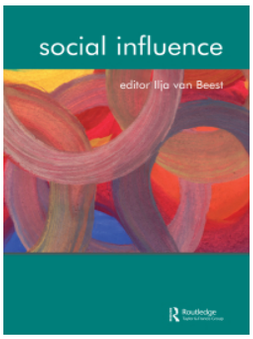

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I'll have what they're having: a descriptive social norm increases choice for vegetables in students

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ABSTRACT

Social information, such as norms, influences behavior. Descriptive norms can be used to guide behavior toward healthier choices. Here, we examined the effect of a descriptive norm on the choice between two similar products (vegetables or fruits). Participants were exposed to a norm promoting vegetables, fruits, or no norm in a remote confederate design. A descriptive norm signaling that a greater proportion of previous participants had chosen a vegetable over a fruit basket tripled the odds of participants choosing vegetables. We found no to small effects of norms on intentions to consume fruits and vegetables or on taste expectations and experiences in a taste test. These findings suggest that descriptive norms may serve as a heuristic to guide food choices in certain choice settings involving similar options.

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Social norms; social modeling; food choice; healthy food; vegetables

People are inherently social beings who seek to belong and be accepted by others (Baumeister & Leary, 1995; Robinson et al., 2011). They pursue this by following social norms that inform them how to behave appropriately in a given situation (Cialdini et al., 1991; Higgs, 2015). For example, people model the amount or type of food they eat based on what others around them consume (Cruwys et al., 2015; Vartanian et al., 2015). For this reason, social norms are frequently employed in behavior change efforts aimed at improving health behaviors.

There are two types of social norms: injunctive norms, which prescribe what is generally accepted behavior, and descriptive norms, which provide information about what other people do (Cialdini et al., 1991; Higgs, 2015). For example, an injunctive norm about eating behavior is that 'you must eat at least five portions of fruits and vegetables a day'. And an example of a descriptive norm is observing people in the supermarket adding fruits and vegetables to their shopping carts.

Exposure to these norms is thought to align an individual's behavior with the corresponding norm. However, the evidence for the efficacy of injunctive norms is mixed, with some findings suggesting that they can induce resistance generated by a sense of intrusion on personal freedom (Stok et al., 2016). On the other hand, descriptive norms

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are important predictors of intentions and behavior within the framework of the Theory of Planned Behavior (ToPB; Ajzen, 1991; Rivis & Sheeran, 2003) and have been found to effectively promote healthier food choices in both laboratory and field settings. In general, these studies demonstrate that people eat more healthy food (e.g., more vegetables) or are more likely to choose healthy over unhealthy foods (e.g., salad over burger) when they are informed that others around them do so (e.g., in a remote confederate design; Burger et al., 2010; Robinson, Thomas, et al., 2014, or through posters containing a social norm message; Mollen et al., 2013; Thomas et al., 2017).

These effects are contingent on the specific referent category and the targeted behavior (Cruwys et al., 2015; Stok et al., 2016). People are more likely to follow the behavior of people who are part of their ingroup (Cruwys et al., 2012), and normative information has a stronger influence on behaviors that are performed less frequently (Robinson et al., 2014). The latter effect may be explained by the fact that habitual behaviors are less dependent on external triggers because they occur frequently and without much conscious thought and effort (De Houwer et al., 2022).

Less explored is the influence of norms on choices between similar options. As mentioned above, previous research has predominantly focused on increasing the consumption of healthy foods, or selecting healthier options over less healthy ones. However, an increase in the consumption of a healthy food does not necessarily entail a decrease in the consumption of unhealthy food (Looney & Raynor, 2012; Robinson et al., 2013), and a choice between a burger and a salad is not representative of everyday food choices. Therefore, the primary aim of the current study was to examine whether a descriptive norm could influence the choice between two similar products, namely fruits and vegetables.

Although fruits and vegetables are similar in nature and are often grouped together, vegetables offer superior nutritional properties, especially those that are high in a type of fiber called inulin-type fructans (ITF), such as leeks, (Jerusalem) artichokes and salsifies (Kalala et al., 2018). These vegetables have positive effects on the microbiota and help regulate appetite (Hiel et al., 2019). To promote their consumption, they should not be compared to burgers but to other healthy foods that do not have the same nutritional benefits, such as vegetables with lower ITF or fruits (Mudannayake et al., 2022).

Furthermore, while norms measured within the context of the ToPB are highly correlated with intentions to perform a given behavior in the future (Rivis & Sheeran, 2003), it is unclear whether momentarily activated norms can produce similar effects. Therefore, a second objective of this study was to explore whether descriptive norms influence participants' intentions to consume more fruits and vegetables in the future.

One potential explanation for how norms influence food choices is by modulating reward expectations or experiences which subsequently guide behavior (Piqueras-Fiszman & Spence, 2015). Just as people attribute better taste to more expensive wines (Almenberg & Dreber, 2011), positive reward associated with norm-consistent, or negative reward with norm-inconsistent behavior, may be attributed to the taste of a product. For example, Robinson et al. (2012) found that exposing participants to normative information indicating that others dislike orange juice led to more negative taste experiences of the juice. However, these findings contrast with another study that reported no effect of a descriptive norm on taste ratings of an insect burger (Berger et al., 2019).

Therefore, a third objective of this study was to examine whether descriptive norms affect taste expectations and experiences of fruits and vegetables.

The present research

We assessed a sample of young Belgian adults who have among the lowest adherence to recommended national guidelines. A mere 10% of male and 18% of female participants consumed at least two portions of fruits and three portions of vegetables a day (Drieskens et al., 2019). Furthermore, consumption of vegetables high in ITF among this population was negligible (Broers, 2019).

Based on the reviewed literature, we expected that participants exposed to a vegetable descriptive norm would be more likely to choose a vegetable basket than participants exposed to a fruit descriptive norm or to a control condition with no norm (Hyp. 1), and that participants exposed to a fruit descriptive norm would be more likely to choose a fruit basket compared to when exposed to no norm (Hyp. 2). In addition, we expected that in the no-norm condition, participants would be more likely to choose the fruit than the vegetable basket (Hyp. 3a) because people tend to prefer fruits over vegetables (Glasson et al., 2011), but that this difference would be smaller than that in the fruit norm condition (Hyp. 3b). Lastly, we expected that the descriptive norms would have a larger effect on participants who consume vegetables (in the vegetable condition) or fruits (in the fruit condition) less frequently (Hyp. 4).

In addition, we explored whether descriptive norms influence intentions to consume fruits and vegetables in the future, and whether they affect taste expectations and experiences of fruits and vegetables.

We pre-registered our hypotheses and methodology on the Open Science Framework where all materials, data, and analysis scripts can be accessed: https://osf.io/d4c8y/?view_only=39c2b2ebcd0740818cf88fd33a64ee29. Additional information and analyses that do not bear on the findings reported in this brief report can be found here and in the Supplementary Online Material (SOM).

Method

Participants and design

Based on a power analysis for chi-square (Hyp. 1), we needed 141 participants to detect a medium effect size ($w = 0.3$) with 90% power and an α of 0.05. We based our effect size estimate on those found in systematic reviews assessing the effect of modeling and social norms on food intake (Robinson et al., 2014; Vartanian et al., 2015), opting for a more conservative estimate given our binary outcome. We recruited $N = 142$ first-year students from the Faculty of Psychological Sciences and Education at the Université Libre de Bruxelles in Belgium. No participants were excluded as they all met the inclusion criteria: correct responses to at least one out of two control questions, no relevant intolerances/allergies, and not guessing the goal of the experiment. The mean age was 21.1 years ($SD = 4.41$) and the sample was predominantly female (77%).

Table 1. Participant descriptives of the overall sample and within each condition.

Characteristic	Overall, $N = 142$[1]	fruit, $N = 49$[1]	vegetable, $N = 48$[1]	control, $N = 45$[1]	p-value[2]
Age	21.14 (4.41)	21.18 (5.35)	20.79 (3.41)	21.47 (4.29)	0.76
Gender					0.77
male	32 (23%)	10 (20%)	10 (21%)	12 (27%)	
female	110 (77%)	39 (80%)	38 (79%)	33 (73%)	
Living situation					0.25
alone	19 (13%)	6 (12%)	5 (10%)	8 (18%)	
renting with others	13 (9.2%)	3 (6.1%)	6 (13%)	4 (8.9%)	
student housing	31 (22%)	8 (16%)	15 (31%)	8 (18%)	
with family	69 (49%)	25 (51%)	21 (44%)	23 (51%)	
with partner	10 (7.0%)	7 (14%)	1 (2.1%)	2 (4.4%)	
Study subject					0.14
health	5 (3.5%)	1 (2.0%)	3 (6.3%)	1 (2.2%)	
humanities and social sciences	134 (94%)	48 (98%)	42 (88%)	44 (98%)	
arts	3 (2.1%)	0 (0%)	3 (6.3%)	0 (0%)	
BMI	22.27 (3.25)	21.73 (2.86)	22.55 (3.28)	22.56 (3.61)	0.36
Unknown	2	0	0	2	

[1]Mean (SD); n (%).
[2]One-way ANOVA; Fisher's exact test.

Participants were randomly assigned to one out of three conditions in which they were exposed to either a vegetable descriptive norm, a fruit descriptive norm, or a no descriptive norm control condition. See Table 1 for participant descriptives.

Ethics statement

The research protocol was approved by the Comité d'Ethique Facultaire Sciences Psychologiques et de l'Education of the Université libre de Bruxelles (060/2015). All methods were performed in accordance with relevant guidelines and regulations. Written informed consent was obtained from participants prior to participation.

Procedure and measures

The experiment consisted of two parts: an online survey (Time 1) and a laboratory experiment at least five days later (Time 2).

Time 1: online survey

Participants provided demographic information and were asked about their eating habits. Specifically, they reported whether they followed a particular diet (vegetarian, vegan, other) and the frequency with which they cook, use fruits or vegetables when cooking, and consume fruits and vegetables (Likert scale from 1 = *never* to 8 = *more than once a day*). Moreover, they were asked about their knowledge of current recommendations for fruit and vegetable consumption (multiple choice), the extent to which they (dis)like fruits and vegetables (visual analog scale from 0 to 100), and their relative preference for fruits or vegetables (semantic differential scale, scaled to 0 for vegetables and 100 for fruits for the analysis). In addition, for

exploratory purposes, participants rated the components of the Theory of Planned Behavior adapted from Broers et al. (2020). Specifically, they were asked about their attitudes, perceived norms, and perceived control of fruit and vegetable consumption (Likert scale from 1 = *not agree at all* to 7 = *totally agree*).

Finally, participants reported their intentions to consume fruits and vegetables in general and for six specific fruits and vegetables (apple, pear, orange, kiwi, banana, persimmon; carrot, red pepper, cucumber, cauliflower, zucchini, artichoke; visual analog scale from 0 to 100).

Time 2: lab experiment

This part of the experiment consisted of a descriptive norm manipulation, survey measures, and a taste test.

Descriptive norm manipulation

Participants were told that part of their response to the online survey had been lost due to an electronic error (cover story). They were asked whether they would be willing to complete the survey again in exchange for a compensation. This compensation consisted of a fruit or vegetable basket, and they were given a sign-up sheet to indicate their choice between the two. The sign-up sheet was presented to them on a laptop computer and contained fictitious names of participants who had made their choice for a vegetable or fruit basket before them (remote confederate design). We used other participants studying at their university as a reference group because they were likely to be perceived as an ingroup member. The number of sign-ups for each of the choices differed between conditions. In the vegetable norm condition, ten participants had chosen the vegetable basket compared to three participants who had chosen the fruit basket (see Figure 1), and these amounts were reversed in the fruit condition. In the no norm control condition, six participants had chosen the vegetable basket and six had chosen the fruit basket.

Survey

Participants again reported responses to the components of the ToPB (see *Time 1 online survey*). The perceived norms questions served as manipulation checks and consisted of two items assessing whether participants perceived that those around them ate a lot of fruits or vegetables.

Taste test

Participants were first asked to rate their taste expectations for six fruits and vegetables. They were asked to rate three fruits (apple, orange and persimmon) and three vegetables (canned artichoke, a vegetable rich in ITF fiber, carrot, and red pepper) in terms of overall liking and taste, its texture, sweetness, bitterness, and sourness. After reporting their taste expectations, they were presented with a plate containing a small portion of the three fruits and vegetables and rated their experience along the same dimensions of liking and taste as they rated their expectations (visual analog scales without labels; see Figure 2). They were given a

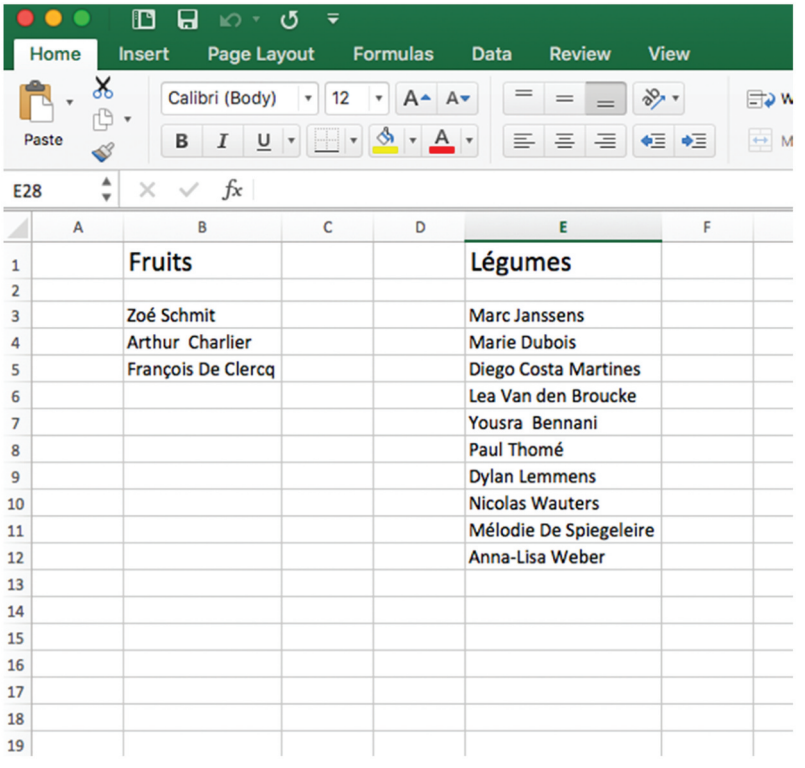

Figure 1. Vegetable descriptive norm presented in the form of a sign-up sheet with choices made by fictional previous participants.

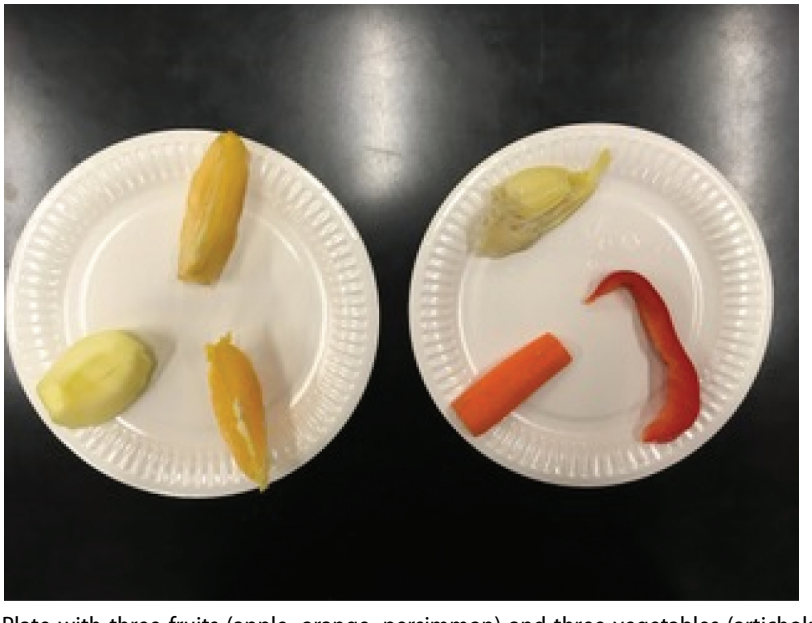

Figure 2. Plate with three fruits (apple, orange, persimmon) and three vegetables (artichoke, carrot, red pepper) presented to participants during the taste test.

glass of water and a piece of tissue to rinse their mouth and clean their hands in between tastings.

Once the data collection was completed, a collective debriefing was sent to the participants. Participants were asked to collect the basket of their choice and were given €5 instead.

Analysis plan

All analyses were conducted in *R* (R Core Team, 2020). Chi-squared tests were conducted to test the proportion of choices between conditions. To explore the influence of norms on intentions and taste expectations and experiences, we conducted linear mixed effects models with condition and food type (fruit/vegetable) as fixed effects and random intercepts for specific foods and participants (Barr et al., 2013). *P*-values were obtained using the Satterthwaite approximation with the 'lmerTest' package (Kuznetsova et al., 2017). Simple slope analyses were performed using the 'lsmeans' package (Lenth, 2016). We adjusted our alpha level from $p < .050$ to $p < .017$ to control for multiple comparisons in our confirmatory analyses, and used Tukey correction for pairwise comparisons in our exploratory analyses.

Results

Descriptives

Thirty-nine percent of participants reported consuming fruit and 54% reported consuming vegetables at least once a day. There were no differences in participants' liking of fruits ($M = 65.0$, $SD = 17.9$) and vegetables ($M = 64.6$, $SD = 19.4$) across the sample, $p = .847$, $\eta^2 = .016$, although they preferred fruits over vegetables on average when asked to rate their relative preferences ($M = 67.1$, $SD = 24.6$), $t(141) = 8.29$, $p < .001$, Cohen's $d = .695$. Additionally, paired *t*-tests showed no difference in fruit or vegetable liking within the three conditions, p's $> .236$, Cohen's d's $< .173$.

Participants across conditions did not differ in the extent to which they consumed or cooked with vegetables (p's $> .570$, η^2's $<.008$) but they did differ in the frequency with which they consumed fruits and cooked with them. Participants in the vegetable norm condition consumed more fruits than those in the fruit norm condition ($b = 0.84$, $SE = 0.35$, $p = .018$, 95% CI [0.15, 1.53], $\eta^2 = .058$), and cooked with fruit more often than those in the fruit norm ($b = 0.90$, $SE = 0.36$, $p = .015$, 95% CI [0.18, 1.62], $\eta^2 = .060$) and control ($b = 0.90$, $SE = 0.41$, $p = .029$, 95% CI [0.09, 1.70], $\eta^2 = .051$) conditions. Although this may imply a more conservative test of our main hypothesis, we nevertheless controlled for these variables in all of our analyses.

Although the difference between vegetarian/vegan status across conditions did not reach significance, $p = .058$, Cramer's $V = 0.214$, 19% of participants in the vegetable condition were vegetarian, compared to 4.4%-6.1% in the other conditions. Thus, we also controlled for dietary status. The analyses reported in this manuscript are without control variables, but can be found in the SOM. Where results diverged, this is reported in the manuscript.

Manipulation check

To test whether our manipulation would change perceived norms, we examined whether responses to the two questions 'Those around me eat a lot of fruits/vegetables' (part of the ToPB questions assessing perceived norms) differed between conditions. There was no difference in perceived norms of vegetable consumption between participants in the vegetable norm (vegetables: $M = 4.98$, $SD = 1.30$; fruits: $M = 4.85$, $SD = 1.47$) and those in the fruit norm (vegetables: $M = 5.29$, $SD = 1.14$; fruits: $M = 4.92$, $SD = 1.41$) or control condition (vegetables: $M = 5.00$, $SD = 1.37$; fruits: $M = 5.00$, $SD = 1.17$), b's < 0.31, p's > .218. These results held when controlling for perceived norms reported at Time 1.

Effect of descriptive norms on choice for fruit or vegetable basket

Overall, across the sample, participants were more likely to choose a fruit basket over a vegetable basket, $\chi^2 = 67.06$ ($df = 1$), $p < .001$, Cohen's $d = 1.03$. However, the proportion of fruit to vegetable choices differed according to the norm condition, $\chi^2 = 10.22$ ($df = 2$), $p = .006$, Cramer's $V = 0.268$. In line with Hypothesis 1, participants exposed to a vegetable norm were more likely to choose a vegetable basket (42%) over a fruit basket than participants exposed to a fruit norm (16%) or participants who were not exposed to a norm (18%), although this latter difference was no longer statistically significant when controlling for dietary status (vegetarian/vegan), $b = 1.07$, $p = .079$.

Contrary to Hypothesis 2, participants exposed to a fruit norm were not more likely to choose a fruit basket over a vegetable basket (84%) compared to those exposed to no norm (82%). See Table 2 for test statistics and Figure 3 for a graphical representation of the fruit or vegetable basket choices by experimental condition. Additional analyses indicated that all results held when controlling for vegetable and fruit liking.

In addition, in line with Hypothesis 3a, participants exposed to no norm were more likely to select fruits than vegetables. The observed proportions of basket choices differed significantly from the expected proportions of equal choices (50% fruits and 50% vegetables), $\chi^2 = 18.69$ ($df = 1$), $p < .001$, Cramer's $V = 0.36$. However, contrary to Hypothesis 3b, the difference in the control condition was not smaller than that in the fruit norm condition, $\chi^2 = 0.02$ ($df = 1$), $p = .893$, Cramer's $V = 0.01$.

Moderation by consumption frequency

Contrary to our prediction (Hyp. 4), the descriptive norms did not have a stronger effect on the choices of participants who consumed vegetables or fruits less frequently. Vegetable consumption frequency did not predict choice in a model alongside condition ($b = 0.04$, $p = .739$), and did not interact with condition (b's < 0.38, p's > .307). Similarly,

Table 2. Simple effects and odds ratio (OR) of condition on choice.

		Descriptive norm		
Outcome	*Predictor*	Vegetable vs. fruit	Vegetable vs. control	Fruit vs. control
Choice for vegetable	*b* (*SE*)	1.30 (0.49)	1.20 (0.49)	0.10 (0.55)
	p	.020	.038	.981
	OR [95% CI]	3.66 [1.46, 9.93]	3.30 [1.31, 9.00]	1.11 [0.37, 3.30]

Note. Odds Ratios (OR) for these effects were calculated based on logistic regression models. Tukey-adjusted *p*-values.

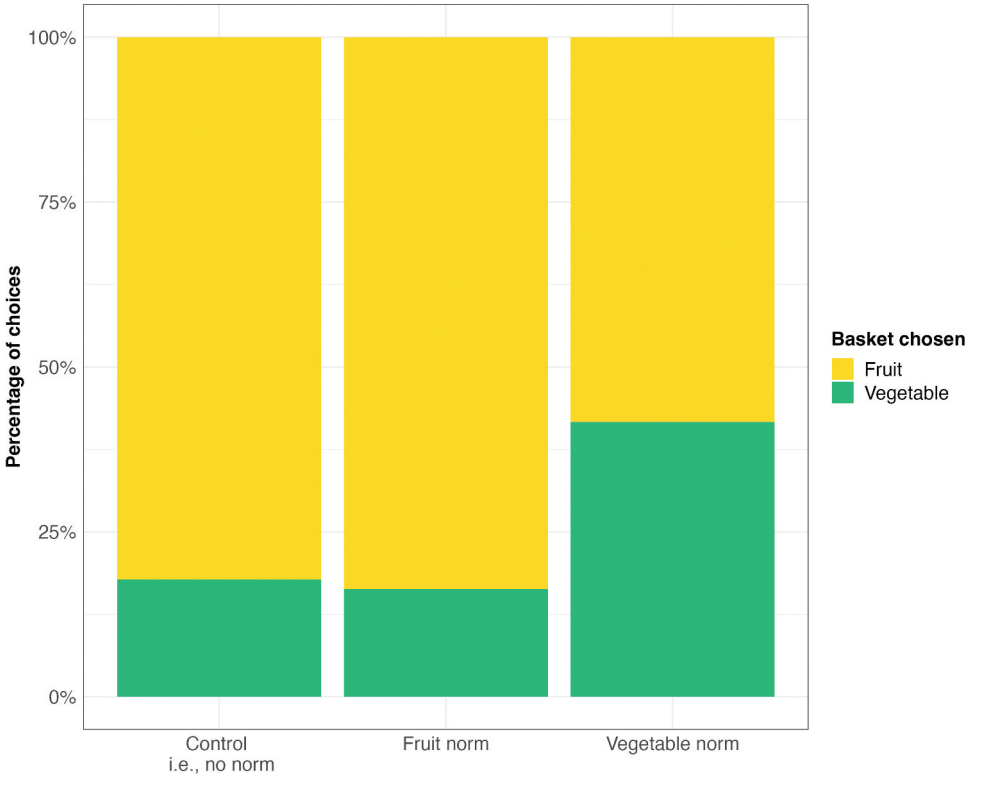

Figure 3. Percentage of participants choosing fruit and vegetable baskets in the three different descriptive norm conditions.

condition did not interact with frequency of fruit consumption (b's < 0.16, p's > .591), and frequency of fruit consumption did not predict choice ($b = 0.01$, $p = .954$).

Exploratory analyses

To explore the effect of condition on intentions and taste expectations and experience, condition contrasts (Fruit vs. Vegetable; Control vs. Fruit/Vegetable) and food type (Fruit vs. Vegetable) were entered in Step 1, and the interaction between condition contrasts and food type was entered in Step 2 (see Table 3).

Effect of descriptive norms on intentions to consume fruits and vegetables

There was no significant effect of condition on intentions to consume fruits and vegetables (see Table 3). This result held when controlling for intentions reported at Time 1.

Effect of descriptive norms on taste expectations and taste experience

Condition had no effect on positive and negative taste expectations, nor on positive taste experiences. However, negative taste experiences of bitterness and sourness decreased for participants exposed to a fruit or vegetable norm compared to those exposed to no norm,

Table 3. Regression results for the effects of condition and food type on intentions and positive and negative taste expectations and experiences.

		Step 1		Step 2		
		Contrast 1 Fruit vs. Vegetable	Contrast 2 Control vs. Fruit/Vegetable	Type: Fruit vs. Vegetable	Contrast1* Type	Contrast2* Type
Intentions	*b* (*SE*)	1.52 (3.33)	−2.00 (3.95)	−1.37 (8.35)	−0.29 (3.05)	− 4.39 (3.61)
	95% CI	−5.01, 8.05	−9.73, 5.74	−17.7, 14.9	−6.26, 5.68	−11.5, 2.68
	p	.650	.614	.872	.924	.224
	R^2_m, R^2_c		0.001, 0.383		0.002, 0.383	
Positive taste expectations	*b* (*SE*)	0.50 (2.92)	−2.49 (2.71)	−13.9 (10.4)	−1.96 (2.17)	−0.14 (2.57)
	95% CI	−3.99, 5.00	−7.81, 2.83	−34.2, 6.38	−6.22, 2.29	−5.17, 4.90
	p	.827	.361	.228	.365	.957
	R^2_m, R^2_c		0.050, 0.310		0.050, 0.310	
Negative taste expectations	*b* (*SE*)	−0.82 (2.62)	−0.75 (3.11)	**-16.4 (4.11)**	−2.54 (2.60)	3.13 (3.08)
	95% CI	−5.96, 4.32	−6.84, 5.35	**-24.4, −8.32**	−7.64, 2.55	−2.90, 9.16
	p	.755	.811	**.007**	.328	.310
	R^2_m, R^2_c		0.095, 0.306		0.096, 0.307	
Positive taste experience	*b* (*SE*)	1.02 (2.44)	−3.39 (2.89)	**-19.0 (7.20)**	1.36 (2.13)	0.15 (2.52)
	95% CI	−3.76, 5.80	−9.05, 2.27	**-33.1, −4.86**	−2.81, 5.53	−4.78, 5.08
	p	.677	.242	**.039**	.523	.952
	R^2_m, R^2_c		0.097, 0.303		0.098, 0.303	
Negative taste experience	*b* (*SE*)	1.34 (2.37)	−5.41 (2.80)	−1.29 (6.74)	−3.07 (2.56)	**8.03 (3.03)**
	95% CI	−3.30, 5.98	−10.9, 0.08	−14.5, 11.9	−8.09, 1.95	**2.10, 14.0**
	p	.573	.055	.854		**.008**
	R^2_m, R^2_c		0.007, 0.259		0.010, 0.263	

Note. We used contrast coding to compare the fruit norm (−0.5) to the vegetable norm (0.5) and the control norm (−0.5) to both the fruit (0.25) and vegetable (0.25) norm conditions. Pseudo-R-squared for Generalized Mixed-Effects models were calculated using the MuMIn package (Bartoń, 2022). R^2_m (marginal) by fixed effects and R^2_c (conditional) is the variance explained by both fixed and random effects. Significant effects are shown in bold.

$b = -5.41$, although this only reached significance when controlling for fruit consumption and cooking frequency (see Table 3). There was a significant interaction between condition (Control vs. Fruit/Vegetable norm) and type of tasted foods (Fruit vs. Vegetable), $b = 8.03$. Pairwise comparisons between norm conditions and food type with Tukey correction indicated that participants exposed to a fruit norm rated fruits as less bitter and less acidic ($M = 17.6$, $SD = 21.8$) than participants exposed to no norm ($M = 26.1$, $SD = 29.2$), $b = -8.50$, $SE = 2.75$, $p = .027$. None of the other comparisons were significant.

Discussion

In this experiment, a vegetable descriptive norm increased the likelihood of selecting a vegetable basket: The odds of choosing the vegetable basket was tripled in a remote confederate design. In contrast, a fruit norm did not increase the likelihood of choosing the fruit basket. The proportion of choices for the fruit basket was high and almost identical between the control (82%) and the fruit condition (84%), suggesting a ceiling effect that may reflect participants' preferred choice.

Furthermore, the effect of the vegetable norm did not depend on the frequency with which participants consumed vegetables. In addition, both types of norms did not affect intentions to consume vegetables and fruits and had very small effects on taste expectations and experiences.

Theoretical implications

Our findings are consistent with previous research showing that descriptive norms influence choice (Stok et al., 2016; Thomas et al., 2017). This study further demonstrates that descriptive norms can be used to increase the choice for a healthier, initially less preferred option. However, the norms did not notably affect intentions and taste expectations and experiences, suggesting that these may not be key in explaining how descriptive norms lead to behavior change. A similar study among adolescents found that a descriptive fruit norm increased fruit consumption, although intentions to consume fruit did not differ from those not exposed to the norm (Stok et al., 2014). These findings support the concept that descriptive norms act as heuristics that influence behavior in a relatively automatic manner (Cialdini et al., 1991; Salmon et al., 2014). The norm may have acted as a social proof heuristic to which participants conformed with little deliberation (Cruwys et al., 2015; Raafat et al., 2009). This explanation is consistent with our findings that frequency of vegetable consumption did not moderate the effect of the norm on participants' choices, and that our experimental manipulation did not affect perceptions of consumption norms.

In other words, participants likely conformed to the majority's choice for a decision about which they were relatively neutral about (as participants reported liking vegetables and fruits equally). Alternatively, they may have followed the norm to protect their self-image (Gross & Vostroknutov, 2022). Given that they were asked to add their name to a list of previous participants' names and choices, they may have inferred that their choice would be visible to participants after them.

Although the fruit norm did not affect choice, it did reduce negative fruit taste experiences compared to the no norm group. This was the only significant effect on taste ratings,

suggesting a limited role for reward modulation by descriptive norms. Previous studies showing such effects have typically associated a specific norm or popularity rating with the product itself (Robinson et al., 2012; Schulte-Holierhoek et al., 2017). In contrast, our descriptive norm referred to a basket of unspecified vegetables or fruits to be received in the future, whereas the taste ratings referred to the specific fruits and vegetables presented to participants. Thus, our findings may reflect that normative information does not influence taste ratings when it is not directly coupled with the product.

Practical implications

Contrary to previous research examining healthy versus unhealthy choices, our descriptive norm increased the choice for a relatively healthier option in a more realistic choice context. A vegetable norm increased the likelihood that young adults would choose vegetables that contain additional nutritional properties. This suggests that such norms could be applied in specific choice settings, such as university cafeterias, to promote vegetable choices.

In addition, our findings suggest the potential for descriptive norms to guide choices among closely related products in choice contexts that promote healthier or more sustainable options that may have less immediate sensory appeal (e.g., unsweetened or plant-based versions of existing products). For example, associating certain plant-based products with high popularity and increasing their availability may increase consumer purchases of plant-based products over meat-based products (Raghoebar et al., 2020).

However, norms did not influence consumption intentions, suggesting that such a simple descriptive norm may not influence future decisions beyond the point of purchase. Future studies could examine whether a change in perceived norms is necessary (Robinson et al., 2014) or whether a combination of descriptive and injunctive norms may be more effective in improving long-term health behaviors (Bevelander et al., 2020; Schultz et al., 2007).

Strengths and limitations

This experiment showed that a descriptive norm promoting vegetables more than tripled the likelihood of choosing a vegetable basket over a preferred fruit basket.

One limitation of this study is the use of a homogenous student population for whom a fruit and vegetable basket may not have been a relevant choice. On the other hand, this suggests that descriptive norms may be effective in increasing healthy choices among people who may not have very strong prior preferences (Venema et al., 2020).

A second limitation is that we found no effect of our norms on our manipulation check. Recent scientific discussion suggests that the outcome of such verbal manipulation checks does not, in and of itself, demonstrate the failure (or success) of a manipulation (Fayant et al., 2017; Hauser et al., 2018). In our experiment, the manipulation involved a cue signaling descriptively higher popularity of a vegetable over a fruit basket. This cue may have been implicitly processed by paricipants and used as a heuristic to model their choice (Cialdini et al., 1991; Salmon et al., 2014), but may not have influenced their beliefs about the vegetable consumption of those around them. Another possible explanation is that participants did not think about their peers when thinking about what 'others around them' eat, but rather relied more on perceived consumption norms in

their household, which for 49% of participants consisted of their family. Future studies may instead assess the effect of such a descriptive norm by asking 'did you notice which basket previous participants chose' or 'why did you choose that particular basket?' Given the various possible interpretations of this manipulation check failure, and the possibility that descriptive norms operate implicitly, we still consider our findings to be robust.

Although this study was well-powered and participants made a real choice, future research should aim to replicate the findings, and assess the processes underlying the effects of social norms using larger sample sizes in more naturalistic settings [for some examples, see Bevelander et al. (2020) and Smit et al. (2021)].

Conclusion

In this study, a descriptive norm increased the choice for a vegetable basket over a generally preferred fruit basket. We found little evidence that norms signaling the preferred option among peers influence taste expectations and experiences or consumption intentions. Descriptive norms may be an effective tool to steer choices toward healthier alternatives in certain consumption contexts.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Data availability statement

The data that support the findings of this study are openly available on the *Open Science Framework* at https://osf.io/d4c8y/?view_only=a64d519e70a94c63bc5b3aa04373fed5.

Open Scholarship

This article has earned the Center for Open Science badges for Open Data, Open Materials and Preregistered. The data and materials are openly accessible at https://osf.io/d4c8y/files/osfstorage/636fa9990e715d191ba99e33.

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Almenberg, J., & Dreber, A. (2011). When does the price affect the taste? Results from a wine experiment. *Journal of Wine Economics*, *6*(1), 111–121. https://doi.org/10.1017/S1931436100001085

Barr, D. J., Levy, R., Scheepers, C., & Tily, H. J. (2013). Random effects structure for confirmatory hypothesis testing: Keep it maximal. *Journal of Memory and Language*, *68*(3), 255–278. https://doi.org/10.1016/j.jml.2012.11.001

Bartoń, K. (2022). *MuMIn: Multi-Model Inference* [Computer software]. https://CRAN.R-project.org/package=MuMIn

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, *117*(3), 497–529. https://doi.org/10.1037/0033-2909.117.3.497

Berger, S., Christandl, F., Bitterlin, D., & Wyss, A. M. (2019). The social insectivore: Peer and expert influence affect consumer evaluations of insects as food. *Appetite*, *141*, 104338. https://doi.org/10.1016/j.appet.2019.104338

Bevelander, K. E., Burk, W. J., Smit, C. R., van Woudenberg, T. J., Buijs, L., & Buijzen, M. (2020). Exploring the directionality in the relationship between descriptive and injunctive parental and peer norms and snacking behavior in a three-year-cross-lagged study. *International Journal of Behavioral Nutrition and Physical Activity*, *17*(1), 76. https://doi.org/10.1186/s12966-020-00977-w

Broers, V. (2019). *A taste for the unfamiliar: Investigating the individual and environmental determinants of prebiotic vegetable consumption* [Doctoral dissertation, l'Université catholique de Louvain]. Dial Research publications. https://hdl.handle.net/2078.1/212245

Broers, V. J. V., Van den Broucke, S., & Luminet, O. (2020). Determinants of prebiotic vegetable consumption: The extended theory of planned behaviour. *Archives of Public Health*, *78*(1), 27. https://doi.org/10.1186/s13690-020-00408-z

Burger, J. M., Bell, H., Harvey, K., Johnson, J., Stewart, C., Dorian, K., & Swedroe, M. (2010). Nutritious or delicious? The effect of descriptive norm information on food choice. *Journal of Social and Clinical Psychology*, *29*(2), 228–242. https://doi.org/10.1521/jscp.2010.29.2.228

Cialdini, R. B., Kallgren, C. A., & Reno, R. R. (1991). A focus theory of normative conduct: A theoretical refinement and reevaluation of the role of norms in human behavior. In *Advances in experimental social psychology* (Vol. 24, pp. 201–234). Elsevier. https://doi.org/10.1016/S0065-2601(08)60330-5

Cruwys, T., Bevelander, K. E., & Hermans, R. C. J. (2015). Social modeling of eating: A review of when and why social influence affects food intake and choice. *Appetite*, *86*, 3–18. https://doi.org/10.1016/j.appet.2014.08.035

Cruwys, T., Platow, M. J., Angullia, S. A., Chang, J. M., Diler, S. E., Kirchner, J. L., Lentfer, C. E., Lim, Y. J., Quarisa, A., Tor, V. W. L., & Wadley, A. L. (2012). Modeling of food intake is moderated by salient psychological group membership. *Appetite*, *58*(2), 754–757. https://doi.org/10.1016/j.appet.2011.12.002

De Houwer, J., Buabang, E. K., Boddez, Y., Köster, M., & Moors, A. (2022). Reasons to remain critical about the literature on habits: A commentary on wood et al. (2022). *Perspectives on Psychological Science*, *174569162211315*(4), 871–875. https://doi.org/10.1177/17456916221131508

Drieskens, S., Charafeddine, R., & Gisle, L. (2019). *Gezondheidsenquête 2018: Voedingsgewoonten (D/2019/14.440/55; Epidemiologie En Volksgezondheid - Levensstijl En Chronische Ziekten)*. Sciensano Accessed 21 September 2023 https://www.sciensano.be/sites/default/files/nh_rapport2_his2018_nl_v3.pdf .

Fayant, M.-P., Sigall, H., Lemonnier, A., Retsin, E., & Alexopoulos, T. (2017). On the limitations of manipulation checks: An obstacle toward cumulative science. *International Review of Social Psychology*, *30*(1), 125. https://doi.org/10.5334/irsp.102

Glasson, C., Chapman, K., & James, E. (2011). Fruit and vegetables should be targeted separately in health promotion programmes: Differences in consumption levels, barriers, knowledge and stages of readiness for change. *Public Health Nutrition*, *14*(4), 694–701. https://doi.org/10.1017/S1368980010001643

Gross, J., & Vostroknutov, A. (2022). Why do people follow social norms? *Current Opinion in Psychology*, *44*, 1–6. https://doi.org/10.1016/j.copsyc.2021.08.016

Hauser, D. J., Ellsworth, P. C., & Gonzalez, R. (2018). Are manipulation checks necessary? *Frontiers in Psychology*, *9*, 998. https://doi.org/10.3389/fpsyg.2018.00998

Hiel, S., Bindels, L. B., Pachikian, B. D., Kalala, G., Broers, V., Zamariola, G., Chang, B. P. I., Kambashi, B., Rodriguez, J., Cani, P. D., Neyrinck, A. M., Thissen, J.-P., Luminet, O., Bindelle, J., & Delzenne, N. M. (2019). Effects of a diet based on inulin-rich vegetables on gut health and nutritional behavior in healthy humans. *The American Journal of Clinical Nutrition*, *109*(6), 1683–1695. https://doi.org/10.1093/ajcn/nqz001

Higgs, S. (2015). Social norms and their influence on eating behavior. *Appetite*, *86*, 38–44. https://doi.org/10.1016/j.appet.2014.10.021

Kalala, G., Kambashi, B., Everaert, N., Beckers, Y., Richel, A., Pachikian, B., Neyrinck, A. M., Delzenne, N. M., & Bindelle, J. (2018). Characterization of fructans and dietary fibre profiles in raw and steamed vegetables. *International Journal of Food Sciences and Nutrition*, *69*(6), 682–689. https://doi.org/10.1080/09637486.2017.1412404

Kuznetsova, A., Brockhoff, P. B., & Christensen, R. H. B. (2017). lmerTest package: Tests in linear mixed effects models. *Journal of Statistical Software*, *82*(13), 1–26. https://doi.org/10.18637/jss.v082.i13

Lenth, R. V. (2016). Least-Squares Means: The R package lsmeans. *Journal of Statistical Software*, *69*(1), 1–33. https://doi.org/10.18637/jss.v069.i01

Looney, S. M., & Raynor, H. A. (2012). Are changes in consumption of "healthy" foods related to changes in consumption of "unhealthy" foods during pediatric obesity treatment? *International Journal of Environmental Research and Public Health*, *9*(4), 1368–1378. https://doi.org/10.3390/ijerph9041368

Mollen, S., Rimal, R. N., Ruiter, R. A. C., & Kok, G. (2013). Healthy and unhealthy social norms and food selection. Findings from a field-experiment. *Appetite*, *65*, 83–89. https://doi.org/10.1016/j.appet.2013.01.020

Mudannayake, D. C., Jayasena, D. D., Wimalasiri, K. M. S., Ranadheera, C. S., & Ajlouni, S. (2022). Inulin fructans – food applications and alternative plant sources: A review. *International Journal of Food Science & Technology*, *57*(9), 5764–5780. https://doi.org/10.1111/ijfs.15947

Piqueras-Fiszman, B., & Spence, C. (2015). Sensory expectations based on product-extrinsic food cues: An interdisciplinary review of the empirical evidence and theoretical accounts. *Food Quality and Preference*, *40*, 165–179. https://doi.org/10.1016/j.foodqual.2014.09.013

Raafat, R. M., Chater, N., & Frith, C. (2009). Herding in humans. *Trends in Cognitive Sciences*, *13*(10), 420–428. https://doi.org/10.1016/j.tics.2009.08.002

Raghoebar, S., Van Kleef, E., & De Vet, E. (2020). Increasing the proportion of plant-based foods available to shift social consumption norms and food choice among non-vegetarians. *Sustainability*, *12*(13), 5371. https://doi.org/10.3390/su12135371

R Core Team. (2020). *R: A language and environment for statistical computing* [Computer software]. https://www.R-project.org/

Rivis, A., & Sheeran, P. (2003). Descriptive norms as an additional predictor in the theory of planned behaviour: A meta-analysis. *Current Psychology*, *22*(3), 218–233. https://doi.org/10.1007/s12144-003-1018-2

Robinson, E., Fleming, A., & Higgs, S. (2014). Prompting healthier eating: Testing the use of health and social norm based messages. *Health Psychology*, *33*(9), 1057–1064. https://doi.org/10.1037/a0034213

Robinson, E., Harris, E., Thomas, J., Aveyard, P., & Higgs, S. (2013). Reducing high calorie snack food in young adults: A role for social norms and health based messages. *International Journal of Behavioral Nutrition and Physical Activity*, *10*(1), 73. https://doi.org/10.1186/1479-5868-10-73

Robinson, E., Higgs, S., & Ishimaru, Y. (2012). Liking food less: The impact of social influence on food liking evaluations in female students. *PLoS ONE*, *7*(11), e48858. https://doi.org/10.1371/journal.pone.0048858

Robinson, E., Thomas, J., Aveyard, P., & Higgs, S. (2014). What everyone else is eating: A systematic review and meta-analysis of the effect of informational eating norms on eating behavior. *Journal of the Academy of Nutrition and Dietetics*, *114*(3), 414–429. https://doi.org/10.1016/j.jand.2013.11.009

Robinson, E., Tobias, T., Shaw, L., Freeman, E., & Higgs, S. (2011). Social matching of food intake and the need for social acceptance. *Appetite*, *56*(3), 747–752. https://doi.org/10.1016/j.appet.2011.03.001

Salmon, S., Fennis, B., Ridder, D., Adriaanse, M., & De Vet, E. (2014). Health on impulse: When low self-control promotes healthy food choices. *Health Psychology*, *33*(2), 103–109. https://doi.org/10.1037/a0031785

Schulte-Holierhoek, A., Verastegui-Tena, L., Goedegebure, R. P. G., Piqueras Fiszman, B., & Smeets, P. A. M. (2017). Sensory expectation, perception, and autonomic nervous system responses to package colours and product popularity. *Food Quality and Preference*, *62*, 60–70. https://doi.org/10.1016/j.foodqual.2017.06.017

Schultz, P. W., Nolan, J. M., Cialdini, R. B., Goldstein, N. J., & Griskevicius, V. (2007). The constructive, destructive, and reconstructive power of social norms. *Psychological Science*, *18*(5), 429–434. https://doi.org/10.1111/j.1467-9280.2007.01917.x

Smit, C. R., de Leeuw, R. N., Bevelander, K. E., Burk, W. J., Buijs, L., van Woudenberg, T. J., & Buijzen, M. (2021). Promoting water consumption among children: A three-arm cluster randomised controlled trial testing a social network intervention. *Public Health Nutrition*, *24*(8), 2324–2336. https://doi.org/10.1017/S1368980020004802

Stok, F. M., de Ridder, D. T. D., de Vet, E., & de Wit, J. B. F. (2014). Don't tell me what I should do, but what others do: The influence of descriptive and injunctive peer norms on fruit consumption in adolescents. *British Journal of Health Psychology*, *19*(1), 52–64. https://doi.org/10.1111/bjhp.12030

Stok, F. M., de Vet, E., de Ridder, D. T. D., & de Wit, J. B. F. (2016). The potential of peer social norms to shape food intake in adolescents and young adults: A systematic review of effects and moderators. *Health Psychology Review*, *10*(3), 326–340. https://doi.org/10.1080/17437199.2016.1155161

Thomas, J. M., Ursell, A., Robinson, E. L., Aveyard, P., Jebb, S. A., Herman, C. P., & Higgs, S. (2017). Using a descriptive social norm to increase vegetable selection in workplace restaurant settings. *Health Psychology*, *36*(11), 1026–1033. https://doi.org/10.1037/hea0000478

Vartanian, L. R., Spanos, S., Herman, C. P., & Polivy, J. (2015). Modeling of food intake: A meta-analytic review. *Social Influence*, *10*(3), 119–136. https://doi.org/10.1080/15534510.2015.1008037

Venema, T. A. G., Kroese, F. M., Benjamins, J. S., & de Ridder, D. T. D. (2020). When in doubt, follow the crowd? Responsiveness to social proof nudges in the absence of clear preferences. *Frontiers in Psychology*, *11*, 1385. https://doi.org/10.3389/fpsyg.2020.01385