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Beyond information seeking: Consumers' online deliberation about the risks and benefits of red meat

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Abstract

Successfully engaging consumers in a dialogue may provide opportunities for better tailored and more effective communication about food-related risks and benefits. Using an online deliberation concept and software, VIZZATA™, we explored the validity of a behavioral measure of deliberation in an online environment in the context of consumers' perceptions and information seeking about the risks and benefits of red meat. Participants from Belgium, Portugal and the United Kingdom (n=150) were given the opportunity to engage in an asynchronous interaction with the research team about the information provided. Online deliberation was operationalized as an individual metric based on the number of questions asked in relation to the information, the number of comments left, the number of glossary terms accessed, and the time spent on deliberative activity. This operationalization provided a coherent measure of deliberation which was positively correlated with information recall about the risks and benefits of red meat. Participants who perceived the information about red meat risks and benefits as too complex engaged less with the information. The study herewith presents a novel method of investigating consumers' deliberation about food issues that conceptualizes consumer engagement as more than just information seeking.

Keywords

Consumer; Information seeking; Online deliberation; Red meat; Risk-benefit communication

Highlights

- A measure of online deliberation about red meat risks and benefits is validated.
- Questions asked, comments given, links clicked, time spent compose the measure.
- Perceiving information about red meat as too complex decreases deliberation.
- Deliberation increases information recall about red meat risks and benefits.

1 Introduction

In the field of food risk and benefit communication, bridging the divide between scientific experts and the lay audience has traditionally been a difficult task (Gaskell, et al., 2004; Hansen, et al., 2003). Communicators have the challenging task to assist consumers in making informed decisions (EFSA, 2012) and provide clear information about the balance between risks and benefits, which should build trust and therefore attenuate unwarranted risk perceptions (Qin & Brown, 2006; van Dijk, et al., 2012). Over the last decade, communication about food-related risks and benefits has undergone a significant change as the interest has grown to involve the public in the communication and decision-making processes (Dijkstra & Gutteling, 2012; Macnaghten, et al., 2005). The focus of this study is on consumers' deliberation or deliberative activity, which is defined as thoughtful, careful and lengthy considerations of information by individuals (Davies, 2009). Deliberation may differ from 'debate', 'discussion', or 'argumentation' in that its essence resides in the careful weighing of information and in making difficult choices and trade-offs among conflicting options (Matthews, 1994), although not all deliberative encounters require decisions (Burkhalter, et al., 2002). Involving citizens in deliberation initiatives has mostly been seen as a way to better inform public authorities and provide input for policy development. Consumers are influenced by deliberative activity as participation in the communication process can support also individuals to become better informed about an issue (Demont, et al., 2013; Min, 2007; Ramsey & Wilson, 2009).

The rapid growth of internet use and in particular the rise of web 2.0, has created new possibilities and new mechanisms for consumer engagement in food-related topics and deliberation, making the online environment a suitable context for the exploration of consumer views on risk and benefit issues. There are a few organisations using the internet or Twitter as a vehicle for consumer engagement in food safety or risk communication (e.g. the Food Standards Agency in the U.K. or the Food Safety Authority of Ireland). Much of this communication is still one-way, not personally tailored and fails to fully engage consumers in a deliberative process or in a proper dialogue, thus leaving a lot of potential that remains largely unexploited (Gaspar, et al., 2014; Panagiotopoulos, et al., 2013; Thackeray, et al., 2012). Besides advantages with respect to the ease and ability to reach out to wide audiences, the use

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of an online environment offers some new potential for deliberation as in theory it might allow researchers to better understand which aspects of the communication people pay most attention to and what their immediate reactions are. Major challenges, however, lie in measuring and monitoring such online deliberation processes, and assessing differences among individuals in their information seeking and deliberative activity (Anderson et al., 2012).

Furthermore, although risk communication has been extensively addressed over the last 30 years, much less attention has been paid to developing strategies for communicating balanced information and to understanding how consumers respond to more complex situations in which both risk and benefit information are available (Cope, et al., 2010; Fischer & Frewer, 2009; Verbeke, et al., 2008). Most food products have both positive and negative aspects which consumers often have to weigh up and trade off. As for the food products that have been characterized by a mixture of positive and negative effects on health, for example, fatty or oily fish, with the trade-off between omega-3 fatty acids and fat-soluble environmental contaminants, has received extensive attention (Foran, et al., 2005; Levenson & Axelrad, 2006; Pieniak, et al., 2008; Verbeke, et al., 2005). Yet less attention has been paid to red meat (the topic of this study) which is also worthy of attention (see e.g. Regan, et al., 2014) as it has increasingly been associated with risks (e.g. the presence of hormone or antibiotic residues, as well as associations with the prevalence of cardiovascular disease and colorectal cancer) (McAfee, et al., 2010; Smolinska & Paluszkiwicz, 2010) as well as benefits (e.g. as a source of high-value protein and essential minerals like iron, zinc and vitamin B12) (McAfee, et al., 2010; Wyness, et al., 2011; Van Wezemael, et al., 2014). Moreover, red meat risks pertain not only to the arena of human health and nutrition, but also to the environmental impact of its production which has recently begun to be acknowledged (Aston, et al., 2011; de Boer, et al., 2013). In a similar vein, benefits associated with red meat extend beyond its nutritional value alone. These include also hedonic attributes providing sensory satisfaction (Banovic, et al., 2009; Verbeke, et al., 2010) and socio-cultural values relating to meat's status, its connection to eating habits, the structural aspects of meals, and consumers' frames of reference and cooking skills (Parry, 2009; Schösler, et al., 2012; Scholderer, et al., 2013).

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Therefore, it is important to investigate how consumers weigh up the various positive and negative aspects of red meat, and how they engage in seeking clarification about these aspects as they try to make sense of the risk-benefit information received. Furthermore, given the ubiquitous use of the online environment for communicating risks and benefits to consumers, it is important to understand how consumers interact with information materials presented to them, and which aspects of such information most capture their attention. The objective of this study is to acquire a better understanding of the nature of consumer deliberation about the risks and benefits of food in an online environment, taking red meat as the specific case. Hereafter deliberation in an online environment will be referred to as "online deliberation".

With the aid of a new online deliberation concept and software, VIZZATATM, this study aims to investigate consumer deliberation about the risks and benefits of red meat while at the same time testing the validity of a behavioral measure of online deliberation. We aim to evaluate the role of personal relevance attached to red meat, information (in)sufficiency and perceived complexity of the information as potential antecedents of online deliberative activity related to information about red meat. We also explore online deliberation as varying by socio-demographic characteristics, including gender, age, education and the presence of children. While such characteristics have been shown to influence food risk and benefit perceptions (e.g. De Vocht et al.; 2013; Bearth et al., 2014) as well as consumer involvement with meat (Verbeke & Vackier, 2004), associations with food-related information seeking are less straightforward. For example, Kuttschreuter et al. (2014) document age-related differences but no gender differences in information seeking about food-related risks. In a similar vein, Hansen et al. (2010) report that women do not necessarily seek more often product-specific health-related information compared to men. Also Verbeke and Ward (2006) report that gender, age, education and presence of children had little impact on consumers' interest in information cues on beef labels with a few notable exceptions such as females reporting higher importance and attention to specific quality indications, and consumers aged below 30 years reporting lower interest in general. We are not aware of any studies specifically investigating differences in deliberation based on socio-demographic factors, but insofar as information seeking is one facet of deliberation there are

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differences which makes it reasonable to explore deliberation as varying by socio-demographic characteristics.

Finally, our study is performed in multiple countries (Belgium, Portugal and the United Kingdom). Although deliberation can be considered a rather universal process that can be found across cultures, and while we are not aware of any literature that looked at the cross-cultural aspects of deliberation, the performance of this work in multiple countries facing the same issues of red meat is believed to add cross-cultural validity to our study's online method and subsequent findings.

2 Theoretical background

2.1 Online deliberation

Mechanisms for engaging the public can range from simple public opinion surveys or focus groups to more complex approaches that involve more participative and deliberative processes such as citizen juries or conferences. While deliberation has been seen predominantly as face-to-face (F2F) communication, the development of new communication technologies has opened new avenues of deliberative possibilities (Boczkowski & Mitchelstein, 2012; Min, 2007; Xenos, 2008), including so-called online or keyboard-to-keyboard (K2K) deliberation (Powell et al., 2011). The new generation of interactive online tools that allow users to generate content and interact are increasingly recognized as an opportunity to involve and empower consumers in the food risk and benefit communication process (Brossard & Scheufele, 2013; Rutsaert, et al., 2013). Website interactivity can be evaluated on two levels: social and mechanical. Social interactivity consists of reciprocal communication through feedback mechanisms (Song & Zinkhan, 2008). The ability to provide feedback in the form of questions or comments is a form of social interactivity and it facilitates mutual relationships (Jiang, et al., 2010). Asking questions is an activity that is indicative of thought and consideration about the presented information; it shows how people are seeking to make sense of new information and indicates a process of 'wondering' (Marcu, et al., 2014). Asking questions can also be considered as an

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indicator of attentiveness (Ripberger, 2011), and analysis of the questions' content is considered a useful way to assess uncertainties and concerns in participants' understanding of the information provided (Dillon, 1982). Giving comments, on the other hand, is a way of expressing a personal view on a topic and providing feedback to the communicator. Like the activity of asking questions, giving comments also requires engagement with and consideration of the material presented. Mechanical interactivity is seen as active consumer control when looking for information, for example by using hyperlinks or clicking glossary terms to access other sources and additional information (Sundar, et al., 2003), whereby active control gives participants the freedom to choose which material they want to engage with (Boczkowski & Mitchelstein, 2012).

In the context of the present study we measured deliberation as the participants' engagement with the study material presented to them. Based on the aforementioned insights, online deliberation is operationalized as a behavioral measure in terms of questions asked by consumers about the online stimulus material, comments left by consumers, glossary terms accessed, together with the total time spent on deliberative activity. The option to comment gave participants the opportunity to express personal views and reflect on the given information. The glossary terms in the text provided the participants the opportunity to access additional information and clarifications they desired. The total time spent on the exercise indicates a level of interest in and close attention to the presented information material.

2.2 *Antecedents of deliberation*

The idea that food-related communication should be clear and easy to understand is generally accepted as best practice (McGloin, et al., 2009). However, scientific results and risk assessments cannot always easily be translated into simple guidelines and advice that the lay public or the media can easily understand (Barnett, et al., 2011). The simultaneous communication of food risks and benefits can result in complex messages and increase confusion and uncertainty. The heuristic-systematic model proposed by Chaiken (Chaiken, 1980; Eagly & Chaiken, 1993) stipulates that information can be processed systematically, heuristically or by a combination of these two. While the heuristic mode

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involves the use of simple decision rules or rules of thumb to process information, the systematic mode is based on a more detailed processing of all useful information to reach judgement. From this perspective, deliberation is a cognitive process involving active information seeking and processing, and is arguably underpinned by systematic rather than heuristic processing as it involves deeper thought and analysis.

A first possible antecedent of deliberation is personal relevance (or importance), as an issue perceived to be personally relevant is more likely to generate systematic information processing efforts (Chaiken, 1980; Griffin, et al., 1999). More involved participants may focus more on the content of a message and look beyond heuristic cues like source characteristics (Chaiken, 1980; Verbeke, et al., 2008). In relation to everyday risks and benefits, food is commonly perceived as a typical low-involvement product, therefore one might expect limited interest in information and consequently a relatively low level of deliberation. Nevertheless, consumer involvement with food may differ depending on the person, the situation and the product at hand. Therefore, personal relevance attached to red meat is a relevant construct to consider as a possible antecedent of deliberation about risks and benefits of red meat.

Building on the heuristic-systematic model, the risk information seeking and processing (RISP) model (Griffin, et al., 1999) assumes that not all individuals need the same amount of information. By developing the concept of 'information (in)sufficiency', Griffin et al. (1999) stipulate that information seeking is strongly based on the discrepancy between the actual level of knowledge and the desired level of knowledge, or information needed to be able to deal adequately with a given risk. The larger the gap between the actual and desired level of information, the more effortful information seeking and processing will take place as people think they need to know more about the given risk or the choice they face. Thus, information (in)sufficiency about red meat risks and benefits can be expected to impact on deliberation.

Finally, in complex situations (or rather, in situations perceived as complex) individuals might fall back on heuristic strategies by attending to the characteristics of a message such as source credibility

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instead of actually engaging with the message content (Kahneman & Tversky, 1979). The RISP model accepts that some people might avoid risk information if it leads to worries they cannot cope with (Griffin, et al., 1999). Perceived message complexity can thus have a significant effect on information processing and reduce deliberative activity.

Based on the aforementioned theories of risk information seeking and processing and information avoidance, we examined the role of personal relevance of red meat, risk and benefit information sufficiency, and perceived information complexity as antecedents of deliberation about the risks and benefits of red meat. Specifically, we test the following hypotheses:

Hypothesis 1: Personal relevance of red meat increases deliberation.

Hypothesis 2: Information sufficiency about red meat (a) risks and (b) benefits decreases deliberation.

Hypothesis 3: Perceived complexity of the information decreases deliberation.

3 Materials and methods

3.1 Participants

A total of 244 participants were invited by a market research agency to take part in a study about the risks and benefits of red meat (80 from the UK; 80 from Belgium and 84 from Portugal). All participants were frequent red meat eaters (i.e. non-vegetarians and consuming red meat at least once a week) who agreed to participate in a deliberation study about red meat, consisting of two stages. Of the total invited sample, 150 participants (62%) completed both phases of the study in the summer of 2012. Of the 150 participants, 55 came from Belgium, 50 from Portugal and 45 from the UK. The sample was diverse in terms of a wide range of socio-demographic characteristics (e.g. education levels, participants with and without children). There was an equal division of men and women in the sample. 22.7% of the sample was younger than 30 years, 42% were aged between 30 and 40 years and 35.3% were older than 40 years. The majority of the sample had completed a higher education (53.3%) and 45.3 % of the sample reported they had children.

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3.2 Procedure

This study used the online deliberation software VIZZATA™ (<http://www.vizzata.com>) (Barnett, et al., 2008). This tool allows researchers to present the target audience with information (text, images, videos, website screenshots, etc.) and to elicit the audience's questions and comments in relation to these pieces of content. The participants can indicate their preference to receive responses from the research team, prior to moving to a second phase where their questions and comments are answered and further questions, comments and answers can be elicited. VIZZATA™ thus offers the opportunity for on-going asynchronous interaction between the communicator or researcher and the audience. A further feature of VIZZATA™ is the inclusion of 'glossary terms' – highlighted words in the online text which can be clicked on to provide further information. One of the core features of VIZZATA™ resides in eliciting questions and comments from the participants and observing their engagement with the study material, for example by measuring the time spent on each of the content testers (online pages with pieces of information) or the number of glossary terms that the participants access.

The recruited participants were invited by email to the website and presented with a series of seven content testers where they could ask questions or make comments. Firstly, the participants completed a short series of closed response questions, which included measures of the antecedents of deliberation and other control measures. They were then presented with the seven content testers. Five of these pages contained highlighted glossary terms. At the bottom of each page, participants had the opportunity to leave questions or comments on the material presented. The first phase of the study finished with the participants completing a further series of measures pertaining to information seeking and processing. After the research team conducted the necessary work to provide responses to the questions and comments participants had submitted, the responses were emailed back to the participants. Approximately two weeks after completion of the first phase, they were invited to the second phase of the study and asked to complete a final set of questions. Between both study phases, no significant incidents regarding the study topic (red meat) were reported in the media in the participating countries.

3.3 *Content of the study*

Table 1 presents an overview of the topics covered in the study. All the content tester pages were about red meat and potential risks and benefits linked to it. The first content tester page gave a general introduction to red meat. The next two pages dealt with nutritional and environmental risks of red meat, respectively. Pages four and five provided information about the nutritional benefits and socio-cultural aspects of red meat, respectively. To avoid bias because of order effects (Verbeke, et al., 2008), half of the participants were presented with the risk information pages first and half with the benefit information pages first. As no significant differences were found as a result of presentation order, the sample was treated as one in further analyses.

On page six, a recent article from the BBC News Online was presented (BBC, 2012) (in Belgium and Portugal, translations of the article were used which appeared in national newspapers). The article discussed the increased risk of early death in relation to excessive consumption of red meat based on a recent US study (Pan, et al., 2012). The seventh content tester contained a YouTube video about synthetic (also referred to as 'in-vitro' or 'cultured') meat (YouTube, 2011) developed by the Royal Institution of Australia. Our choice of content testers aimed to reflect the different aspects of red meat which are currently discussed in society, based not only on information provided by food communicators but also through other sources and media channels. In addition, synthetic meat (using beef, thus red meat as a model) was selected as a possible complex topic that had recently emerged and is expected to develop further in the upcoming years (Hocquette et al., 2013; Verbeke et al., 2014). The synthetic meat content tester basically informed participants about the fact that animal cells can be cultured and grown into meat without the necessity of killing an animal. While this content tester did not explicitly refer to risks or benefits of red meat, it brought to attention the environmental impact of red meat and it also presented synthetic or cultured meat as a possible future substitute to traditional meat without the need of harming animals. The red meat news story and the synthetic meat YouTube video did not contain clickable glossary terms.

[Insert Table 1 here]

3.4 Measures

We aimed to measure how consumers engaged in deliberative activity, which we operationalized as a latent construct based on the standardized scores of four components: (i) the number of questions participants asked, (ii) the number of comments they left, (iii) the number of glossary terms they accessed and (iv) the total time they spent on deliberative activity. It is important to note that standardized scores were calculated, which means that the deliberation measure for each participant is a relative measure that takes into consideration the comparison to the other study participants.

Personal relevance of red meat and information sufficiency about the risks and benefits of red meat were measured as self-reported variables before participants were exposed to the content testers. Personal relevance (or personal importance attached to red meat, Van Wezemael et al. (2010)) was measured on a 7-point Likert scale using four items as presented in Table 4. Griffin et al. (1999: S233) defined information sufficiency as "the amount of information people say they need in order to deal adequately with a given risk in their own lives". Information sufficiency refers to the extent to which the individual feels his/her need for information on a given topic was satisfied (Eagly & Chaiken, 1993). Information sufficiency regarding both the risks and benefits of red meat was measured on a 7-point Likert scale ranging from 'completely disagree' to 'completely agree' (Table 4).

Perceived complexity of the presented information and information recall were measured after participants had been exposed to the content testers. Perceived complexity of the presented information was measured on a 7-point Likert scale based on the study of Shepherd and Kay (2012). The participants were asked to name up to three risks and three benefits of eating red meat they could remember from reading the material presented in the first phase. The measure of recall was calculated as the sum of risks and benefits correctly recalled and thus ranged from zero to six.

Data were analysed using the statistical software SPSS version 20.0 and LISREL 8.72. First, descriptive statistical analyses were performed using independent sample tests for comparison of mean scores between groups of participants. Second, a maximum likelihood confirmatory factor analysis was conducted using the robust maximum likelihood procedure in LISREL 8.72. Third, structural

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equation model coefficients were estimated and the general fit of the model was assessed. With the use of structural equation modelling (SEM), the examination of all the relationships between constructs and items was performed simultaneously. To evaluate how closely the data fit the hypothesized model, the following goodness of fit indices are reported: the χ^2 -value together with degrees of freedom (df), the ratio (χ^2 /df), the Root Mean Square Error of Approximation (RMSEA), the non-normed fit index (NNFI), and the Comparative Fit Index (CFI). Values below 0.08 for RMSEA (Browne & Cudeck, 1993) and above 0.90 for NNFI and CFI (Hu & Bentler, 1999); and χ^2 /df <2 (Tabachnick & Fidell, 2007) indicate an acceptable fit of the model. Due to the fact that χ^2 is very susceptible to sample size and the number of items, it is recommended selecting the ratio of the χ^2 /df as an alternative criterion (Hair, et al., 2006; Tabachnick & Fidell, 2007).

4 Results

4.1 Descriptive statistics

Table 2 presents the differences between socio-demographic groups for the number of questions asked, comments left, clicks on glossary terms and average time spent on deliberative activity about the risks and benefits of red meat. Of the 150 participants who completed the study, 72% engaged in deliberative activity by asking questions, giving comments or clicking on glossary terms. In total, the participants asked 138 questions, left 279 comments and accessed the 20 glossary terms 435 times. Participants with a higher education level provided significantly more comments and spent on average a longer time on the stimulus material. Participants with children gave on average more comments. No significant differences were found for the four hypothesized antecedents of deliberative activity between countries, gender and age categories.

Figure 1 shows the number of questions asked and comments given per content tester. Most comments were given about CT6 (red meat in the news) and CT7 (synthetic meat). Although content analysis of the questions and comments is beyond the scope of this paper, examples of questions and comments

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are provided in appendix 1, while we provide a detailed analysis of the questions and comments pertaining to synthetic meat in a related paper (Marcu et al., 2014). Briefly, despite recognizing moderate meat consumption as being indispensable in their personal diets, participants wondered about the precise role of red meat in a healthy and varied diet and, how much and how frequently red meat can safely be eaten. They also expressed doubts about a wide diversity of issues relating for example to red meat's nutritional value, the impact of meat processing and preparation, possible alternatives to red meat, the possibility of counterbalancing risks by leading healthier lifestyles, and scientific uncertainties or inconclusiveness about the alleged impacts of meat consumption on human health and the environment.

[Insert Table 2 here]

[Insert Figure 1 here]

Table 3 presents socio-demographic differences in participants' reported personal relevance of red meat, information sufficiency about risks and benefits of red meat and perceived complexity of the given information. Information sufficiency about the risks of red meat was perceived higher in Portugal than in Belgium and the United Kingdom. Information sufficiency about the benefits of red meat was perceived higher for participants aged above 35 years compared to younger age. Participants with a higher education level perceived the information to be significantly less complex compared to lower educated participants.

[Insert Table 3 here]

4.2 *Confirmatory factor analysis*

Confirmatory factor analysis was performed to determine whether measures of a construct actually converged towards the intended latent variable of deliberation or shared a high proportion of variance in common, and whether the constructs were distinct from each other. Latent variables, items, loadings and reliability estimates are presented in Table 4.

[Insert Table 4 here]

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Due to low factor loadings (<0.40) six items were deleted (Table 4, footnote). Loadings of the remaining items on the constructs were all significant with values ranging from 0.49 to 0.96. All cross loadings were below 0.40. One factor loading was relatively low (0.49 for the item *It is valuable to me to include red meat in my diet*). However, due to acceptable values of Cronbach's alpha coefficients for the personal relevance construct (alpha=0.80) and the consistent meaning of the item within the construct we decided to retain it in further analyses. All Cronbach's alpha internal reliability coefficients were above the threshold value of 0.70 for satisfactory scales (Hair et al., 2006). Descriptive statistics of the five constructs, factor loadings and reliability estimates are presented in Table 5.

[Insert Table 5 here]

4.3 *Deliberation and information recall*

Information recall was assessed as a check of the validity of our behavioral measure of online deliberation. Based on the deliberation scores, the participants were divided in three tertiles, i.e. low, medium and high deliberators. High deliberators (M=4.32; SD=1.72 on a scale from zero to six) recalled significantly more risks and benefits compared to low (M=2.74; SD=1.85; $t(98) = -4.42$, $p < .001$) and medium deliberators (M=3.22; SD=1.84; $t(98) = -3.09$, $p < .01$).

4.4 *Model validation*

The hypothesized online deliberation model performed well (Figure 2). The χ^2 for the model was 202.18 with 125 degrees of freedom ($p < 0.001$), and a ratio of 1.6 thus in accordance with the recommended threshold level. The RMSEA value was 0.064; the NNFI was 0.95 and the CFI was 0.94, indicating that the goodness-of-fit indices were satisfactory. Direct relationships between personal relevance, information sufficiency about risks of red meat, information sufficiency about benefits of red meat and online deliberation had been included in the model but failed to reach statistical significance (hypotheses 1, 2(a) and 2(b) not supported). Perceived complexity of the information was negatively moderately (-0.41) and directly associated with our measure of online deliberation. The higher the perceived complexity of the information in the stimulus material, the

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lower the online deliberation, supporting hypothesis 3. The SEM results thus support only one of the four theorized antecedents of online deliberation.

[Insert Figure 2 here]

5 Discussion and conclusion

The present study offers insight in how consumers engage in online deliberation when provided with information about the risks and benefits of red meat. We conceptualized and operationalized deliberation as an activity resulting from asking questions, leaving comments, accessing glossary terms, and spending time on the study stimulus material. While previous research has focused on deliberation as a method for policy makers to obtain a picture of consumer understandings that are collectively developed about a specific topic, our approach explored deliberation as manifest in an individual's activity and even encouraged it further with the provision of individually-tailored responses to questions and comments. Using the VIZZATATM online deliberation concept and software, we identified a number of actions undertaken by individuals that allowed us to construct an individual measure of deliberation. The results indicate that deliberative activity can be assessed as an individual and behavioral measure that – at least, for the case of red meat – varies among individuals and associates with the level of education and having a responsibility as a parent. The results suggest that the higher educated people are, the more able they are to engage with complex communications, such as information presenting both the risks and benefits of red meat. This may be the result of being better 'equipped' and more skilled to deliberate around the complexity of an issue, and/or of being more familiar with such situations as a result of more frequent exposure to complex information. The implication is that food communicators should tailor their messages so as to reach those groups of consumers who are less able to navigate around the complex aspects of food-related risks and benefit. The presence of children in the household led to leaving more comments. This suggests parents may attend more to the complex aspects of food, which is possibly driven by their protective role (Eibach

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& Mock, 2011) and concern about providing adequate nutrition and wholesome food to their children (Verbeke, 2005).

The findings also suggest that, besides content, the presentation format of information influences deliberative activity. The content testers including a news article and YouTube video, resulted in twice as much comments compared to standard verbal content testers. This may be due to content, but also to the higher level of experimental realism as the article and video content testers were visibly copied from an original and professional source. Material presented in a well-recognized and typical media format such as a news page or YouTube video may seem more credible, may be more engaging, and may stimulate more active deliberation from participants.

Having constructed a coherent measure of online deliberative activity we corroborated it further using a measure of information recall which enabled us to observe a systematic relationship between behavioral indicators of attentiveness to and engagement with the stimulus material and the responses provided. That is not to say that recall is the primary or necessary outcome of deliberation but as part of this first attempt to develop online methods that facilitate deliberation, information recall can serve as a useful cognitive construct against which to locate the deliberation measure. Other possible validation measures can be attitudinal (e.g. specific beliefs, perceptions, or attitudinal ambivalence) or behavioral (e.g. intentions to consult more (or less) information about red meat, to pay more (or less) attention in the future to similar news, information avoidance, or intentions to reconsider one's current red meat consumption).

The development of a measure of online deliberation allowed us to investigate possible antecedents of online deliberation such as personal relevance, perceived information sufficiency and complexity for the specific case of red meat. By using structural equation modelling, we were able to estimate the strength of direct relationships between the different constructs on one hand and deliberation on the other hand. Our first hypothesis was that personal relevance would have a positive influence on deliberation as in the case with information seeking (Chaiken, 1980), i.e. the more personally relevant red meat was, the more the participants were expected to engage in commenting, questioning, and

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accessing glossary terms. The concept of personal relevance has also been linked previously with involvement in the context of fresh meat consumption (Verbeke & Vackier, 2004). Despite a positive correlation between personal relevance (or perceived importance of red meat in the diet) and deliberation, this construct had no significant impact in the structural equations model (H1 not supported), which suggests that people may engage in deliberative activity irrespective of their level of personal involvement with the issue at hand.

Information sufficiency about the risks and benefits of red meat was hypothesized to decrease deliberation. While the RISP model of Griffin et al. (1999) suggests that the perceived gap between the actual and the desired level of knowledge influences information seeking, information sufficiency was not found to relate to online deliberation for the case of red meat (H2a and H2b not supported). A possible explanation is that risks and benefits about red meat have been regularly and quite prominent in the news during recent years, which may have led to a 'good match' between the actual and desirable level of knowledge, or even to some degree of 'fatigue' among consumers. For example, Portuguese participants reported a significantly higher level of information sufficiency about the risks of red meat, which is an empirical issue as such, though it may also reflect a higher degree of 'fatigue' among Portuguese meat consumers as compared to consumers in the UK or Belgium concerning the risks of red meat. In general, our findings suggest that if people feel knowledgeable about the risks and benefits of red meat, they may either refrain from further deliberation or they may still enjoy engaging with additional stimulus material by asking questions, leaving comments or clicking glossary terms, e.g. out of curiosity or to confirm their own knowledge.

Perceived information complexity was the only significant antecedent with a negative effect on deliberation (H3 supported). While one might have assumed that difficulties in understanding the information may have resulted in people leaving more questions and comments or accessing more the glossary terms, the opposite was found as the greatest deliberation was observed among people with low perceived information complexity. This might tie in with previous research on the effect of task complexity on motivation which has found that when people are able to complete a more complex task this can in turn lead to satisfaction of a feeling of competence (Sun, et al., 2012). By contrast, if

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perceived task complexity is negatively related to the probability of completing a task and thus resulting in unsuccessful fulfilment, this can lead to a sense of incompetence. It could be argued that the participants who perceived the information about red meat as too complex might have therefore preferred to avoid this information instead of feeling incompetent to deal with it. Additional antecedents that might be considered in future studies are, for example, knowledge, need for cognition, trust in science and society, or interest in information in general as general personal difference variables. In addition, possible case-specific antecedents such as interest and trust in food-related information, concern about climate change, openness to innovation in food or interest in any specific information about issues that are stressed in the content testers provided to the study participants, may matter.

Previous research has indicated that communicating balanced information about food is a difficult task (Verbeke et al., 2008; Roosen, et al., 2009). The widespread use of the internet and the emergence of social media are creating a shift in the traditional communication model in which the communicator had control over the message and how it was spread (Hoffman & Novak, 1996). Although the integration of social media in public or private communication strategies might worry some food policy makers and communicators (Rutsaert, et al., 2014), engaging consumers into a dialogue, whether online or offline, can lead to better informed and more critically thinking consumers. The present findings are supported by the work of Bjoernes, et al. (2012) who concluded that an online asynchronous dialogue between healthcare professionals and patients can accommodate the individual patients' information and communication needs. Neglecting the opportunities for consumers to engage in a dialogue with food communicators can even result in others taking over the role of communicator and providing potentially inaccurate information to the public (Agostino, 2013). In order to limit the influence of unreliable information, there is value in trusted food policy makers and stakeholders actively engaging with consumers around food-related risks and benefits.

Measuring deliberation in the context of public consultation provides food policy makers and marketers with valuable insights, and enables them to produce communications and interventions that focus on prevalent knowledge gaps, thus better adopting food-related communication and marketing

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efforts to people's information needs. While the present study investigated deliberative activity and its antecedents for the specific case of red meat, it remains to be tested whether the insights obtained (e.g. significant vs. non-significant antecedents) apply equally to other food product categories. The case of red meat may be specific because of the large amount of predominantly negative press that has emerged during the last decade. This may have shaped both consumers' interest in engaging with additional information about red meat, as well as the perceived personal relevance of red meat in their diet and information sufficiency about risks and benefits of red meat. Our study is a first step towards a better understanding of the potential and possible effects of consumer deliberation beyond simple information seeking in a food context. Whereas this cross-national study demonstrates that deliberative activity can be meaningfully assessed in different cultural settings, e.g. using the newly developed VIZZATATM tool, further studies are recommended to investigate the impact of information presentation formats, the role of people's prior information base when exposed to information that is consistent or inconsistent with prior knowledge, as well the wider implications of consumer deliberation, notably in terms of its impact on food-related attitude, preference and behavior change.

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Table 1: The title and topics of the content testers (information pages)

Content tester	Title	Topics
1	Introducing red meat	Definition of red meat General information about meat consumption Red meat within the food pyramid
2	Possible risks of eating red meat	Cardiovascular disease risk Colon cancer risk Advantages of lean meat
3	Other downsides to red meat	Environmental impact of livestock production Greenhouse Gas Emissions Impact on deforestation
4	Benefits of eating red meat	Nutrients and vitamins Providing satiety Red meat and growth in children
5	Other values to red meat	Taste and hedonic satisfaction Socio-cultural identity Advantages of organically grown meat
6	Red meat in the news	Media online article with title: "Red meat increases death, cancer and heart risk, says study." (BBC, 2012)
7	Synthetic meat	YouTube video about synthetic meat (YouTube, 2011)

Table 2: Sample characteristics, and differences in number of questions asked, comments left, clicks on glossary terms and average time spent on deliberative activity about the risks and benefits of red meat across participant groups

	n	Number of questions asked	Number of comments left	Glossary terms clicks	Time spent (seconds)
Total	150	138	279	435	146,902
Mean (S.D.)	150	0.92 (1.92)	1.86 (2.48)	2.90 (4.35)	979 (1004)
Country					
Belgium	55	0.93 (2.53)	1.84 (2.91)	2.75 (4.49)	954 (1037)
Portugal	50	0.78 (1.33)	1.42 (1.97)	2.56 (3.90)	894 (986)
U.K.	45	1.07 (1.63)	2.38 (2.36)	3.47 (4.68)	1,103 (991)
Gender					
Male	75	1.25 (2.47)	2.07 (2.84)	3.04 (4.72)	983 (1029)
Female	75	0.59 (1.05)	1.65 (2.04)	2.76 (3.97)	975 (985)
Age					
≤35 years	66	1.06 (1.74)	1.97 (2.46)	3.42 (4.41)	1,080 (1134)
>35 years	84	0.81 (2.20)	1.77 (2.51)	2.49 (4.28)	900 (887)
Higher Education					
Yes	80	1.15 (2.40)	2.30 ^b (2.71)	3.24 (4.68)	1,110 ^b (1083)
No	70	0.66 (1.13)	1.63 ^a (2.10)	2.51 (3.94)	829 ^a (888)
Having children					
Yes	68	1.26 (2.57)	2.38 ^b (2.81)	3.46 (4.56)	1,130 (1206)
No	82	0.63 (1.08)	1.43 ^a (2.09)	2.44 (4.14)	854 (784)

The a-b indicate significantly different mean scores between participant groups using non-parametric Kruskal-Wallis and Mann-Whitney tests.

Table 3: Differences in personal relevance, information sufficiency and perceived complexity of the information across participant groups

	n	Personal relevance of red meat	Information sufficiency about red meat risks	Information sufficiency about red meat benefits	Perceived complexity of the information
Total	150	4.64 (1.18)	3.97 (1.04)	4.15 (1.12)	3.16 (1.22)
Country					
Belgium	55	4.70 (1.20)	3.83 ^a (0.85)	4.06 (1.03)	3.06 (1.17)
Portugal	50	4.39 (1.12)	4.27 ^b (1.27)	4.15 (1.35)	3.03 (1.27)
U.K.	45	4.85 (1.17)	3.81 ^a (0.93)	4.26 (0.95)	3.42 (1.22)
Gender					
Male	75	4.62 (1.17)	3.84 (1.06)	4.04 (1.20)	3.07 (1.26)
Female	75	4.69 (1.18)	4.09 (1.01)	4.25 (1.03)	3.25 (1.19)
Age					
≤35 years	66	4.50 (1.23)	3.96 (1.16)	3.91 ^a (1.25)	3.08 (1.31)
>35 years	84	4.75 (1.13)	3.98 (0.95)	4.33 ^b (0.97)	3.23 (1.16)
Higher Education					
Yes	80	4.67 (1.15)	3.96 (1.06)	4.26 (1.14)	2.94 ^a (1.17)
No	70	4.61 (1.21)	3.99 (1.03)	4.02 (1.10)	3.41 ^b (1.25)
Having children					
Yes	68	4.60 (1.22)	4.07 (1.18)	4.27 (1.24)	3.02 (1.28)
No	82	4.67 (1.14)	3.89 (0.91)	4.04 (1.02)	3.27 (1.17)

The a-b indicate significantly different mean scores on a seven-point scale (1 totally disagree; 7 totally agree) between participant groups using non-parametric Kruskal-Wallis and Mann-Whitney tests.

Table 4: Latent variables, items, factor loadings and reliability estimates

Constructs and items	
<i>Online deliberation</i>	(0.73)
Number of questions asked	0.63
Number of comments given	0.71
Number of glossary terms clicked	0.55
Total time spent (s)	0.79
<i>Personal relevance of red meat</i>	(0.80)
It is important to me to include red meat in what I eat in a typical week	0.79
It is valuable to me to include red meat in my diet	0.96
It is not important to me to eat red meat on a regular basis (R)	0.49
Eating red meat is important to my well-being	0.75
<i>Information sufficiency about red meat risks</i>	(0.74)
I know many of the negative aspects of eating red meat	0.84
I am confident I know enough about the risks of eating red meat	0.88
I am not satisfied with my knowledge about risks of red meat for human health (R)	0.70
<i>Information sufficiency about red meat benefits</i>	(0.83)
I know many of the positive aspects of eating red meat	0.64
I am confident I know enough about the benefits of eating red meat	0.85
I am not satisfied with my knowledge about benefits of red meat for human health (R)	0.64
<i>Perceived complexity of the information</i>	(0.78)
The various benefits and risks of eating red meat were difficult to grasp	0.86
I found myself struggling to understand the information on red meat	0.93
The risks and benefits of red meat consumption seemed incredibly technical and complex	0.63
The sheer number of things to take into consideration when deciding how much red meat I should eat was overwhelming	0.50

Note: internal construct composite reliabilities are reported in parentheses. All factor loadings are significant at $p < 0.001$. Fit-statistics: $\chi^2(120) = 157.53$, $p = 0.012$; RMSEA = 0.044; NNFI = 0.97; CFI = 0.98. Items not included owing to factor loadings < 0.40 : There is no need for me to find out more information about the benefits of red meat; Understanding the aspects of red meat production and consumption is quite a challenge; I was able to follow the arguments about the benefits and risks associated with red meat; It was easy to see why eating red meat has risks and benefits both for human health and the environment.

Table 5: Correlation matrix of constructs of interest

Construct	1	2	3	4	5
1. Online deliberation*	1.00				
2. Personal relevance of red meat	0.19*	1.00			
3. Information sufficiency about red meat risks	-0.06	0.06	1.00		
4. Information sufficiency about red meat benefits	0.01	0.42*	0.72*	1.00	
5. Perceived complexity of the information	-0.41*	-0.14	-0.13	-0.15	1.00

Note: *correlations are statistically significant at $p < 0.05$ (two-tailed).

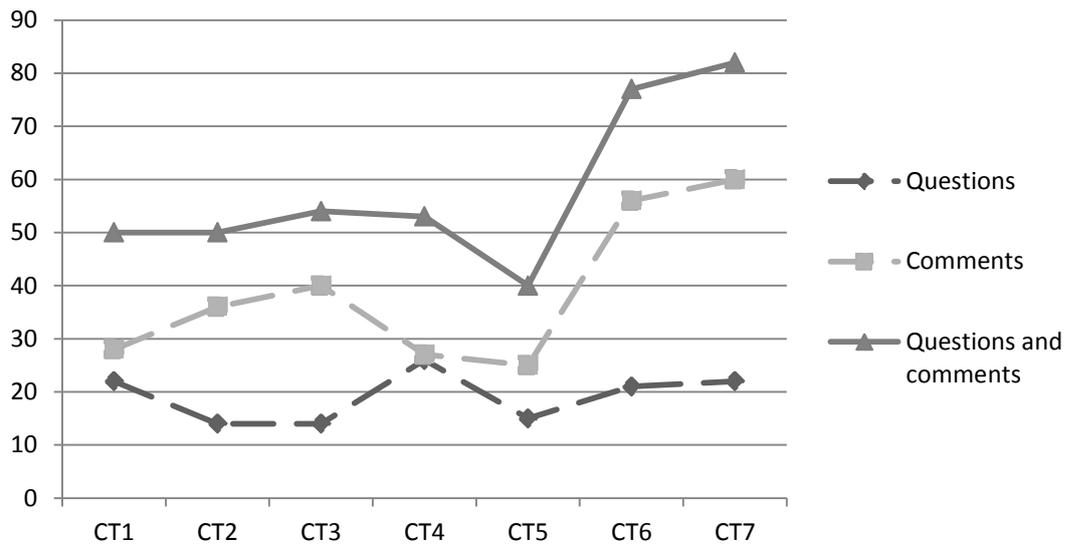


Figure 1: Total number of questions asked and comments given per content tester (CT). See Table 1 for the topics included in each content tester.

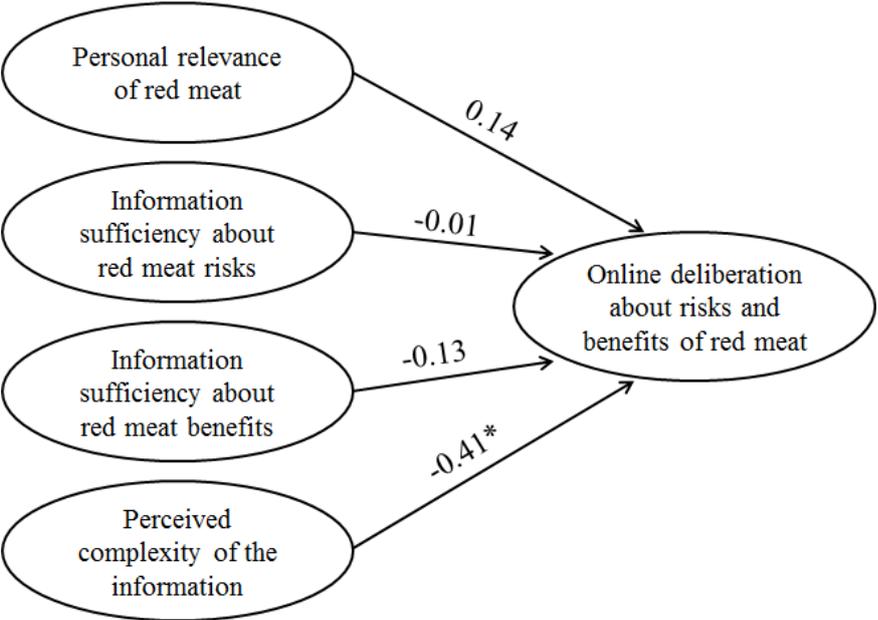


Figure 2: Path modelling (SEM) results of antecedents of online deliberation about risks and benefits of red meat. Note: *: $p < 0.01$.

1 **Appendix 1:** Examples of comments and questions asked by the study participants in relation to the different content testers

Content tester	Comments	Questions
CT1: Introducing red meat	<p>One should not analyse food that much, it is a basic need. Red or white meat, why does it matter? It is all good if you eat it with moderation. It is necessary for my children's growth and development.</p> <p>I did not realise that pork was classified as red meat.</p>	<p>Why do men eat more red meat than women? Which nutrients do they need more than women?</p> <p>With which product do you have to replace red meat? Shifting completely to white meat is probably also not healthy?</p>
CT2: Possible risks of eating red meat	<p>I know people who eat only cereals, fruits and vegetables and are indeed healthier.</p> <p>I did not know that red meat increased the chance on bowel cancer and vascular diseases. Somewhere this is quite logical if you link it to the saturated fats/cholesterol.</p> <p>I too had to reduce red meat consumption due to medical advice (high blood pressure and cholesterol).</p>	<p>There is a myth that says that red meat grilled on charcoal may contain carcinogenic substances. Is this true?</p> <p>If the studies are not conclusive, why are people advised to reduce red meat consumption?</p> <p>I am a very active person. I walk five kilometres a day, go to the gym three times a week, and I eat red meat every day. In this scenario, the fact that red meat contains cholesterol, is this not balanced by my active lifestyle?</p>
CT3: Other downsides to red meat	<p>The environmental issue: deforestation due to cattle is doubtful; it is also due to palm oil extraction from palm trees.</p> <p>I always thought that the liberation of fertilizer compounds was good for the environment.</p> <p>I feel sad I cannot find organic meat for an affordable price.</p>	<p>Quorn, does it exist in Portugal?</p> <p>What is organic red meat? Is organic cattle grazing on pasture or fed in another way?</p> <p>Has scientific research been carried out about the reduction of CO₂ and other emissions from the livestock and meat industry?</p>
CT4: Benefits of eating red meat	<p>The way you cook red meat can also influence the quality of your diet.</p> <p>Happy to finally hear about the advantages of red meat. Mostly, you always hear the negative much quicker than the positive.</p> <p>My children cannot become vegetarians before they are</p>	<p>Why do you need zinc and selenium?</p> <p>Is red meat bad for rheumatism?</p> <p>Which are the alternative sources of all these nutrients?</p> <p>How much red meat is healthy to eat in one week?</p>

	physically full grown.	
CT5: Other values to red meat	<p>Cultural identity: I'm from a family with a great tradition when it comes to eating. Big steaks, big meals. And since my grandparents have surpassed the age of 80, I'm eager to know more about the benefits of red meat.</p> <p>This is nice to hear. In general, I find it important to eat a varied diet and for my case also with red meat, around two times per week. Besides that, also chicken, grains, vegetables, fruits, ... When all the animals are well treated, this should not be a problem as long as one varies within the diet.</p>	<p>What are the benefits for the development of children and adults?</p> <p>Why do I need to read statistics?</p> <p>What do you mean with lean red meat? Is it healthier processed or not?</p> <p>From a farmers' point of view, is red meat a good business? I mean, do they make a reasonable income from cattle farming?</p>
CT6: Red meat in the news	<p>I was a little bit scared by this news.</p> <p>It seems a trustworthy study with a large sample.</p> <p>This news is only one study and stands for little.</p> <p>Moderation is the key to healthy eating.</p>	<p>What is the relevance of red meat for health? To what extent is red meat still healthy?</p> <p>Is there a difference between packaged meat (pre-packed or vacuum) and the meat sliced at the point of sales?</p> <p>I am wondering if the consumption of red meat is really the reason for their results? Was there nothing else that matched with their lifestyle that could be the cause of this? Or was this filtered out?</p>
CT7: Synthetic meat	<p>It sounds weird that meat is created in a lab.</p> <p>Everything is possible nowadays. I think they should continue with the study about synthetic meat.</p> <p>I am not pro genetically modified food.</p> <p>This sounds unhealthy and disgusting.</p>	<p>How is the taste of synthetic meat?</p> <p>Is it really the same as traditionally grown meat?</p> <p>How many billions would they put in their pockets if this worked?</p> <p>What will happen to the animals that will not be needed anymore?</p>