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Jonathon P. Schuldt, Jamie E. Guillory & Geri K. Gay

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Prejudice and the Plate: Effects of Weight Bias in Nutrition Judgments

Jonathon P. Schuldt
Department of Communication
Cornell University

Jamie E. Guillory
RTI International

Geri K. Gay
Department of Communication
Cornell University

As millions of people turn to social media for health information, better understanding the factors that guide health-related judgments and perceptions in this context is imperative. We report on two Web experiments ($n > 400$ total) examining the power of society's widespread weight bias and related stereotypes to influence nutrition judgments in social media spaces. In Experiment 1, meals were judged as lower in nutritional quality when the person who recommended them (the source) was depicted as obese rather than of normal weight, an effect mediated by stereotypic beliefs about the source as a generally unhealthy person. Experiment 2 replicated this effect, which—notably—remained significant when controlling for objective nutritional information (calories and fat content). Results highlight spillover effects of weight bias that extend beyond person perception to color impressions of objects (here, food) that are associated with stigmatized attributes. Implications for everyday nutrition judgments and public health are considered.

In recent years, the Internet has emerged as a leading source of health information for millions of people seeking rapid access to credible and reliable health advice. Not only do most Americans report having turned to Web sources for health-related content (Fox, 2011), but the percentage using mobile technologies to do so has risen sharply, with more than 50% of smartphone users reporting using their device to access health information (Fox & Duggan, 2012). At the same time, research has documented the rising popularity of websites devoted to food and nutrition, such as food blogs—social networking sites that typically feature photographs of food accompanied by descriptive text created by blog users (Banas, 2008; Cox & Blake, 2011; Lynch, 2010; Simunaniemi, Sandberg, Andersson, & Nydahl, 2011). As with other types of social media, the content of food blogs is typically recommended or endorsed by other users of the platform, raising the possibility that salient characteristics of those who recommend or endorse social media content can alter how the content itself is perceived (e.g., Eastin, 2001).

The rise of online health information seeking and networking sites devoted to food and nutrition highlights a need to better understand the factors that influence how audiences process health information on the social Web. These factors likely vary in the extent to which they serve as valid indicators of health and nutrition status. For instance, food blogs may convey objective information about a food's nutritional content (e.g., total fat and calories) that would be expected to exert substantial influence on health perceptions from a normative perspective. At the same time, food blogs are replete with less nutritionally diagnostic cues that may nevertheless influence health perceptions, from design features of

Correspondence should be addressed to Jonathon P. Schuldt, Department of Communication, Cornell University, 465 Mann Library, Ithaca, NY 14853. E-mail: jps56@cornell.edu

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webpages (color and form) to conspicuous attributes of bloggers who post information (gender, attractiveness, weight status).

In this vein, the present work explores whether salient characteristics of the people who recommend food on social media sites can alter perceptions of the nutritional quality of the food itself. In particular, in an age characterized by high rates of obesity and widespread prejudice toward those perceived to be "fat," we test whether the same foods are perceived as less healthy when recommended by a person who is depicted as obese rather than of normal weight. Moreover, we simultaneously explore the role of more nutritionally diagnostic information (e.g., objective nutritional content) to gain insight into the relative influence of weight bias in nutrition judgments, as well as the role that explicit weight-related stereotypes play in these effects. Given our focus on the relative influence of factors that can be considered more central versus more peripheral in nutrition judgments (e.g., nutritional content vs. weight status of the recommender/source, respectively), we connect our findings to the extensive literature in psychology and communication on the role of systematic versus heuristic information processing in message effects (e.g., Chaiken, 1980; Petty & Cacioppo, 1986).

We begin by briefly reviewing relevant literature on obesity and weight bias before turning to recent work demonstrating the role of salient visual cues in guiding nutrition judgments and food perceptions. We then describe two experimental studies that integrate these perspectives by testing the effect of weight bias in nutrition judgments using a mock social media platform in which only the thumbnail photograph of the person recommending the food was varied, such that the source was portrayed as obese or as of normal weight.

OBESITY AND WEIGHT BIAS

The past few decades have witnessed a dramatic rise in overweight and obesity rates worldwide (World Health Organization, 2013). In a society that celebrates and privileges thinness (e.g., Cramer & Steinwert, 1998; Silverstein, Perdue, Peterson, & Kelly, 1986), persons with obesity also face significant social consequences rooted in widespread weight bias (e.g., Crandall & Schiffhauer, 1998; Puhl & Brownell, 2006). Not only has anti-fat prejudice been found to exceed other common forms, including anti-gay and anti-Muslim prejudice (Latner, O'Brien, Durso, Brinkman, & MacDonald, 2008; see also Vartanian, 2010), it has even been observed among physicians and other health care professionals on both explicit and implicit attitude measures (Bessenoff & Sherman, 2000; Puhl, Wharton, & Heuer, 2009; Sabin, Marini, & Nosek, 2012; Schwartz, Chambliss, Brownell, Blair, & Billington, 2003) and among persons with obesity themselves (Teachman & Brownell, 2001; Wang, Brownell, & Wadden, 2004). Complementing these observations, research highlights numerous negative stereotypes about persons with obesity—including that they are lazy, unintelligent, self-indulgent, and lacking in willpower—and a tendency for observers to blame affected individuals for their weight status, despite considerable evidence implicating situational forces (e.g., the built environment) that encourage a sedentary lifestyle and limit access to healthy whole foods (for reviews, see Puhl & Brownell, 2001; Puhl & Heuer, 2009).

Although obesity is caused by myriad situation and person factors that interact in complex ways (e.g., Gearhardt et al., 2011; Kopelman, 2000), negative stereotypes of persons with obesity persist and exert a powerful and negative influence during impression formation. For instance, DeJong (1993) asked female students to provide judgments about a target person who was made to appear as obese or as of normal weight and observed stereotype-consistent ratings in the obese condition (e.g., self-indulgent, less disciplined), unless participants' attention was drawn to a plausible situational cause in the form of a medical disorder. Exploring implications in work settings, Larkin and Pines (1979) observed that heavier employees were evaluated more negatively than their normal weight counterparts across a range of valued work-related traits, stereotypic beliefs that manifested as discrimination in a mock hiring scenario. Such findings complement more recent research that highlights pervasive anti-fat discrimination in real-world workplaces (for a review see Fikkan & Rothblum, 2005), including among the ranks of corporate chief executive officers (CEOs) (Roehling, Roehling, Vandlen, Blazek, & Guy, 2009).

While a body of work demonstrates numerous consequences of weight bias for the way that persons with obesity themselves are perceived, comparatively less work has investigated possible "spillover" effects of weight bias on targets of judgments that are merely associated with heavier people. In this vein, Hebl and Mannix (2003) observed that impressions of a normal weight job candidate on a variety of work-related traits were negatively influenced by his mere proximity to a person who appeared to be obese. Presumably, simply viewing persons with obesity activates category-based stereotypes and implicit affective associations stored in memory that— once rendered accessible—are more likely to shape judgments of related targets (Higgins, 1996; Kunda & Spencer, 2003; Wyer, 2013). At the same time, such findings may reflect conscious-level inferential processing about people who associate socially with stigmatized persons that are similarly rooted in weight bias (Devine, 1989).

Our present aim is to explore whether spillover effects of weight bias extend beyond judgments of people to influence impressions of associated nonhuman objects, namely, foods. In addition to the theoretical motivations for testing this possibility in general, there are a number of special considerations for exploring effects on food judgments in particular. First, food is deeply imbued with social meaning and carries

rich cultural associations (for reviews see Mintz & DuBois, 2002; Rozin, 1996a), suggesting that social perceptions may have a pronounced effect on how foods themselves are perceived. Second, as individuals in society have become heavier, so too have many users of social media—therefore, any effects of users' weight status on the perceived nutritional quality of the foods they recommend could carry important public health implications. As we discuss in the following section, prior research into the factors that affect nutrition judgments has revealed various visual cues capable of biasing these impressions. Yet the weight status of persons associated with those foods has received little attention, which is surprising given that the obesity stereotype contains content that is directly relevant to nutrition judgments (e.g., the belief that persons with obesity overeat nutritionally poor, "junk" foods; Chambliss, Finley, & Blair, 2004) and that obesity cannot be easily hidden during social encounters, unlike some other stigmatized categories (Teixeira & Budd, 2010).

VISUAL CUES IN NUTRITION JUDGMENTS

Although seemingly straightforward, identifying foods that are healthful and nutritious is surprisingly difficult in contemporary food environments awash with deceptive health claims, highly engineered snack foods, and nutritionally poor "food-like substances" (Brownell & Warner, 2009; Nestle, 2002; Pollan, 2008). This confusion has prompted social scientists to examine the social and situated nature of food-related judgments and decisions (e.g., Carels, Harper, & Konrad, 2007; Provencher, Polivy, & Herman, 2009; Rozin, 1996b), and in particular, the biasing role of visual cues that are highly salient when these judgments are made. For example, research participants assume that foods bearing a "no cholesterol" label contain lower levels of fat (Andrews, Netemeyer, & Burton, 1998) and that healthy options like strawberries contain fewer beneficial micronutrients when topped with "disreputable" additives like sugar (Oakes, 2004). They also judge meals containing an additional healthy item (e.g., a burger plus a salad) as lower in calories than meals without one (i.e., the burger alone), an effect that is most pronounced among consumers who report actively monitoring their energy intake (Chernev, 2011). Presumably, such biases reflect the use of heuristics that guide and simplify nutrition judgments—many of which are cognitively complex and prone to error (e.g., Gomez, 2012; Livingstone & Black, 2003; Rasnake, Laub, Lewis, & Linscheid, 2005) and may be rooted in individual differences (including observers' diet-relevant values and goals) that guide how individuals attend to and process such cues.

Despite the increased attention to the biasing role of visual cues in nutrition judgments, little attention has been paid to the possible role of an interaction partner's weight status. However, widespread weight stigma and negative stereotypes about persons with obesity suggest that, all else equal, foods may appear less healthy when they are associated with obese individuals. Recent and related findings on the social nature of food choices lend support to this prediction. McFerran, Dahl, Fitzsimmons, and Morales (2010a) observed that participants tended to choose larger portions when they witnessed another person doing so—except when that person was obese, which led participants to choose smaller portions instead. The same researchers also found that snack consumption was influenced by the weight status of a server, such that dieters ate more when their server was obese whereas non-dieters ate more when their server was of normal weight (McFerran et al., 2010b). These findings not only suggest that food consumption decisions are sensitive to salient social cues such as others' weight status, but reiterate that individual difference variables may play an important role in these effects.

On the basis of the preceding discussion, we pursued the following hypotheses:

H1: All else equal, foods will be perceived as less healthy when the person recommending them (the source) appears to be obese rather than of normal weight.

H2: The expected effect will be mediated by perceptions of the source as a generally healthy or unhealthy person.

In addition, we explored two related research questions to probe boundary conditions of the hypothesized effect. First, in light of previous findings on the role of weight-relevant individual difference variables in nutrition judgments (e.g., Chernev, 2011; McFerran et al., 2010a; 2010b), we asked:

RQ1: Is this effect moderated by personal relevance or involvement as assessed by weight-relevant individual difference variables (e.g., gender, body mass index [BMI], exercise frequency, weight-watching concern)?

Second, because observers may be especially likely to rely on peripheral information such as a recommender's weight status when more central information such as objective nutritional content is unavailable, we further asked:

RQ2: Does this effect emerge even when observers are provided with message content that is more directly diagnostic of a food's nutritional status (e.g., calories and fat content)?

THE PRESENT WORK

We conducted two experiments testing whether another person's weight status can influence the nutrition judgments made by observers. Specifically, we tested whether meals ostensibly recommended on a social networking site were perceived as less healthy when the recommender/source appeared to be obese rather than of normal weight (H1) and

FIGURE 1 Sample stimuli from Experiment 1 ("healthy" label condition). The thumbnail images for the normal weight (left) and obese (right) conditions that appear here were also used in Study 2.

whether this effect was mediated by stereotypic beliefs about an obese source as a generally unhealthy person (H2). Moreover, we simultaneously explored the role of individual difference variables related to health and diet (i.e., gender, BMI, exercise frequency, and weight-watching concern) (RQ1) as well as that of more diagnostic nutritional information ("healthy" vs. "indulgent" labels in Experiment 1, calorie and fat content in Experiment 2) (RQ2) in order to gain insight into the boundary conditions of the hypothesized effect.

EXPERIMENT 1

Method

Participants. Web participants (n = 230) were recruited through Amazon Mechanical Turk (http://www.mturk.com) to complete a "health questionnaire" in exchange for $1.50. On average, participants were 36.4 years old (SD = 12.5), 48% were female (n =110), and 82.6% identified as White/Caucasian. Average BMI, based on self-reported height and weight, fell at the lower end of the overweight category according to U.S. government formulas (M = 26.28, SD = 6.46) and was distributed across the weight categories utilized by the Centers for Disease Control and Prevention (CDCP) as follows: underweight (BMI < 18.5: 3.9%), normal weight (18.5 ≤ BMI < 25: 46.3%), overweight (25 ≤ BMI < 30: 28.4%), obese (BMI ≥ 30: 21.4%).

Materials and procedure. Participants first completed a brief questionnaire regarding Web use and online behaviors as part of a separate study—for our purposes, however, the questionnaire included an item assessing exercise frequency, which we analyzed as a potential moderating variable: "How often do you exercise, or participate in physical activity for fun or sport for at least 20 minutes?" (2 or more times a day, 1 time a day, 3–4 times a week, 1–2 times a week, less than once a week, less than once a month). Participants were then directed to the main judgment task, which involved viewing 10 images of the kind typically appearing on social media websites whose primary focus is photo sharing (e.g., Pinterest, Instagram) and that commonly feature food-related content (e.g., recipes, meals ordered at restaurants; Stapinski, 2013). Each image consisted of three main components: a meal, a thumbnail photograph of the source (i.e., the ostensible author of the blog post), and a health-related label.[1] The thumbnail photographs always depicted the same woman ("Elizabeth Jones") as obese or as of normal weight, depending on condition (see Figure 1).[2]

We employed a 2 (recommender/source weight status: normal weight vs. obese) × 2 (health-related label: "Healthy Meals" vs. "Indulgent Meals") between-subjects factorial design. Regardless of experimental condition, participants viewed and judged the overall healthfulness of the same 10 meals, which were randomly ordered for each participant. Directly beneath each image appeared the key dependent measure, perceived meal healthfulness: "In your best judgment, how healthy is the food shown in this image?" (1 =

[1]Ten meal images were selected from various online sources and pretested to ensure they were perceived as ambiguously healthy, namely, black bean and cheese quesadilla, chicken bagel sandwich, chopped salad with croutons and dressing, corned beef with vegetables, fruit and cheese plate, grilled vegetable quesadilla, pancakes with blueberries and syrup, sliced beef with vegetables, spinach salad with bacon and hardboiled eggs, and a vegetarian sandwich with sweet potato fries. For added validity, some images contained a tally of "likes" common in social media. Likes had no effect on our dependent variables are not discussed further.

[2]Thumbnail images were selected from a larger set of before-and-after weight-loss images after pretesting revealed them to be closely matched on facial appearance.

very unhealthy to 7 = *very healthy*; 4 was labeled *neutral*).[3] Directly beneath appeared a question assessing stereotypic perceptions of the source as a generally healthy/unhealthy person, allowing us to test whether weight bias mediated any effect of source weight status on nutrition judgments: "How healthy is the person who posted this image?" (1 = *very unhealthy* to 7 = *very healthy*; 4 was labeled *neutral*). As an instructional manipulation check (Oppenheimer, Meyvis, & Davidenko, 2009), we later asked participants to indicate the five meal images that they had not previously seen from a set of 10, in order to identify participants who paid insufficient attention to the study materials. Finally, participants completed a brief questionnaire containing standard demographic items (including gender and self-reported height and weight, with the latter two being used to calculate BMI) and a question capturing general weight-watching concern: "Generally speaking, how concerned are you with watching your weight?" (1 = *not at all concerned* to 5 = *extremely concerned*) before being directed to a debriefing page. On average, the study lasted approximately 10 minutes.

Results

Four participants (about 2%) failed the manipulation check and were excluded from the analysis, leaving an analytic sample of $n = 226$. We first averaged the ten meal healthfulness judgments provided by each participant to form our key dependent variable, perceived meal healthfulness ($\alpha = .82$).

Our main analysis took the form of separate analysis of variance (ANOVA) models testing the effects of recommender/source weight status (normal weight vs. obese), health-related label ("Healthy Meals" vs. "Indulgent Meals"), and their interaction term on perceived meal healthfulness. As expected, a main effect of source weight status emerged, such that meals were perceived as significantly less healthy when the recommender appeared to be obese ($M = 4.19$, $SD = 0.86$) as compared to of normal weight ($M = 4.44$, $SD = 0.96$), $t(224) = 2.10$, $p < .05$, $d = .27$.[4] Although the meals were perceived as somewhat healthier when they were tagged as "healthy" as compared to "indulgent" ($M = 4.42$, $SD = 0.98$ vs. $M = 4.22$, $SD = 0.85$), this difference was not significant, $t(224) = 1.62$, $p = .11$, nor was the interaction term ($t < 1$, *ns*).

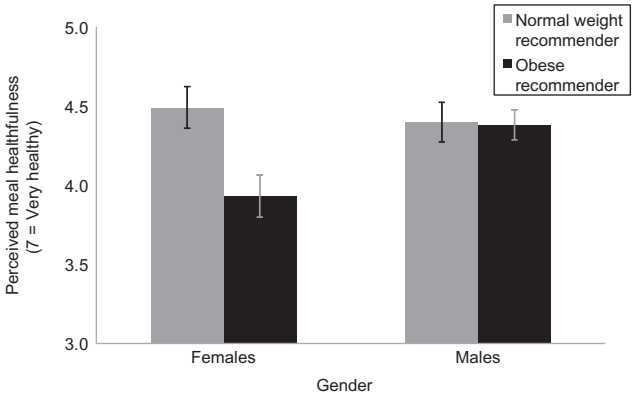

FIGURE 2 Graph depicting the interaction between weight status and participant gender in Experiment 1. Error bars represent mean standard error.

To test whether the main effect of source weight status varied by weight-relevant individual difference variables (i.e., gender, BMI, exercise frequency, and weight-watching concern), we conducted separate regressions testing each potential moderator.[5] Results revealed that, overall, perceived meal healthfulness was positively associated with BMI ($b = .13$, $t(222) = 2.95$, $p < .01$) and negatively associated with exercise frequency ($b = –.03$, $t(221) = –2.67$, $p < .01$). Furthermore, gender emerged as the only significant moderating variable interaction ($b = .54$, $t(222) = 2.23$, $p = .03$), such that females in particular perceived the meals as significantly less healthy when the source appeared to be obese ($M = 3.93$, $SD = .94$) as compared to of normal weight ($M = 4.49$, $SD = 1.00$), $t(222) = –3.16$, $p < .01$. This effect was not observed among male participants ($M_{obese} = 4.38$ vs. $M_{normal\ weight} = 4.40$, $t < 1$, *ns*) (Figure 2).

Recall that we also expected that stereotypic beliefs about the obese source as a generally unhealthy person would mediate this effect. To test this we first created a composite variable, perceived source healthfulness, by averaging participants' ratings of the recommender's health status ($\alpha = .99$).[6] We then used an SPSS macro from Hayes (2012) to compute the indirect effect of source weight status (X) on perceived food healthfulness (Y) via perceived source healthfulness (M) using 5,000 bias-corrected bootstraps (for details see Preacher & Hayes, 2004). As predicted, results revealed a significant indirect effect, equal to –0.93 with a

[3]We employed this single-item measure of overall healthfulness rather than more specific questions about the nutritional content of foods (e.g., estimated calorie content) in light of evidence that responses to the latter vary widely and are often vastly inaccurate (Carels et al., 2007; Lansky & Brownell, 1982).

[4]A mixed-measures ANOVA featuring source weight status as the between factor and food healthfulness judgments as the repeated factor was also significant, as was a separate mixed-measures ANOVA featuring perceived healthfulness of the source as the repeated factor (Fs > 9.30, ps < .001).

[5]Continuous variables (weight-watching concern, exercise frequency, and BMI) were mean-centered prior to constructing the interaction terms. Gender was coded 0 = female, 1 = male. Weight-watching concern did not vary by experimental condition, neither here nor in Experiment 2 (Fs < 1, *ns*).

[6]We solicited multiple ratings of perceived source healthfulness to allow participants to update their impressions based on additional information (i.e., recommended meals). Suggesting that the weight status manipulation was effective, the source was perceived as significantly less healthy when she appeared obese ($M = 2.78$, $SD = 1.09$) as compared to of normal weight ($M = 5.08$, $SD = 0.95$), $t(224) = 16.91$, $p < .001$.

95% confidence interval of –1.21 to –0.69 (unstandardized *b*s for the X → M and M → Y pathways were –0.75 and 0.40, respectively; *p*s < .001) ($p < .05$ for the indirect effect).[7]

Discussion

The present results suggest that negative stereotypes about persons with obesity alter how observers perceive foods that are associated with them. The same set of meals was perceived as significantly less healthy when the person recommending the meals appeared to be obese rather than of normal weight. This effect emerged even when controlling for the effect of more nutritionally diagnostic information ("healthy" and "indulgent" labels) and was driven by female participants in particular, consistent with recent research suggesting that women are more likely to notice and be affected by weight cues in their social environments (McFerran et al., 2010a, 2010b).

While it is intriguing that food healthfulness perceptions were more strongly affected by the source's weight status (a relatively peripheral cue) than by the more diagnostic "healthy" and "indulgent" labels (a relatively central cue), we note that participants' interpretations of these descriptors themselves may have been influenced by the source's weight status in ways consistent with the obesity stereotype—that is, observers may view an obese recommender as a less credible judge of nutritional quality standards. If so, this would represent unintended variation in the pragmatic meaning of these descriptors, and conclusions about the relative effects of source weight status and heath-related labeling should be made with caution. Experiment 2 sought to avoid this potential ambiguity by replacing vague descriptors with objective nutritional information in the form of calories and fat content. In doing so, Experiment 2 provides a more conservative test of the spillover hypothesis, in light of social–cognitive perspectives suggesting that information that is highly relevant to the judgment at hand (here, calories and fat content) should reduce participants' reliance on less relevant, stereotypic associations in forming judgments (e.g., Gilbert, Pelham, & Krull, 1988; Stanovich & West, 2000).

EXPERIMENT 2

Method

Participants. We recruited another Web sample ($n = 229$) using the same methods as in Experiment 1. On average, participants were 32.3 years old ($SD = 11.0$), 47% were female ($n = 108$), and 75.1% identified as White/Caucasian. Average BMI again fell at the lower end of the overweight category according to U.S. government formulas ($M = 25.49$, $SD = 5.75$) and was distributed across the CDCP's four weight categories as follows: underweight (BMI < 18.5: 5.3%), normal weight (18.5 ≤ BMI < 25: 48.9%), overweight (25 ≤ BMI < 30: 28.2%), obese (BMI ≥ 30: 17.6%).

Materials and procedure. Participants were led through a procedure similar to Experiment 1 with a couple of exceptions: namely, nutrient profile information in the form of calories and fat content accompanied each meal, replacing the health-related labels (i.e., "Healthy Meals" and "Indulgent Meals") featured in Experiment 1. For each meal, we created a relatively healthy and a relatively unhealthy profile based on pretesting and consultation with a nutrition scientist. On average, the healthy profiles contained roughly half the calories and one-third the fat of the unhealthy profiles (255 calories and 9g fat vs. 558 calories and 26g fat, respectively) (see Figure 3 for an example).

We employed a 2 (recommender/source weight status: normal weight vs. obese) × 2 (nutrient profile: healthy vs. unhealthy) between-subjects factorial design. As in Experiment 1, participants viewed the same 10 meals (presented in a random order) regardless of condition and for each reported two main judgments: perceived healthfulness of the meal and that of the source. Finally, we again employed an instructional manipulation check (Oppenheimer et al., 2009), this time by asking participants to identify which meal, from a list of five possible options, they had not viewed previously.

Results

Two participants (about 1%) failed the manipulation check and were therefore excluded from the analysis, leaving an analytic sample of $n = 227$. We again averaged the 10 meal healthfulness judgments provided by each participant to form our key dependent variable, perceived meal healthfulness ($\alpha = .80$).

We conducted separate ANOVA models testing the effects of source weight status (normal weight vs. obese), nutrient profile (healthy vs. unhealthy), and their interaction term on perceived meal healthfulness. The results replicated our Experiment 1 findings. Despite being provided with objective nutrition information in the form of calories and fat content, participants nevertheless perceived the meals as significantly less healthy when the source appeared to be obese ($M = 4.13$, $SD = 0.95$) as compared to of normal weight ($M = 4.45$, $SD = 0.80$), $t(225) = 2.79$, $p < .01$, $d = .36$.[8] Suggesting that our nutrient profile manipulation was

[7] We also tested an alternative mediation model featuring perceived food healthfulness as the mediating variable, which revealed a smaller but still significant indirect effect, equal to –0.13 with a 95% confidence interval of –0.29 to –0.01.

[8] As in Experiment 1, a mixed-measures ANOVA featuring source weight status as the between factor and food healthfulness judgments as

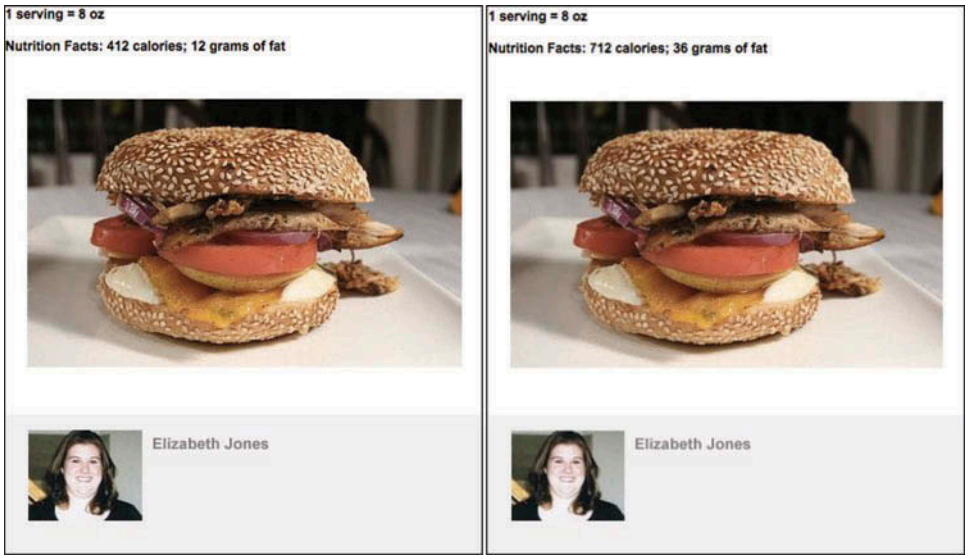

FIGURE 3 Sample stimuli from Experiment 2 (obese source condition), featuring healthy (left) and unhealthy (right) nutrient profiles in the upper left-hand corner.

successful, meals were also perceived as significantly less healthy when accompanied by the unhealthy profile (M = 4.11, SD = 0.96) as compared to the healthy profile (M = 4.47, SD = 0.77), t (225) = 3.07, $p < .01$, $d = .41$. The interaction term again was not significant, $t(233) = 1.53$, $p = .13$.

We also tested whether the effect of source weight status on perceived meal healthfulness varied by the same individual difference variables examined in Experiment 1. Results from a series of linear regressions revealed that, overall, perceived meal healthfulness was again positively associated with BMI ($b = .07$, $t(222) = 2.12$, $p < .05$) and negatively associated with exercise frequency, although not significantly so ($b = –.19$, $t(222) = –1.39$, $p = .17$). Interestingly, although gender emerged as the only significant moderator in Experiment 1, that pattern was not observed here ($t < 1$, *ns* for the interaction). However, the interaction between source weight status and BMI was significant ($b = –.04$, $t(222) = –2.15$, $p < .05$), such that participants reporting above-average BMI in our sample (M + 1SD) perceived meals as significantly less healthy when the source appeared obese (M = 4.03) as compared to of normal weight (M = 4.62), $t(222) = 3.54$, $p < .001$. In contrast, participants reporting below-average BMI (M – 1SD) showed no such effect (M_{obese} = 4.32 vs. $M_{\text{normal weight}}$ = 4.24), $t < 1$, *ns*. We consider some possible explanations for these different moderation patterns in the discussion.

We also examined whether the interaction between source weight status and participants' BMI varied across nutrient profiles with an ANOVA featuring these three variables and all possible interaction terms. Both two-way interaction terms featuring BMI (i.e., BMI crossed with source weight status and with nutrient profile) were significant (ts > 2.30, ps < .05). Closer inspection of these interactions revealed that although higher BMI participants perceived foods as less healthy when recommended by the obese source regardless of nutrient profile condition (healthy profile: M_{obese} = 4.38 vs. $M_{\text{normal weight}}$ = 4.88; unhealthy profile: M_{obese} = 3.85 vs. $M_{\text{normal weight}}$ = 4.34) (ts > 2.20, ps < .05), this effect was driven by distinct judgment patterns across nutrient profile conditions. Specifically, whereas BMI was positively correlated with healthfulness perceptions when healthy meals were recommended by the normal weight source ($b = .11$, $t(218) = 2.52$, $p = .02$), BMI was negatively correlated with healthfulness perceptions when unhealthy meals were recommended by the obese source ($b = –.06$, $t(218) = –2.79$, $p < .01$) (Figure 4) (see Aiken & West, 1991, for a discussion of simple slopes analysis).

Finally, we again tested whether the effect of source weight status on perceived meal healthfulness was mediated by the stereotypic belief that the obese recommender was a generally unhealthy person (perceived source healthfulness composite: $\alpha = .98$) using the bootstrapping procedure from Hayes (2012) described earlier. Replicating the Experiment 1 results, we again found evidence for a significant indirect effect, equal to –0.84 with a 95% confidence interval of –1.14 to –0.55 (unstandardized bs for the X → M and M → Y pathways were –0.79 and 0.38, respectively; ps < .001)($p < .05$ for the indirect effect).[9]

the repeated factor was also significant, as was a separate mixed-measures ANOVA featuring perceived healthfulness of the source as the repeated factor (Fs > 13.33, ps < .001).

[9] As in Experiment 1, an alternative mediation model featuring perceived food healthfulness as the mediating variable revealed a smaller but still significant indirect effect (–0.14 with a 95% confidence interval of –0.26 to –0.05).

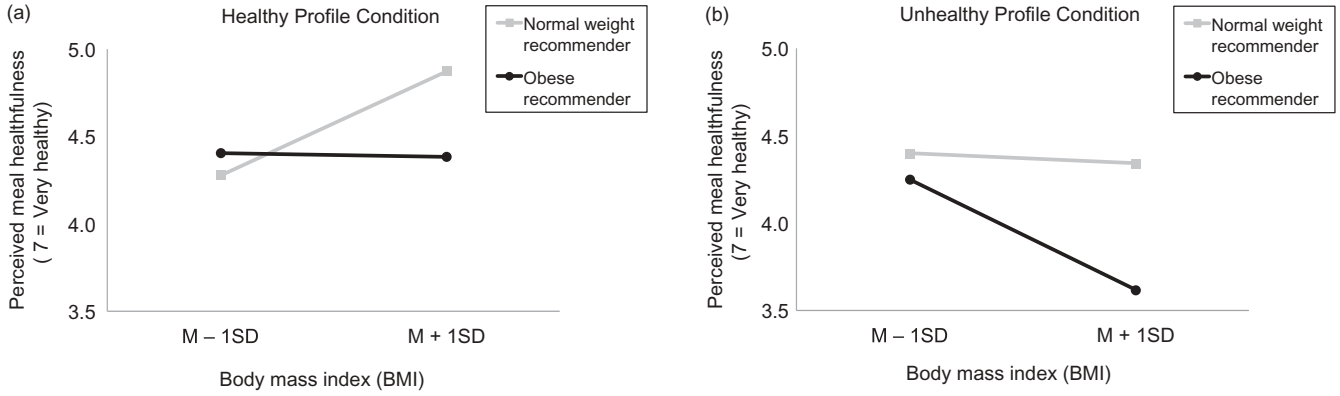

FIGURE 4 Graphs depicting the interaction between source weight status and participant body mass index (BMI) in Experiment 2, separately for healthy (left) and unhealthy (right) nutrient profile conditions.

Discussion

The present results build on those of Experiment 1 in important ways. First, we replicated the main effect of recommender/source weight status, such that the same meals were perceived as less healthy when posted to a social networking site by a person who appeared obese rather than of normal weight, even when controlling for objective nutritional information (namely, calories and fat content). Moreover, while Experiment 2 replicated the previous mediating effect of stereotypic beliefs about the source as a generally healthy/unhealthy person, the moderating effect of gender from Experiment 1 was not replicated. Instead, BMI emerged as the only significant moderator, such that higher-BMI participants were particularly likely to judge meals as less healthy when recommended by an obese person, an interaction pattern that took distinct forms for meals accompanied by healthy versus unhealthy nutrient profiles.

These differing interaction patterns may offer initial insights into the conditions under which identity variables shape the effect of a source's weight status on nutrition judgments. For example, the observation that BMI correlated positively with healthfulness perceptions for "healthy" meals recommended by a normal weight source, but correlated negatively with healthfulness perceptions for "unhealthy" meals recommended by an obese source, suggests that stigmatized individuals may be especially attentive to information that confirms preexisting weight-based stereotypes (i.e., "persons with normal weight are healthy eaters"; "persons with obesity are unhealthy eaters"), perhaps reflecting the heightened salience of these stereotypes among this group in particular (for a related discussion see Hogg & Turner, 1987; Turner, Hogg, Oakes, Reicher, & Wetherell, 1987). Moreover, the differing moderators that we observed across studies (gender in Experiment 1, BMI in Experiment 2) may similarly hold clues regarding when and how weight-related identities guide nutrition judgments in response to relevant social cues, a point we expand on in the general discussion.

GENERAL DISCUSSION

Despite decades of research into the consequences of dietary choices for health and longevity, the public appears to be profoundly confused about which foods constitute healthy choices. For instance, surveys find that the majority of Americans consider their diet to be "somewhat" or "very healthy," an observation that is difficult to reconcile with concurrent reports of actual consumption choices (Gallup, 2013). Meanwhile, record numbers of people are seeking health and nutrition information from online sources including social media sites, platforms that typically feature the sharing of food-related content alongside information about other users (e.g., Pinterest) (Banas, 2008; Cox & Blake, 2011; Eastin, 2001; Fox, 2011; Lynch, 2010).

Within this context, it is important to understand the factors that shape whether foods are perceived as healthy or unhealthy. Complementing a growing literature on the biasing role of visual cues in nutrition judgments (e.g., Chernev, 2011; Wansink, Painter, & North, 2005), the present research focused on the apparent weight status of a person recommending food as one underexplored factor. Although a person's weight status logically bears little on the nutritional content of any given meal with which they are associated, the stereotype of persons with obesity as consumers of high-calorie junk foods (e.g., Hill & Silver, 1995; McClure, Puhl, & Heuer, 2011; Puhl & Heuer, 2009) led us to expect that observers would perceive the same set of foods as less healthful when recommended by someone who appeared to be obese rather than of normal weight. Results from two experimental studies supported this prediction. Importantly, this effect persisted when controlling for the effect of more nutritionally diagnostic information (namely, "healthy" vs. "indulgent" labels in Experiment 1; relatively healthy vs. unhealthy nutrient profiles in Experiment 2) and appeared to be mediated by the belief that an obese recommender is an unhealthy person in general, further suggesting that this effect is rooted in weight-based stereotyping and prejudice. These observations suggest that the apparent weight status of

others may be a consequential determinant of whether or not foods are perceived as healthy.

The present findings may also provide insight into the processes that underlie the observed effects. In line with previous literature suggesting that females may be more attentive to others' weight status during social interactions (McFerran et al., 2010a), Experiment 1 revealed that women were particularly likely to view meals recommended by an obese individual as less healthy. In Experiment 2, however, only BMI moderated this effect, such that higher-BMI participants perceived meals recommended by an obese individual as less healthy. Although a satisfactory explanation for these patterns awaits future research, we note that the distinct information environments that participants faced across these studies may offer clues. For instance, numerous studies suggest that women seek out nutritional information more often than men (e.g., Biltstein & Evans, 2006; Nayga, 1997; 2000; Satia, Galanko, & Neuhouser, 2005); in the absence of such information, women may fall back upon weight-based stereotypes as a heuristic when formulating nutrition judgments. At the same time, these data suggest that objective nutritional content information may markedly affect nutrition judgments when consistent with preexisting weight-based stereotypes (e.g., when a person with obesity recommends a high-fat, high-calorie meal)—stereotypes that themselves may be more salient among higher-BMI individuals who face chronic weight stigma in modern society, consistent with previous observations in the social psychology and consumer literatures (Hogg & Turner, 1987; McFerran et al., 2010a; Nayga, 1997).

Our results also carry implications for understanding the extent to which nutrition judgments are driven by relatively deep processing as compared to relatively shallow processing of health-related information (e.g., Chaiken, 1980; Petty & Cacioppo, 1986). Numerous studies in the persuasion literature present audiences with two types of information: that which is central to the judgment at hand (e.g., argument quality) and that which is less so but can nevertheless sway attitudes and beliefs (e.g., physical attractiveness of the message source) (e.g., Pallak, 1983; Petty & Cacioppo, 1984). Central cues are theorized to have more impact than peripheral cues when audiences are motivated and able to deeply process (or "elaborate") messages, conditions often satisfied when messages are high in personal relevance (Petty & Cacioppo, 1986). Although the present studies did not feature an explicit persuasive attempt per se, they did feature cues that were more central (calories and fat content) as well as more peripheral (recommender/source weight status), as well as weight-relevant individual differences variables that may speak to personal relevance and involvement (e.g., gender, BMI).

Regarding whether the present results are rooted primarily in heuristic as opposed to systematic processing, our findings appear to offer mixed support. On the one hand, our observation that the physical appearance of a person recommending food influenced nutrition judgments even in the presence of objective nutritional information suggests that the rapid and associative processes characteristic of heuristic thinking are at least partly responsible for these effects. On the other hand, we also observed larger effects of recommender/source weight status among females (Experiment 1) and higher-BMI participants (Experiment 2), groups that from a relevance perspective might have been expected instead to be influenced more by central cues (e.g., calories and fat content). While this pattern may seem surprising in light of many dual-process models of judgment, it is not unprecedented: As mentioned earlier, previous research has documented greater effects of health-related visual cues on calorie judgments among participants presumed to have higher issue involvement (e.g., "the dieter's paradox"; Chernev, 2011). Although the present experiments were not designed to disentangle the relative contributions of heuristic and systematic processes, we would note that the influence of peripheral cues does not necessarily imply heuristic processing. For instance, it is possible that observers explicitly reasoned that, all else being equal, persons with obesity are relatively more likely to prepare and recommend less healthful and more energy-dense meals—an inferential process that may be more likely under high issue relevance.[10] Future research should examine these processes in greater detail.

Some limitations of this work are worth noting. First, both experiments featured a female source recommending the foods, which may help explain the moderating effect of gender observed in Experiment 1. Although we deliberately employed a female target, given that women are especially likely to engage in food blogging (Lynch, 2010), future research that manipulates the gender of the message source may extend our understanding of this effect, including its generalizability. Second, although our mediation analyses suggest that individual differences in weight bias play an important role in this effect, further work should employ established measures of this construct (e.g., the Fat Phobia Scale; Bacon, Scheltema, & Robinson, 2001) to better test this possibility. Additionally, the research design may prompt questions regarding the effect's directionality, given that the present experiments omitted a no-photograph control. While including such a condition may help illuminate whether normal weight or obese depictions exert greater influence on nutrition judgments from baseline, we instead chose to prioritize controlling for the message source—the recommender herself—using before-and-after weight loss images. We would also note that although the reported effect sizes are relatively modest (ds $\sim$.30), they were produced by a subtle photographic manipulation that was employed alongside more nutritionally diagnostic information, which itself produced similarly sized effects.

[10] As an anonymous reviewer suggested, our observation that the present effect was mediated by explicit endorsements of the source as a generally healthy/unhealthy person is at least suggestive of more systematic processing of the weight status cue.

Beyond its relevance to everyday nutrition judgments, this work contributes to the large literature on halo effects in communication and psychology that highlights how initial, general impressions of others can shape subsequent, specific evaluations in evaluatively consistent ways (e.g., Asch, 1946; Kelley, 1950; Nisbett & Wilson, 1977). While our findings are consistent with other well-documented halos emanating from physical attractiveness (Dion, Berscheid, & Walster, 1972), extant research has mainly explored how physical attractiveness impacts perceptions of the target's personality (e.g., warmth, sociability). In contrast, our work suggests that appearance-based impressions of strangers can affect evaluations of objects with which they are associated (here, food), halos strong enough to overcome the influence of more central, highly judgment-relevant information that should constrain such effects (e.g., objective nutritional content).

We end by noting some implications of this work for public health. Complementing other recent research reporting that important health decisions are sometimes swayed by the weight status of people who provide that information rather than the merits of the information itself (e.g., as when the public discounts medical advice from obese physicians; Puhl, Gold, Luedicke, & DePierre, 2013), the present findings suggest that well-intentioned recommendations about healthy diet choices may be ineffective when they are attributed to a person with obesity. More broadly, in an age characterized by a high prevalence of obesity, online health information seeking, and a rapidly expanding social Web, this work underscores the need to better understand how incidental and seemingly irrelevant features of Web-based social encounters can affect users' most basic health-related judgments and perceptions.

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