

**The Impact of Traceability, Health Claim and Verification of Health Claim on
Consumer Evaluations of Multiple Functional Food Categories**

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ABSTRACT

Various studies have shown that information cues appearing on food product labels impact the decision-making process of consumers and shape consumer behavior. Accordingly, both marketers and regulatory agencies have sought to facilitate consumer food decision-making processes. In order to provide a better understanding of the mechanisms underlying consumer evaluations of functional foods, this study investigates the role in this process of traceability, health claim and verification of health as labelling cues. Data from a sample of 303 participants were analyzed via a mixed between-within-subjects factorial ANOVA design. Results highlight the interaction effects of traceability, health claim and the verification of health claim on consumer evaluations. Until now, the interplay of these variables has remained largely unexplored in the area of Food Marketing. Results carry clear implications with respect to marketing strategy and public policy.

Keywords: Traceability, Health claim, Verification of health claim, Consumer evaluation, Functional foods, Mixed between-within subjects analysis of variance.

1. Introduction

Foods which are deemed *functional* are essentially enhanced with bioactive ingredients (e.g. probiotics, omega-3 fatty acids, fibres, etc.) and their health benefits are taken to exceed their basic nutritional value (Galland 2013). Like other food products, functional foods have credence attributes such as nutritional and health benefits that typically remain unknown to consumers before and after purchase (Zou and Hobbs 2006). Consequently, uncertainty about the functionality, health impact, and safety of these products (Verbeke 2005a; Zou 2011) leads consumers to rely on labeling information (e.g. nutritional value or contents, place of origin, traceability, production methods, and health claims) as proxies or heuristics in order to form expectations about the quality, safety and performance of food products (Verbeke 2005b). In fact, several studies have reported that the information provided on food product labels is of paramount importance in helping consumers make informed choices (Hailu et al. 2009; Hoefkens and Verbeke 2013). Consequently, both producers and government agencies are greatly interested in the function of product label information cues in consumer decision-making (Grunert and Aachamann 2016) and thus spend millions of dollars annually in attempts to effectively label products (Rousu and Corrigan 2008). Nevertheless, space constraints on labels and time constraints on consumers when they are selecting products affect the capacity of labels to effectively convey all relevant information (Rousu and Corrigan 2008). Moreover, the inclusion of irrelevant information on product labels can potentially lead to misunderstanding, avoidance, boredom, overload, irritation and impatience on the part of consumers (Verbeke 2005b). For this reason, an understanding of consumer responses to food product labels becomes a key element in their design. Accordingly, it has been argued that the adequate labeling of functional foods is necessary for market definition and growth (Basu et al. 2007).

Past studies of the effects of labelling information on consumers' evaluations of foods have focused on a variety of factors which have included traceability (Chen and Huang 2013; Chen et al. 2014; Hobbs et al. 2005; Stranieri et al. 2010), health claim (Hoefkens and Verbeke 2013; Saba et al. 2010; van Kleef et al. 2005; Verbeke et al. 2009) and verification of health claim by various parties (Cox et al. 2008/2011; Hailu et al. 2009; Zou 2011). However, these studies have examined these factors in isolation and the effects of the nexus of these variables on consumers has remained largely unexplored. Besides, previous research on food labeling has mainly focused on cognitive responses and research on affective response to food labeling has in turn remained scant (Grunert and Aachmann 2016). In fact, given that most foods are low involvement products, consumers are unlikely to engage in systematic information processing during decision-making (Grunert and Aachmann 2016; Verbeke 2005b); and this potentially augments the importance given to more peripheral cues such as the presentational and design characteristics of food labels in consumer decision-making (see Grunert and Aachmann 2016) and the importance of ensuing feelings with respect to products. Thus, a formal investigation of the simultaneous effects of the information cues of interest in this study on consumer attitude and behavior may give rise to novel and important insights which will be of use to both functional food manufacturers and policy makers. This study involves additional contributions. Mainly, it is noteworthy that previous studies have generally focused on specific foods as carriers of functional ingredients such as fruit juices, yoghurts, spreads, breads, margarines, soups, etc. (e.g., Hoefkens and Verbeke 2013; van Kleef et al. 2005) and that none has considered wider arrays of food product categories. Based on the «*Eating Well with Canada's Food Guide*» (Health Canada 2017), this study incorporates five food products categories enriched with omega-3 fatty acids, namely: meat products, eggs, cereal products, dairy products and processed fruits or vegetables. As such, its scope is rather exhaustive.

Furthermore, the selection in this study of omega-3 fatty acids as a functional ingredient can be justified for three reasons. Primarily, omega-3 fatty acids have a considerable commercial popularity (McManus et al. 2011). They are today added as functional ingredients to a wide array of products such as milk, eggs, breads, etc. (Grag et al. 2006). Moreover, several studies have demonstrated the various health benefits of omega-3 fatty acids including the prevention of cardiovascular diseases and cancer (Riediger et al. 2009). Thirdly, the inclusion of functional and disease risk reduction health claims on food product labels based on the use of omega-3 fatty acids is not yet permitted in Canada (Canadian Food Inspection Agency 2016). However, their use is accepted in the EU and the US. Given that regulations in Canada are evolving (Malla et al. 2013), it is conceivable that new and more lenient regulations may soon emerge in this direction (Zou 2011). Accordingly, the results of this study may soon be of great relevance to policy makers and functional foods producers alike.

2. Theoretical background

2.1. The role of traceability

Growing concerns with food safety, quality and production features have resulted in greater demand for food products with credence attributes presented on labels (Wirth et al. 2011). Credence attributes are essentially unobservable through search or experience and enhance product differentiation (Baron 2011). One such credence attribute of foods rests on the notion of *Traceability* which refers to «*the information trail that follows the physical trail of food from farm to table, and can affect every member of the supply chain - including the end consumer*» (Newman et al. 2014, p.6). Following a number of crisis events and scandals involving food quality and safety (Hobbs 2004; Verbeke 2005b), it has been vehemently argued that traceability systems help maintain and restore consumer confidence (Hobbs 2004). Knowing where a food product (and its constituents or ingredients) originates from

throughout its various stages of transformation enables consumers to make more informed purchasing decisions (Verbeke and Ward 2006). Accordingly, it has been shown that traceability strengthens consumer responses to foods (Chen and Huang 2013; Chen et al. 2014; Hobbs et al. 2005; Stranieri et al. 2010). The following hypotheses which relate traceability to consumer evaluations are proposed: **(H1a)**. Consumers have a more favorable attitude toward traceable rather than non-traceable foods enriched with omega-3 fatty acids. **(H1b)**. Consumers are more likely to endeavor to try completely traceable rather than non-traceable foods enriched with omega-3 fatty acids.

2.2. The role of health claim

Health claims, as information statements presented on front-of-food product labels, are particularly important in communicating the potential health benefits of functional foods (Lähteenmäki 2013). In turn, as a legitimate educational tool, health claims presumably inform and therefore affect consumer behavior (Patch et al. 2004). Although several studies have investigated the effects of health claim on consumer responses to functional foods (Williams 2005), disparate results have been reported. For instance, Hoefkens and Verbeke (2013), Sabba et al. (2010), and Verbeke et al. (2009) concluded that consumers were more likely to buy functional foods when a nutrition claim or a functional health claim is presented versus a disease risk reduction claim. Conversely, van Kleef et al. (2005) as well as Grunert et al. (2009) found that consumers were more likely to buy functional foods labeled with risk reduction claims rather than those labeled with functional health claims. Considering these evident inconsistencies in the literature, we have decided to cast a wide net in the present study. Consequently, our second set of hypotheses do not involve any *a priori* specification of the particular impact of differing types of health claims on consumer evaluations: **(H2a)**. Health claim types significantly and differentially impact consumer attitudes toward foods

enriched with omega-3 fatty acids. **(H2b)**. Health claim types significantly and differentially impact consumer intentions to try foods enriched with omega-3 fatty acids.

2.3. The role of verification of health claim

Svederberg (2002) holds that various claims may be a reason for extended information acquisition on the part of consumers. Additional information cues that are increasingly being included on food product labels involve attestations of verification or certifications of health claims by a variety of sources. Verification plays an important role in consumer acceptance of functional foods (Hailu et al. 2009). In addition, it supports the effective development of marketing strategies, especially when the functional ingredient is novel and when the anticipated effects on health are yet unknown by consumers (Hailu et al. 2009). Moreover, given that the health benefits derived from functional foods represent credence attributes that cannot be experienced directly nor immediately by consumers, the verification of health claims by reputable and credible organizations can feasibly help reduce perceived risks and uncertainty on the part of consumers and reinforce the credibility of such claims (Ronteltap et al. 2007).

Despite its evident role in consumer acceptance and the trustworthiness of functional foods, the role of verification of health claims accuracy by various organizations on consumer behavior has not been thoroughly investigated (Niva and Mäkelä 2007). In fact, only a small number of studies have formally investigated the link between verification of health claims by varying organizations and consumer acceptance of functional foods (Cox et al. 2008/2011; Hailu et al. 2009). Their findings indicate that acceptance of functional foods was greater when product labels mentioned that the verification of a health claim had been carried out by a government agency (Cox et al. 2008/2011; Hailu et al. 2009). Similar findings have been reported in studies of public acceptance of new food technologies (Cardello et al. 2007). The

following set of hypotheses are therefore suggested: **(H3a)**. Consumers have more favorable attitudes toward foods enriched with omega-3 fatty acids when product labels indicate verification by a government agency rather than a non-governmental agency. **(H3b)**. Consumers are more likely to try functional foods enriched with omega-3 fatty acids when product labels indicate verification by a government agency rather than a non-governmental agency.

2.4. Two-way interaction between health claim and verification of health claim

Although functional food manufacturers have somewhat managed to influence and shape consumer awareness, their efforts have also resulted in skepticism and distrust via the use of information sources which are often deemed unreliable or biased by consumers (Bech-Larsen and Scholderer 2007; Verbeke et al. 2009). A distinctive parallel can be raised and drawn here with respect to pharmaceuticals. Specifically, the pharma industry has traditionally relied on indirect promotional efforts to medical professionals or *learned intermediaries* who then prescribe products to consumers or patients (see Donohue and Berndt 2004) whereas the functional foods industry has usually relied on direct promotional efforts. Consequently, the growing informational clutter, the often confusing character of the information flow, the complexity of products, and the inherent novelty of a slew of functional foods tend to complicate and muddle consumer perceptions (Dolgopolova et al. 2015). Furthermore, even after having used a functional food product, consumers cannot verify a health claim because they typically lack the required technical expertise (Ford et al. 1988) and its effects on the body is subject to individual differences and thus may be quite variable, delayed, more or less subtle, and not readily perceptible by the senses after ingestion and even after prolonged usage. In sum, the prevalence of these factors can easily lead to a lack of trustworthiness and to non-acceptance on the part of consumers (Sirò et al. 2008).

The trustworthiness of proffered health claims (Annunziata and Vecchio 2013; Sirò et al. 2008) and the level of knowledge about functional ingredients and their potential effects on health (Barrios et al. 2008) in fact emerge as primordial factors in consumer acceptance of functional foods. Trust is a means to reducing informational complexity and perceptions of risk (Luhman 2000). Thus, a verified health claim is likely to fill the gap created by direct promotional efforts to consumers by augmenting the level of trust consumers experience with respect to a functional food product and impel them to form positive attitudes and intentions. Accordingly, Hailu et al. (2009) as well as Ronteltap et al. (2007) suggest that verification acts as a quality signal over and above a proffered claim and is thus important in positively grounding the credibility of the claim. Consequently, a potential interaction effect between health claim and verification of health claim on the evaluation of functional foods appears to be indicated. In general, attitudes tend to be highly predictive of behavioral intentions (Bagozzi 1981; Kim and Hunter 1993). The following hypotheses are therefore proposed:

(H4a). The interaction between health claim and verification of health claim carries a significant effect on consumer attitudes toward foods enriched with omega-3 fatty acids.

(H4b). The interaction between health claim and verification of health claim carries a significant effect on consumer intentions to try foods enriched with omega-3 fatty acids.

2.5. Three-way interaction between traceability, health claim, and verification of a health claim

Foods in general possess credence attributes that cannot be adequately assessed by consumers (Verbeke 2005a). Thus, ambiguity and uncertainty persist in the mind of consumers (Hobbs 2004) and are likely to increase perceptions of risk which, in turn, are likely to negatively affect attitudes and purchase decisions. In such situations, consumers are expected to gather additional information to decrease the levels of perceived uncertainty (Kim

and Benbasat 2003). Consumers typically do so through the use of extrinsic quality cues such as brand names and information provided on product labels including nutritional value or contents, traceability, production methods, origin/provenance, and health claims as proxies or heuristics in making inferences and judgments with respect to a food product's quality, safety and production features (Verbeke 2005a; Wirth et al. 2011). Consequently, the use of traceability-related information alone in marketing efforts appears to have lesser potential because it is of limited practical value to consumers unless it is accompanied by some form of trustworthy quality verification assertion (Hobbs et al. 2005; Verbeke 2005a; Verbeke and Ward 2006). Moreover, van Rijswijk and Frewer (2008) have argued that traceability may be a powerful tool in helping to establish the authenticity of food and to check the veracity of food claims made by processors. Furthermore, it has been suggested that credence attributes necessitate traceability systems to infer or check the integrity of claims on labels (Golan et al. 2004; Tronstad et al. 2005). Additionally, Drichoutis et al. (2006) as well as Stranieri et al. (2010) hold that traceability-related information and the sources of this information, amongst other factors, represent important determinants of consumers' use of nutrition information. These findings somewhat rejoin Dickinson and Bailey (2002) where it is argued that food safety, traceability, and health information are valuable forms of information for consumers. Finally, with respect to functional foods in particular, it is likely that health claims and their verification represent a minimal requirement in the minds of consumers and their positive effects are likely to be further enhanced via additional information provided by traceability for instance. We remain however perplexed as to whether traceability information is processed in an additive or multiplicative fashion in conjunction with health claim and its verification. Nevertheless, past results do point to the possibility of moderation and thus interaction between traceability and the two-pronged bundle of more conceptually related cues comprised of health claim and verification of health claim. The following hypotheses are therefore

proposed: **(H5a)**. The impact of traceability on consumer attitudes toward foods enriched with omega-3 fatty acids is moderated by health claim and verification of a health claim. **(H5b)**. The impact of traceability on consumer intentions to try foods enriched with omega-3 fatty acids is moderated by health claim and verification of a health claim.

3. Method

3.1. Research design

The hypotheses were tested by means of a mixed (2 x 2) x (2 x 5) between-within subjects factorial ANOVA design. This method was employed to assess the impact of *traceability* (two levels: completely traceable versus not traceable), *health claim* (two levels: functional health claim versus disease risk reduction health claim) and *verification of health claim accuracy* (two levels: a government agency versus a non-governmental agency) across multiple *food product categories* enriched with omega-3 fatty acids (namely: meat products, eggs, cereal products, dairy products and processed fruit or vegetable products) on consumers' evaluations of these foods. *Traceability* and *health claim* were treated as between-subjects factors whereas *verification of health claim accuracy* and *food product categories* were modeled as two within-subjects factors involving repeated measurements thereby yielding a two-between and two within-subjects factorial ANOVA design.

3.2. Sample and Procedures

Five hundred questionnaires were distributed to a convenience sample of undergraduate students at various universities in the Montreal and Ottawa areas (Canada). Participants were randomly assigned to one of the four between-subjects conditions. A total of 303 usable questionnaires was returned. Although not ideal given obvious generalizability of result issues to populations, the use of a student sample was deemed adequate because homogeneity with respect to subjects' characteristics is desirable when testing theoretical hypotheses (Sternthal

et al. 1994). In other words, given the novelty of the topic and the paucity of past research findings, our concerns were much more greatly centered on ensuring adequate internal validity rather than addressing external validity issues.

More than one half (52,4%) of the respondents were male, 93,1% were less than 25 years old, 95,4% were single, and 33,7% had an annual income of \$25 000 or less. The number of respondents in each of the four between-subject conditions varied between 139 and 157 to ensure the statistical power of the experimental design.

3.3. Measures

Consumer attitude and intention to try were respectively measured via the following statements assessed on seven-point semantic differential scales: “*Your evaluation of [insert food product category] enriched with omega-3 fatty acids is (1) Unfavorable (1) / Favorable (7)*” and “*I do not want to try (1) / I want to try [insert food product category] enriched with omega-3 fatty acids (7)*”.

4. Results

ANOVA results are reported in Table 1. For the hypothesized main effects, only the effects of traceability and verification of health claim on consumer attitude and intention to try foods enriched with omega-3 fatty acids were significant. Hypotheses H1a, H1b, H3a and H3b were therefore supported whereas H2a and H2b which involved the hypothesized main effect of health claim were rejected. Furthermore, the two-way interaction effect between health claim and verification of health claim was significant only in the case of the dependent variable consumer attitude. In other words, the impact on attitude of differing health claims (functional health claim versus disease risk reduction health claim) varied in conjunction with the party that verified the accuracy of the proffered health claim (a government agency versus

a non-governmental agency). Thus H4a was supported, whereas H4b which involved the dependent variable intention to try was rejected.

Table 1 Between-Within Subjects ANOVA Results by Dependent Variable

Source of Variation	Attitude				Intention to try			
	<i>df</i>	<i>Sum of Squares</i>	<i>F</i>	<i>P</i>	<i>df</i>	<i>Sum of Squares</i>	<i>F</i>	<i>p</i>
T	1	111.934	10.825	0.001*	1	149.383	9.109	0.003*
HC	1	19.496	1.885	0.171	1	2.563	0.156	0.683
VHC	1	80.976	39.645	0.000*	1	111.937	35.056	0.000*
FPC	4	54.441	7.316	0.000*	4	42.725	3.968	0.005*
HC x VHC	1	5.722	2.804	0.095***	1	1.562	0.489	0.485
T x HC x VHC	1	0.828	0.406	0.525	1	14.072	4.407	0.037**
Error <i>df</i>	297				279			

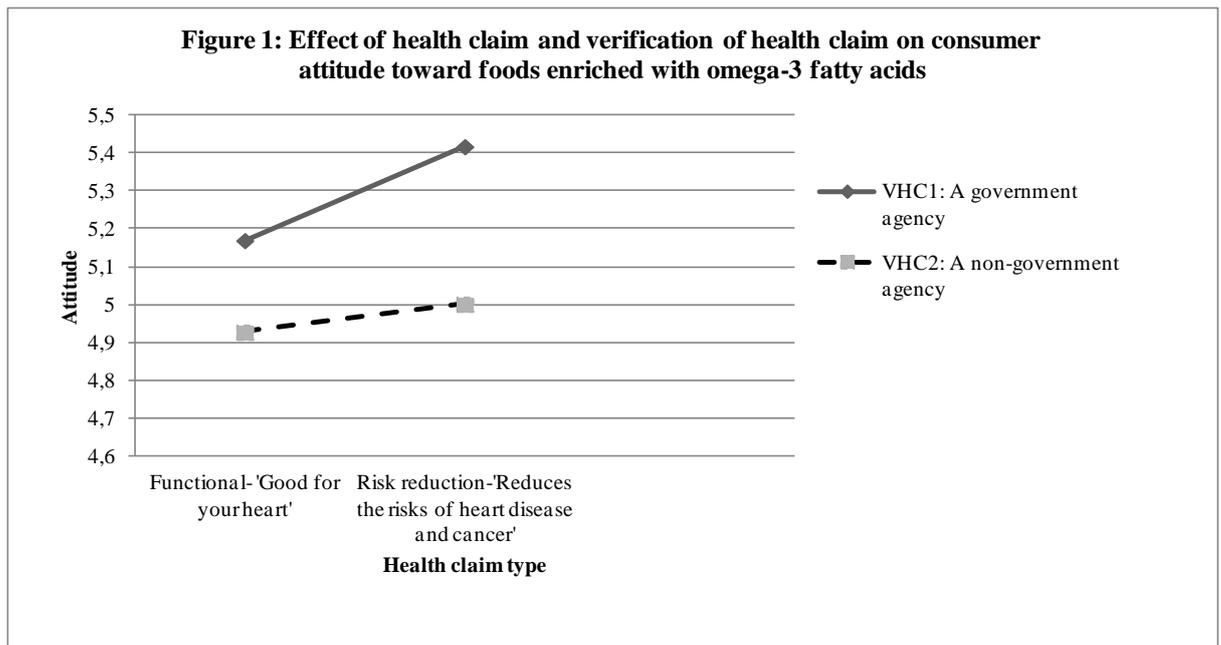
Abbreviations : T = Traceability; HC = Health Claim; VHC = Verification of Health Claim; FPC = Food Product Categories.

* Significant at 0.01 level.

** Significant at 0.05 level.

*** Significant at 0.1 level.

Given the omnibus nature of the significant two-way interaction and the apparent complexity of this result, a *post hoc* Bonferroni comparison test was carried out to identify significant differences between pairs of treatment means. Specifically, for each level of health claim, a difference test was carried out between the two levels of verification of health claim. Significant differences appeared throughout. Pairs of treatment means and p-values for the differences between them are presented in parentheses per level of health claim: For the functional health claim (“*Good for your heart*”) a significant difference emerges ($M_{:a \text{ government agency VHC}} = 5.169$, $M_{:a \text{ non-governmental agency VHC}} = 4.927$, $p = 0.001 < 0.01$) and for the disease risk reduction health claim (“*Reduces the risk of heart disease and cancer*”) a significant difference is also evident ($M_{:a \text{ government agency VHC}} = 5.417$, $M_{:a \text{ non-governmental agency VHC}} = 5.001$, $p = 0.000 < 0.019$). Figure 1 provides a spatial diagram of the treatment means of the pairwise differences between them.



Finally, as indicated in Table 1, the hypothesized three-way interaction between traceability, health claim, and verification of health claim was only significant for the dependent variable intention to try. Thus H5b was supported whereas H5a which involved consumer attitude was rejected. A subsequent *post-hoc* Bonferroni comparison test confirmed that the differences between the verification of health claim accuracy by a government agency (VHC 1) and the verification of health claim by a non-governmental agency (VHC 2) were significant between traceability treatments (completely traceable versus not traceable) only for the functional health claim (“*Good for your heart*”) ($p = 0.067 < 0.10$) but not for the disease risk reduction health claim (“*Reduces the risk of heart disease and cancer*”) ($p = 0.380 > 0.05$). Thereby, when foods enriched with omega-3 fatty acids are completely traceable, labeled with a functional health claim, and when at the same time product labels state that the accuracy of that health claim has been verified by a government agency, consumers are more likely to try these foods than those which are not traceable, labeled with a functional health claim and indicating on their labels that a non-government agency has

verified the health claim. Figures 2a and 2b provide spatial diagrams of the treatment means and of the pairwise differences between them.

Figure 2a. Effects of traceability, health claim, and verification of health claim on consumer intention to try not traceable omega-3 fatty acids enriched foods

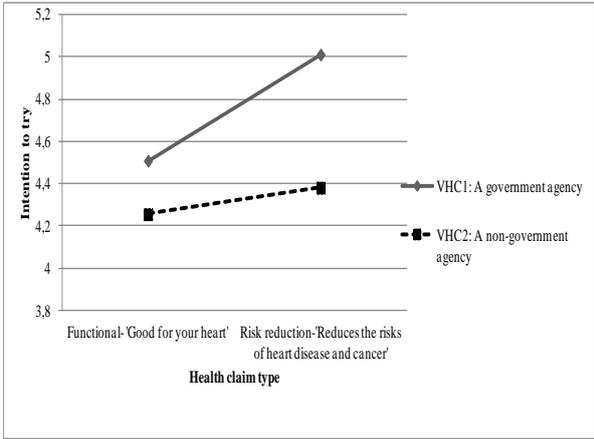
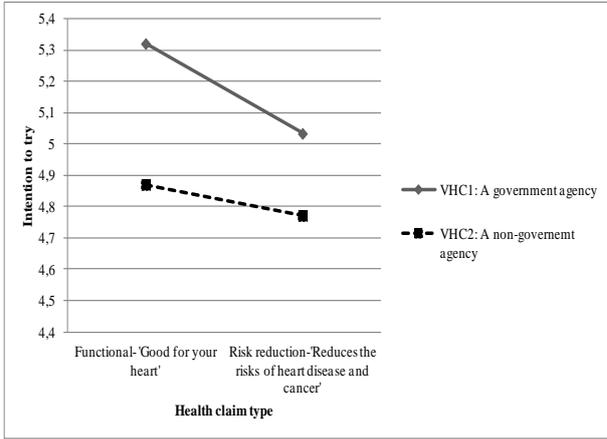


Figure 2b. Effects of traceability, health claim, and verification of health claim on consumer intention to try completely traceable omega-3 fatty acids enriched foods



It is important to note here that the main effect of food product categories (meat products, eggs, cereal products, dairy products and processed fruits and vegetable products) on consumer attitude and intention to try were not developed into formal hypotheses because there were no bases on which to ground these hypotheses given the rather exhaustive and unprecedented number of food categories which were used in the present study. Nevertheless, the main effect of this factor was highly significant on both dependent variables (see Table 1). In fact, consumers have more favorable attitudes and are more likely to try cereal products, eggs, dairy products, and meat products enriched with omega-3 fatty acids. However, they harbor relatively less favorable attitudes and are less likely to try processed fruit and vegetable products enriched with omega-3 fatty acids. A subsequent *post-hoc* Bonferroni pairwise comparison test was carried out to identify significant differences amongst the five food product categories for each of the dependent variables. With respect to consumer attitude, significant differences appeared between the following foods enriched with omega-3 fatty acids: eggs and processed fruit and vegetable products ($p = 0.007 < 0.01$); cereal

products and processed fruit and vegetable products ($p = 0.000 < 0.01$), and dairy products and processed fruit and vegetable products ($p = 0.000 < 0.01$). With respect to intention to try, only one significant difference appeared between enriched cereal products and enriched processed fruit and vegetable products ($p = 0.001 < 0.01$).

5. Discussion and conclusion

We found significant main effects of traceability and verification of health claims on consumer attitudes toward functional foods as well as on intentions to try functional foods enriched with omega-3 fatty acids. With respect to traceability, these findings are coherent with results reported in previous studies which examined the effects of traceability on evaluation of fast food products (Chen and Huang 2013), agri-food products (Chen et al. 2014) and meat products (beef, pork). With respect to verification of health claim, past studies found that consumer acceptance of functional foods was higher when it was mentioned on labels that verification of health claim had been undertaken by a reliable source outside the food industry such as a government agency (Cox et al. 2008/2011; Hailu et al. 2009).

Nevertheless, it is noteworthy that the appearance of traceability and verification of health claim as information quality cues on functional foods packaging does not necessarily imply that they are extensively processed and therefore considered in the final food choice. Given that many foods are low involvement products, consumers are in fact unlikely to indulge in systematic processes during decision-making (Grunert and Aachmann 2016; Verbeke 2005a). As indicated in Grunert and Aachmann (2016, p. 80), «*the presence of a quality label on the product may lead to a positive affective response that is not necessarily based on an understanding of what the label stands for or on any conscious effort to decode its meaning*». This statement highlights the distinction between the cognitively-laden path and

the affect-laden path in human decision-making and is in line with results reported in Petty and Cacioppo (1986) with respect to dual processing (Grunert and Achmann 2016).

Although the potentiality of a main effect of food product categories enriched with omega-3 fatty was not developed into a formal hypothesis, our findings are consistent with results reported in previous studies. For instance, Zou (2011) found that consumers have positive responses toward omega-3 enriched milk and Verbeke et al. (2009) reported that consumers have quite positive valuations of spreads enriched with omega-3 fatty acids enriched. According to Verbeke et al. (2009) and Verbeke et al. (2005), this is perhaps due to cumulated associations over time of certain foods with omega-3 fatty acids.

It is noteworthy that the processed fruit and vegetable products enriched with omega-3 fatty acids category yielded the least favorable attitudes and trial intentions. Perhaps consumers consider this enrichment as inherently artificial, mismatched, or even as unnecessary or superfluous. Accordingly, Bech-Larsen and Grunert (2003) note that consumers consider fruit juices to already possess a healthy image. Consequently, the combination of a food product which conveys a healthy image (fruit juice) with a rather artificial type of enrichment (i.e., the addition of omega-3 fatty acids) is perhaps perceived as being less natural and therefore results in poorer consumer evaluations (Bimbo and Viscecchia 2016; Verbeke et al. 2009).

With respect to health claims, the results of our study indicate that the sole use of health claim types has no significant effect on consumer attitude and intention to try foods enriched with omega-3 fatty acids. These findings contradict those of previous studies (Hoefkens and Verbeke 2013; Saba et al. 2010; van Trijp and van der Lans 2007; van Kleef et al. 2005; Verbeke et al. 2009). However, Lähteenmäki (2013) has pointed out that there are relatively few consistent findings about consumer responses to functional food health claims. Several explanations are in fact possible for the rejection of hypotheses H2a and H2b in our study.

First, many foods are low involvement products (Grunert and Aachmann 2016, Verbeke 2005a) and therefore quality cues on food labels may be ignored or may give rise to affect-based influences on decision-making processes. In our study, health claims, as a quality cue, seemed to be ignored by consumers because no significant differences emerged between health claim types on consumer attitude and trial intention. Similarly, Grunert et al. (2010) concluded that consumers often ignore or pay little attention to health claims when shopping for food products. Second, according to van Buul and Brouns (2015), in real-life situations, consumers rarely have time and do not have a sufficient background or expertise to read through and effectively process complex information included on labels. Given the very short exposure, on average, to health claims (less than 4 seconds), consumers do not extensively process labeling information and only 7 to 10% can recall looking at a given claim (Aschemann-Witzel and Hamm 2010). In addition, consumers simply do not understand the information they read on labels (Pothoulaki and Chrysoschoidis 2009). This phenomenon may be related to of the complexity of health claims (Verbeke et al. 2009), the presence of too much information on food packaging (Tonkin et al. 2015), and/or to the low intensity consumer motivations to process health claim information (Hung et al. 2016). Finally, van Buul and Brouns (2015) reported that perceptions of health claims depend on the particular consumer segments that are targeted. Indeed, consumers who need the product, accept the ingredient, understand the product benefits, and trust the brand are likely to perceive health claims more positively (van Buul and Brouns 2015). Given that the majority of our subjects is composed of undergraduate students of about 25 years of age, the arguments advanced by van Buul and Brouns may serve to explain why health claim types did not differ significantly in their respective effects on consumer evaluations of omega-3 fatty acids enriched foods.

In any case, the present study, brought to light a significant two-way interaction effect between health claim and the verification of health claim on the dependent variable consumer

attitude as well as a significant three-way interaction effect amongst traceability, health claim and verification of health claim on consumer intention to try foods enriched with omega-3 fatty acids. With respect to the two-way interaction, our findings show that the impact of health claim types on consumer attitude is moderated by verification of the health claim accuracy. In other words, when foods enriched with omega-3 fatty acids are labeled with a functional health claim (“*Good for your heart*”) or a disease risk reduction health claim (“*Reduces the risks of heart disease and cancer*”) and their labels indicate that the veracity of these claims has been verified by a government agency, consumers have more favorable attitudes toward these food products than toward those labeled with a functional health claim or a disease risk reduction health claim verified as being accurate by a non-governmental agency. In regards to the triple interaction, our results demonstrate that the effect of traceability on consumers behavioral intentions toward foods enriched with omega-3 fatty acids is moderated by health claim and by verification of health claim.

A plausible explanation for both interaction effects can perhaps be provided by notions which stem from the Elaboration Likelihood Model (see Petty and Cacioppo 1986). Indeed, because many foods are low involvement products (Grunert and Aachmann 2016; Verbeke 2005a) consumers will tend to use simple heuristics or rules of thumb in their evaluation without much additional cognitive elaboration or depth of information processing (Leathwood et al. 2007; Verbeke 2005a). Moreover, memory appears to be organized as an associative network of information (Bower, 1981). Therefore, information cues that are somehow related can be linked to one another via associative networks and/or grouped together under more general categories (Leathwood et al. 2007). In this study, a source that can be trusted (a government agency) and traceability can represent instances of use of satisficing heuristics by consumers. In conjunction with a proffered health claim, this use of heuristics then facilitates their evaluation of omega-3 fatty acids enriched foods. Given that health benefits are credence

attributes that cannot be instantly experienced, consumers will tend to use the verification of a health claim as a quality signal and traceability information as a signal of production control safety and assurance.

Findings of this study might be of particular interest to actors in the functional food industry as well as to policy makers. With respect to industry players, the findings reported herein provide a better understanding of the role of traceability, health claim and the verification of health claim and of their interactions on consumer evaluations of omega-3 fatty acids-enriched foods. Given the reported impact of traceability in this study, both functional food manufacturers and retailers could benefit from a potential positive socially-responsible image for their products, brand name and company. This could lead to increases in sales and market share. Therefore, the producers of functional foods should engage in a dialogue with government to provide consumers with truthful information about the production, safety and quality features of their products through effective traceability. Regarding health claims, results showed that whether functional foods were labeled with a functional health claim (“*Good for your heart*”) or a disease risk reduction health claim (“*Reduces the risk of heart disease and cancer*”), consumer attitudes as well as intentions to try did not vary significantly. Consequently, actors in the functional food industry should perhaps consider investing in marketing communications by focussing their efforts on the core benefits of their products rather than on trying to substantiate a particular health claim (Hoefkens and Verbeke 2013; Hung et al. 2016). Nevertheless, although health claim types alone do not vary significantly in affecting consumer evaluations of foods enriched with omega-3 fatty acids, our results demonstrated that differences between health claim types do vary in conjunction or in interaction with the verification of health claim in affecting consumer attitude. Specifically, functional and disease risk reduction health claims when combined with verification carried out by a credible governmental agency have significant effects on this dependent variable.

Accordingly, functional food industry actors could stress in conjunction with policy makers the value of authorizing the use of functional and disease risk reduction health claims for food enriched with omega-3 fatty acids.

For policy makers, results of this study suggest that verification of health claim accuracy by a government agency has significant repercussions on consumer evaluations of omega-3 fatty acids enriched foods. Therefore, government regulatory agencies should establish effective verification procedures, protocols and programs for functional foods in particular. In fact, it is important for government regulatory agencies to put in place programs which allow functional food industry actors to state on their product labels that the health claim type they are proffering has been verified as accurate by a government agency as long as functional the food industry complies with imposed health claim guidelines and regulations.

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