



The impact of communicating conflicting risk and benefit messages: An experimental study on red meat information



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ABSTRACT

Health risk and benefit messages that pertain to the same food may leave consumers unsure about the health consequences and advisability of consuming the food where conflict is inferred between the risk and benefit messages. A 2×2 between-subjects vignette study was carried out to investigate how food consumers from eight European countries ($N = 803$) appraised conflicting risk and benefit messages and whether the trustworthiness of a third-party communicator through which a conflicting message is received moderated appraisals of this information. We also investigated whether appraisals were subject to cross-cultural variation based on cultural levels of uncertainty avoidance. Communication of a conflicting message outlining the benefits of red meat led to decreased credibility being attributed to the original risk message compared to when a second confirmatory risk message was communicated. Evaluation of the new information was not impacted by any apparent conflict with the original risk message; however, the third-party communicating the new message did impact the credibility of this new information. These effects were not subject to cultural variation. Further understanding on the strategies employed by consumers to evaluate conflicting food-related risk and benefit messages is discussed.

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Introduction

Consumers often encounter situations where a single behaviour (e.g. eating red meat) can produce two distinct outcomes (health *benefits* e.g. relating to protein, mineral and vitamin intake and health *risks* e.g. increased risk of heart disease and cancer). In such situations, consumers may receive information on both the risks and the benefits within the same or different messages. The public may be unable to reconcile such messages which may appear to offer opposing advice; they may infer the presence of conflict and experience uncertainty about the health consequences of engaging in that behaviour (Nagler, 2014). Conflicting food risk and benefit information presents a significant communication challenge to those charged with ensuring consumers are fully informed when it comes to making decisions relating to their dietary health. The primary goal of this study was to understand how

consumers react to food-related risk and benefit communications which they perceive to be conflicting. Conflicting messages become a particularly salient issue with the involvement of numerous communicators. An additional goal of this study was to assess how the involvement of third-party communicators may impact consumer responses. A number of foods have received heightened attention within the public domain for their links with both negative and positive health consequences, with oily fish as a primary example thus far. As a food which remains a staple part of many European diets, the recent focus on the health consequences and positioning of red meat in our diet (Perez-Cueto & Verbeke, 2012) has been widely reported on by mainstream journalists and within online discussion forums (Spiegelhalter, 2012). Red meat represents a timely and topical case study to investigate how consumers may react to conflicting risk and benefit information.

The effects of perceiving conflicting risk–benefit information

Research has investigated the impact that simultaneous communication of risk and benefit information may have on individual

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consumers' risk and benefit perceptions, attitudes towards the food and behavioural intentions (Fischer & Frewer, 2009; Van Dijk, Fischer, & Frewer, 2011; Verbeke et al., 2008). Few studies in the area of dietary communication specifically have investigated what impact perceived conflicting risk and benefit messages relating to the same food may have on credibility of the information and trust in the information source. However, there is qualitative evidence which suggests that when presented with conflicting advice on whether a food is healthy or unhealthy, consumers become suspicious and doubt the credibility of messages, as well as those communicating them (Lupton & Chapman, 1995; O'Key and Hugh-Jones, 2010; Vardeman & Aldoor, 2008). Studies in the wider risk communication literature have shown that receiving conflicting information about the probability of a risk leads to lowered credibility of the information (Breakwell & Barnett, 2003; Dean & Shepherd, 2007; Smithson, 1999). It may be that when uncertainty about risk information is inferred rather than explicitly stated, doubts over the information are raised as recipients may perceive that the full story has been intentionally concealed (Breakwell & Barnett, 2003). Within the decision-making literature, Smithson (1999) argued that when exposed to conflicting pieces of information from different sources, there will be a heuristic assumption that all evidence relating to the topic in question will have been equally distributed amongst unbiased and trusted sources; when conflicting messages appear to be based on two different sets of evidence or alternative ways of interpreting the evidence, then suspicions will arise as to the quality of the information. Informed by closely-related work in the risk communication domain (Breakwell & Barnett, 2003; Dean & Shepherd, 2007; Smithson, 1999) and building on the qualitative work already carried out in the area of conflicting food and nutrition communications (Lupton & Chapman, 1995; O'Key & Hugh-Jones, 2010; Vardeman & Aldoor, 2008), we undertook a quantitative approach in the current study, proposing the following hypothesis:

H1. The credibility of two (conflicting) risk and benefit messages will be perceived as lower than two (consistent) risk messages.

Mixed evidence exists as to whether trust in a communicator is influenced by the presence of conflicting information. Within the risk communication domain, conflicting risk information has been found to negatively impact source trust (Breakwell & Barnett, 2003; Smithson, 1999). Other research found that communicating risk information related to GM foods amidst conflicting messages did not decrease trust in a government agency, in fact, giving out risk information amidst communications of other stakeholders (whether in consensus or in conflict) appeared to enhance the image of the government agency as less self-interested (Dean & Shepherd, 2007). It could be argued that government agencies in this case were viewed as working with other actors, regardless of interests. The situation may be different when thinking about the impact of conflicting risk and benefit communications; trust in a communicator may be impacted more by the perception of expertise and competency than the potential for self-interest. No quantitative investigation has been carried out on the impact of communicating risk and benefit messages relating to the same food on trust in communicator. However, there is qualitative evidence to suggest that consumers are increasingly doubtful of those organisations and agencies which are involved in the communication of conflicting dietary advice (Lupton & Chapman, 1995; O'Key & Hugh-Jones, 2010; Vardeman & Aldoor, 2008). A recent qualitative study found that participants were confused about the healthfulness of foods because of conflicting opinions and changing recommendations in relation to risks and benefits of a food, and

that ultimately this was leading them to distrust the information source (Van Dijk, Van Kleef, Owen, & Frewer, 2012). Thus, the following hypothesis was proposed:

H2. The communicator of a risk message that is followed by a benefit message will be perceived as less trustworthy than when the risk message is followed by another risk message.

The involvement of third-party communicators

Third-party communicators are ubiquitous in the new media communication era; journalists, bloggers, social networks, and organisation websites are just a few of the many online avenues through which an official communication can be picked up and spread throughout a community (Rutsaert, Pieniak, Regan, McConnon, & Verbeke, 2013). For those charged with an official remit for communicating about food risks or benefits to the public (e.g. national food safety authorities), collaborations with other trusted groups may increase the credibility of their message (Dean & Shepherd, 2007). However, depending on the trustworthiness of the third-party communicator and the message they are communicating, their involvement may present a significant challenge to the official communicator's goals. The involvement of a low-trust third-party communicator may influence consumers to judge the message as less credible (Dean & Shepherd, 2007). Credibility of the information may be impacted, even when it is made clear that the information originated from an official source. This is because third-party communicators may be viewed as playing a gatekeeping role, judged as equally active in the development and/or selection and interpretation of the risk or benefit information that they are disseminating to the public (Hu & Sundar, 2010). The perceived trustworthiness of the communicator is a commonly-employed heuristic for consumers when judging the soundness of a food risk or benefit message (Verbeke, 2005). With these considerations in mind, we suggest that there is potential for the credibility of an official communicator's message to be judged based on the perceived trustworthiness of the third-party communicator through which the message is received.

H3. A message received through a low-trust third-party communicator will be judged as less credible compared to when the same message is received from a high-trust third-party communicator.

The presence of a third-party in the communication process between official communicator and recipient becomes particularly relevant when the question of conflicting messages arises. When faced with conflicting risk and benefit messages on a food, consumers may rely on the trust heuristic to evaluate the soundness of the opposing messages. When processing information from multiple sources, as more pieces of advice are available, the complexity of the integration increases and task complexity generally leads people to rely on heuristics (Yaniv & Milyavsky, 2007). Thus, when consumers are presented with multiple pieces of information, they may be inclined to turn to heuristics, such as the perceived trustworthiness of the communicators, to reduce the amount of information to be considered (Payne, 1976). Thus, when a conflicting message is communicated through a low-trust or potentially biased third-party communicator, there may be greater reason to dismiss this message as non-credible and thus, conflict is less likely to be a problem as it is easier to deal with the conflicting message; by judging it simply as non-credible. We hypothesize the following interaction effect to occur:

H4. The credibility of a benefit message that follows a risk message will be adjudged as lower when it is disseminated by a low-trust third-party communicator.

Materials and methods

Design

Two factors – ‘nature of the new message’ and ‘level of trust in the third-party communicator’ – were manipulated in a 2 (confirmatory message vs. conflicting message) \times 2 (low trust vs. high trust third-party communicator) full factorial between-subjects design. Participants were randomly assigned to one of the four conditions. Vignettes were used to present the information conditions to the study participants. Following exposure to the vignette, participants were presented with a number of questions measuring the dependent variables of interest.

The vignettes were composed of a short text in which the official communicator (the national food safety body) initially communicates, through their own website, about the risks of consuming red meat, along with advice to limit personal intake of red meat. This is followed by a second newer message which is attributed again to the national food safety body but is communicated through a third-party. The first factor was the nature of the new message: half of the participants received a second, new message which was a confirmatory risk message alongside advice to limit intake and the other half received a conflicting benefit message alongside advice to increase intake. The second factor was the third-party communicator through which the second, new message was disseminated. Half of the sample received this second message from a low-trust communicator: an anonymous author online. The other half of the sample received the second message from a high-trust communicator: the national doctor’s association website. Research showed that anonymous online actors providing information have been viewed by consumers as untrustworthy (Rutsaert et al., 2013), whilst health professionals have been found to be one of the most trusted sources of information (European Commission, 2010).

Sample and data collection

As part of a wider pan-European study on food risk and benefit perceptions and communication, 6439 participants from eight European Union (EU) countries were recruited through a market research agency. A quota sampling procedure with quota control variables of age, gender, and region for each country was used. Exclusion criteria were individuals aged beneath 18 years and 75 years or above. A sub-section of these participants ($N = 803$) took part in the current vignette study. Descriptives of the sample are provided in Table 1.

Previous research has investigated how cultural differentiation based on Hofstede dimensions (in particular Uncertainty Avoidance) may impact responses to risk information (Houghton, Van Kleef, Rowe, & Frewer, 2006; Van Dijk et al., 2008; Van Kleef et al., 2007). Uncertainty Avoidance (UA) reflects the extent to which members within a particular society are threatened or uncomfortable in uncertain, unstructured circumstances (Hofstede, 2001, 2014). It has been proposed that risk messages which convey uncertainty may need to be tailored at country level according to cultural scores on the UA cultural index (Wardekker, van der Sluijs, Janssen, Klopogge, & Petersen, 2008). For example, cultures with a low UA score may be more open to new concepts and changes relating to food risks (Smillie & Blissett, 2010). In the current analysis, the eight countries were grouped into four categories based on their UA score (Hofstede, 2001, 2014): Very High UA (Portugal, UA = 99, Belgium, UA = 94), High UA (Spain, UA = 86, Italy, UA = 75), moderate UA (Germany, UA = 65, the Netherlands, UA = 53) and low UA (United Kingdom, UA = 35, Ireland, UA = 35). We were interested in the extent to which appraisals of

the information and communicator were subject to cross-cultural variation in the different EU countries. One might expect that those countries with lower UA scores may be less inclined to negatively appraise conflicting information and the associated communicator.

All materials relevant to the study were initially developed in English and then translated into the native language in each participating country. In order to ensure accurate translation, the method of ‘back-translation’ was employed (Brislin, 1970). The translated questionnaires were pre-tested in the national languages in pilot studies to ensure that users of the target language could easily comprehend all messages, questions and procedures. The data were collected September–October 2012. All participants self-administered the questionnaire through a web-based platform which took about 30 min to complete.

Dependent measures

Manipulation checks

The statements within the vignettes were checked to establish the effectiveness of the intended manipulations. For the factor ‘nature of the new message’, participants were asked to rate agreement with the statement: “the two articles I have just read present contradictory information on red meat”. For the factor ‘level of trust in the third-party communicator’, participants were asked to rate their agreement with the statement “I have a high level of trust in the organisation (either the anonymous author online OR the national doctors association website) that is communicating the second message”. Agreement was measured on a 7-point interval scale (1 = strongly disagree; 7 = strongly agree).

Credibility of the original and new messages

We used three items, adapted from Hu and Sundar (2010), to measure credibility of the original and new messages. Hu and Sundar asked participants to indicate the extent to which they thought the information they had just read was “accurate” and “believable”. To increase the reliability of the scale, we added a third item (“credible”). Participants rated the extent to which they thought the information they had read was accurate, believable, and credible on a 7-point interval scale (1 = strongly disagree; 7 = strongly agree). For both the original and new message, we averaged the three items to get a mean item credibility score: higher scores indicated greater message credibility. Both scales had excellent internal reliability ($\alpha = .94$ for the original message and $\alpha = .95$ for the new message).

Trust in the official communicator

Peters, Covello, and McCallum (1997) found that expertise, honesty, and trustworthiness are reliable indicators of perceptions of trust. We drew from this research to measure trust in the official communicator, the national food safety body. Participants were asked to express the extent to which they agreed that the national food safety body demonstrated expertise, honesty, and trustworthiness on a 7-point interval scale (1 = strongly disagree; 7 = strongly agree). The three items were averaged to obtain a mean item score, where higher scores indicated more trust. The scale again demonstrated excellent internal reliability with a Cronbach’s α of .94.

Analytic strategy

To assess the impact of the experimental manipulations, one-way between-subjects ANOVAs were carried out on the two manipulation checks. For the main analyses, a 2 (nature of the new message) \times 2 (level of trust in the third-party communicator) \times 4 (country grouping based on Uncertainty Avoidance (UA) scores) between-subjects ANOVA was carried out on the three

Table 1
Sample characteristics.

Characteristic	Low UA (n = 201)	Moderate UA (n = 201)	High UA (n = 201)	Very high UA (n = 200)	Total sample (n = 803)
<i>Age (years)</i>					
Mean	42.18	44.32	43.25	41.21	42.74
SD	(14.68)	(14.86)	(15.95)	(14.28)	(14.97)
<i>Gender</i>					
Male	49.3%	54.2%	50.7%	48.0%	50.6%
Female	50.7%	45.8%	49.3%	52.0%	49.4%
<i>Financial situation</i>					
Living very comfortably	3.5%	7.5%	3.5%	3.5%	4.5%
Living comfortably	22.4%	22.4%	15.4%	33.0%	23.3%
Coping on present income	44.3%	43.3%	49.3%	38.0%	43.7%
Finding it difficult	20.4%	22.9%	21.9%	17.5%	20.7%
Finding it very difficult	9.5%	4.0%	10%	8.0%	7.8%
<i>Settlement type</i>					
A big city	17.4%	24.9%	37.8%	19.5%	24.9%
Suburbs/outskirts of a big city	20.9%	15.4%	12.9%	23.0%	18.1%
A town or a small city	38.3%	33.8%	33.8%	36.5%	35.6%
A country village	23.4%	25.9%	15.4%	21.0%	21.4%

dependent variables: credibility of the original risk message; credibility of the new message; and trust in the official communicator. For each $2 \times 2 \times 4$ ANOVA, a model was estimated with both main and two-way interaction effects. Due to increased complexity in interpretation, higher order interactions were not included.

Results

Manipulation checks

A one-way between-subjects ANOVA was conducted to evaluate the extent to which participants felt they had received contradictory information based on whether the new message they had received was a benefit message or a risk message. A significant difference was found, $F(1, 801) = 63.03$, $p < .001$, partial $\eta^2 = .073$. Those who received a new benefit message perceived a higher level of contradiction between the two messages ($M = 4.42$, $SD = 1.85$) compared to those who received a new risk message ($M = 3.46$, $SD = 1.59$). An interesting result in itself, this indicates that individuals exposed to a risk message followed by a benefit message relating to red meat were more likely to infer conflict.

A one-way between-subjects ANOVA was conducted to evaluate to what extent participants trusted the third-party communicator disseminating the new message. A significant difference was found between both communicators, $F(1, 801) = 200.654$, $p < .001$, partial $\eta^2 = .110$. As intended, those participants who received the second message through the anonymous online author had lower trust for this communicator ($M = 3.59$, $SD = 1.44$) compared to those who received the same message attributed to the national medical doctor's association website ($M = 4.52$, $SD = 1.21$).

Main analyses

Credibility of the original risk message

A $2 \times 2 \times 4$ between-subjects ANOVA was carried out to examine the influence of the nature of the new message and level of trust in the third-party communicator on the credibility of the original risk message communicated by the national food safety body, and to investigate whether appraisals were subject to cross-cultural variation based on cultural levels of UA.

There was a main effect for country grouping based on UA scores on credibility in the original risk message, $F(3, 787) = 9.122$, $p < .001$, partial $\eta^2 = .034$. A Bonferroni post hoc test, alongside investigation of the means (presented in Table 2),

indicated that those participants from countries with moderate UA scores had significantly lower credibility in the original risk message compared to participants from countries with low UA scores ($p = .001$), high UA scores ($p < .001$), and very high UA scores ($p < .001$).

There was a significant main effect for nature of the new message on credibility in the original risk message, $F(1, 787) = 7.649$, $p = .006$, partial $\eta^2 = .010$. Investigation of the means, shown in Table 3, indicated that those participants who received a new benefit message perceived the original risk message to be less credible than those who received a new risk message. This provides partial support for Hypothesis 1, that the credibility of two (conflicting) risk and benefit messages will be perceived as lower than two (consistent) risk messages. There was no interaction effect between country grouping and nature of the new message, $F(3, 787) = 1.018$, $p = .384$, indicating that the effect of nature of the new message on credibility in the original risk message was consistent across countries with different UA scores.

We found that the level of trust in the third-party communicator disseminating the new message did not influence credibility in the original risk message $F(1, 787) = .224$, $p = .636$. We found no interaction effect in this analysis for third party communicator and nature of the new message, $F(1, 787) = .021$, $p = .885$, indicating that the credibility rating of the original risk message was not a function of the trustworthiness of the third party communicating a conflicting message. There was also no interaction effect for third party communicator and country grouping, $F(3, 787) = .759$, $p = .517$.

Trust in the official communicator

A $2 \times 2 \times 4$ between-subjects ANOVA was carried out to examine the influence of the nature of the new message and the level of trust in the third-party communicator on trust in the official communicator, the national food safety body, and to investigate whether appraisals were subject to cross-cultural variation based on cultural levels of UA. There was a main effect for country grouping based on UA scores on trust in the official communicator, $F(3, 787) = 6.550$, $p < .001$, partial $\eta^2 = .024$. Bonferroni post hoc tests, alongside investigation of the means (presented in Table 2), revealed that those participants from countries in the high UA category had significantly more trust in the official communicator compared to participants from those countries in the moderate UA category ($p < .001$) and the low UA category ($p = .002$).

Our analysis revealed that contrary to Hypothesis 2, the presence of conflicting messages did not lead to a significant impact

Table 2

Means and standard deviations for country groupings based on Uncertainty Avoidance scores (low, moderate, high, and very high) for each of the three dependent variables: credibility of the original risk message, trust in the official communicator, and credibility of the new message.

	Low UA M (SD)	Moderate UA M (SD)	High UA M (SD)	Very high UA M (SD)
Credibility of the original risk message	4.74 (1.02)	4.32 (1.14)	4.75 (1.10)	4.84 (1.09)
Trust in the official communicator	4.64 (1.05)	4.60 (1.09)	5.03 (1.11)	4.81 (1.09)
Credibility of the new message	4.60 (1.09)	4.15 (1.23)	4.52 (1.12)	4.50 (1.24)

Table 3

Means and standard deviations for credibility of the original risk message for both levels of nature of the new message (confirmatory message vs. conflicting message).

	Confirmatory message M (SD)	Conflicting message M (SD)
Credibility of the original risk message	4.77 (1.00)	4.55 (1.23)

Table 4

Means and standard deviations for credibility of the new message for both levels of trust in third party communicator (high trust vs. low trust).

	Low trust communicator M (SD)	High trust communicator M (SD)
Credibility of the new message	4.18 (1.20)	4.70 (1.05)

on trust in the official communicator, the national food safety body, $F(1, 787) = .593, p = .441$. There was no significant interaction effect between nature of the new message and country grouping on trust in the official communicator, $F(3, 787) = .723, p = .538$.

No significant main effect was found for the level of trust in the third-party communicator on trust in the official communicator, $F(1, 787) = 1.407, p = .236$. We found no significant interaction effect, $F(1, 787) = .089, p = .765$, that a conflicting message communicated by a high-trust third-party communicator compared to a low-trust third-party communicator would compromise trust in the official communicator. There was no significant interaction effect between third party communicator and country grouping on trust in the official communicator, $F(3, 787) = .422, p = .738$.

Credibility of the new message

A $2 \times 2 \times 4$ between-subjects ANOVA was carried out to examine the influence of the nature of the new message and the level of trust in its third-party communicator on the credibility of the new message, and to investigate whether appraisals were subject to cross-cultural variation based on cultural levels of UA. There was a main effect for country grouping based on UA scores on credibility in the new message, $F(3, 787) = 6.427, p < .001$, partial $\eta^2 = .024$. A Bonferroni post hoc test, alongside investigation of the means (presented in Table 2), indicated that those participants from countries within the moderate UA category had significantly lower credibility in the new message compared to participants from countries in the low UA category ($p < .001$), the moderate UA category ($p = .006$) and the very high UA category ($p = .010$).

There was a significant main effect for level of trust in the third-party communicator on credibility of the new message, $F(1, 787) = 43.365, p < .001$, partial $\eta^2 = .052$. Investigation of the means, presented in Table 4, showed that those who received the new message from a low trust third-party communicator, the anonymous author online, accorded less credibility to the information than those who received it from a high trust third-party communicator, the national medical doctor's association website. This confirmed Hypothesis 3 that an official message disseminated by a low-trust third-party communicator will be perceived as less credible compared to when it is disseminated by a highly-trusted third-party communicator. There was no interaction effect between country grouping and third party communicator, $F(3, 787) = .391, p = .759$, indicating that the effect of third party communicator on credibility in the new message was consistent across countries with different UA scores.

In contrast with Hypothesis 1, there was no significant main effect for nature of the new message on credibility in the new

message, $F(1, 787) = 1.489, p = .223$. That the new benefit message conflicted with the initial risk message did not significantly influence the credibility of the benefit message. There was no interaction effect between nature of the new message and country grouping, $F(3, 787) = .629, p = .597$.

There was also no significant interaction effect between nature of the new message and third party communicator, $F(1, 787) = .350, p = .555$. This was contrary to our Hypothesis 4 that consumers would make use of a trust heuristic to evaluate the credibility of a new conflicting message. The fact that a conflicting message came through a lower-trusted third-party did not influence participants to judge it as any less credible.

Discussion

This study revealed the potential for the communication of health risk and benefit messages about the same food (red meat in this case) to lead consumers to infer perceptions of conflicting information. New information emphasising the benefits of red meat and perceived to contradict older risk messages led to judgments that the original risk message was less credible. New information communicated by a more trusted third-party was perceived as more credible no matter whether the information it provided was in line with, or contradicted the original information. These effects were not subject to cultural variation. These findings have important implications for official communicators who seek to minimise the confusion, uncertainty and frustration felt by consumers in the face of numerous and often conflicting food and nutrition messages. These implications are considered in more detail in the paragraphs which follow.

Qualitative research suggested that conflicting food and nutrition information leads to lower credibility in related information (Lupton & Chapman, 1995; O'Key & Hugh-Jones, 2010; Vardeman & Aldoory, 2008). We found quantitative support to triangulate these qualitative findings. We found that credibility in an original risk message on red meat was lowered when followed by a newer conflicting message that emphasised the benefits of red meat. However, we found no evidence that the credibility of the new benefit information was impacted by its apparent conflict with the original risk information. It can be considered that judgements of the conflicting information may have been driven by a heuristic that the most recent information is the most accurate information. This has been referred to as a temporal order effect, whereby individuals place more weight on more recently provided information, believing it to be based on more superior or pertinent scientific knowledge (Viscussi, Magat, & Huber, 1991). Future research

should seek to further investigate what impact temporal patterns may have on consumer reactions to conflicting messages.

In spite of qualitative research indicating the potential for conflicting dietary messages to negatively impact trust in those communicating (Lupton & Chapman, 1995; O'Key & Hugh-Jones, 2010; Van Dijk et al., 2012; Vardeman & Aldoorj, 2008), we did not find evidence of such an effect in our study. A positive interpretation can be taken from these findings; consumers in the current study showed adaptation to changing official food and nutrition information without negatively appraising those officials in charge. Previous research (Breakwell & Barnett, 2003; Smithson, 1999) found that source trust was impacted when conflicting opinions were given about risk information within the same time space. Consumers might be more likely to appraise an information source negatively when conflicting information about a risk is communicated concurrently (or in a close time frame) resulting in a perception that such information was being intentionally withheld by the information source (Breakwell & Barnett, 2003). However, in the current study, it may have been that consumers believed the second message to be more recent and the original information to be out-dated, thus diminishing responsibility on the part of the information source for the changed message. These findings again stress the need to carry out more research investigating the temporal impact on consumer reactions to perceived conflicting risk and benefit messages.

The current study suggests that consumers may evaluate risk and benefit messages based on heuristics; as previous research has also indicated (Van Dijk et al., 2011; Verbeke et al., 2008). However, a limitation of the current study was that we did not measure whether the decision making process was systematic or heuristic in nature. Future research should consider more explicitly the use of heuristics in decision-making relating to conflicting risk and benefit messages, making sure to explicitly measure participants' decision-making. It is vital to be cognisant of the role heuristics may play as they may lead consumers to make biased judgements. Reliance on a temporal order heuristic in the presence of conflicting information may not always necessarily be the appropriate action for a consumer to take; for example, more recent information may not always translate to be the most accurate information. One obvious path for communicators to take is to communicate balanced risk–benefit messages in a manner which attempts to address and explain the apparent contradiction to consumers – this falls within the remit of previous work looking at the development of effective simultaneous risk and benefit messages (Fischer & Frewer, 2009; Van Dijk et al., 2011; Verbeke et al., 2008). Principles of effective risk communication stress that where true scientific uncertainty exists about a risk, this should be actively acknowledged and communicated to the public in a manner that empathises with their confusion (Miles & Frewer, 2003). In the same vein, authoritative and official acknowledgement of the potential confusion that can result from the communication of risk and benefit messages may help to reassure consumers. Nonetheless, despite the best intentions of some risk communicators to try and encourage a balanced and informed outlook, consumers will continue to be exposed to one-sided stories through a variety of other third-party sources (Goldberg & Sliwa, 2011). Failing to report the necessary detail of the science underpinning risk and benefit messages in an adequate manner may impair readers' ability to make sense of seemingly conflicting information (Nagler & Hornik, 2012). A positive development in this regard are the many on-going efforts to engage and educate media journalists in better practices of science communication (Schneider, 2010), thus ensuring a more balanced story. Consideration may be given to extending such training programmes and tools to influential online citizen-journalists who are increasingly communicating about food risks and benefits to online communities (Rutsaert et al., 2013).

Although we found no evidence that the level of trust in the third-party communicator off-sets the impacts of conflicting messages, main effects suggested that the new messages (both conflicting and confirmatory) were evaluated in part based on the third-party communicator disseminating them, even though these new messages had been explicitly attributed to an official source. Consumers may have employed a trust heuristic to evaluate the new information (Verbeke, 2005); credibility in the new message was lower when a low-trust third party disseminated the message compared to a highly-trusted third-party. A possible explanation is a gate-keeping effect whereby the third-party communicators were perceived to have been active in developing, selecting, or interpreting the official message (Hu & Sundar, 2010). As indicated in previous research (Dean & Shepherd, 2007), collaborations with other highly-trusted communicators will increase the credibility of the official's message. However, if an untrusted third-party opts to pick up and disseminate an official message, this may be a cause for concern as the current study indicated that an anonymous online third-party disseminating an official message led it to be judged as less credible. This is a particularly relevant point for official communicators to consider in the online information age where official messages, remarks, and quotes can be easily sourced and referenced by third-party communicators. By monitoring online media, particularly social media which can be synonymous with anonymity, and thus, reduced trust (Rutsaert et al., 2013), official bodies can become aware of where and how their information is being further disseminated and used.

The experimental factors' impacts on credibility in the messages were not subject to cultural variation. At one level, this provides support for risk communication strategies operated by trans-European organisations such as the European Food Safety Authority (EFSA) or DG Sanco (Houghton et al., 2006), who can anticipate that EU consumers may respond to conflicting risk and benefit messages on a rather uniform basis. However, other research has cautioned the adoption of pan-EU risk communication policies, given that cross-cultural variations likely play some role in how consumers will appraise management and communication efforts, and thus, local institutions may be better positioned to communicate in a way that acknowledges values in local cultures (Van Dijk et al., 2008). This is supported also in the current study as we observed a number of noteworthy main effects at the level of culture: those participants from a culture scoring moderate in UA (Germany and the Netherlands) had less credibility in the presented information, while those participants from a culture scoring high in UA (Spain and Italy) tended to have more trust in the official communicator. This indicates that culture has an important role to play in how different Europeans may appraise risk information at a more general level. It is difficult to determine the extent to which Hofstede's cultural dimension of UA accounts for the current effects found; other explanatory factors (e.g. past experiences, general trust in government, science and society) may also account for cross cultural differences in consumer appraisals. The impact of culture on consumers' responses to risk information is a complex concept to measure; there is value in future research exploring the applicability of Hofstede's cultural framework to risk communication.

One of the limitations of this study is that the effects sizes found were small. Previous research has noted that it is not uncommon for limited effect sizes to be found in consumer behaviour experiments and that often only a small amount of variance in response variables is explained (Peterson, Albaum, & Beltramini, 1985; Van Dijk et al., 2008). It is worth considering that the responses recorded to the vignettes reflect a laboratory-type setting where participants were exposed to one vignette within which two conflicting messages appeared simultaneously. In the real world setting, consumers are constantly exposed to conflicting information

on food and nutrition; some which will appear in close proximity, others which will appear further apart – both temporally and physically. It is difficult to capture this cumulative impact of information; we endeavoured to investigate reactions to the presence of conflicting risk–benefit information within a controlled environment. Future research may want to consider experimental designs which expose individuals to multiple individual messages across a longer period of time. Furthermore, we chose to conceptualise ‘conflict’ within the food and nutrition communication environment as the conflict between independent advisory messages which emphasise either the risks or benefits separately. However, as acknowledged in previous work (Nagler & Hornik, 2012; Vardeman & Aldoori, 2008), there are multiple ways in which conflict can be conceptualised within the food and nutrition information environment. Additional separate analyses by the author team showed that the findings in the current study did not hold when benefit information was communicated first, followed by either a confirmatory benefit communication or a conflicting risk communication – no impacts on credibility of either of the messages were found. This finding may be the result of the specific case chosen for this study, namely red meat, for which the current base of information among consumers may be predominantly negative in the study countries. Future research should consider how other types of conflict (e.g. risk and benefit messages communicated by the same communicator; risk and benefit messages communicated within the same message; different combinations of risk and benefit messages) and other target foods might differentially impact appraisals of the information and those communicating it.

Conclusion

The current study demonstrated how consumers are likely to infer conflict when presented with risk and benefit messages relating to red meat. When presented with new information which emphasised the benefits of eating red meat, consumers judged an original message emphasising the risks as less credible. Credibility of new information was not impacted by its conflict with older information; instead, the new messages were evaluated based on the trustworthiness of the third-party through which the messages had been communicated. It is evident that conflicting information perceived by consumers to exist in the food and nutrition communication domain has the potential to cause appraisals which could be detrimental for the goals of official communicators. For example, heuristics (such as the temporal order in which conflicting messages appear) may be employed to evaluate conflicting information which may in some instances lead to biased or inaccurate judgements. There is a need to pursue further research aimed at understanding how food consumers are dealing with conflicting food and nutrition information and potential ways to enable consumers to discern appropriate responses.

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Appendix A. Vignette texts of the four cells in the 2 × 2 experimental design

Cell 1 Conflicting message from a low trust communicator

Please Read the following articles relating to red meat which have appeared at different times in the last year.

Article 1 was published **last year** on the **official website of the National Food Safety Body**

A large number of people across Europe eat red meat. The public are currently being warned by the National Food Safety Body about a potential link between eating red meat and developing colon cancer. The public are being advised to limit their weekly intake of red meat.

An **anonymous author** published Article 2 **on the internet last month**

Red meat is a main food in many European diets. A campaign is currently being run by the National Food Safety Body highlighting red meat as a valuable source of iron and Vitamin B. The public are being encouraged to make sure they get a sufficient amount of red meat in their weekly diet.

Cell 2 Conflicting message from a high trust communicator

Please Read the following articles relating to red meat which have appeared at different times in the last year.

Article 1 was published **last year** on the **official website of the National Food Safety Body**

A large number of people across Europe eat red meat. The public are currently being warned by the National Food Safety Body about a potential link between eating red meat and developing colon cancer. The public are being advised to limit their weekly intake of red meat.

The **official website of the National Doctor’s Association** published Article 2 **last month**

Red meat is a main food in many European diets. A campaign is currently being run by the National Food Safety Body highlighting red meat as a valuable source of iron and Vitamin B. The public are being encouraged to make sure they get a sufficient amount of red meat in their weekly diet.

Cell 3 Confirmatory message from a low trust communicator

Please Read the following articles relating to red meat which have appeared at different times in the last year.

Article 1 was published **last year** on the **official website of the National Food Safety Body**

A large number of people across Europe eat red meat. The public are currently being warned by the National Food Safety Body about a potential link between eating red meat and developing colon cancer. The public are being advised to limit their weekly intake of red meat.

An **anonymous author** published Article 2 **on the internet last month**

Red meat is a main food in many European diets. A campaign is currently being run by the Food Safety Body highlighting that eating red meat may lead to colon cancer. The public are advised to limit their weekly intake of red meat

Cell 4 Confirmatory message from a high trust communicator

Please Read the following articles relating to red meat which have appeared at different times in the last year.

Article 1 was published **last year** on the **official website of the National Food Safety Body**

A large number of people across Europe eat red meat. The public are currently being warned by the National Food Safety Body about a potential link between eating red meat and developing colon cancer. The public are being advised to limit their weekly intake of red meat.

The **official website of the National Doctor's Association** published Article 2 **last month**

Red meat is a main food in many European diets. A campaign is currently being run by the Food Safety Body highlighting that eating red meat may lead to colon cancer. The public are advised to limit their weekly intake of red meat.

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