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**I Tweet, They Follow, You Eat:
Number of Followers as Nudge on Social Media to Eat More Healthily**

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1. Introduction

Health risks associated with unhealthy eating have been largely documented (i.e., Cecchini et al., 2010; Gakidou et al., 2016; Olshansky et al., 2005). Recently, obesity has again been identified as one of the leading causes of noncommunicable and preventable diseases worldwide (Swinburn et al., 2019), despite all interventions to stimulate healthy eating. This outcome suggests that interventions may have to focus on another barrier that still restrains people from making healthier food choices – in addition to the barriers traditionally addressed (e.g., insufficient nutritional information, lack of perceived palatability of healthy food, etc.) – but that has been somewhat overlooked: the social value of food.

Food choices are indeed largely driven by social factors: they signal social identity and are used to judge others (Berger and Rand 2008; Stead et al., 2011). Interestingly, a recent stream of research stresses that healthy food still suffers from a low social value (Cruwys et al., 2015; Elliott, 2014; Stead et al., 2011); in other words, healthy food tends to conflict with the norms of groups, and this could very well explain why people still curtail their healthy food consumptions (Munt et al., 2017). It is noteworthy that individual factors do not seem critical in explaining this conflict (Cruwys et al., 2015). Therefore, as long as unhealthy food benefits from a more popular (i.e., more socially desirable) value, than that of healthy food, healthy food might present a too strong a disadvantage to convince people to change their current consumption. That is why the question is raised whether one can improve the – currently less – desirable social value of healthy food and, as such, stimulate people to make healthier food choices. To do so, this research relies on the nudging literature.

Nudges are simple interventions that change individuals' choice architecture and lead them to act in a predetermined direction without limiting their freedom of choice (Thaler and

Sunstein, 2008). Proposing larger plates for healthy food in cafeterias (DiSantis et al., 2013), setting healthy food at eye level in stores (Foster et al., 2014), using low-fat labels or green stickers to emphasize the healthiness of choices (Kiesel and Villas-Boas, 2013; Olstad et al., 2015) are examples of nudges that stimulate healthier eating (for a recent review, see Cadario and Chandon 2019). Nudges used to stimulate healthy eating are effective (Cadario and Chandon, 2019) but need to compete with intensive promotions and communications by the unhealthy food industry. Strikingly, the unhealthy food industry very often stresses the social dimension of unhealthy food in their communications, i.e., by showing the conviviality of a barbecue, of a shared pizza or a beer. Considering all of the above, we argue that a nudge that emphasizes the social dimension of healthy food and, as such, improves the social value of healthy food may stimulate healthy eating.

Recently, social nudges – nudges that rely on social factors such as a mere mention of what the majority thinks or a simple phrase pronounced by a cafeteria staff member - have been reported as effective (Furth-Matzkin and Sunstein, 2018). However, only a limited amount of research in the healthy eating domain has examined social nudges (see Cadario and Chandon, 2019, for a review), and to the best of our knowledge, the process explaining their effectiveness has not been investigated. Based on the social influence literature and, notably, the theory of Influence of Presumed Influence (IPI) (Gunther and Storey 2003), we argue that the social value of healthy food can be improved if recommended by people who are perceived to have a strong social influence on others.

Finally, social media – applications that allow the creation and exchange of user-generated content (Kaplan and Haenlein, 2010, p. 61) – appear to be effective media for spreading a social nudge for healthy eating. First, social media are online social networks that

have the potential to disseminate innovation or social ideas to a large number of people quickly and inexpensively (Aral and Walker, 2011; Burt, 1987, Kleinberg, 2008). Second, social media have successfully been used in health contexts (Chau et al., 2018; Dahl et al., 2016, Neighbors and Lewis, 2016, Schillinger et al., 2020). Third, and most central to this research, on social media, simple cues, such as the number of followers, indicate how much social influence a person has on others and could thus perhaps serve as a social nudge for healthy eating.

Interestingly, it should be stressed that lay expertise indeed appears as highly valuable source of information on health issues (Rueger et al. 2020; Wang et al., 2019). These three reasons support the relevance of investigating the effectiveness of the number of followers as a social nudge to trigger healthy eating on social media.

This research, therefore, seeks to answer the following four questions: (1) does healthy food indeed suffer from a lower social value than unhealthy food? (2) can one actually improve the social value of healthy food, and more specifically (3) can the number of followers on social media serve as a social nudge to improve this social value? and (4) what is the mechanism that will improve the social value of healthy food?

In this research, a pre-study first investigates the main assumption that is driving this research and according to which the social value of healthy food is low. As this main assumption is validated, experiment 1 tests whether a high (versus low) number of followers on social media serves as a healthy eating nudge that has the potential to reach a large audience. Experiment 2 tests the process that explains the effectiveness of the social nudge on healthy eating intentions. By providing evidence for the effectiveness of and the social process behind social nudges, this research contributes to different streams of research: social sciences and health, nudges and communication. More specifically, it offers new insights to the nudge literature by explaining

how social triggers may be used in health communication, and it increases our understanding of the social role of (healthy) food and explains the process behind the social trigger. From a pragmatic perspective, this research shows how social media may be used to widely spread the idea that healthy food is popular. As such, this study also proposes solutions to strengthen the dissemination of nudges.

2. Theoretical Background and Hypotheses Development

2.1. Relevance of “Social Value” for Healthy Food

Food can signal social identity and influence social acceptance and belonging (Berger and Rand 2008; Cruwys et al., 2015; Stead et al., 2011). In many groups and cultures, social factors drive food choices, not only relative to what to eat or how much to eat (Binder et al. 2019; Cruwys et al., 2015; Fox and Ward, 2008; Herman, 2015) but also as an influence on perceptions of tastiness (Bellisle et al., 2004; Binder et al. 2019; Poor et al., 2013). One of the explanatory reasons why healthy eating is not widely adopted may be that healthy food still holds a rather negative social value compared to that of unhealthy food (Elliott, 2014). For instance, whereas broccoli is perceived as unpopular and boring and eggs as nerdy (Elliott, 2014), items of junk food such as soft drinks, candy bars or cakes are associated with “cool” (Elliott, 2014; Schor and Ford, 2007), “popular” (Elliott, 2014, Roberts and Pettigrew, 2013) and “fun” (Elliott, 2014).

However, social modeling, whereby people use others’ eating as a guide for what and how much to eat, occurs predominantly in unhealthy consumption situations (Cruwys et al. 2015). In other words, the mere evocation or presence of others seems to increase consumption

quantities and the expected taste of palatable and unhealthy food (Herman et al., 2003; Herman, 2015, 2017; Nakata and Kawai, 2011; Poor et al., 2013). However, healthy food palatability is not influenced by the representation of others (Binder et al., 2019; Poor et al., 2013). This outcome suggests that merely showing people who eat healthy food does not seem to be sufficient to improve the social value of healthy food (Binder et al., 2019) and nudge people into healthy eating.

The reason for this outcome can be twofold. First, it is largely documented and widely accepted that healthy food is not sufficiently supported by promotional communication that would encourage its consumption (Cairns et al., 2013; Goldberg and Gunasti, 2007), while unhealthy food is (Binder et al., 2019, Swinburn et al., 2019; W.H.O., 2014). Indeed, children and parents rate foods that are more heavily promoted as more pleasurable than foods that are less heavily promoted (Roberts and Pettigrew, 2013). Second, while communication strategies promoting unhealthy food tend to focus on the social dimension (emphasizing the social benefits of consuming junk food, e.g., pleasure of sharing) (Schor and Ford, 2007), when healthy food is promoted, its functional or nutritional value is usually emphasized (Pettigrew, 2016).

Communication programs designed to stimulate healthy eating rarely consider the concept of food pleasure (Cairns, 2013). Only recently did research really start to stress the relevance of considering pleasure to enhance intervention effectiveness (for a few examples, see Marty et al., 2018; Pettigrew, 2016; Rodney, 2018) and, to the best of our knowledge, only a few intervention programs have integrated pleasure as a component, for instance the “We love Eating” program funded by the European Union (launched in September 2014) and the VIASANO program (Vinck et al., 2016). Therefore, the association between healthy food and a positive social value is at best unfamiliar (Elliott, 2014) and at worst not credible. Restoring the communication

balance by instilling the idea that healthy food is validated by many other individuals could encourage healthy consumption (Goldberg and Gunasti, 2007). This outcome has been shown in a study on children where the most effective driver in convincing children to eat healthy food was the threat to their social acceptance (in comparison with threats to physical integrity or health) (Charry and Pecheux, 2011).

Nevertheless, merely showing advertisements with people having fun while eating salads may indeed be against the norm instilled by heavy unhealthy food advertising and not be perceived as credible. It would thus be ineffective at improving the social value of healthy food. It seems necessary to find other ways to build the association between healthy food and social situations. Therefore, this research focuses on more subtle interventions, namely, nudges.

2.2. Relevance of “Social Nudges” in Promoting Healthy Food

Research has identified three main categories of nudges: cognitive, affective, and behavioral nudges (Cadario and Chandon, 2019). Cognitive nudges rely on knowledge changes, such as improving the nutritional knowledge of individuals. This may be achieved through clearer energy information or nutrition labeling on packaging (Lembregts and Pandelaere, 2013; Wansink and Chandon, 2014) or stressing positive health consequences of healthy dietary choices (e.g., Brug et al., 2003). Behavioral nudges “automatically” modify behaviors without changes in knowledge or affect. For example, separators placed between every 10 chips in potato chip packs (Wansink and Chandon, 2014) or food served in plates of a color similar to the food (Van Ittersum and Wansink, 2012) seem to automatically lead to changes in perceptions of quantities and hence, quantities consumed, without changing *per se* knowledge or affect. Affective nudges call out to emotions to modify food choices (without altering knowledge).

Social nudges are classified as affective nudges as they seem to thrive on the affective power of social influence (Cadario and Chandon, 2019).

This third category is of particular interest to us for two main reasons. First, as mentioned above, food appears to have a crucial social function; second, these affective nudges actually outperform cognitive nudges (i.e., informing people about the nutritional benefits of healthy food) (Cadario and Chandon, 2019). One, however, needs to consider how to effectively disseminate this social nudge.

2.3. Relevance of Social Media in the Promotion of Healthy Food

It was argued earlier that social media appear adequate for achieving our objective for various reasons. First, social media are effectively used to disseminate innovations and social ideas (Aral and Walker, 2011; Burt, 1987; Kleinberg, 2008). Second, the use of social media has increased exponentially in the health education domain (Chau et al., 2018, Schillinger et al. 2020); not only is it considered by the various stakeholders as an opportunity to communicate (Rutsaert et al., 2014) but it has also been shown to stimulate recommendable behaviors (Chau et al., 2018; Fergie, Hunt and Hilton, 2016; Schillinger et al., 2020). Third, social media use is strongly related to social identity and social value construction (Steinfeld et al., 2008). Considering that social media are used by nearly one out of three people worldwide (Clement, 2019b), social media may arguably be ideal contexts to improve the social value of healthy food.

Finally, communication research on social media provides interesting insights about cues that may be used by individuals to infer the social value of the information posted. The number of friends or followers displayed on one's social media account, indeed seems to be an indicator

of one's social value, the more being the better (De Veirman et al., 2017; Utz, 2010). In other words, the number of followers serves as a cue to infer the social value of the owner of an account and the social acceptability of his or her opinions. In a nonhealth-related context, a high number of followers has been shown to trigger intentions to consume nonhealth-related products (Jin and Phua, 2014). We argue that, also in a health-related context, the number of followers could represent a nudge in the social media environment that improves the association between healthy food and social acceptability. A high number of followers of a particular social media account may enhance the social value of a message presented on that particular social media account and may thus help to stimulate intentions to eat more healthily.

Therefore, the following hypothesis is proposed:

H1: A high (versus low) number of followers on a social media account that promotes healthy food, leads to higher intentions to consume healthy food.

2.4. The Role of Influence of Presumed Influence

As mentioned above, in non-health-related contexts a high number of followers could positively affect intentions to consume non-health-related products (Jin and Phua, 2014). However, the underlying mechanism explaining the complete process through which changes in intentions to consume healthy food occur, as a result of social cues such as followers, has neither been proposed nor empirically demonstrated. According to the Influence of Presumed Influence (IPI), an individual's decision to behave can be affected by their perceptions that others are influenced by media (Hong and Kim, 2019; Noguti and Russell, 2014). In other words, when individuals perceive that others are influenced by media content, they subsequently modify their own

attitudes and behavior as a reaction to that perception (Gunther and Storey, 2003). Prior research has shown that the size of the audience is an antecedent to presumed influence because the perception that a large number of people are exposed to a message predicts the perception that a large number of people are affected by that message (Eveland et al., 1999). On social media, the number of followers indicates how socially valuable the message is to a large audience (De Veirman et al., 2017; Steinfield et al., 2008; Utz, 2010). Based on the IPI theory, the view that this message strongly influences others can change people's own perceptions, attitudes and behaviors in line with the recommendations in the message.

It should, therefore, be expected that the number of followers first impacts perceptions about the social value of healthy food. This impact, in turn, will influence the attitude towards healthy food, which will then influence the intention to eat healthy food.

Specifically, we hypothesize the following serial process:

H2: A high (versus low) number of followers on a social media account that promotes healthy food has a positive impact on IPI, which in turn benefits the perceived social value of healthy food, which in turn positively influences attitudes towards healthy food, which finally increases healthy eating intentions.

To test these hypotheses, a pre-study and two experimental studies were conducted. The objective of the pre-study was to support our assumption that healthy food is still perceived as having less social value than unhealthy food, as our research relies on this assumption. Study 1 shows that a simple nudge on social media (i.e., the number of followers) increases people's intentions to eat more healthily. Study 2 further investigates the serial mechanism that explains

the changes in intentions to eat healthily. First, we test whether the number of followers actually serves as a social cue that indicates the perceived influence of the source of the message (IPI) and whether it, in turn, benefits the perceived social value of healthy food. Then, we check whether this increased social value of healthy food positively influences attitudes towards healthy food and how this attitude positively impacts healthy eating intentions. All data in these studies are de-identified. Because of our use of Amazon Mechanical Turk (MTurk) for recruitment and our sample population of non-vulnerable adults, we met the criteria given by our institutions for human subjects research that does not require review and ethical clearance: (1) MTurk implies that all participants provided informed consent and were treated equally, (2) the topics asked about were not of a sensitive nature, and (3) no unintended consequences or risks other than everyday life could be foreseen.

3. Pre-Study

To verify the assumption that a barrier for people in choosing healthy food is the low perceived social value of healthy food, a survey was set up with two scenarios that each implied a food choice in a private and in a social setting.

To avoid socially desirable answers, the pre-study did not directly ask for the participants' own choice, but instead, to imagine what most of their friends would choose. Table 1 presents the four questions and choice options in different scenarios and settings. All participants answered all questions, while the order of 'Setting' was randomized within 'Scenario' and the order of 'Choice Options' was randomized within 'Question', to avoid any halo effect. Participants could choose only one of the two choice options. The questionnaire ended with sociodemographic questions (e.g., gender and age).

INSERT TABLE 1 ABOUT HERE

Ninety-six American respondents aged between 21 and 68 (M age = 34.55; 57.3% men) completed the pre-study. Data were collected via Amazon Mechanical Turk (i.e., a US online labor market commonly used for social and behavioral science research (Berinsky et al., 2012; Furth-Matzkin and Sustein, 2018; Paolacci et al., 2010), where people execute tasks such as participating in studies in exchange for small incentives).

Choices were compared in the social versus private setting by means of a McNemar test. For ‘Side Dish’, the proportion of the healthy option (mixed salad) is significantly lower in the social setting (24.0%) than in the private setting (35.4%) ($p = .043$). As far as ‘Snack’ is concerned, the proportion of the healthy option (pieces of fruit) is significantly lower in the social setting (24.0%) than in the private setting (36.5%) ($p = .012$). The same healthy option being significantly less chosen in social settings compared to private settings supports the tenet that healthy food still suffers from a low perceived social value. Study 1 will now investigate whether a social nudge can positively influence healthy eating intentions, and tests this by manipulating the number of followers of a social media account that promotes healthy food.

4. Study 1

4.1. Design and Sample

To test H1, an experiment with two between-subject conditions was set up in which we manipulated the number of followers (high versus low). Data were collected via MTurk, and 290 American participants between 17 and 75 years old ($M_{age} = 34.80$; 50% men) completed the experiment. An independent-samples t -test and χ^2 analysis showed no significant differences between conditions with respect to age ($p = .526$) and gender ($p = .481$).

4.2. Experimental Procedures

In selecting a social media platform to act as our disseminating medium at the time of data collection, we decided to focus on Twitter. Twitter is one of the most popular and influential social media, with over 330 million monthly active users worldwide (Clement, 2019a). The main advantage of Twitter is that its users come from different age groups ranging from under 18 to over 65 (Clement, 2020); thus, communications on Twitter has a broad reach. As such, focusing on Twitter in this study could eventually broaden the validity of our contributions to many categories of individuals. We created two mock Twitter pages that were identical except for the number of followers (23 versus 423,000 followers). These pages will represent our two experimental conditions. In both conditions, two tweets about healthy food were presented: one talked about a healthy salad lunch and was accompanied by a picture, and the other mentioned a fresh fruit salad. The source of the message (i.e., the owner of the Twitter account) is unknown to participants, as she was created for the sake of this study (see Appendix). Participants were randomly assigned to only one of two conditions so that each participant was exposed to only one social media page. i.e., either one with a high or a low number of followers. After watching the assigned Twitter page, participants responded to items assessing their healthy eating intentions.

4.3. Measures

Our rationale is that a better social value of healthy food triggered by a social nudge will lead to positive associations (Elliott, 2014; Stead et al., 2011) and will consequently influence healthy eating intentions. The dependent variable *healthy eating intentions* was measured by means of three items on a 5-point Likert scale (ranging from 1 = ‘not at all’ to 5 = ‘definitely’): (1) ‘These tweets make me want to try salads more often’; (2) ‘These tweets make me want to add salads to my menus’; (3) ‘These tweets make me wish I would eat more salads’ (Bruner and Hensel, 1996). After validating the reliability of the scale (healthy eating intentions: Cronbach’s $\alpha = .97$), a composite measure was constructed by averaging responses to the composing items (a common procedure used in quantitative research for internally reliable scales).

Then, a manipulation check was included, i.e., a test to verify that participants exposed to the page with a high number of followers correctly perceived that the Twitter account was followed by a higher number of people in comparison with individuals exposed to the page with a low number of followers. If that is so, then our manipulation of the number of followers is successful. To this end, we asked with one item whether, according to them, the blogger had many followers on a 5-point Likert scale (ranging from 1 = ‘definitely not’ to 5 = ‘definitely yes’).

4.4. Data Analysis

IBM SPSS was used for data analysis. Independent samples *t*-tests were run to test the impact of the two conditions (i.e., high versus low followers) on the manipulation check and on the

dependent variable as stated in Hypothesis 1.

4.5. Results

Manipulation check. An independent samples t-test run on the manipulation check showed a significant difference in perception of number of followers between the two conditions ($t(280.96) = -13.82; p < .001$), indicating that our manipulation of the number of followers was successful ($M_s = 4.13$ vs. 2.31).

Dependent variable. To test Hypothesis 1, a one-sided independent samples t-test was run with the manipulated variable ‘number of followers’ as the independent variable and the measured variable ‘healthy eating intentions’ as the dependent variable. Results show that a high (versus low) number of followers leads to higher healthy eating intentions ($M_s = 3.07$ vs. 2.79 ; $t(288) = -1.81, p = .036$). These results provide support for Hypothesis 1.

4.6. Discussion

Study 1 provides support for our first hypothesis. Results show that merely increasing the number of followers of a social media account that discusses healthy food can positively influence people’s intentions to eat more healthily. The aim of Study 2 is to demonstrate the role of social drivers in these results. More specifically, Study 2 tests whether a higher number of followers leads to a higher influence of presumed influence, which in turn benefits the social value of healthy food, the latter leading to a more favorable attitude towards healthy food and therefore increasing people’s healthy eating intentions. Moreover, Study 2 will also measure health perception of the presented food to support our assumption that respondents in both conditions indeed perceive the food in the Twitter post as healthy. This approach should rule out

the potential alternative explanation that the results are driven by a difference in perceived food healthiness.

5. Study 2

5.1. Design and Sample

To test H2, a similar experiment as in Study 1 was set up. Data were collected via MTurk, and 182 American participants between 22 and 74 years old (M age = 39.3; 55.5% men) completed the experiment. An independent-samples t-test and a chi-square analysis show no significant differences between conditions with respect to age ($p = .992$) and gender ($p = .540$).

5.2. Experimental Procedures

As in Study 1, participants had to watch a Twitter page with either a low or a high number of followers. The stimuli were identical to those in Study 1 (see Appendix). This study measured participants' attitude towards the food presented in the Twitter posts, healthy eating intentions, social value of healthy food, health perception of the food presented on the Twitter page, using a manipulation check of the number of followers, influence of presumed influence, and sociodemographic measures.

5.3. Measures

Healthy eating intentions were similarly measured as in Study 1. *Attitude towards the healthy food* presented in the tweets was measured with three items on a 5-point semantic differential scale: (1) 'I don't like/like the salads'; (2) 'I'm unfavorable/favorable towards these salads'; (3)

'I think that the salads are bad/good' (Mitchell and Olson, 1981). *Perceived social value of the food* was measured with two items: (1) 'Healthy food is popular'; and (2) 'Healthy food is liked by many people' (Park et al., 2007). *Perceived food healthiness* was measured with one item, 'What is your perception about the food presented on the Twitter page', on a scale from 1 = 'very unhealthy' to 5 = 'very healthy' to validate whether the food on the Twitter page was actually perceived as healthy food. Afterwards, a manipulation check for *perceived number of followers* was included, similar to the one in Study 1. Participants could also state that they did not remember how many followers the account had. *Influence of presumed influence (IPI)* was assessed with five items based on the measures used by Gunther and Storey (2003): 'Could you now evaluate the percentage of people who read this blog and who would.. (1) relate to the blogger and follow her suggestions; (2) get ideas from the blogger; (3) imitate the blogger; (4) learn things from the blogger; (5) be interested in things proposed by the blogger'. After verifying the reliability of the scales (attitude towards the food: Cronbach's $\alpha = .95$; healthy eating intentions: Cronbach's $\alpha = .98$; social value perception: Cronbach's $\alpha = .81$; IPI: Cronbach's $\alpha = .94$), composite measures were constructed by averaging responses to the composing items.

5.4. Data Analysis

To test the process that drives the positive impact of the number of followers on individuals' healthy eating intentions (Hypothesis 2), serial mediation analysis was performed using PROCESS for SPSS (Hayes, 2013). Mediation analysis is commonly used in social and behavioral sciences to test whether the data are in line with presumed causal relationships (e.g., Carpiano and Fitz 2017; de Vries et al. 2013). Serial mediation assumes "a causal chain linking

the mediators with a specified direction of causal flow” (Hayes, 2012, p. 14). Hypothesis 2 assumes that a high (versus low) number of followers increases IPI, which increases the perceived social value of healthy food, which in turn increases attitude towards healthy food and thus increases behavioral intentions towards healthy food (i.e., followers → IPI → perceived social value → attitudes → intentions). In PROCESS (Model 6), we entered healthy eating intentions as the dependent variable, number of followers as the independent variable, and IPI, perceived social value, and attitude towards healthy food as serial mediators in the hypothesized order. Bootstrapping with 10,000 resamples was used to estimate the indirect effect at a 95% confidence interval (CI).

5.5. Results

Manipulation check. An independent samples *t*-test on the manipulation check shows a significant difference in the perception of the number of followers between the two conditions ($t(132.98) = -11.52; p < .001$), indicating that our manipulation of the number of followers was successful ($M_s = 4.37$ vs. 2.13). Note that to isolate the effect of the number of followers in the process and rule out any other cause, 41 participants were excluded who indicated that they did not remember how many followers the influencer had.

Perceived food healthiness. Overall, as expected, participants rated the food presented in the Twitter posts as healthy ($M = 4.52; SD = .67$). An independent samples *t*-test shows no difference between the two conditions ($t(139) = -.94; p = .35$) (M High Followers = 4.58 ; M Low Followers = 4.47).

Mediation analyses. We tested whether IPI, perceived social value of the food, and attitude towards the food mediate in this specific sequence the effect of the number of followers

on healthy eating intentions. To test this, Model 6 of PROCESS in SPSS was used. The results (see Figure 1) show that the number of followers has a positive impact on IPI ($a = 10.48$; $p = .017$). In turn, IPI has a positive impact on the perceived social value of healthy food ($b_1 = .01$; $p < .001$). In turn, the perceived social value of the healthy food has a positive impact on attitude towards the presented food ($b_2 = .21$; $p = .019$). Finally, attitude towards the presented food has a positive impact on healthy eating intentions ($b_3 = .62$; $p < .001$). Overall, this indirect effect is significant, as the 95% bootstrap confidence interval does not include 0 ($a \times b_1 \times b_2 \times b_3 = .01$; 95% *bootstrap CI* = [.002; .052]). This result provides evidence for serial mediation. The direct effect of the number of followers on healthy eating intentions is not significant after controlling for the serial mediators ($c = -.18$; $p = .36$), which provides proof of full mediation.

INSERT FIGURE 1 ABOUT HERE

6. General Discussion

6.1. Findings and Contributions

The objective of this research was fourfold. First, this research verified whether healthy food still suffers from a lower social value than unhealthy food. Second, this research tested whether the social value of healthy food can be improved. Third, this research examined whether a social nudge (i.e., number of followers) could help to stimulate healthy food choices by increasing the social value of healthy food. Fourth, this research aimed to offer insights and proofs to the mechanism behind the effectiveness of social nudges. To this end, three studies were conducted: a pre-study and two experiments.

The pre-study corroborates that healthy food still suffers from an unfavorable social value, meaning that most people opt for unhealthy food in social settings. This outcome may be an additional barrier for many people (next to a lack of nutritional knowledge, perceived palatability, etc.) to adopt healthy eating (Munt et al., 2017). The two experiments first show that a simple nudge, namely, a high (versus a low) number of followers of a social media account that presents healthy food, can stimulate healthy eating intentions. Second, beyond replicating the main effect, the results support the relevance of classifying this nudge as a social nudge, as they show that the mechanism behind the positive effect of the number of followers on healthy eating intentions is driven by social factors. Specifically, a socially relevant source (i.e., a source with many followers) on social media appears to create the perception that many other people are influenced by this source. This presumption of social influence increases the perceived social value of healthy food presented by that source, which in turn leads to a more positive evaluation of healthy food and eventually to higher eating intentions (see Figure 1).

This research provides contributions to several areas of academic literature, such as social sciences and health, nudging, and communication literature. First, the findings extend current knowledge of the role of the perceived social value of healthy food in restraining people's healthy food choices. Although social factors are increasingly pointed to as potential explanations for people's unhealthy food choices (Cruwys et al., 2015; Stead et al., 2011), insufficient research has shown it in such a direct and quantitative way. This research directly compares individuals' choices between healthy and unhealthy products in a private and a social setting. Moreover, there is still limited focus on the promising role of social factors in overcoming the barrier to consume healthy food (Binder et al., 2019; Pettigrew, 2016). This

research identifies the number of followers of a social media account as an effective cue to enhance the social value of healthy food and therefore to nudge people into healthy eating.

Second, this research adds to the stream of nudging research in the food domain, focusing on the social dimension of food. Most prior nudging research focused on dimensions such as nutritional value, portion sizes, package, etc. (see Cadario and Chandon, 2019 for a review). Furthermore, to the best of our knowledge, the scarce nudging research focusing on the dimension of healthy food relies on real-life settings, that is, contexts in which people physically interact with the nudge such as plates in cafeterias or products packaging, limiting *per se* the dissemination to the physical properties of the nudge. Our studies use the social media context to broaden the reach offered by traditional settings in which nudges are usually implemented. We show that the effectiveness of nudges may be expanded to virtual settings, thereby enhancing its potential dissemination.

This research may also weaken the issues raised in previous research on health promotion on social media. Vaterlaus et al. (2015) indeed found that although social media could help healthy decisions by creating access to a variety of recipes or receiving inspirational achievements from others, their social nature also provided a venue for showcasing the food young adults eat or prepare (i.e., unhealthy food). As such, social media may distract young adults from making positive food choices. By restoring a balance between unhealthy and healthy food promotion on social media and using social nudges, the risk of distraction towards unhealthy food in social settings should be reduced.

Third, this research significantly contributes to the (online) communications literature by explaining the process behind the persuasive influence of online popularity cues, of which the

number of followers is only one example. Our findings indicate that the persuasive influence of popularity cues is driven by a perception of social influence.

In addition to theoretical contributions, this paper also offers relevant contributions for both public policy makers and practitioners in the health domain. First, this paper tends to confirm that social media may be efficient platforms to communicate health-related messages (Chau et al., 2018; Dahl et al., 2016; Fergie et al., 2016; Neighbors and Lewis, 2016; Schillinger et al. 2020; Vaterlaus et al., 2015). Moreover, by gaining a deeper understanding of the mechanism behind the effects, this paper may help practitioners design health-related messages. Specifically, we propose a concrete way to stimulate behavioral changes in the health domain, that is, the use of accounts that have reached a high number of followers. Popular influencers may be solicited to support such causes, notably because people naturally turn to “peers” to validate opinions in the health domain (Rueger et al., 2020). Inventive tactics to gain followers on a social media account (such as organizing contests, etc.) may also be implemented. At least two main advantages may arise from this recommendation. First, popular social media accounts can have a broad reach without a high cost (Schillinger et al. 2020). Therefore, the online environment offers an easy and inexpensive solution to nudge healthy behavior compared to the more cumbersome and expensive nudges proposed in physical environments or in the design of products and packaging (e.g., Hanks et al., 2012; Kroese et al., 2015). In addition to social media *per se*, our results could be extrapolated to other platforms, such as online grocery shopping platforms and cooking platforms, and could also be associated with other domains that could reduce obesity, such as sports platforms. All these efforts would increase the dissemination and enhancement of the social value of healthy food and help overcome an important barrier to healthy eating.

Second, a social nudge may help practitioners overcome the issues encountered with traditional advertisements for healthy food. For instance, advertisements that explicitly stress the social value of healthy food still go against the social norm currently (Cairns, 2013; Herman, 2017; Jiawei and Bailey, 2019) and may evoke psychological reactance. Psychological reactance against a persuasive message is induced when consumers feel that the message tries to limit their freedom (e.g., induces them to choose an option against another) (Brehm, 1966). This result may lead to increased counterarguments and negative feelings towards the message (Dillard and Shen, 2005), thus decreasing message credibility. As nudges are rather subtle libertarian techniques that by definition guarantee the freedom to act, psychological reactance is unlikely to occur (Bruns et al., 2018).

6.2. Limitations and Future Research

This research nevertheless presents some limitations that pave interesting paths for future research. First, the paper focuses on one specific social nudge (i.e., the number of followers). Future research should continue identifying nudges – both online and offline – that improve the social value of healthy food and compare these different social nudges in terms of effectiveness. Moreover, the effectiveness of combining different types of nudges (i.e., cognitive, affective, behavioral) should be investigated because their individual effects could interact and strengthen the overall process.

Furthermore, the design of the experiments leads people to focus their attention on the tweets of only one endorser, which may not reflect real-life situations. Social media characteristically overload individuals with information. This may limit their cognitive capacity to process every single message (Gomez-Rodriguez et al., 2014) and, as such, reinforce heuristic processing of messages (Chaiken, 1980). Nevertheless, we argue that the effects would hold as

we assume that these social cues serve as heuristics, but we did not provide evidence to it. It appears relevant to investigate further how and when social nudges are effective (i.e., whether the information is indeed processed in a heuristic or a systematic way). Heuristics in persuasion, especially in contexts where people may feel less directly motivated to process the message (Chaiken, 1980), such as public health, education, pro-environmental communication, etc. – are known to be effective, proving further that the heuristic nature of the process would underscore the value of this tool for public policymakers.

The cultural dimension also appears as a relevant element to consider (Shelton et al., 2019). As we stated earlier, food is indeed intrinsically associated with culture and sub-cultures. While we have focused on cultures that do not yet seem to value healthy food very positively in social settings, there might be cultures that already do. Nevertheless, we find little reasons to believe that our conclusions would not hold in these contexts. When an important number of people is already eating healthily in social settings, it is unlikely that the perception of more people following accounts that support healthy food behaviors would have a negative impact. This research also shows that “the more, the better.” Yet, there might be cultures or sub-cultural groups that use social media, and that grant no or a completely different sort of (social) value to (healthy) food. Future research could investigate whether our effect and process hold in these different types of (sub-)cultures and whether different processes may take place.

Then, this research looked at the effect of the number of followers on eating intentions of specific food items (i.e., salads) and not on complete dietary patterns. Although referring to singled-out food items in a dichotomized way (healthy or unhealthy) can scientifically be justified (Lobstein and Davis, 2009), and is therefore frequently used in research, we believe it is important not to demonize some food items. Furthermore, while classification of food may also

help individuals in their food choice (Kasper et al., 2016; Zenobia et al., 2017), they should be aware that it is their general diet that matters. Experts indeed usually evaluate the healthiness of what people eat from a general diet perspective (Guenther et al., 2013). Fortunately, we believe that the results of this research are also positive from that general perspective. Improving the social value of healthy food items should eventually influence the overall dietary pattern in a positive way, facilitating the mission of nutritionists and other practitioners involved in nutrition. Nevertheless, future research could consider individuals' entire dietary pattern as a potential moderator of the effects.

Finally, we acknowledge that our study only investigates short-term effects, while a change in attitudes and perceptions about healthy food is a long-term objective. Although the Attribution Theory (Heider, 1958), which states that individuals may infer attitudes from their own behaviors, may provide support to the long-term effect of nudges, this support would need to be demonstrated.

7. Conclusions

This research shows that a social media account presenting a high number of followers enhances the consumption of healthy food. A high number of followers indeed acts as an effective social nudge. This research also offers insights on the serial mediation process at work, explaining that via the influence of presumed influence, the perceived social value of healthy food is improved which eventually enhances the attitude towards healthy food and the intentions to eat healthily. Last, it provides easy-to-implement practices encouraging public policy and health associations to use social nudges.

The expression “you are what you eat” appears to apply not only to the health motivation in food choices but also to social motivation. In societies where social belonging and social capital are fuel for life, changing the social value of healthy food may represent one of the triggers for which the fight against obesity is looking.

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Appendix

The image shows a screenshot of a Twitter profile for a user named Lana (@LanaST). The profile header includes a profile picture of a woman, the name "Lana", and the handle "@LanaST". Below the name, it shows the location "Los Angeles" and a link to "youtube.com". A blue "Tweeter" button is visible. The statistics bar shows 10.3 K tweets, 43 following, and 423 K followers. The main content area displays two tweets from Lana, both posted 11 hours ago. The first tweet says "A salad for lunch. It's quick, delicious, and nutritional." and includes a photo of a fresh salad with tomatoes, peppers, and lettuce. The second tweet says "A snack that is easy to prepare and at the same time delicious: a salad with fresh fruit." and includes a photo of a salad with fresh fruit.

Twitter Page with a High Number of Followers

The image shows a screenshot of a Twitter profile for a user named Lana (@LanasT). The profile picture is a portrait of a woman with long brown hair. The bio includes the name "Lana", the handle "@LanasT", the location "Los Angeles", and a link to "youtube.com". The profile statistics are: TWEETS: 10,3 K, FOLLOWING: 43, and FOLLOWERS: 23. The navigation tabs are "Tweets", "Tweets & replies", and "Photos & videos". Two tweets are visible:

- Tweet 1:** Posted 11 hours ago. Text: "A salad for lunch. It's quick, delicious, and nutritional." Includes a photo of a colorful salad with tomatoes, peppers, and lettuce on a white plate.
- Tweet 2:** Posted 11 hours ago. Text: "A snack that is easy to prepare and at the same time delicious: a salad with fresh fruit." Includes a small profile picture icon.

Twitter Page with a Low Number of Followers

Figures

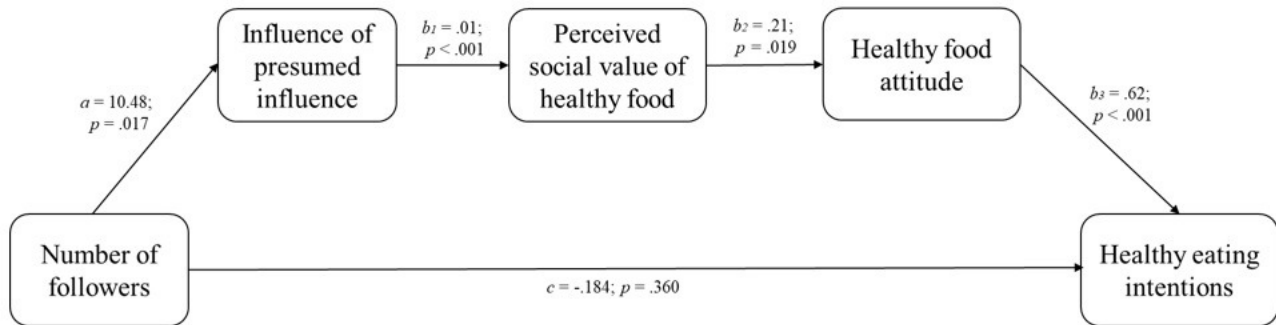


Figure 1. Serial mediation model

Table 1. Design of the pre-study.

Scenario	Setting	Question	Choice Options
Side dish	Social	According to you, what would most of your friends choose as a side dish at a restaurant in the company of other friends?	<input type="radio"/> mixed salad <input type="radio"/> fries
	Private	According to you, what would most of your friends choose as a side dish at home?	<input type="radio"/> mixed salad <input type="radio"/> fries
Snack	Social	What do you think most of your friends expect to have as a snack if they stop by another friend's place in the middle of the afternoon?	<input type="radio"/> pieces of fruit <input type="radio"/> cookies
	Private	What do you think most of your friends will have as a snack at their place in the middle of the afternoon?	<input type="radio"/> pieces of fruit <input type="radio"/> cookies