender, $b = 0.03$, $p = .404$ as well as of the time elapsed since the last meal, $b = 0.05$, $p = .135$.

Model 2b (see Table 10): Which adds to the first the interaction of the experimental condition with diet plan (general model $F(9,893) = 6.82$, $p < .001$, $R^2adj = 0.06$). The analysis revealed a significant effect of the diet plan, $b = 0.14$, $p < .001$; the probability of actually ordering this meal, $b = 0.09$, $p = .011$ and age, $b = -0.12$, $p < .001$. The analysis also shows a tendential effect of the frequency of visits to Burger King, $b = 0.06$, $p = .079$. However, no effects were found for the experimental condition, $b = -0.19$, $p = .332$; for finding the burger appetizing,

Table 10. Study 2 – Model 2b.

Model Coefficients							
						95% Confidence Interval	
Predictor	Estimate	SE	t	p	Stand. Estimate	Lower	Upper
Intercept	414.00	91.78	4.511	< .001			
Experimental Condition	−63.07	64.98	−0.971	0.332	−0.1916	−0.57891	0.3208
Finding the Burger Appetizing	7.40	7.25	1.021	0.307	0.0368	−0.03396	0.0959
Probability of Actually Ordering This Meal	20.65	8.11	2.547	0.011	0.0915	0.02099	0.0574
Gender	17.78	21.54	0.825	0.409	0.0279	−0.03845	0.9155
Age	−7.51	2.16	−3.470	< .001	−0.1145	−0.17919	−0.0437
Number of Hours Since the Last Meal	3.69	2.43	1.520	0.129	0.0495	−0.01443	0.0434
Frequency of Visit to Burger King	11.87	6.75	1.758	0.079	0.0608	−0.00709	0.0486
Diet Plan	70.42	17.32	4.067	< .001	0.1363	0.07052	0.3171
*Experimental Condition*Diet Plan*	18.51	0.05880	1.061	0.289	0.0562	−0.04775	0.2625

$b = 0.04$, $p = .307$; for the gender, $b = 0.03$, $p = .409$; for the time since the last meal, $b = 0.05$, $p = .129$ and for the interaction between the experimental condition and diet plan, $b = 0.06$, $p = .289$.

Discussion of study 2

Once again, our results confirm our main hypothesis: participants in the "Vege Whopper" condition rated their burger as less caloric than participants in the "New Whopper" condition. These results are consistent with the health halo effect literature, allowing us to conclude that a health halo effect is based on the vegetarian label. However, this effect does not seem to be moderated by the consumption of animal products. Moreover, contrary to what we had assumed and in line with the results obtained in the first study, participants in Vege Whopper condition did not order more caloric accompaniments than participants in New Whopper condition. This leads us to believe that the label has an effect on the food concerned solely, in this case the burger, and not on all the foods constituting a meal.

This time again, the study presents several limitations, particularly concerning the recruitment of participants. The number of flexitarian, vegetarian and vegan participants is far too low compared to the number of omnivorous participants for us limiting the statistical power. Further research will be needed to conclude with more precision on the hypotheses involving participants who eat little or no animal products.

General discussion

In these two studies, we were able to highlight the existence of a health halo effect based on the vegetarian label. This discovery joins the long list of other labels with the same effects such as low-fat (Wansink and Chandon 2006), organic (Besson et al. 2019), gluten-free (Prada, Godinho, Rodrigues, Lopes, Garrido, 2019) or fair-trade labels (Schuldt, Muller, and Schwarz 2012). The vegetarian label (like the others) seems to induce a lower caloric evaluation of food which could be problematic insofar as people on a diet could misunderstand when making decisions leading to eat food as much or even more caloric than if they had eaten meat-based food. However, since processed meats and red meat are involved in a number of diseases (World Health Organization, 2018), this vegetarian halo effect could lead to a decrease in the amount of meat consumed per year. Therefore, the implications of this effect can be both negative and positive. We can only encourage governments to make a nutritional score label mandatory, which makes it possible to provide global nutritional information when making purchasing decisions and encourage manufacturers and restaurateurs to change the composition of their products (see Hawkes et al. 2015 for a review). However, it would seem

that the health halo effect only concerns the labeled product and that it does not spread to the entire brand image and other products on sale. Similarly, it does not seem to generate a licensing effect in the construction of the menu to the extent that we did not observe any difference between the participants in vegetarian and meat conditions. This effect is the fact that a person who performs a virtuous action feels free to act in a less virtuous way afterward (Khan and Dhar 2006). This seems consistent with the previous literature which shows that for this effect to occur, it is essential that people intentionally choose the so-called virtuous food (Prada, Rodrigues, and Garrido 2016). The health halo effect does not therefore seem to spontaneously induce this licensing effect. Further research will obviously be needed to better understand the effect of labels, and in particular the vegetarian label, on actual consumption. In addition, although diets containing few or no animal products do not appear to modulate the effect of vegetarian health halo in the case of burger marketed by an international fast food chain, it may be interesting to observe whether the situation is maintained in the case of vegetarian products (e.g., falafels) and in the case of products marketed by independent restaurants or with a healthier image (e.g., Prêt a manger). Finally, future studies will need to be more vigilant about the composition of their samples, not only by ensuring that there are more flexitarian, vegetarian and vegan participants, but also by having a better male/female distribution since men think more that meat is essential for good nutrition to the extent that the more they eat meat the less they display consideration of meat consumption on animal welfare (see Ruby 2012 for a review).

Notes

1. an individual who is neither vegetarian nor vegan but tends to reduce his consumption of animal protein.
2. We were unable to use this information in our analyses because people with specific diets represented only 19.9% of the sample.
3. 12 participants did not answer on their frequency of visit to Burger King.

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Appendix 1. Burger posters





Appendix 2. List of complementary foods and calorie content per 100g

Coca Cola Light (33cl) – 0 kcal
Fanta (33 cl) – 39 kcal
Vittel (33cl) – 0 kcal
Orange juice Minute Maid (33cl) – 44 kcal
Sprite (33cl) – 112 kcal
Coca Cola Zero (33cl) – 0 kcal
Lipton Green Ice Tea (33cl) – 19 kcal
Coca Cola (33cl) – 168 kcal

San Pellegrino (33cl) – 0 kcal
Volvic Juicy Exotic (33cl) – 26 kcal
Volvic Juicy Strawberry (33cl) – 26 kcal
Lipton Ice Tea Peach (33cl) – 18 kcal
Apple Juice Minute Maid (33cl) – 44 kcal
Heineken Beer (33cl) – 41 kcal
Chili Cheese Nuggets cheese filled (114g) – 311 kcal
French Fries (114g) – 251 kcal
Nuggets (114g) – 278 kcal
Onions Rings (114g) – 299 kcal
Garden Side Salad (114g) – 70 kcal
Vanilla Sundae (topping with caramel, strawberry or chocolate) – 144 kcal
Waffle (chocolate or caramel sauce) and vanilla ice cream – 453 kcal
Muffin (blueberry or chocolate) – 441,5 kcal
Donut (chocolate or vanilla) – 437 kcal
Milk Shake (vanilla, strawberry or chocolate) – 132 kcal
Chocolate fondant (dark or white chocolate) and vanilla ice cream – 372 kcal