Product-harm science communication: The halo effect and its moderators

Olga Untilov, Stéphane Ganassali

OLGA UNTILOV AND STÉPHANE GANASSALI

Product-Harm Science Communication: The Halo Effect and its Moderators

Abstract: Science communication on a product-harm situation aims to create awareness on the product's potential impacts for consumers. However, consumers tend to overestimate the information provided, due to possible halo effects. Here we designed a contextual model of halo development including individual and message characteristics detected in the literature as potential moderators. Our experimental study, based on a sample of 3,766 European respondents, evaluates these halo moderators in the context of a product-harm science communication. The results reveal a stronger halo effect on consumers' beliefs when the focal topic is considered as more important (health *vs* ethics) and simultaneously when the source of information is more credible (official *vs* non-official). Highly involved consumers are also subject to greater halo effects. Suggested implications mainly focus on the need to consider potential amplifying halo effects and on the importance of responding to a product-harm communication via a very accurate communication approach.

Authors information: Olga Untilov (olga.untilov@univ-smb.fr) is a PhD Student at the Institute for Research in Management and Economics (IREGE), University Savoie Mont Blanc, Annecy, France, and Assistant Professor at Audencia Business School, Nantes, France. Stéphane Ganassali (stephane.ganassali@univ-smb.fr) is an Associate Professor of Marketing at the Institute of Business Administration, University Savoie Mont Blanc, Annecy, France.

Acknowledgments: Financial support from the European Union's Horizon 2020 research and innovation program under the Grant Agreement No. 635761 (PrimeFish) is gratefully acknowledged.

INTRODUCTION

In the context where product-harm events have become rife in the marketplace, research has addressed how negative information impacts consumers' attitudes towards branded products (Finkelstein 2005; Van Heerde, Helsen, and Dekimpe 2007). A stream of research has focused on how product scandals spill over and negatively affect attitudes to the entire brand (Ahluwalia 2002; East, Hammond, and Lomax 2008) or even competing brands (Roehm and Tybout 2006). These far-reaching effects are often much stronger than expected (Cleeren, Dekimpe, and Helsen 2008). Other studies have analyzed how consumers make inferences about product attributes not presented in warning communication. According to Lutz (1975), this phenomenon, called a *halo effect* or *spillover effect* (Ahluwalia, Unnava, and Burnkrant 2001; Roehm and Tybout 2006; Borah and Tellis 2016), explains more variance in attitudinal alteration than the change in attitudes toward explicitly-mentioned attributes. The halo effect is a consumer disposition to maintain a certain cognitive consistency (Abelson et al. 1968; Holbrook 1983) or to minimize cognitive dissonance (Kiesler, Nisbett, and Zanna 1969) by evaluating different attributes of a product/service in a way which is consistent with the evaluation of the dominant attribute. For example, when chocolate bars are presented with a "fair trade" label, some consumers would infer that the product is lower in calories (Schuldt, Muller, and Schwarz 2012). It thus appears that a full understanding of the effects of communicated information dealing with a product harm requires study of the halo effect (Cleeren, Dekimpe, and van Heerde 2017).

Most of the research to date has focused on proving the existence of halo effects for various attributes, like brand, country of origin, or corporate social responsibility (CSR) image. However, the consumer studies literature has not yet studied the drivers of halo effects in any real depth or detail, and so we still know very little about possible facilitators or inhibitors of the halo process in this important context. Do criteria like source credibility,

attribute importance, or consumer involvement operate as moderators on the magnitude of the halo effect? Moreover, the halo effect has mainly been analyzed in the context of brand scandals (Trump and Newman 2017), but not in the case of food scares related to a whole product category, which is a threat that food industries continue to face today. Since the mid-1980s, a number of countries have had to deal with various food scares (e.g. mad cow disease, dioxin contamination) that have increased public concern around health and ethical issues tied to modern methods of food production (Knowles, Moody, and McEachern 2007). These food scares, relayed widely by mass media, have resulted in adverse short-term effects on consumer preferences and on consumption of the affected products (Verbeke 2001; Lloyd et al. 2006; Angulo and Gil 2007). In the academic literature, communication issues related to food scares or food-related incidents are included in the field of science communication, specifically "public communication of science and technology" (PCST).

The main purpose of this study is to assess the expected moderating factors that could foster or mitigate the impact of halo effects on consumers' product beliefs, through a case of a negative food-related science communication.

The target product category for our fictitious negative communication is salmon. The rationale for choosing this product was that it is widely consumed, despite ongoing controversy over the health benefits of salmon consumption (Beckmann 2005). The existence of major international projects (i.e. PrimeFish and Success—Horizon 2020 EU projects) aiming to strengthen the economic sustainability of the seafood market further confirms the topicality of the subject.

The background section of our paper first offers a definition of science communication, then considers the challenges in product-harm events before going on to discuss how consumer beliefs, attitudes and behavior are affected by halo effects in this

context. We propose a theoretical framework serving to develop our hypotheses and summarize them via a contextual explanatory model including consumer characteristics and stimulus elements (source credibility and addressed attribute) that moderate halo effects and their impacts on consumer-belief alteration. In the methodology section, we present the experiment that we conducted in five European countries, using salmon consumption as a case study. The results confirm the risks of halo effects that can occur in negative food-related communication. Our findings allow us to formulate a set of policy implications on how to communicate food risk information properly depending on source credibility and nature of the issue.

BACKGROUND

Science Communication

Food scares can be considered as a special case in the broader field of science communication or public communication of science and technology (PCST). According to Burns, O'Connor, and Stocklmayer (2003, 191), science communication is the "use of appropriate skills, media, activities, and dialogue to produce one or more [...] personal responses to science", i.e. awareness, enjoyment, interest, opinions and understanding. Research in PCST aims at improving the understanding of the best ways to communicate complex information, in particular to people who are outside the arena of scientific research (Priest 2010).

Lewenstein (2003) identifies four key models that have been used to describe PCST activities: the deficit model, the contextual model, the lay expertise model, and the public participation model. Deficit models are concerned by the development of actions aimed at filling the deficit of public knowledge and science literacy. Lay expertise models are interested in local knowledge (held by farmers for example) and their ability to be as relevant

to solving a problem as academic scientific knowledge. They are targeted to valuing local knowledge as expertise in their own right. Public participation models focus on a series of activities (e.g. conferences, citizen juries, deliberative technology assessments, etc.) driven by a commitment to "democratizing" science and intended to enhance public participation and hence trust in science policy.

The contextual models acknowledge that individuals process public scientific information according to social and psychological schemas that have been shaped by their previous experiences, cultural context, and personal circumstances. A related area that has extensively developed the use of the contextual model is risk perception and risk communication (Slovic 1987). According to Kahneman and Tversky (2013), perceived risk significantly shapes consumer behavior, and this is especially visible with food risks, as food consumption is connected to a physical risk (Kuttschreuter 2006). Therefore, the contextual model seems to be the most relevant one in the case of product-harm science communication.

Challenges in Food Product-Harm Events

Over the last few decades, research on the relation between health and food has grown exponentially (Silchenko, Askegaard, and Cedrola 2019). Even though food safety is higher today than ever before, the number of consumers experiencing anxiety, doubt or even fear of food is growing constantly (De Jonge et al. 2007; Kher et al. 2013). This form of food-related anxiety has been fueled by the recurrence of food scares since the mid-1980s (Bergadaà and Urien 2006). Increasingly complex food products, stricter product safety legislation and more demanding customers have converged to accelerate the frequency of food product-related communications (Dawar and Pillutla 2000).

Science communication on food scares has systematically prompted multiple lines of research into the influence of these incidents on the performance and sales of the brand.

Product harm around a branded product have a strong impact on the company's sales. An emblematic example is the scandal elated to traces of benzene found in bottles of Perrier, which had a direct cost estimated at $30 million USD (Berman 1999). In addition, corporate or brand scandals can lead to mistrust of the product category as a whole (Alessi and Staaf 1994).

Due to the information overload that consumers are facing today (Bergadaà and Urien 2006), they tend to overestimate or underestimate the level of risk caused by food scares (Verbeke, Vermeir, and Brunsø 2007). This makes it important to understand how consumers perceive food-related risks and process science communications in order to appropriately inform them about the repercussions of food-related controversies or product harms, and minimize the related economic loss (Heiman and Lowengart 2011; Niewczas 2014).

Halo Effect

Since Thorndike's (1920) original conceptualization, the halo effect has been consistently defined as a rater's failure to discriminate between conceptually distinct and potentially independent attributes, with the result that individual attribute ratings co-vary more than they otherwise would. The halo effect may be explained by cognitive consistency theories: people strive to maintain a consistent set of beliefs, because any inconsistencies in the cognitive system would induce adverse psychological tension (Leuthesser, Kohli, and Harich 1995). Psychologists also refer to the concept of *generalization* that can be defined as an inductive inference made on the basis of the available evidence (Lee et al. 2019). Boatwright, Kalra, and Zhang (2008) state that the term *halo effect* refers to two broad effects. The first is the interdimensional similarity halo, where a person will rate an object similarly across different dimensions. In a marketing context, this means that consumers would use an observable attribute to infer an unobservable one. The second effect refers to the general

impression halo, where people's overall evaluation or belief leads them to evaluate all aspects of performance.

Dual-process theories of human judgment (Kahneman 2011) generally distinguish between two types of cognitive systems: one that is relatively fast, intuitive, and automatic (termed *System 1*) and one that is relatively slow, deliberative, and controlled (termed *System 2*). The halo process could then be seen as an outcome of our cognitive *System 1*. More precisely, the observed halo is a combination of the *true halo* and the *illusory halo*. True halo reflects actual correlations (or partial redundancy) among the categories being evaluated. Illusory halo is present when observed halo exceeds true halo and is largely attributable to illusory covariance theories (Cooper 1981).

Halo effects have been studied in relation to consumer behavior on a regular basis. Some of the scholarship has focused on the development of halo within the same group of attributes —like CSR attributes in Roe, Levy, and Derby (1999)—but most of the other studies have looked at effects between different types of attributes (Schuldt, Muller, and Schwarz 2012). A halo effect generally occurs if a consumer generalizes positive or negative perceptions from a product attribute to other product attributes.

Most of the time, the literature identifies halo effects as positive. Positive halo occurs when the causing and the impacted attributes of halo are positively correlated and consequently both evolve in the same direction. For example, Burke, Dowling and Wei (2018) suggest that corporate reputation activities create a general halo effect that influences consumers' product choices by improving the utility of a product offered by the company. Apaolaza et al. (2014) showed that exposure to a natural-ingredients claim significantly increased the belief that a perfume had a natural smell and improved hedonic sensory experience assessed by such items as pleasantness, attractiveness or joy, among others. In the

context of food products, values-based claims such as “organic” and “fair trade” and other ethics-related production qualities were proven to promote unwarranted health inferences (e.g. perceived loser calories) (Schuldt, Muller, and Schwarz 2012). In the very context of product incidents, Klein and Dawar (2004) found that a CSR halo might mediate the impact of the incident on consumers’ other brand evaluations. They investigated the halo effect of consumers’ prior beliefs about a company’s stance on CSR onto attributions around a product-harm controversy involving that company. In a similar context, Coombs and Holladay (2006) showed that the halo effect created by the organization’s prior favorable reputation works as a shield that deflects the potential current reputational harm of an incident.

In a much more limited number of cases, halo can be negative, which means that causing and impacted attributes of halo are negatively correlated and so both evolve in opposite directions. Lähteenmäki et al. (2010) for example suggested that consumers do not imply other health benefits from health claims and that the overall halo effect from health claims to other product attributes tends to be negative or neutral at best. Luchs et al. (2007), in line with Sen and Bhattacharya (2001), asserted an inherent trade-off between a product’s ethical attributes and the product’s effectiveness or functional performance, and found that consumers assume less effectiveness of ‘ethical products’, moderated by the degree to which they believe the ethical issues to be important.

THEORETICAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

Our study covers two of the key issues for theoretical work in science communication identified by Trench and Bucchi (2010): first, the operation of models of science communication, and second, their effectiveness. Our research, based on the contextual-model theories (Lewenstein 2003), aims to answer the question: “How do individual (involvement)

and communication (source of information and focal topic) characteristics moderate the halo effect?" To do so, and in light of the preceding theoretical framework, we find it important to first verify the existence of a possible positive halo effect in the context of product-harm science communication in relation to a whole food category. We then set out to analyze the possible drivers and moderators of halo effects, which we differentiate from the direct true alteration of affected consumer beliefs.

Consumer Beliefs Affected by the Halo Effect

In order to achieve the main goal of this research (assessing the moderators of halo effects on consumers' product beliefs), it is important primarily to confirm the existence of halo effects in the context of a negative science communication about a food product category and to investigate how beliefs about the product category may be altered accordingly. Building on Ahluwalia, Unnava, and Burnkrant (2001), we decided to focus on the impact of information on beliefs, as they represent the antecedents of attitude (Fishbein 1963). As we are measuring the reaction to a potential (fictitious) product issue, it is more pertinent to evaluate beliefs rather than attitudes because "...attitudes do not exist at all until an individual perceives an attitude object (on a conscious or unconscious basis) and responds to it on an explicit or implicit basis" (Eagly, Wood, and Chaiken 1978, 584). As a first hypothesis, we set out to confirm that a positive halo could occur between different product attributes, in the context of product-harm event.

H1: In the case of food science communication, because of the halo effect, consumers show a belief change for attributes that are not mentioned in the communication.

The Drivers of Halo Effect

According to contextual PCST theory, context can be affected by personal psychological factors, such as stage in life or personality type (e.g. fearful or aggressive), along with the social context in which information is received (e.g. a trusting relationship with an old friend versus a confrontational relationship with a distrusted employer). Contextual models also recognize the ability of social systems and media representations to either dampen or amplify public concern about specific issues. In this family of work based on contextual models, Kasperson et al. (1988) were interested in the social amplification of risk. They studied how hazards interact with different factors like psychological, social, institutional, and cultural processes in ways that may amplify or attenuate public responses to the risk or risk event.

Some of the previous research that attempted to analyze the possible drivers/moderators of halo effects has cited criteria that can be grouped into three main categories: the generating attributes, the credibility of the sources, and the degree of consumer expertise or involvement. The SPARTA model, which is an econometric analysis of consumer behavior under risk developed by Mazzocchi et al. (2008), offers a useful theoretical framework for analyzing halo effects within a food scare situation. The core section of the model focuses on factors affecting the development of attitudes, risk and trust, namely personal components, risk factors, and trusted sources. These assumptions are also consistent with some of the factors (nature of risk, seriousness of threat, and media credibility) presented by Niewczas (2014) in her article on consumer reactions to food scares.

Regarding the generating attributes or risk factors, previous papers (Wirtz and Bateson 1995; Luchs et al. 2007) suggested it would be useful to check whether important attributes would produce stronger halo effects than less important ones. Health-related information can be considered as extremely important in a food product-harm event, whereas ethics-related information, although also relevant, is less crucial (Verbeke et al. 2008). According to global

consumer surveys (Nielsen 2015), health represents one of the most frequently sought food attributes, and this was confirmed by some of the preliminary outputs of our research (see sections *Preliminary Qualitative Study* and *Key Measures*). As a second hypothesis, we set out to confirm the stronger impact of a more important attribute on halo, in the context of our study.

H2: Attributes considered more important (health) produce stronger halo effects than attributes considered less important (ethics).

As a response to their increased concern about health and ethics, consumers are increasingly exposed to a massive amount of public information about the quality of food products and possible food risks. Multiple food scares across Europe during the last decades prompted the move to create the European Food Safety Authority (EFSA) to inform and advise the population on food quality. However, EU food-risk communications are not always efficient, as food risk information processing is culturally specific (Mazzocchi et al. 2008), and so different national agencies in charge of health (like ANSES, the National Agency for Food, Environmental and Occupational Health and Safety in France, or the National Health Service (NHS) in the UK) and environmental issues (like the Ministry of Ecology in France or the Federal Agency for Nature Conservation in Germany) have since emerged. While these agencies represent official sources of communication, there has also been a boom in development of non-official sources of information. The non-official sources of information are represented by social media communities (e.g. Facebook), photo-sharing (e.g. Instagram), video-sharing platforms (e.g. Youtube), blogs, etc. These platforms serve to share user-generated content created by general-public citizens. According to the 2018 Edelman Trust Barometer, 41% of people trust information created by "a person like me" on social media. However, the trust in social media is considered as lower than the trust in official sources of information (66%). The development of different social media applications facilitates risk

communications that consumers use in their judgments about a food issue. However, the multiplication of communication methods exposes some serious issues related to source credibility (Pieniak et al. 2007). Prior research into sources of information based on source credibility theories (Dopico, Blazquez, and Tudoran 2009) has naturally suggested that more credible sources would generate stronger impact. That is the focus of our third hypothesis.

H3: More credible sources of information produce stronger halo effects than less credible sources of information.

Moderating Influence of Consumer Involvement

A growing body of empirical research has shown that the impact of food risk statements differs according to consumer characteristics (Lobb, Mazzocchi, and Traill 2007; Mazzocchi et al. 2008). We think it is important to consider consumer–product relationship dimensions like involvement or expertise as being possible moderators of the halo effect in science communication related to food products.

For Schuldt, Muller, and Schwarz (2012), people with strong ethical food values, for whom the ethics of food production is more personally relevant, appear to be processing more heuristically rather than systematically. When it comes to ethical food claims, heuristic processing seems to trump systematic processing when personal relevance is high, and then fosters the halo effect.

However, as a rule, involvement is thought to negatively moderate the halo effect. As suggested by some previous articles (Ahluwalia, Unnava, and Burnkrant 2001; Wirtz 2003; Im et al. 2008), halo effects should operate more significantly in situations where little information is available, when consumers are neither experts nor involved. Dick, Chakravarti, and Biehal (1990) experimentally found that when their subjects had limited attribute

information available, they inferred brand attribute beliefs that were consistent with their prior evaluations. So, the halo effect may also be considered as a common method of inference, especially in low-involvement product categories, when consumers infer attribute values based on their overall evaluations of that product (Degeratu, Rangaswamy, and Wu 2000). We have formulated our fourth hypothesis accordingly.

H4: Halo effects are weaker for more involved consumers.

Figure 1 offers a visual representation of halo drivers and moderators and summarizes our four research hypotheses.

[Insert Figure 1 about here]

METHODOLOGY

Preliminary Qualitative Study

This study was carried out within the framework of a project led under the Horizon 2020 research program that included several quantitative consumer studies and one qualitative study. The qualitative interviews (90 in total) were done in five European countries (France, Germany, Italy, Spain and the UK), similarly to our experiment. They are focused on positive or negative perceptions, associations, beliefs and attitudes towards fish consumption. Respondents revealed that they are more receptive to various cues when buying salmon than other fish species like cod, herring, sea bass, etc. Salmon is a very versatile food product because it is "nutritious, rich in micronutrients, minerals, marine omega-3 fatty acids, very-high-quality protein, and several vitamins" (Marine Harvest Industry Handbook 2018, 19), but at the same time, it requires a lot of effort and skills to select a good-quality salmon. The results of this study allowed us to draw up a series of attributes that are important for consumers when buying salmon, the most controversial ones being: healthy, safe, nutritious,

expensive, tasty, good or bad for the environment, ethical, sustainable. These items will be used in the experimental assessment of the halo effect in the context of a salmon-harm science communication. The predominance of health attributes versus ethical characteristics in the decision-making process was also confirmed in this preliminary qualitative study.

Design

The hypotheses were tested in a between-subject experimental design with source of information (more *vs* less credible) and focal topic (health *vs* ethical issues) as the manipulated variables. In order to represent more and less credible sources of information, we used official sources as more credible and non-official blogs as less credible. Thus, four different articles about salmon consumption (see Appendix 1) were presented to respondents in relation to health or ethical issues and published either by an official government source or by a non-official blog. We chose this communication channel, as mass media is the preferred source of information in the case of food safety issues (Böcker and Hanf 2000; Burger and Waishwell 2001; Rosati and Saba 2004).

Participants

We surveyed salmon consumers in five European countries (France, Germany, Italy, Spain and the UK), giving us a total of 3,766 respondents (see Appendix 2). Each national sample was provided by a professional online access panel (Bilendi) and is very nearly representative in terms of gender, age groups and main national regions: young consumers were actually the only slightly underrepresented group.

Stimuli

For the stimuli, salmon was selected as a target product due to the many hazards stemming from salmon farming methods (with the nutritional qualities of farmed salmon

under constant challenge), but also to overfishing (reinforcing the idea of the ethical impact of food issues). Moreover, the qualitative study mentioned in section *Preliminary Qualitative Study* revealed that the buying process for this popular species of fish is particularly delicate. However, at the time of the survey (August-September 2017), salmon was not particularly in the media spotlight, which means that our respondents were not specifically sensitive to the subject.

Based on existing articles published in newspapers, on viral online content, and on close collaboration with researchers in fishery and aquaculture sciences, two target messages were developed: one presenting the impact of salmon consumption on health and the second presenting the impact on the environment. Both messages simultaneously contained information about farmed and wild salmon, because presenting information about farmed salmon only would not impact the attitudes and intentions of respondents consuming only wild salmon, and vice versa. A series of pre-tests was carried out in order to check for trust in the messages and to define their final forms. The clear difference in the nature of the stimulus (health *vs* ethical) was confirmed by scientific peers. The final messages were assessed as veracious by a big majority of our target consumers (see section *Key Measures*).

In order to amplify the impact of the messages, they were all accompanied by representative photos: some fish with their heads out of the water for the health-related message, and a big net full of fish for the ethical-related message.

The experiment was carried out based on a fictitious science communication, but the articles were presented as screenshots from existing national websites, corresponding to the proposed objective (see Appendix 3). For example, for France, the ANSES website was selected as official and health-related, the Ministry of Ecological and Solidarity Transition website was selected as official and ethics-related, a health, diet and nutrition blog called

‘Docteur Bonne Bouffe’ was selected as non-official and health-related, and ‘Vedura’, a private portal specialized in sustainable development, whose objective is to inform and educate citizens and professionals on sustainable development issues, was selected as non-official and ethics-related.

We controlled the potential influences from individual characteristics in the results of our experiment. Since the four possible messages were randomly assigned to our respondents, we should expect a similar distribution of participant sociodemographics in our four sub-samples (health information - official source / health information - non-official source / ethical information - official source / ethical information - non-official source). To confirm that, we ran cross-tabulations and observed the distribution of countries, genders, age-brackets and educational attainment levels within our four experimental sub-samples. Chi-square tests were performed and resulted in non-significant differences for all four individual characteristics. Specifically, we found the following values on our experimental sub-samples:

- for country: χ^2 (12, N = 3766) = 16.96, p = .15;
- for gender: χ^2 (3, N = 3766) = 1.07, p = .78;
- for age groups: χ^2 (6, N = 3766) = 7.29, p = .29;
- for education attainment: χ^2 (6, N = 3766) = 6.31, p = .39.

Procedure

Data for this study was collected through a web survey with an experimental message design. The survey consisted of two questionnaires, sent within a two-week period.

The first questionnaire mainly included sociodemographic questions, measured involvement, and proposed a first assessment of beliefs concerning salmon consumption. In the second questionnaire (received 14 days later), the participants had to read an article

talking about the negative impacts of salmon consumption. Respondents were randomly assigned to one of the four stimuli, and the distribution of four experimental messages was about equal throughout the five focus-countries. After assessing the credibility of the articles, respondents had to state their beliefs concerning salmon consumption for a second time.

Key Measures

Beliefs concerning salmon consumption were measured twice, through the same eight-item Likert scales (1 = totally disagree, 2 = disagree, 3 = somewhat disagree, 4 = somewhat agree, 5 = agree, 6 = totally agree), before and after the negative informational stimulus. The items were generated based on the earlier qualitative study (see section *Preliminary Qualitative Study*), i.e. healthy, safe, nutritious, expensive, tasty, good or bad for the environment, ethical, sustainable.

Involvement was measured with five statements adapted from Laurent and Kapferer (1985): "*I'm interested in salmon (as food)*", "*I enjoy eating salmon*", "*The (type of) salmon I buy reflects the sort of person I am*", "*If I make a mistake when purchasing salmon, the consequences are important to me*" and "*Choosing salmon is difficult*".

In the second questionnaire, after reading the article, consumers had to evaluate the credibility of the information and the source. The six statements for assessing consumer perceptions regarding the article are related to both information relevance (useful, important and worrisome) and source credibility (serious, reliable and trustworthy).

The stimuli were perceived as veracious by a large majority of respondents. The average values (see Table 1) show that official and non-official stimuli had the same scores for usefulness, importance and concern, and in accordance with our assumptions, the

assessment of the institution (serious, reliable and trustworthy) was significantly lower for non-official sources:

- about seriousness: M = 4.68, SD = .99 for official sources versus M = 4.40, SD = 1.01 for non-official sources (t [3764] = 9.25, $p < .0001$);
- about reliability: M = 4.61, SD = .98 for official sources versus M = 4.32, SD = .99 for non-official sources (t [3764] = 8.83, $p < .0001$);
- about trustworthiness: M = 4.56, SD = 1.01 for official sources versus M = 4.26, SD = 1.00 for non-official sources (t [3764] = 8.59, $p < .0001$).

This finding confirms that our official/governmental articles can be properly used to represent credible sources and that unofficial/blog articles represent less credible sources.

[Insert Table 1 about here]

In order to realize a manipulation check related to H2 and the importance of product attributes, we also included a question in our quantitative study asking the participants to rank the three most important variables that have particularly affected their salmon consumption during the past three years. Better health awareness was chosen by 48% of them and thus ranked as the most important driver, a finding which supports the foundations of our second hypothesis.

PRELIMINARY OUTPUT AND DATA PREPARATION

Preliminary Output

As a preliminary outcome, we observe (see Figure 2) that after exposure to our stimuli, the scores of beliefs towards salmon consumption decreased significantly, with an average alteration of 11.3% for all items. Some items like safety were affected more (-19%),

while others like price were affected less (-1.8%). As expected, health-related stimuli had a stronger impact on dimensions like health, safety and nutrition, and ethics-related stimuli had a stronger impact on dimensions like sustainability, ethics and environment.

[Insert Figure 2 about here]

Data Reduction

To properly test our hypotheses, we needed to get some consistent measurements of the main halo dimensions. We thus conducted a principal components analysis (with Varimax rotation) on the eight beliefs related to salmon consumption for both pre-manipulation and post-manipulation responses. As shown in Table 2, the factorial structure is stable within the two situations and explains almost ¾ of the variance (72.2% before the manipulation and 74.5% after the manipulation). The three factors can be interpreted as follows: factor 1 represents personal health dimensions, factor 2 represents the ethical components and the impact on society, and factor 3 is the price.

[Insert Table 2 about here]

Halo Calculation

In order to operationalize the halo effect, building on the previous data reduction we first calculated the difference between the pre- and post-manipulation belief assessments on three dimensions: ethics, health and price. Then, that total alteration was divided into two parts:

- the direct alteration generated by the corresponding stimulus (i.e. alteration concerning health with health-related stimuli or concerning ethics with ethics-related stimuli);

- the halo, via the alteration on the other unrelated belief dimensions (i.e. alteration concerning health with ethics-related stimuli or concerning ethics with health-related stimuli).

For example, the pre-manipulation beliefs score on salmon consumption for a respondent λ is 30, composed of 15 points for ethics, 12 for health, and 3 for price. After manipulation with the ethics-related stimulus, the beliefs score is down to 25, composed of 11 points for ethics, 11 for health, and 3 for price. The alteration is thus 5 points, composed of 4 points for direct alteration (related to ethics) and 1 point for halo (related to other dimensions).

RESULTS

The difference between the price beliefs values before (2.73) and after the manipulation (2.68) is near-insignificant. We therefore consider that the halo generated by a health stimulus only actually results in an alteration of ethical dimensions, and vice versa (see Table 3).

[Insert Table 3 about here]

As a first simple analysis, we tested that the halo effect was significantly superior to 0 ($M = 1.14$, $SD = 2.56$, $t\,[3765] = 27.19$, $p < 0.0001$). **Hypothesis 1 is accepted.**

To test H2 and H3, we conducted a two-way analysis of variance, to test the effect of topic importance (health *vs* ethics) and source credibility (official *vs* unofficial) and the interaction between them - on the volume of halo. As shown in Table 4, the two direct effects are not significant, neither from the topic importance, $F\,(1, 3764) = 1.34$, $p = .24$ nor from the source credibility, $F\,(1, 3764) = .20$, $p = .66$. However, the interaction effect interestingly

appears to be significant, F (1, 3764) = 4.01, p = .04, indicating that the topic importance effect is greater in the more credible condition than in the less credible condition.

[Insert Table 4 about here]

This result is confirmed by the comparison of halo means for our four stimuli (see Table 5). The mean halo value in the health-official condition (M = 1.28, SD = 2.51) is significantly higher than the mean halo value in the ethics-official condition (M = 1.03, SD = 2.59, *t* [1014] = 2.08 p = .03). Therefore, **hypotheses 2 and 3 are partially accepted**. The two candidate-moderators significantly foster the development of halo, but only when they operate in interaction.

[Insert Table 5 about here]

Finally, we checked whether consumer involvement in the product (salmon) would moderate the halo effect. For this purpose, we created three classes of consumers on the basis of their total involvement score. This variable was discretized into three classes with similar frequencies and used as a possible factor in the halo analysis of variance.

Our results showed that there is a significant effect of amount of involvement on generated halo for the three levels (F [2, 3763] = 9.70, p < .001). Halo increases with involvement level. Figure 3 visualizes the phenomenon. The average halo for the high-involvement group (M = 1.40, SD = 2.81) was statistically different from the mean of the two other groups, from the moderate-involvement class (M = 1.10, SD = 2.37, *t* [2376] = 2.85, p = .002) and from the low-involvement class (M = .95, SD = 2.51, *t* [2486] = 4.22, p < .0001). **Hypothesis 4 is rejected**, and the actual impact is even opposite to the expected impact.

[Insert Figure 3 about here]

DISCUSSION AND IMPLICATIONS

The main aim of this paper was to analyze the moderators of the halo effect in the context of an industry-wide product-harm communication. From both theoretical and empirical standpoints, our research confirms that it is important to study how halo effects develop and which moderators operate in the context of food science communication and in negative-information persuasion processes in general. Here we proposed the first version of an explanatory model (see Figure 1) including consumer characteristics and stimulus elements that could drive and moderate the development of halo effects and their impacts on consumer-belief alteration, consistently with PCST contextual-model theories.

Our experiment shows that when consumers are subjected to attribute-specific negative information related to a food product, positive halo effects may be generated on other product dimensions/attributes. This confirms the risks of halo effects that can occur in the context of food-related communications. This is especially true when the science communication is rooted in a topic that is very sensitive or very important to the consumer – typically health issues – and communicated via highly credible sources as official governmental bodies. This finding tells potentially-exposed companies or governmental institutions that it is crucial to communicate very specifically on the envisaged effects of the food issues. To avoid or reduce the probable halo effect, we would advise healthcare and consumer welfare advocates to clearly inform people and prevent them from envisaging some imaginary collateral effects. Since in our study the experiments are based on science communication through digital channels like websites and blogs, we consider that consumer advocacy groups also need to guide consumers on the use of the various digital information sources (Adams, Van Veghel, and Dekker 2015; Dahl, Peltier, and Milne 2018).

From the point of view of consumers' rights and well-being, it is important to consider that in the situation of food-related scares (or science communication in general), the consumers expectation is for very accurate and focused information. In that context, all the more-information is useless "if one does not understand how to use it and transform it into practical knowledge" (Pappalardo 2012, 326). For the private and public organizations potentially involved, it is crucial to communicate in order to avoid inappropriate generalization or inference, which would consequently lead to the development of additional and unjustified concerns or worries in the population. Salmon consumption offers an eloquent example showing how consumers may feel confused when faced with massive contradictory information about the impact of fish consumption on health. On one side, fish is a traditional component of the typical healthy diet, while on the other side, possible exposure to mercury or antibiotics is an issue that is sometimes raised. For product-harm events management, experts suggest to firstly address risks of 'hemorrhage': authorities must immediately engage the situation in a determined and forceful manner, with complete honesty about the seriousness of the challenges. Even if communication cannot be the sole dimension of controversy piloting, speed, power, and laterality in information sharing are crucial (Lagadec 2013).

In terms of potential moderating factors, it is interesting to see that in food-related science communication settings, non-official sources may produce slight halo effects on products beliefs. Even though those effects are lower than the ones generated by official sources for important attributes, stakeholders should consider using official sources in tandem with non-official ones (like blogs) to diffuse reassuring information on controversial food-related scares.

We also confirm that some attributes (logically the most important ones in the consumer decision process) may have a stronger impact on the occurrence of halo effects, in

the context of official sources. This means that not all information attributes/dimensions have the same potential halo "dangerousness". It also means that institutional stakeholders need to really well understand consumer psychologies and decision processes. It is especially crucial to be aware of the hierarchy of the different attributes' dimensions of the focal product.

Another surprising finding here was the effect of consumer involvement: halo effect is stronger (higher) for more involved consumers. This effect runs counter to conclusions from previous research. Note, however, that none of the previous studies analyzing the moderators of halo effects used science communication as their experimental field. We thus infer that involved consumers become even more careful and sensitive in a product-harm situation. Heath and Douglas (1990) suggested that a post-communication response is likely to have a greater effect on the attitude and purchase intentions of highly-involved consumers compared to less-involved consumers. More research is therefore needed to clarify these divergences. For example, instead of involvement, one could also consider the moderating impact of consumer product literacy (Kopp 2012) on the production of halo effects.

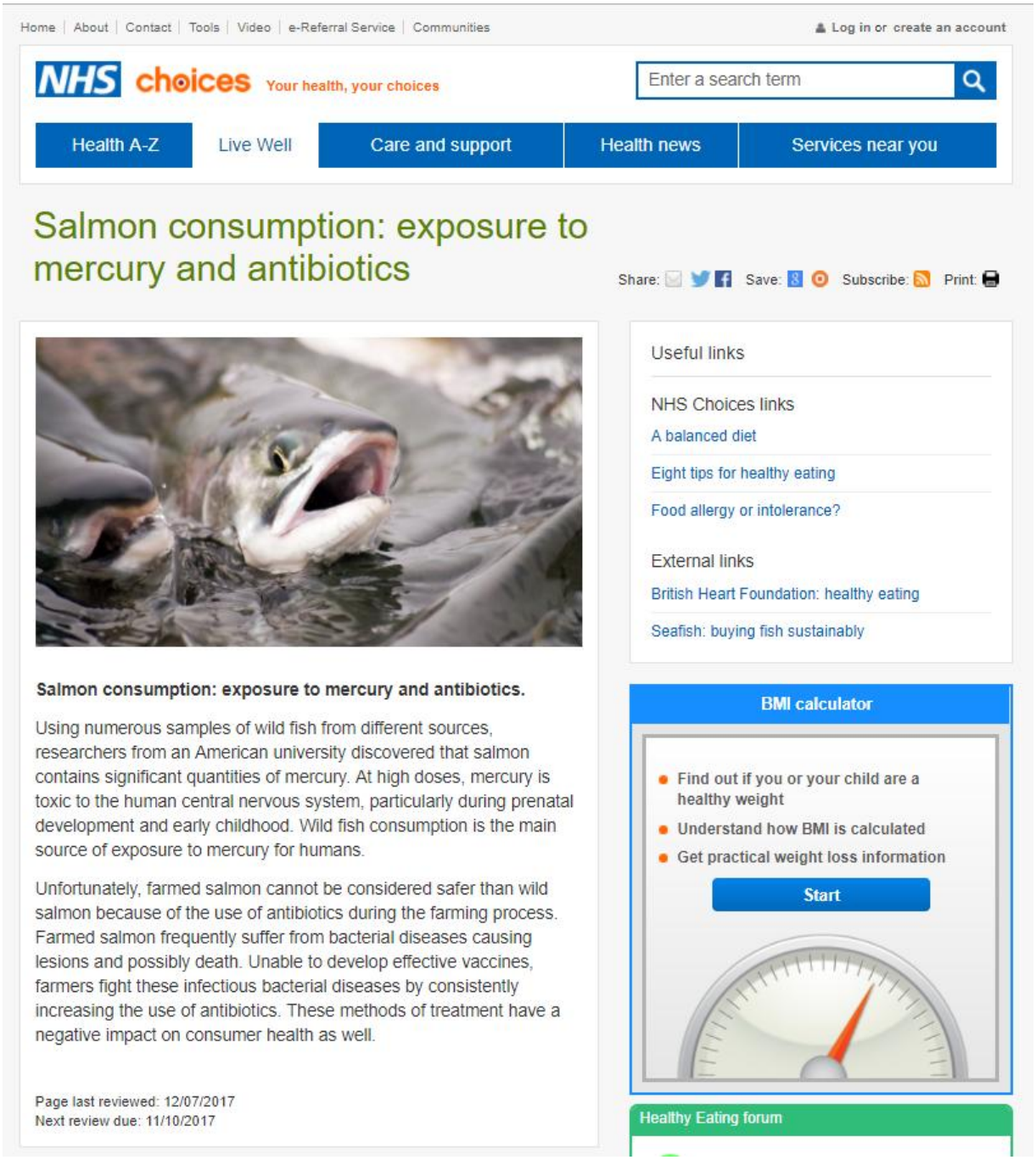
As another relevant direction for further research, we think it would be important to study how the halo phenomenon could be reduced according to the different levels of argument specificity (Atkinson and Rosenthal 2014). For example, we would expect detailed specific information to generate a lower halo than more generic vague messages. It would also be interesting to assess how possible halo effects operate on behavioral changes and purchasing intentions. Any solid analysis of consumer responses to science communication requires special attention to the related intentions and behavioral changes. In the food sector for example, behavioral changes could be related to the search for more information about products, intentions to more often purchase labeled/certified products, intentions to change diets, etc.

Although our experiment is the first (to our knowledge) to integrate the moderators of halo effects in the context of science communication, its external validity remains limited due to the use of a single case study, in this case salmon. Future research could replicate this study on other food or non-food products in order to confirm the moderating power of message and individual characteristics. Another limitation of our study is that our negative message was spread through a single communication channel, whereas in reality product-harm scientific information is usually conveyed via several media. It could be important to investigate halo-effect moderators when messages (on health or environmental issues) circulate on microblogging services such as Twitter or Instagram. In that context, the popularity or image of the spokesperson may also be an important factor to consider when analyzing the moderators of halo effects. This kind of research would cover another limitation of our study—the relatively small number of moderators taken into account—and produce relevant findings in the current real-world context. Indeed, many environmental activists use microblogging for communicating with consumers.

APPENDIX 1

Articles from the Four Experimental Conditions Used in the UK

Official and Health-Related



BE HEALTHY NOW

Natural Living & Healthy Lifestyle

Home | Natural Health | Healthy Recipes | Healthy Living | Fitness | Natural Beauty | Work with me | Contact

Healthy Living , Nutrition

Salmon consumption: exposure to mercury and antibiotics

July 12, 2017 14 Comments

Using numerous samples of wild fish from different sources, researchers from an American university discovered that salmon contains significant quantities of mercury. At high doses, mercury is toxic to the human central nervous system, particularly during prenatal development and early childhood. Wild fish consumption is the main source of exposure to mercury for humans

Unfortunately, farmed salmon cannot be considered safer than wild salmon because of the use of antibiotics during the farming process. Farmed salmon frequently suffer from bacterial diseases causing lesions and possibly death. Unable to develop effective vaccines, farmers fight these infectious bacterial diseases by consistently increasing the use of antibiotics. These methods of treatment have a negative impact on consumer health as well.

Looking for something?

SEARCH

Want to be healthier?

Get started today and subscribe to my weekly newsletter to receive valuable health articles, healthy eating inspiration, healthy living tips and a sprinkle of green beauty.

First Name

Email Address

Subscribe

Popular posts

- Natural and organic sunscreens: What to buy and what not to buy
- CBD oil, a miracle natural medicine: Everything you need to know
- How to keep your joints healthy: 6-step guide
- Why you should know your vitamin D levels
- Everything about baobab and its fruit pulp powder
- The truth about Epsom salts + Westlab Epsom salts review
- Top UK vegetarian food bloggers to follow

GOV.UK

Search

Departments Worldwide How government work
Policies Publications Consultations Statistics

Home

Press release

Salmon consumption: between overfishing and dangerous farming

From: Environment Agency
Part of: Environmental quality
Published: 12 July 2017

Wild salmon populations are under threat from a variety of human activities. Decades of freshwater pollution, habitat destruction, rampant over-fishing and unsustainable marine salmon farming have taken their toll. According to recent scientific studies, salmon populations could face localized extinction in less than 5 years.

While the population of wild salmon is steadily decreasing, there is a huge increase in the production of farmed salmon. Unfortunately, while satisfying the high market demand for this species, fish farming also has negative impact on the environment. The heavy use of antibiotics on salmon farms negatively affects the wildlife in the vicinity of the farm. There were also numerous cases of farmed salmon escaping their cages and entering the wild environment where they cause ecosystem degradation.

Non-Official and Ethics-Related

conserve

HOME ABOUT ME ABOUT CONSERVE

SALMON CONSUMPTION: BETWEEN OVERFISHING AND DANGEROUS FARMING

July 12, 2017 · by orionsmcc · in Conservation Policy, Fisheries, Marine Conservation · 7 Comments

By **Orion McCarthy**

Wild salmon populations are under threat from a variety of human activities. Decades of freshwater pollution, habitat destruction, rampant over-fishing and unsustainable marine salmon farming have taken their toll. According to recent scientific studies, salmon populations could face localized extinction in less than 5 years.

While the population of wild salmon is steadily decreasing, there is a huge increase in the production of farmed salmon. Unfortunately, while satisfying the high market demand for this species, fish farming also has negative impact on the environment. The heavy use of antibiotics on salmon farms negatively affects the wildlife in the vicinity of the farm. There were also numerous cases of farmed salmon escaping their cages and entering the wild environment where they cause ecosystem degradation.

Take Home Message: *Strong fishery laws such as the Magnuson-Stevens Act help to safeguard seafood resources and prevent overfishing. Other countries around the world should enact similar legislation encouraging scientific fisheries management to stem global overfishing. You can help stop overfishing by becoming an educated consumer and purchasing sustainable seafood.*

Enter your email address to follow Conserve and receive notifications of new posts by email.

Enter your email address

Follow Conserve

POPULAR STORIES


6 ways Brazil is saving the Amazon


8 creative ways to reduce human-wildlife conflict


10 everyday activities you didn't know were eco-friendly


How the world can stop

APPENDIX 2

Sociodemographic Characteristics of the Participants

Characteristic	*N*	*%*
Gender		
Female	1,864	49.5
Male	1,902	50.5
Age-bracket		
18–34	926	24.6
35–44	756	20.1
45–54	832	22.1
55–74	1,252	33.2
Country		
France	758	20.1
Germany	787	20.9
Italy	774	20.6
Spain	723	19.2
United Kingdom	724	19.2

APPENDIX 3

Websites Used as Sources of Information

Country	Official Sources		Non-Official Sources	
	Health-Related	Ethics-Related	Health-Related	Ethics-Related
France	ANSES (Agence nationale de sécurité sanitaire et de l'alimentation)	Ministère de la Transition Ecologique et Solidaire	Docteur Bonne Bouffe	Vedura
Germany	Deutsche Gesellschaft für Ernärhrung	Bundesamt für Naturschutz	Medizin Transparent	Gesellschaft Fuer Oekologie
Italy	Ministero Della Salute	Ministero Dell'Ambiente	Tanta Salute	Green Me
Spain	Ministerio de Sanidad, Consumo y Bienestar Social	Fundacion Biodiversidad (Ministerio para la Transición Ecológica)	Juan Revenga	Xataka
United Kingdom	National Health Service	GOV.UK (UK public-sector information website)	Be Healthy Now	How to Conserve

REFERENCES

Abelson, Robert P., Elliot Ed Aronson, William J. McGuire, Theodore M. Newcomb, Milton J. Rosenberg, and Percy H. Tannenbaum. 1968. *Theories of Cognitive Consistency: A Sourcebook.* Chicago: Rand-McNally.

Adams, Samantha A., Dennis Van Veghel, and Lukas Dekker. 2015. Developing a Research Agenda on Ethical Issues Related to Using Social Media in Healthcare: Lessons from the First Dutch Twitter Heart Operation. *Cambridge Quarterly of Healthcare Ethics*, 24 (3): 293–302.

Ahluwalia, Rohini. 2002. How Prevalent Is the Negativity Effect in Consumer Environments? *Journal of Consumer Research*, 29 (2): 270–279.

Ahluwalia, Rohini, H. Rao Unnava, and Robert E. Burnkrant. 2001. The Moderating Role of Commitment on the Spillover Effect of Marketing Communications. *Journal of Marketing Research*, 38 (4): 458–470.

Alessi, Louis De, and Robert J. Staaf. 1994. What Does Reputation Really Assure? The Relationship of Trademarks to Expectations and Legal Remedies. *Economic Inquiry*, 32 (3): 477–485.

Angulo, Ana M., and Jose M. Gil. 2007. Risk Perception and Consumer Willingness to Pay for Certified Beef in Spain. *Food Quality and Preference*, 18 (8): 1106–1117.

Apaolaza, Vanessa, Patrick Hartmann, Cristina López, Jose M. Barrutia, and Carmen Echebarria. 2014. Natural Ingredients Claim's Halo Effect on Hedonic Sensory Experiences of Perfumes. *Food Quality and Preference*, 36 (September): 81–86.

Atkinson, Lucy, and Sonny Rosenthal. 2014. Signaling the Green Sell: The Influence of Eco-Label Source, Argument Specificity, and Product Involvement on Consumer Trust. *Journal of Advertising,* 43 (1): 33–45.

Beckmann, Suzanne C. 2005. Information, Consumer Perceptions and Regulations: The Case of Organic Salmon. In *Environment, Information and Consumer Behaviour*, edited by Signe Krarup and Clifford S. Russell (197). Chettenham: Edward Elgar.

Bergadaà, Michelle, and Bertrand Urien. 2006. Le Risque Alimentaire Perçu Comme Risque Vital de Consommation. *Revue Française de Gestion,* 162 (3): 127–144.

Berman, Barry. 1999. Planning for the Inevitable Product Recall. *Business Horizons,* 42 (2): 69–78.

Boatwright, Peter, Ajay Kalra, and Wei Zhang. 2008. Research Note—Should Consumers Use the Halo to Form Product Evaluations? *Management Science*, 54 (1): 217–223.

Böcker, Andreas, and Claus-Hennig Hanf. 2000. Confidence Lost and — Partially — Regained: Consumer Response to Food Scares. *Journal of Economic Behavior and Organization,* 43 (4): 471–485.

Borah, Abhishek, and Gerard J. Tellis. 2016. Halo (Spillover) Effects in Social Media: Do Product Recalls of One Brand Hurt or Help Rival Brands? *Journal of Marketing Research*, 53 (2): 143–160.

Burger, Joanna, and Lynn Waishwell. 2001. Are We Reaching the Target Audience? Evaluation of a Fish Fact Sheet. *Science of the Total Environment,* 277 (1–3): 77–86.

Burke, Paul F., Grahame Dowling, and Edward Wei. 2018. The Relative Impact of Corporate Reputation on Consumer Choice: Beyond a Halo Effect. *Journal of Marketing Management,* 34 (13–14): 1227–1257.

Burns, Terry W., Daniel J. O'Connor, and Susan M. Stocklmayer. 2003. Science Communication: A Contemporary Definition. *Public Understanding of Science,* 12 (2): 183–202.

Cleeren, Kathleen, Marnik G. Dekimpe, and Harald J. van Heerde. 2017. Marketing Research on Product-Harm Crises: A Review, Managerial Implications, and an Agenda for Future Research. *Journal of the Academy of Marketing Science,* 45 (5): 593–615.

Cleeren, Kathleen, Marnik G. Dekimpe, and Kristiaan Helsen. 2008. Weathering Product-Harm Crises. *Journal of the Academy of Marketing Science,* 36 (2): 262–270.

Coombs, Timothy W., and Sherry J. Holladay. 2006. Unpacking the Halo Effect: Reputation and Crisis Management. *Journal of Communication Management,* 10 (2): 123–137.

Cooper, William H. 1981. Ubiquitous Halo. *Psychological Bulletin,* 90 (2): 218.

Dahl, Andrew J., James W. Peltier, and George R. Milne. 2018. Development of a Value Co-Creation Wellness Model: The Role of Physicians and Digital Information Seeking on Health Behaviors and Health Outcomes. *Journal of Consumer Affairs,* 52 (3): 562–594.

Dawar, Niraj, and Madan M. Pillutla. 2000. Impact of Product-Harm Crises on Brand Equity: The Moderating Role of Consumer Expectations. *Journal of Marketing Research,* 37 (2): 215–226.

De Jonge, Janneke, Hans Van Trijp, Reint Jan Renes, and Lynn Frewer. 2007. Understanding Consumer Confidence in the Safety of Food: Its Two-Dimensional Structure and Determinants. *Risk Analysis,* 27 (3): 729–740.

Degeratu, Alexandru M., Arvind Rangaswamy, and Jianan Wu. 2000. Consumer Choice Behavior in Online and Traditional Supermarkets: The Effects of Brand Name, Price, and Other Search Attributes. *International Journal of Research in Marketing,* 17 (1): 55–78.

Dick, Alan, Dipankar Chakravarti, and Gabriel Biehal. 1990. Memory-Based Inferences during Consumer Choice. *Journal of Consumer Research,* 17 (1): 82–93.

Dopico, Domingo C., Félix Blazquez-Lozano, and Ana A. Tudoran. 2009. Credibility of Collective Brand as a Source of Equity: An Empirical Application for Spanish Wine Market. Proceedings of the 113th EAAE Seminar, "A Resilient European Food Industry in a Challenging Word", MAICH, Chania, Greece, 3-6 September.

Eagly, Alice H., Wendy Wood, and Shelly Chaiken. 1978. Causal Inferences about Communicators and Their Effect on Opinion Change. *Journal of Personality and Social Psychology,* 36 (4): 424–35.

East, Robert, Kathy Hammond, and Wendy Lomax. 2008. Measuring the Impact of Positive and Negative Word of Mouth on Brand Purchase Probability. *International Journal of Research in Marketing,* 25 (3): 215–224.

Edelman Trust Barometer. Global Report. 2018. https://www.edelman.com/sites/g/files/aatuss191/files/2018-10/2018_Edelman_Trust_Barometer_Global_Report_FEB.pdf

Finkelstein, Sydney. 2005. When Bad Things Happen to Good Companies: Strategy Failure and Flawed Executives. *Journal of Business Strategy*, 26 (2): 19–28.

Fishbein, Martin. 1963. An Investigation of the Relationships between Beliefs about an Object and the Attitude toward That Object. *Human Relations*, 16 (3): 233–239.

Heath, Robert L., and William Douglas. 1990. Involvement: A Key Variable in People's Reaction to Public Policy Issues. *Journal of Public Relations Research*, 2 (1–4): 193–204.

Heiman, Amir, and Oded Lowengart. 2011. The Effects of Information about Health Hazards in Food on Consumers' Choice Process. *Journal of Econometrics*, 162 (1): 140–147.

Holbrook, Morris B. 1983. Using a Structural Model of Halo Effect to Assess Perceptual Distortion Due to Affective Overtones. *Journal of Consumer Research*, 10 (2): 247–252.

Im, Seunghee, Doo-Hee Lee, Charles R. Taylor, and Catherine D'Orazio. 2008. The Influence of Consumer Self-Disclosure on Web Sites on Advertising Response. *Journal of Interactive Advertising*, 9 (1): 37–48.

Kahneman, Daniel. 2011. *Thinking, Fast and Slow*. Macmillan.

Kahneman, Daniel, and Amos Tversky. 2013. Prospect Theory: An Analysis of Decision under Risk." In *Handbook of the Fundamentals of Financial Decision Making: Part I* edited by Leonard C. MacLean and William T. Ziemba (99–127). World Scientific.

Kasperson, Roger E., Ortwin Renn, Paul Slovic, Halina S. Brown, Jacque Emel, Robert Goble, Jeanne X. Kasperson, and Samuel Ratick. 1988. The Social Amplification of Risk: A Conceptual Framework. *Risk Analysis*, 8 (2): 177–187.

Kher, Swaroop V., Janneke De Jonge, Meike T.A. Wentholt, Rosirez Deliza, Juliana C. De Andrade, Hilde J. Cnossen, Niels B. L. Luijckx, and Lynn J. Frewer. 2013. Consumer Perceptions of Risks of Chemical and Microbiological Contaminants Associated with Food Chains: A Cross-National Study. *International Journal of Consumer Studies,* 37 (1): 73–83.

Kiesler, Charles A., Richard E. Nisbett, and Mark P. Zanna. 1969. On Inferring One's Beliefs from One's Behavior. *Journal of Personality and Social Psychology*, 11 (4): 321–327.

Klein, Jill, and Niraj Dawar. 2004. Corporate Social Responsibility and Consumers' Attributions and Brand Evaluations in a Product–Harm Crisis. *International Journal of Research in Marketing,* 21 (3): 203–217.

Knowles, Tim, Richard Moody, and Morven G. McEachern. 2007. European Food Scares and Their Impact on EU Food Policy. *British Food Journal*, 109 (1): 43–67.

Kopp, Steven W. 2012. Defining and Conceptualizing Product Literacy. *Journal of Consumer Affairs*, 46 (2): 190–203.

Kuttschreuter, Margôt. 2006. Psychological Determinants of Reactions to Food Risk Messages. *Risk Analysis,* 26 (4): 1045–1057.

Lagadec, Patrick. 2013. *Le Risque Technologique Majeur: Politique, Risque et Processus de Développement*. Elsevier.

Lähteenmäki, Liisa, Piritta Lampila, Klaus Grunert, Yasemin Boztug, Øydis Ueland, Annika Åström, and Emilia Martinsdóttir. 2010. Impact of Health-Related Claims on the Perception of Other Product Attributes. *Food Policy,* 35 (3): 230–239.

Laurent, Gilles, and Jean-Noel Kapferer. 1985. Measuring Consumer Involvement Profiles. *Journal of Marketing Research*, 22 (1): 41–53.

Lee, Jessica C., Peter F. Lovibond, Brett K. Hayes, and Danielle J. Navarro. 2019. Negative Evidence and Inductive Reasoning in Generalization of Associative Learning. *Journal of Experimental Psychology: General*, 148 (2): 289.

Leuthesser, Lance, Chiranjeev S. Kohli, and Katrin R. Harich. 1995. Brand Equity: The Halo Effect Measure. *European Journal of Marketing*, 29 (4): 57–66.

Lewenstein, Bruce V. 2003. Models of Public Communication of Science and Technology. *Public Understanding of Science*, 16: 1–11

Lloyd, Timothy A., Steven McCorriston, Wyn C. Morgan, and Anthony J. Rayner. 2006. Food Scares, Market Power and Price Transmission: The UK BSE Crisis. *European Review of Agricultural Economics*, 33 (2): 119–147.

Lobb, Alexandra E., Mario Mazzocchi, and Bruce W. Traill. 2007. Modelling Risk Perception and Trust in Food Safety Information within the Theory of Planned Behaviour. *Food Quality and Preference*, 18 (2): 384–395.

Luchs, Michael, Rebecca Walker Naylor, Julie Irwin, and Rajagopal Raghunathan. 2007. Is there an expected trade-off between a product's ethical value and its effectiveness? Exposing latent intuitions about ethical products. *Advances in Consumer Research*, 34: 357-358

Lutz, Richard J. 1975. Changing Brand Attitudes through Modification of Cognitive Structure. *Journal of Consumer Research*, 1 (4): 49–59.

Marine Harvest. 2018. Salmon Farming Industry Handbook. https://mowi.com/wp-content/uploads/2019/04/2018-salmon-industry-handbook-1.pdf

Mazzocchi, Mario, Alexandra Lobb, Bruce W. Traill, and Alessio Cavicchi. 2008. Food Scares and Trust: A European Study. *Journal of Agricultural Economics*, 59 (1): 2–24.

Nielsen. 2015. We Are What We Eat. Healthy Eating Trends Around the World. https://www.nielsen.com/wpcontent/uploads/sites/3/2019/04/Nielsen20Global20Health20and20Wellness20Report20-20January202015-1.pdf

Niewczas, Magdalena. 2014. Consumers' Reactions to Food Scares. *International Journal of Consumer Studies*, 38 (3): 251–257.

Pappalardo, Janis K. (2012), Product Literacy and the Economics of Consumer Protection Policy. *Journal of Consumer Affairs*, 46 (2): 319–332.

Pieniak, Zuzanna, Wim Verbeke, Joachim Scholderer, Karen Brunsø, and Svein Ottar Olsen. 2007. European Consumers' Use of and Trust in Information Sources about Fish. *Food Quality and Preference*, 18 (8): 1050–63.

Priest, Susanna Hornig. 2010. *Encyclopedia of Science and Technology Communication*. Sage Publications.

Roe, Brian, Alan S. Levy, and Brenda M. Derby. 1999. The Impact of Health Claims on Consumer Search and Product Evaluation Outcomes: Results from FDA Experimental Data. *Journal of Public Policy and Marketing*, 18 (1): 89–105.

Roehm, Michelle L., and Alice M. Tybout. 2006. When Will a Brand Scandal Spill over, and How Should Competitors Respond? *Journal of Marketing Research*, 43 (3): 366–373.

Rosati, Simona, and Anna Saba. 2004. The Perception of Risks Associated with Food-Related Hazards and the Perceived Reliability of Sources of Information. *International Journal of Food Science and Technology,* 39 (5): 491–500.

Schuldt, Jonathon P., Dominique Muller, and Norbert Schwarz. 2012. The 'Fair Trade' Effect: Health Halos from Social Ethics Claims. *Social Psychological and Personality Science,* 3 (5): 581–589.

Sen, Sankar, and Chitra Bhanu Bhattacharya. 2001. Does Doing Good Always Lead to Doing Better? Consumer Reactions to Corporate Social Responsibility. *Journal of Marketing Research,* 38 (2): 225–243.

Silchenko, Ksenia, Søren Askegaard, and Elena Cedrola. 2019. Three Decades of Research in Health and Food Marketing: A Systematic Review. *Journal of Consumer Affairs,* 53 (4): 1–40.

Slovic, Paul. 1987. Perception of Risk. *Science,* 236 (4799): 280–285.

Thorndike, Edward L. 1920. Intelligence and Its Uses. Harper's Magazine.

Trench, Brian, and Massimiano Bucchi. 2010. Science Communication, an Emerging Discipline. *Journal of Science Communication,* 9 (3): C03.

Trump, Rebecca K., and Kevin P. Newman. 2017. When Do Unethical Brand Perceptions Spill over to Competitors? *Marketing Letters,* 28 (2): 219–230.

Van Heerde, Harald, Kristiaan Helsen, and Marnik G. Dekimpe. 2007. The Impact of a Product-Harm Crisis on Marketing Effectiveness. *Marketing Science,* 26 (2): 230–245.

Verbeke, Wim. 2001. Beliefs, Attitude and Behaviour towards Fresh Meat Revisited after the Belgian Dioxin Crisis. *Food Quality and Preference*, 12 (8): 489–498.

Verbeke, Wim, Filiep Vanhonacker, Lynn J. Frewer, Isabelle Sioen, Stefaan De Henauw, and John Van Camp. 2008. Communicating Risks and Benefits from Fish Consumption: Impact on Belgian Consumers' Perception and Intention to Eat Fish. *Risk Analysis: An International Journal*, 28 (4): 951–967.

Verbeke, Wim, Iris Vermeir, and Karen Brunsø. 2007. Consumer Evaluation of Fish Quality as Basis for Fish Market Segmentation. *Food Quality and Preference*, 18 (4): 651–661.

Wirtz, Jochen. 2003. Halo in Customer Satisfaction Measures: The Role of Purpose of Rating, Number of Attributes and Customer Involvement. *International Journal of Service Industry Management*, 14 (1): 96–119.

Wirtz, Jochen, and John E.G. Bateson. 1995. An Experimental Investigation of Halo Effects in Satisfaction Measures of Service Attributes. *International Journal of Service Industry Management*, 6 (3): 84–102.

TABLES

TABLE 1

Means, Standard Deviations, and One-Way Analyses of Variance in Credibility Evaluations of Different Sources of Information (Six-Level Likert Scales)

Measure	Official Sources		Non-Official Sources		*t*
	M	*SD*	*M*	*SD*	
The article sets out useful information	4.77	1.06	4.72	1.03	ns
The article sets out important information	4.96	1.03	4.91	1.01	ns
The article sets out worrisome information	4.86	1.11	4.81	1.09	ns
The institution providing the information is serious	4.68	0.99	4.40	1.01	9.25***
The institution providing the information is reliable	4.61	0.98	4.32	0.99	8.83***
The institution providing the information is trustworthy	4.56	1.01	4.26	1.00	8.59***

***$p < .0001$

TABLE 2

Pre- and Post-Stimuli Factor Analysis of Consumer Beliefs

Consumer Beliefs Item	Factor Loading					
	Pre-Stimuli			Post-Stimuli		
	1	2	3	1	2	3
Factor 1: Health						
Healthy	**0.732**	0.251	0.032	**0.802**	0.246	0.132
Safe	**0.650**	0.435	0.062	**0.670**	0.408	0.201
Nutritious	**0.818**	0.140	0.006	**0.833**	0.108	-0.002
Tasty	**0.747**	0.033	-0.070	**0.703**	0.041	-0.199
Factor 2: Ethics						
Environmentally-friendly	0.124	**0.872**	0.084	0.121	**0.884**	0.103
Ethical	0.229	**0.832**	0.039	0.243	**0.852**	0.012
Sustainable	0.191	**0.865**	0.013	0.152	**0.890**	0.048
Factor 3: Price						
Cheap	-0.014	0.091	**0.994**	-0.003	0.088	**0.963**

TABLE 3

Halo Effects Generated by Four Different Stimuli

Alteration	Stimuli			
	Health Official	Health Non-Official	Ethical Official	Ethical Non-Official
Ethical	**1.28**	**1.09**	1.99	2.00
Health	2.76	2.51	**1.03**	**1.15**

Note: This table presents the direct alteration generated by the corresponding stimulus (alteration concerning health with health-related stimuli or concerning ethics with ethics-related stimuli) and in bold, the halo effect via the alteration on the other unrelated belief dimensions (alteration concerning health with ethics-related stimuli or concerning ethics with health-related stimuli).

TABLE 4

Two-Way Analysis of Variance for Topic Importance and Source Credibility

Factor	Sum of Squares	*df*	Mean Square	F	p
Topic importance	8.84	1	8.84	1.34	.24
Source credibility	1.31	1	1.31	.20	.66
Topic importance x source credibility	26.50	1	26.50	4.01	.04
Residuals	24,881	3762	6.61		

TABLE 5

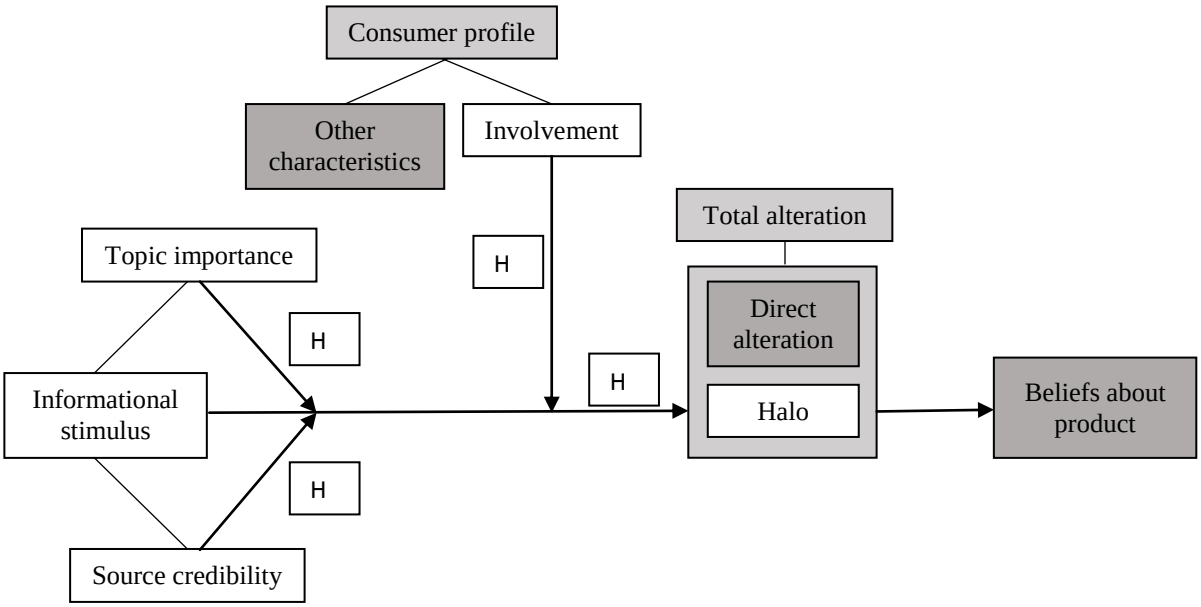
Impact of Topic Importance and Source Credibility on Halo Effect: *Comparison of Means for Four Stimuli*

Halo Effect Mean Value per Stimuli		Health Official		Health Non-Official		Ethical Official		Ethical Non-Official	
		t	p	*t*	p	*t*	p	*t*	p
Health Official	1.28			1.61	.11	2.08	.03	1.05	.30
Health Non-Official	1.09					.51	.61	.56	.58
Ethical Official	1.03							1.05	.29
Ethical Non-Official	1.15								

FIGURES

FIGURE 1

Visual Representation of the Hypotheses



Note: Only the relations between the measures presented in the white-colored rectangles have been tested. The measures presented in the grey-colored rectangles serve the purpose of better visualizing the involved concepts.

FIGURE 2

Pre- and Post-Stimuli Consumer Beliefs

	Before	After
Sustainable	4.02	3.45
Ethical	4.10	3.63
Good for the environment	3.80	3.25
Tasty	5.10	4.89
Cheap	2.73	2.68
Nutritious	5.09	4.78
Safe	4.59	3.85
Healthy	4.95	4.38

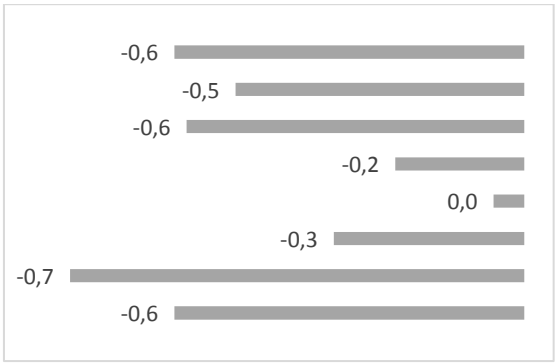


FIGURE 3

Halo Effect for Different Involvement Levels