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Consumers' Willingness to Consume Insect-Based Protein Depends on Descriptive Social Norms

Sebastian Berger[1] and Annika M. Wyss[2]*

[1] Department of Organization and Human Resources, University of Bern, Bern, Switzerland, [2] Department of Social Neuroscience and Social Psychology, University of Bern, Bern, Switzerland

Eating of insects has been discussed as a more sustainable source of animal protein, but consumer research about uptake behavior of Western consumers is still scarce. Based on previous psychological research highlighting the role of social norms, the present research shows that even subtle cues about descriptive social norms affect Westerners' willingness to eat unprocessed insects. In a series of four studies, we demonstrate that adherence to descriptive social norms underlies eating intention and behavior. Study 1 shows that individual beliefs about the descriptive social norm correlates with the willingness to eat an unprocessed insect, an effect which is replicated in an experiment showing the causal direction from norm beliefs to eating behavior (Study 2). Study 3 establishes that even in the absence of concrete information about social norms, consumers construe norms based on other options. Manipulating the perceived eating-contingent financial rewards for other people from the same population, un-incentivized participants are more readily willing to eat when they believe that others receive a higher incentive, an effect that is mediated by beliefs about the eating frequency of these participants. Study 4, finally, shows that manipulating beliefs about the norms provides the causal explanation as the effect of the incentive disappears when norm information is explicitly given. Taken together, the studies show that descriptive social norms partially underlie Westerns willingness (or reluctance) to consume insects and that behavioral change initiative could focus on the importance of using norms to increase reliance on non-standard sources of animal protein.

Keywords: entomophagy, social norms, consumer psychology, sustainability, behavioral economics

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****Correspondence:***
Sebastian Berger
sebastian.berger@iop.unibe.ch

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INTRODUCTION

The ecological burden of human food consumption poses a major challenge for climate change mitigation. According to the Intergovernmental Panel on Climate Change (IPCC) fifth assessment report, food production contributes to about a quarter of global anthropogenic greenhouse gas emissions and increasing food demand will exacerbate this trend (e.g., Pelletier and Tyedmers, 2010). Quite crucially, the production of meat and dairy products accounts for half of these food emissions (Eshel et al., 2014; IPCC, 2014). Given the problematically high level of meat consumption worldwide, interest in alternative protein sources, such as insect-based foods, has therefore increased remarkably in recent years. In fact, insect-containing food products have not only been suggested as a more sustainable source of protein (e.g., less greenhouse gas emissions and less land/water required for production, Oonincx and de Boer, 2012), but have also been associated with health benefits (e.g., rich in proteins, fats, vitamins, and minerals, Rumpold and Schlüter, 2013; van Huis, 2013).

Entomophagy, which is the consumption of edible insects, has also attracted increasing public attention due to recent progress in agricultural technology and food safety: Automation, reduction in microbial contamination by personnel, and increased space utilization have finally made insects a viable option for industrial and private production alike (Parker, 2005; van Huis, 2013). Moreover, deregulation allowing for the commercial production and marketing of edible insects (e.g., in Switzerland in 2017 or as provided by the new regulation of the European Union 2015/2283 on novel foods which entered into force by 2018) have allowed innovators from companies and top-level cuisine to enter the market for insect-based foods (Van Raamsdonk et al., 2017; Berger et al., 2019). However, despite these favorable developments and obvious ecological advantages of insect consumption, Westerners' willingness to eat insect-containing foods is still very low (Deroy et al., 2015; Hartmann et al., 2015) and, up to this date, scientific knowledge about the factors underlying this aversion is relatively scarce. For example, Verbeke (2015) provides an attempt to profile potential customers willing to eat insects by showing the correlational pattern with various demographic or psychological factors. Accordingly, younger males with a weak attachment to meat, who are more open to trying novel foods, and who are interested in the environmental impact of their food choices are more likely to become early adopters of edible insects. Other results addressing situational factors of insect-consumption point to effects of insect processing (i.e., insect visibility, Hartmann et al., 2015; Jensen and Lieberoth, 2019), advertising content (e.g., hedonic framing, Berger et al., 2018) and cultural variation (Tan et al., 2015). Finally, previous research suggests that one main reason for individuals' aversion toward insect-based foods lies in the disgust they evoke (Hartmann and Siegrist, 2016; La Barbera et al., 2018; Berger et al., 2019), which allegedly results from Westerners' association of insects with decaying matter and feces (Looy et al., 2014).

However, the fact that Westerners have always eaten other types of food strongly associated with decay (e.g., mold cheese or fungi) and that entomophagy is widespread across several Asian and African countries (van Huis et al., 2013), indicates that food-evoked disgust is primarily culturally learned (Rozin and Haidt, 2013; Looy et al., 2014). Thus, Westerners' reluctance to consume insect-containing products may stem from perceived cultural or social norms rather than a genuine fear of eating contaminated food. And, indeed, there is ample evidence showing that food choice and food intake are strongly influenced by the social environment (e.g., Robinson et al., 2013b; Cruwys et al., 2015; Higgs, 2015). In fact, such norms can be transmitted directly via cultural practices and rules (e.g., by the use of certain foods—or the lack thereof—in Western cuisine), observed reactions in a given situation (e.g., disgust responses to eating insects), or more subtly via environmental cues (e.g., portion sizes) (Higgs, 2015). For example, studies have documented the strong influence of portion size norms on how much people eat (Herman et al., 2003), which is so strong, that even food-deprived individuals adjust their amount of food intake to others who eat very little (Goldman et al., 1991). Research further highlights the role of social influence on *what* we eat (see Robinson et al., 2013a, 2014 for reviews). More specifically, studies found that perceived perception of peers' attitudes to and intake of certain foods predict healthy (e.g., fruits, vegetables) as well as unhealthy (e.g., fast food, soft drinks) food choices (Ball et al., 2010; Lally et al., 2011).

Notably, recent studies have also shown that the influence of social norms on food-related behaviors also translates into the context of entomophagy. Jensen and Lieberoth (2019), for example, found that subjective insect eating norms significantly predicted individuals' tasting behavior of food products containing visible as well as invisible mealworms. In the study of Berger et al. (2019), individuals were exposed to different peer and expert ratings about mealworm-based food products. The authors found that these social norm manipulations affected participants' acceptance of mealworm-based burgers and nutrition bars. However, it is unclear whether these effects also apply to unprocessed insects and, more generally, causal evidence for the role of social norms in acceptance of insects as foods remains scarce. The goal of the present research is thus to contribute to this open spot in research landscape by addressing the question of whether and how normative influence causally affects people's willingness to consume unprocessed insects. To do so, four studies were designed to show an association of beliefs about social norms and subsequent eating behavior that takes the form of tasting an entirely unprocessed, visible insect in all studies. Throughout the manuscript, we conceptualize norms as descriptive, which is the belief about the share in the population engaging in a certain behavior.

OVERVIEW OF STUDIES

In total, four psychological studies show the impact of descriptive norms on participants' willingness to consume unprocessed insects. Study 1 was designed as an initial test demonstrating a correlation between a participant's belief about the share of other people consuming an unprocessed insect in the course of the study and his or her own willingness to consume. Study 2 re-examines this effect and, additionally, demonstrates a causal relationship by manipulating social beliefs experimentally while observing subsequent consumption behavior. Study 3 shows that in principle non-normative information may be used to infer descriptive norms. More specifically, it manipulates participants' beliefs about a consumption-contingent payment for other participants, but not the target participant, and shows that this information not only affects their beliefs about the share of other participants consuming the insect, but that this belief translates into a higher probability to consume themselves. Finally, Study 4 experimentally manipulates the mediator found in Study 3 and shows that the effect of consumption-contingent payments only transfer into eating intentions in the absence of more concrete norm information. As consumption of insect-based products is legally possible and insects are readily available in supermarkets, the studies did not require additional ethical approval at the university where the studies were conducted. All studies strictly followed the Declaration of Helsinki and all participants gave informed consent and were debriefed at the end of the respective study. In order to avoid selection effects, in none of the studies were participants recruited for an "insect-eating" study. Rather they were always approached to a consumer study involving the opportunity to sample or judge novel foods, but learned in the information that the study would involve the opportunity to eat insects.

Study 1

Participants and Procedure

Thirty-five participants (16 males, 19 females; $M_{age} = 22.34$ $SD_{age} = 2.50$) were recruited on the campus of a Swiss university. Participants were directly approached within a central building and asked to participate in a consumer study in exchange for a chocolate or candy bar. After agreeing to participate, the researchers guided the participants to the laboratory room. First, they disbursed theinformed consent sheet, after which the study began. In the information sheet, participants learnt that they could not take part in the study if they reported at least one allergic reaction to food (e.g., seafood, gluten, nuts, etc.) or were presently pregnant and that opting-out at this stage would equally lead to their compensation. None of the participants reported a food allergy or pregnancy. The laboratory seated up to eight participants in a single session, but the number of participants varied in each session.

In the study documents, participants learnt that the study involved the opportunity to eat a freeze-dried locust (*locusta migratoria,* see **Figure 1** for an image of the insect as well as the original packaging). First, they were asked to work through the questionnaire. The initial question assessed the subjective belief about how many (out of 100) participants would be willing to consume the insect. Subsequently, we assessed their taste expectation ("What do you expect regarding the taste?") using a 7-point scale ranging from "1" (unpalatable) to "7" (delicious). Finally, participants had the opportunity to consume a whole insect. Our central dependent variable is dichotomous taking on the value "1" if the insect was eaten or "0" otherwise. After the consumption decision, participants completed a brief questionnaire including an assessment of their demographics (age, gender) as well as some additional information such as being vegan/vegetarian. Finally, participants were thanked, debriefed and dismissed from the study.

FIGURE 1 | Images of insect and products. It displays the image of the insect as displayed to participants (top panel) as well as the original packages (left side) sourced from the Swiss firm Essento Food AG (bottom panel).

Results

Out of 35 participants, 23 decided to eat the insect, while 12 decided not to eat. As our central result, there was a highly significant point-biserial correlation between a participant's social belief about how many other people would eat the insect and his or her own willingness-to-eat, $r = 0.45$, $p = 0.006$. In order to test the robustness of this correlation, we used a probit-regression accounting for the dichotomous nature of the dependent variable and controlled for several variables typically associated with the choice of eating insects, such as gender and vegetarianism. **Table 1** displays the regression results. Importantly, the main correlational pattern associating social beliefs and eating behavior remains significant even after controlling for these variables. In addition, as the laboratory included the opportunity that more than one participant was present at each individual session, we report the regressions with clustered standard errors at the session level.

To sum up, Study 1 provided initial evidence that social beliefs about the descriptive norm in place associates to the willingness-to-eat an unprocessed insect.

Study 2

Showing a simple correlational pattern does not imply any causal direction suggesting that social beliefs about descriptive norms in fact *cause* participants to eat insects. Thus, it is necessary to experimentally induce descriptive norms in order to demonstrate their causal role on insect-eating. Study 2 attempts to do that by using a highly established tool to manipulate the perception of descriptive norms, scale-manipulations. Especially in behavioral economics, such manipulations are frequently used to experimentally vary the subjective experience about locally

TABLE 1 | Probit regression analysis including control variables (Study 1).

Dependent variable: eating behavior (1 if yes)	Model 1	Model 2
Norm beliefs	0.03689**	0.0322***
	(0.0155)	(0.0111)
Gender (0 = male respondent, 1 female respondent)		−1.570**
		(0.6475)
Age		0.0579
		(0.0967)
Vegetarian (0 = no, 1 = yes)		0.6645
		(8.326)
Constant	−0.4481	−0.7556
	(0.3598)	(2.1532)
Observations	35	35
(Pseudo) R-squared	0.19	0.007

*Robust standard errors in parentheses, clustered at session level accounting for the fact that in some sessions more than one individual was present in the lab (28 clusters), Dependent variable: eating behavior (0 = no, 1 = yes). ***p < 0.01, **p < 0.05, *p < 0.1.*

TABLE 2 | Probit regression on non-vegetarians ($n = 133$) including control variables (Study 2).

Dependent variable: eating behavior (1 if yes)	
High norm induction (1 = high scale, 0 = low scale)	0.3899**
	(0.1870)
Gender (0 = male respondent, 1 female respondent)	−0.5237*
	(0.6475)
Observations	133
(Pseudo) R-squared	0.044

*Robust standard errors in parentheses, clustered at session level accounting for the fact that in some sessions more than one individual was present in the lab (51 clusters), Dependent variable: Eating behavior (0 = no, 1 = yes). ***p < 0.01, **p < 0.05, *p < 0.1.*

present social norms (e.g., Ockenfels and Werner, 2014; Feldhaus et al., 2018).

Participants and Procedure

Study 2 followed the identical protocol as Study 1, with the exception that it did not openly ask about the share of other people eating an insect, but restricted answers to this question to a scale that was manipulated to either induce high or low social beliefs. One hundred and fifty nine participants (67 males, 92 females; $M_{age} = 22.60$ $SD_{age} = 4.14$) were recruited on the campus from the same Swiss university, but we did not allow participants to enter who had already participated in Study 1. As in Study 1, participants were directly approached within a central building and asked to participate in a consumer study in exchange for a chocolate or candy bar. After agreeing to participate, the researchers guided the participants to the laboratory room. Participants were randomly assigned to one of only two experimental condition, the "low beliefs" condition or the "high beliefs" condition. The progression through the study was the following. First, the researchers disbursed an informed consent sheet. After giving informed consent, the study began. In an information sheet, participants learnt that they could not take part in the study if they reported at least one allergic reaction to food (e.g., seafood, gluten, nuts, etc.) or were presently pregnant and that opting-out at this stage would equally lead to their compensation. None of the participants reported a food allergy or pregnancy. The laboratory seated up to eight participants in a single session.

In the study documents, participants learnt that the study involved the opportunity to eat a freeze-dried locust. First, they were asked to work through the questionnaire. The initial question assessed the subjective belief about how many (out of 100) participants would be willing to consume the insect. Participants in the "low beliefs" condition were asked to indicate their belief using a five-point scale anchored at the points <10, 15, 20, 25, or >30%. Participants in the "high beliefs" condition were asked to indicate their belief the same five-point scale, but anchored at substantially higher values, which were <60, 65, 70, 75, or >80%. Subsequently, we assessed their taste expectation ("What do you expect regarding the taste?") using the same 7-point scale ranging from "1" (unpalatable) to "7" (delicious) as in Study 1. Finally, participants had again the opportunity to consume a whole insect, leading to the same dichotomous dependent variable as in Study 1. After the consumption decision, participants again completed a brief questionnaire assessing their demographics (age, gender) as well as some additional information such as being a vegan or vegetarian. Finally, participants were thanked, debriefed, and dismissed from the study.

Results

Out of 159 participants, 84 (52.83%) decided to eat the insect, while 75 (47.17%) did not decide to eat. As a central analysis, we compare the eating rate across conditions. In the high condition, the eating rate was 55.56%, whereas the eating rate in the low condition was 50.00%. This difference failed to reach statistical significance in a χ^2-test ($p = 0.483$). This apparent non-result, however, seems entirely explained by an oversampling of females and vegetarians into the high beliefs treatment. Unfortunately, there was a stark over-representation of females in one experimental condition that makes it necessary to control for gender effects. Therefore, a probit-regression using session-clustered standard errors was used to estimate the causal effect of social norms, controlling for the strong gender difference in insect-eating. **Table 2** displays the regression results on non-vegetarian respondents ($n = 133$). Importantly, the main correlational pattern associating social beliefs and eating behavior established in Study 1 emerges when social beliefs are causally manipulated in Study 2. Controlling for gender, the causal effect of social norms on eating emerges as significant ($p = 0.0037$). To sum up, Study 2 provided additional indication that social norms may partially underlie the uptake of entomophagy in Western cultures. Although the scale manipulation did not provide a large and robust effect on participants' willingness to eat unprocessed insects, regression analysis controlling for potential confounders such as gender provided evidence that norms underlie eating behavior.

Study 3

Study 3 was designed to replicate the effect and to show that information that does not necessarily in itself carry norm-information may be used to construct social beliefs. In particular, the experimental manipulation was adopted from behavioral economic work on the normative role of incentives (Ambühl, 2018). In this line of reasoning, we use a study design that manipulates seemingly non-normative information in an effort to nevertheless affect people's belief about what others will do. We hypothesize that high incentives create a belief that more people will eat an insect compared to a situation where they are offered a smaller incentive. Thus, we are able to show that non-normative information (monetary compensation) is used to infer social norms, which is strongly indicative that people's eating preferences in fact depend on the inferred normative environment.

Participants and Procedure

In Study 3, 120 participants (60.8% females, $M_{age} = 22.9$, $SD_{age} = 4.93$) were recruited at a Swiss university. After agreeing to take part, participants were guided to the laboratory and given an information pamphlet starting with an informed-consent form. In the information sheet, participants learnt that they could not take part in the study if they reported at least one allergic reaction to food (e.g., seafood, gluten, nuts, etc.) or were presently pregnant and that opting-out at this stage would equally lead to their compensation. None of the participants reported a food allergy or pregnancy. Next, they learnt that in Switzerland it is possible to consume edible insects as at the time of the study, the corresponding legislation was just passed. We informed them that we are planning a set of studies in which we are paying other participants a financial compensation in order to take part in a study, which is contingent on actually sampling an insect (*locusta migratoria*, as in Studies 1 and 2). We randomly enrolled participants in one of only two conditions. They were made to believe that in our planned studies, participants would receive either CHF3 or CHF30 as a financial compensation for eating an insect. Next, participants were asked to report their belief about the share of people actually tasting the insect. After they have made their judgment, they were invited to taste a locust without any financial compensation being offered. Next, they completed a brief questionnaire involving demographic information such as age and gender. Finally, participants were thanked, debriefed and dismissed from the study.

Results and Discussion

Participants in the 30 CHF condition estimated the consumption rate to be significantly higher than in the 3 CHF condition (44.1 vs. 26.4%, $t = 3.9512$ $p < 0.001$). In a regression model using clustered standard errors at the session level, the same effect emerged ($p < 0.001$, see **Table 3**, Model 1). Next, we analyzed the effect of the experimental manipulation on the actual eating behavior. Whereas, in the 3 CHF condition, 28.81% eat the insect, this value rises to 44.26% in the 30 CHF condition, an effect that is marginally significant ($p = 0.079$, based on a χ^2-test). In a regression using clustered standard errors at the session level, this result emerges as well when not controlling for gender ($p = 0.064$) as well as when controlling for gender ($p = 0.063$, see **Table 3**, Models 2 and 3).

However, the key interest is in whether the effect of the (arbitrary) experimental manipulation is mediated by the perception of the social norms and, therefore, we tested the mediation hypothesis, according to which the financial compensation affects beliefs, which in turn should translate into eating behavior. Importantly, methodological research highlights that a significant total effect is not a necessary pre-condition (i.e., "a gate-keeper") to test a mediation hypothesis and make a statistical conclusion about an indirect effect (Shrout and Bolger, 2002; Hayes, 2009). Without a statistical significant effect or with just a marginally significant effect (as is the case here) of the independent variable (X) on the dependent variable (Y), one can still observe a mediation effect of the mediator (M) on the XY relationship. We therefore used a bootstrapping method with 5,000 resamples to estimate the indirect effect using the SGMEDIATE command in Stata. For our analysis, the low incentive condition served as reference category. The 95% bootstrap confidence interval of the indirect effect excluded 0 (0.16, $SE = 0.26$ [0.07, 0.30]) showing a significant mediation of the effect of the incentive on eating behavior via norm beliefs. In sum, Study 3 showed that even in in-principle non-normative cues are used to derive norm information, which in turn affects the willingness to eat unprocessed insects.

Study 4

Study 4 re-examines the effect of Study 3 and shows that norm-beliefs are in fact causal in this relationship. To do so, we replicate the effect while addressing various supplementary aspects. Most importantly, we experimentally manipulate the mediator by using the scale manipulation established in Study 2 to assess the norm-belief after confronting the participants with either the low or high incentive condition. Thus, we fully cross the design in an effort to show that manipulating norms in fact affects eating preferences and in-principle non-normative information (i.e., information about compensation) is just used in the absence of such normative information. Furthermore, as Studies 1–3 have all been conducted in a university context in Switzerland, we extend the external validity by using a broader sample from the United States. As Studies 1–3 established that actual eating behavior is affected by norm-manipulations, we do not replicate this effect once again, but rather rely on Amazon Mechanical Turk to assess norm beliefs at the benefit of getting access to a broader participant population. Amazon Mechanical Turk is an online labor market that is frequently used by behavioral scientists to run online-studies. A major advantage for using Amazon Mechanical Turk is that the sample of recruited subjects has been shown to be more diverse and more nationally representative than the typical college student sample at major research universities (e.g., Buhrmester et al., 2011).

Participants and Procedure

A total of 213 participants (46% females, $M_{age} = 38.05$, $SD_{age} = 11.68$) were recruited using Amazon Mechanical Turk in exchange for a small monetary compensation that was paid upon successful completion of a brief survey. After giving informed

TABLE 3 | Regression models (Study 3, Model 1: OLS; Models 2/3: Probit).

Dependent variable: norm beliefs	Model 1 (beliefs)	Model 2 (eating behavior)	Model 3 (eating behavior)
Experimental condition (1 = high, 0 = low)	17.675***	0.415*	0.409*
	(4.160)	(0.224)	(0.220)
Gender (0 = male respondent, 1 female respondent)			−0.817*** (0.269)
Constant	26.407	−0.559***	−0.080
	(0.360)	(0.173)	(0.214)
Observations	120	120	120
(Pseudo) R-squared	0.12	0.064	0.09

*Robust standard errors in parentheses, clustered at session level accounting for the fact that in some sessions more than one individual was present in the lab (28 clusters), Dependent variable: Norm beliefs (0–100; Model 1), Eating behavior (0 = no, 1 = yes, Model 2). ***p < 0.01, **p < 0.05, *p < 0.1.*

consent, participants learnt that as part of a consumer study in Switzerland, the researchers are trying to gain insights into estimates about how many participants (out of 100) are willing to eat a freeze-dried insect as displayed in **Figure 1**. Participants were randomly enrolled into an experimental condition of a 2 × 2 design. The key experimental manipulations were thus 2-fold: first, the experimental remuneration that participants of the would-be study in Switzerland receive in exchange for eating the insect (3 vs. 30 CHF [1 CHF ∼ 1 USD at the time of the study]); second, whether or not the answer included a first guess using a scale (yes vs. no). The scale anchored the beliefs around the midpoint 31–35% (i.e., low beliefs). If the experimental manipulation of the announced remuneration in fact transports norm information, the effect should uniquely emerge when the scale is not present. The key dependent variables was the belief about the percentage of prospective participants eating the insect. Participants could therefore enter any number between 0 and 100. Afterwards, we gathered participants' age and gender and they were dismissed from the study by entering their completion word that triggered their payment.

TABLE 4 | Regression model (Study 4).

Dependent variable: norm beliefs	Beliefs
CHF condition (1 = high, 0 = low)	16.193***
	(4.584)
Scale condition (0 = no, 1 = yes)	0.520
	(4.430)
Interaction effect	−11.922*
	(6.39)
Constant	26.407
	(0.360)
Observations	120
Gender & Age controls	YES
(Pseudo) R-squared	0.12

*Robust standard errors in parentheses, Dependent variable: Norm beliefs (0–100). ***p < 0.01, **p < 0.05, *p < 0.1.*

Results and Discussion

The general pattern that emerged in Study 3 also replicated using a sample recruited online, importantly only when the answering option did not include a scale that more explicitly transports norm information. ANOVA shows a marginally significant interaction effect ($p = 0.081$), in addition to a significant effect of the CHF condition ($p < 0.01$) and a marginally significant effect of the scale presence ($p = 0.106$). As predicted, planned contrasts using a Tuckey-HSD correction show that the difference in the 3 vs. 30 CHF condition uniquely emerges when no scale is used between displaying the information and the assessment of the norm belief ($p < 0.001$; Tuckey 95%-CI ranging from 4.20 to 27.97, excluding zero). In a supplementary regression using gender and age as control variables, the interaction effect of the two experimental conditions remains at the identical significance level ($p = 0.064$). Neither age nor gender significantly predicted the belief assessment. The regression results are displayed in **Table 4**.

Thus, Study 4 showed causally that providing normative information renders a manipulation that previously transmitted norm information (3 vs. 30 CHF as offered compensation) insignificant, suggesting that participants actively use minimal cues to infer normative information about eating insects, which have in the previous studies been consistently linked to participants own eating behavior.

GENERAL DISCUSSION

The present research demonstrated a link between perceptions of descriptive social norms and the willingness to consume unprocessed insects. Based on four studies utilizing freeze-dried locusts, we find that norms affect eating intentions and behavior. Up to date, only little research investigates Westerners' willingness to eat such unprocessed insects following norm-manipulations. The present research therefore contributes to an emerging field investigating the consumer psychology of entomophagy. **Table 5** displays the design and the results of each study in plain language as a summary.

Future research can take several directions. First, it can augment the ecological validity by running experiments in more naturalistic decision environments (e.g., with the use of

TABLE 5 | Summary of results.

Study	Type of study	Independent variable	Dependent variable	Main result
Study 1	Correlational	Belief about eating behavior	Eating of an insect (yes vs. no)	Beliefs about eating and eating behavior correlate with each other
Study 2	Experimental	Exposure to high vs. low belief	Eating of an insect (yes vs. no)	Exposure to high beliefs may increase probability to eat
Study 3	Experimental	Exposure to high vs. low incentives that other people face	Eating of an insect (yes vs. no)	Exposure to information that other people receive high may affect probability to eat
Study 4	Experimental	Exposure to high vs. low incentives that other people face Exposure to low belief vs. no exposure	Belief about eating rate	Effect of Study 3 uniquely emerges when participants do not receive explicit norm-information (i.e., the low beliefs scale)

field experiments) or in-store samplings. Especially research in behavioral economics has established elegant tools and strategies to test effects of social norms in the field where real people make real decisions without being aware of being monitored (e.g., Alcott and Mullainathan, 2010 in the domain of energy behavior). Whereas, our research has uniquely relied on laboratory work as well as Amazon Mechanical Turk using one kind of insect, future research could transfer these findings also to other insect species that are suitable for human consumption and to other (Western) markets. Second, laboratory work always comes at a certain degree of artificiality. It is unclear whether the results and effects would emerge equally (e.g., in terms of effect size) in real-world contexts, although it is also imaginable that true social norms (e.g., observations of peers and opinion leaders) actually amplify the established effects.

Third, our research is essentially mute on potential moderators such as individual differences. For instance, people with a strong inclination to follow norms could be particular prone to the established effects, whereas consumers with a more individualist approach to life may actually prefer insects so long others do not share that preference. An alternative individual difference measure could be novelty seeking. Corresponding research showed that novelty seeking, i.e., "the sheer 'strangeness' and 'novelty' of other landscapes, lifeways and cultures that satisfy tourists' desires, and which cannot be satisfied at home" (Ji et al., 2016, p. 389) is positively related to novel food consumption (in foreign countries). In fact, strong normative information could actually decrease the impact of novelty seeking on insect-eating behavior as strong norm information may suggest that eating insects is not very special. However, one can expect that personality differences or other individual differences are important variables affecting the results and consumer research should continue to address the presented effects on various customer segments to gain a better understanding.

To summarize, our research provided more evidence that insect products may be promoted using social norms, which complements recent research showing that social influence factors are associated with insect eating (Berger et al., 2019; Jensen and Lieberoth, 2019). As humans are a particular social species, leveraging the social nature may prove particularly useful. Other domains of combating climate change show similar results that coordinated action is strongly influenced by social motives. For example, in cooperation games where foregoing individual benefits in order to secure social gains is necessary, coordinated reciprocal actions have been shown to strongly influence sustainable behavior (e.g., MacKay et al., 2015). Thus, making norms transparent (e.g., giving people feedback about how frequent consumption is) can actually not only take the fear of novel foods away, but lead to collective action in favor for a more sustainable way of consuming animal proteins (Oonincx and de Boer, 2012; van Huis, 2013; van Huis and Oonincx, 2017) from traditionally uncommon sources such as insects in the Western world. Quite clearly, social scientific research offers many routes to influence the uptake of more sustainable diets and social norms are one of many variables affecting humans' decision about what to eat.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

SB designed and performed the experiments, analyzed the data, and drafted the manuscript. AW provided critical feedback on the analysis and contributed to the final manuscript. All authors contributed to the article and approved the submitted version.

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