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Review Article

Consumer understanding of nutrition and health claims: sources of evidence

Peter D. Leathwood[1], David P. Richardson[2], Peter Sträter[3], Peter M. Todd[4,5] and Hans C. M. van Trijp[6,7]

[1]*Nestlé Research Centre, P.O. Box 44, 1000 Lausanne, Switzerland*
[2]*DPR Nutrition Limited, 34 Grimwade Avenue, Croydon, Surrey, CR0 5DG, UK*
[3]*Südzucker, Wormser Strasse 11, 67283 Mannheim, Germany*
[4]*Indiana University, Department of Psychology, 1101 E. 10th Street, Bloomington, IN 47405, USA*
[5]*Max Planck Institute for Human Development, Lentzeallee 94, 14195 Berlin, Germany*
[6]*Unilever Food and Health Research Institute, Olivier van Noortlaan 120, 3133 AT Vlaardingen, The Netherlands*
[7]*Wageningen University, Hollandseweg 1, 6706 KN Wageningen, The Netherlands*

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Provided that they are scientifically substantiated, nutrition and health (NH) claims linked to food products can help consumers make well-informed food choices. The new European legislation on NH claims made on foods entered into force on 19 January 2007. The law sets out conditions for their use, establishes a system for their scientific evaluation, and will create European lists of authorised claims. An important aspect of this proposed legislation is that it states, in article 5.2, 'the use of nutrition and health claims shall only be permitted if the average consumer can be expected to understand the beneficial effects expressed in the claim'. The present review examines consumer understanding of NH claims from a consumer science perspective. It focuses on the type of data and information that could be needed to provide evidence that the average consumer adequately understands a particular NH claim. After exploring several different methodologies, it proposes a case-specific approach using a stepwise procedure for assessing consumer understanding of a NH claim.

Nutrition and health claims: Consumer understanding: Claim methodology: Legislation

Nutrition and health (NH) claims are potentially powerful tools in consumer communication as they convey information on food characteristics (for example, 'contains calcium') and health-related food benefits (for example, 'contributes to a heart-healthy diet') that might otherwise remain unknown to the consumer. As such, NH claims may influence consumer preference and facilitate well-informed food choices. The use of NH claims is becoming widespread[1,2] and, applied correctly, has the potential to enhance consumers' nutritional knowledge and healthy eating patterns[3–5] as well as to improve public health more generally.

NH claims also have the potential to misdirect consumers towards food choices that may be against their own best interests. Many countries around the world have developed laws, guidelines and codes of practice regarding NH claims, and the European Union (EU) has recently published its new legislation[6] on the use of NH-related claims in commercial communication including labelling, presentation and advertising of foods. An important aspect of the new legislation is that it states that 'the use of nutrition and health claims shall only be permitted if the average consumer can be expected to understand the beneficial effects expressed in the claim' (article 5.2)[6].

Scientifically, this raises the question: what types of data and evidence about consumer understanding are sufficient to show that the average consumer can be expected to understand a particular NH claim? The aim of the present review is to explore this question from a consumer science perspective. The 'consumer understanding in the new regulatory context' section reviews some of the key points in the new EU legislation and its implications for measuring consumer understanding. Next, the 'consumer processing of product information' section explores understanding of NH claims and culminates in a working definition of consumer understanding from a consumer science point of view. The 'methodologies for nutrition and health claim consumer research' section outlines some of the different research approaches and sources of evidence that can be used to substantiate

Abbreviations: EU, European Union; NH, nutrition and health.

* **Correspondence:** ILSI Europe a.i.s.b.l., Avenue E. Mounier 83, Box 6, 1200 Brussels, Belgium; fax +32 2 762 00 44; email publications@ilsieurope.be

consumer understanding. Finally, the 'conclusions and recommendations' section provides recommendations for assessing consumer understanding of NH claims.

In its treatment of understanding NH claims, the present paper can be seen as complementing the Process for the Assessment of Scientific Support for Claims on Foods (PASSCLAIM) Concerted Action Project that provided recommendations for the assessment of scientific support for claims on foods[7–9].

Consumer understanding in the new regulatory context

New legislation

The current legal requirement in Europe is that companies that make claims on food products must prove that their claims are truthful and that their advertising does not mislead consumers. At this time, there is no legal requirement to show that the average consumer understands the claim. However, as quoted earlier, the new regulation on NH claims made on foods[6] states that they can only be used if there is the expectation that the average consumer will understand their claimed beneficial effects (article 5.2)[6]. This new regulation shall apply to NH claims made in commercial communications, whether labelling, presentation or advertising, regarding foods to be delivered as such to the final consumer, including foods that are placed on the market unpacked or supplied in bulk.

Specifically, the European regulation deals with nutrition claims, health claims and reduction of disease risk claims. Nutrition claims refer to situations where it is stated, suggested or implied that a food has particular beneficial nutrition properties due to (1) the energy it provides, provides in a reduced or increased amount, or does not provide; or (2) the nutrients or other substances it contains, contains in reduced or increased amounts, or does not contain. 'Other substances' are non-nutrient substances that, in addition to a wide range of nutrients, have a nutritional or physiological effect. A health claim is any claim that states, suggests or implies that a relationship exists between a food category, a food or one of its constituents and health. A reduction of disease risk claim is any health claim that states, suggests or implies that the consumption of a food category, a food or one of its constituents significantly reduces a risk factor in the development of a human disease. All claims have to comply with the general principles that they are not false, ambiguous or misleading (as laid down in article 3)[6], and they have to be scientifically substantiated (article 6)[6].

Additional conditions exist for the different types of claims. Specifically, nutrition claims will only be allowed as currently listed in the annex of the new legislation. Other nutrition claims and 'other substance' content claims referring to probiotics, prebiotics, omega-3 fatty acids and so forth can be added to the annex by a committee procedure (described in article 25 of the new legislation)[6]. These content claims must comply with the general conditions laid down in article 5[6], namely, that the nutrient or 'other substance' has to be present in such a quantity that will produce the nutritional or physiological effect claimed as established by generally accepted scientific evidence. In addition (as specified in article 8)[6], for those food components not already on the annex list, the Commission will involve, where appropriate, interested parties – in particular, food business operators and consumer groups – to evaluate the perception and understanding of the claims in question.

NH claims under article 13[6] describe or refer to the role of a nutrient or 'other substance' in (1) growth, development and the functions of the body; (2) psychological and behavioural functions, or (3) slimming or weight control, reduction in the sense of hunger or increase in the sense of satiety, or reduction of the available energy from the diet. NH claims based on generally accepted scientific evidence fall under article 13.1[6]; these well-established or 'generic' claims must also be well understood by the average consumer. In contrast, those NH claims that are based on newly developed scientific evidence and/or that include a request for the protection of proprietary data fall under article 13.5[6]; these are required to have a dossier of scientific evidence and a proposal for the wording of the nutrition or health claim and specific conditions for use. Again, in all cases, NH claims shall only be permitted if the average consumer can be expected to understand the beneficial effects as expressed in the claim.

The consumer and new legislation

One new feature in the European legislation is that the role of the consumer has become much more prominent. The regulation takes as its benchmark the 'average consumer', defined as a consumer 'who is reasonably well informed and reasonably observant and circumspect'. (Recital 16, in the preamble to the new regulation, defines further the notion of the 'average consumer'. The recital takes account of different social, cultural and linguistic factors as interpreted by the European Court of Justice and suggests that it is desirable that the impact of the claim be assessed from the perspective of the average member of the particular group it is intended to reach. It also states that the average consumer test is not a statistical test and that national courts and authorities will have to exercise their own faculty of judgement, according to the case law of the Court of Justice, and determine the typical reaction of the average consumer in a given case. The legal implications of this approach of defining the average consumer will need to be clarified in case law.) The key objectives of the new legislation are to ensure that NH claims are truthful, relevant and understood by consumers. At several points reference is made to consumer understanding, but it is not clear what criterion for adequate understanding should be used. Thus compliance with the proposed regulation that 'the use of nutrition and health claims shall only be permitted if the average consumer can be expected to understand the beneficial effects as expressed in the claim' (article 5.2)[6] requires (1) a definition of the average consumer, (2) a definition of what it means to understand the claim's beneficial effects, and (3) way(s) to assess that understanding.

In the next section we consider how consumers process information.

Consumer processing of product information

How a consumer goes about understanding a particular NH claim can be viewed as an example of human information processing where individuals are exposed to external information

(here the NH claim), pay a certain degree of attention to it, bring all or some of it into their cognitive system, perhaps elaborate on it and form an assessment or evaluation that may or may not result in behaviour. Hence an outline of how this information processing is presumed to work is useful for deciding how best to assess consumer understanding.

Humans are active information processors, so they usually think about and build on information (such as NH claims), rather than just passively respond to it. There is a constant interaction between externally obtained information and internal knowledge representations already present in memory. This interaction can be broken down into a series of stages of information processing that individuals may go through before they act based on the information. Many information-processing models build on a basic thinking–liking–behaving (or cognition–affect–connation) sequence. For example, the so-called AIDA model[10] proposed four steps: attention, interest, desire and action. The model of Lavidge & Steiner[11] proposed six: awareness, knowledge, liking, preference, conviction and purchase. McGuire[12] suggested eight: exposure, perception, comprehension, agreement, retention, retrieval, decision making and action. Keller *et al.*[13] applied a similar framework to the analysis of food purchase when they argued that NH claims can influence consumer behaviour to the extent that consumers are aware of the claim, understand it, draw health inferences from it, consider it credible, appealing and motivating and translate it into action (purchase or not).

For decisions taken at low levels of involvement, individuals do not usually follow this full sequence. Thus, when buying a carton of milk, consumers are likely to act directly on the information available (for example, price, package design, memory of previous experience) without much further cognitive processing. Most models of choice (for example, the elaboration likelihood model of Petty & Cacioppo[14] and the heuristic systematic processing model of Chaiken *et al.*[15]) take into account how much thinking consumers are likely to do before making their choices, depending on the situation. Information may be processed in depth (systematic processing), or more superficially (heuristic processing). In systematic processing, consumers are assumed to use more of the available information to reach a decision. In heuristic processing, the information is interpreted quickly using simple rules of thumb or cognitive heuristics (for example, 'experts can be trusted' as in Chaiken *et al.*[15]) without much cognitive elaboration or deep thought. Whether consumers engage in systematic, heuristic or other processing depends on their current motivation and ability to process the information available in the choice situation.

As with most information-processing theories, these models build on the assumption that human memory is organised as an 'associative network' of information items linked according to the associations and relationships between them (for example, Solomon[16]). For instance, information items that are perceived to be related can be both linked to each other and to shared characteristics, and grouped together under some more general categories. The associative network thus represents to some extent the consumer's stored knowledge, interpretations, associations and expectations.

If an individual is subsequently confronted with a piece of information, he or she can access knowledge stored in the network about that new input. Not only can individuals actively follow mental links to elaborate on information and access their associated knowledge, but much of it can be accessed spontaneously, with little mental effort. This process has been referred to as 'spreading activation'[17], where the activation of one particular memory item can lead to activation of others with particular meanings linked to them. 'Horizontal activation' can bring to mind the defining characteristics of an object while 'hierarchical activation' can invoke more complex associations. For example, the word 'cheese' can trigger horizontal access to defining characteristics (for example, a food, perhaps yellowish in colour, sometimes with holes, and possibly a strong smell) and hierarchical links to categories and evaluations (for example, 'dairy product' and 'it's good for me').

Information-processing models and the notion of spreading activation are relevant to determining consumer understanding of NH claims. Because of spreading activation, NH claims may have meanings that go beyond what is actually stated in the claim. Consider, for example, a US consumer[18] encountering a margarine content claim 'low in cholesterol'. Let us assume that certain ideas about spreads and cholesterol are already stored in the consumer's memory. The consumer's understanding of the claim will be influenced by that existing knowledge and by how far activation spreads through the stored knowledge network. For example, via horizontal activation the claim may bring to mind ideas about other nutrients (perhaps: 'I know low-cholesterol margarine is not necessarily lower in fat' or 'a margarine low in cholesterol may also be low in fat'). The latter link ('low cholesterol may go with low fat') could lead to a conclusion beyond what is stated in the claim. In such a case the claim may be misinterpreted. Similarly, activation may spread hierarchically, leading the consumer to make inferences about the perceived consequences of cholesterol content. For example, the consumer may conclude from the low cholesterol claim that this margarine may help reduce blood cholesterol levels or may reduce the risk of CVD (these associations may also be correct, but neither is mentioned in the health claim and so would be over-interpretations). Some consumers may even conclude that the margarine will help them be active and successful (another over-interpretation of the claim).

In this model, the extent to which a consumer elaborates on (NH) information depends on many factors, including motivation (personal and social stake in the decision to be made) and ability to process the information (knowledge, time and cognitive resources). Consumers who are highly involved with the issue being communicated are more likely to process the information in more detail before reaching a decision (the systematic route). On the other hand, if motivation, knowledge or time is lacking, heuristic processing is more likely. Consumers may use heuristics or simple rules of thumb to jump quickly from the information provided to a decision. But either of these types of processing could lead to over-interpretation and misunderstanding – heuristic processing, while simpler and quicker, is not necessarily more error-prone. In fact, Gigerenzer *et al.*[19] have argued that, in appropriate conditions, heuristics can even outperform more extensive processing.

Other information presented along with a health claim can influence its interpretation via processing of associations. Consumer acceptance of a health claim can be positively

influenced by indications of support of the medical community[20] or by endorsement of an independent, familiar and trusted body[21]. For example, in the UK, a 100 % wholegrain breakfast cereal with an approved health claim for benefits to heart health[22] was endorsed by a leading heart health charity. This resulted in consumers perceiving the claim to be more believable, credible and trustworthy. The logo of the heart health charity acted as a recognition cue[23], leading some consumers to make a choice without searching for more information about the product[21].

Finally, the interpretation of an NH claim can be influenced by how a consumer views the claim as an instance of communication in a 'conversation' with some other party who is trying to achieve a particular end. That is, an NH claim may be understood as a speech act[24] within the context of discourse between the consumer and the originator of the claim, typically the food manufacturer. Speech acts commonly have an intended meaning in addition to their literal meaning, which can be calculated according to Grice's[24] conversational maxims, such as the maxim of parsimony (say no more than is necessary) and the maxim of relevance (say what is relevant). Because we frequently reason about intended meanings on the basis of conversational maxims, consumers will often make inferences beyond the literal meaning of claims. It is important to find out what these inferences are likely to be, in order to tell whether consumers might be misled. For instance, if a package bears the claim 'with added riboflavin', the consumer may infer, following the two maxims just presented, and assuming that the claim is being communicated by a trusted source, the following: that the claim contains all the information that he or she needs to know, that the claim is relevant to his or her (eating) goals, and, based on these, that riboflavin is beneficial for his or her eating goals and sufficient riboflavin will be obtained by eating this product (since the claim does not say otherwise). However, none of these inferences may be warranted. (See Gleis[25], chapter 3, for a detailed discussion of how conversational implicatures can lead consumers exposed to advertising claims using weak words such as 'may', 'might', and 'could' to infer stronger effects.)

From an information-processing perspective, adequate understanding of the beneficial effects as expressed in the claim (article 5.2)[6] should thus take into account possible inferences that a 'reasonably well informed and reasonably observant and circumspect consumer' may make based on the claim. Specifically, adequate understanding implies that this consumer makes inferences that are justified by the objective content of the claim without significant embellishment or exaggeration. These inferences may be influenced by other communication elements in the environment of the claim such as the packaging and/or endorsements, so understanding of the claim needs to be tested in context.

Methodologies for nutrition and health claim consumer research

Once we have defined adequate understanding, we must determine the proportion of consumers likely to adequately understand a given claim. Van Trijp & Van der Lans[26] asked consumers how difficult or easy it was for them to understand a range of NH claims and their benefits and found that only rarely did more than 75–80 % of respondents rate even the simpler claims as 'quite easy' or 'very easy' to understand. In addition, there were sometimes important differences between countries. Thus, for a probiotic yogurt, about 75 % of respondents in the UK, Germany and Italy said they understood the claim that it 'helps strengthen the body's natural defence system', while the claim 'helps strengthen the body's natural defence system because it contains probiotics' was understood by 60 % of respondents in Germany and the UK, and only 25 % in Italy[26]. That more respondents said they understood the simpler version of the benefit expressed in the claim does not prove they really did understand it, but this result, together with the qualitative results of Croft *et al.*[27], does suggest that adding unfamiliar scientific or technical terms to a claim is potentially confusing to many consumers. However, there is very little published quantitative information available on the proportion of consumers who understand claims that are already in use, let alone claims that are new and original, making it difficult to set targets for adequate amounts of consumer understanding. We next turn to ways of measuring understanding.

Studies of consumer understanding of nutritional communications and NH claims have been carried out for a variety of different reasons and using a wide range of approaches. Objectives range from improving nutrition communication and evaluation of potential regulatory strategies[28] to improving marketing communications for food products with claims and evaluation of new business opportunities. This section outlines some of the approaches that can be used to establish that a defined group of consumers understands a particular NH claim. In the 'conclusions and recommendations' section, a set of strategies is then proposed to achieve this goal.

Qualitative approaches

The domain generally referred to as qualitative research examines an NH claim from the (individual) consumer's point of view, using a range of approaches including observation and semi-directive interviews, to grasp the logic the consumer uses to interpret and understand the claim. Comprehending the logic consumers bring to understanding NH claims and information is a key first step towards developing better and more reliable communication.

Methods

Qualitative research encompasses at least three dimensions that are important for work on understanding of NH claims[29]:

(1) It seeks to identify the different rationales that individual consumers, in their particular social and cultural contexts, bring to the understanding of NH claims, and how the meaning of a claim is influenced by the food vehicle to which it is applied.
(2) It uses an organised but informal approach to data collection and tries to identify the differences between what individuals say, think and do. Used appropriately, it can help get behind normative responses – individuals telling the researcher what they feel they 'ought' to say or what they think the interviewer would like to hear – to uncover actual behaviour and the reasons for it.

(3) Its emphasis on individual particularity helps avoid inaccurate generalisations.

In qualitative research it is essential to avoid preconceived ideas and value judgements about how something may be viewed. This is because what is 'rational' may sometimes be socially and culturally specific and valid only in its local context.

Applications of the approach

• United Kingdom Food Standards Agency research on consumer understanding of health claims

In 2002, the European Commission announced its intention to regulate health claims and identified four levels of claim:

(1) 'Functional', for example, calcium aids in development of strong bones;
(2) 'Enhanced function', for example, calcium strengthens bone structure;
(3) Reduction of disease 'risk factor', for example, sufficient calcium may reduce a risk factor for developing osteoporosis in later life;
(4) Reduction of disease 'risk', for example, sufficient calcium may reduce the risk of developing osteoporosis in later life.

The UK Food Standards Agency rapidly carried out a qualitative study on 130 consumers at six different locations to assess how consumers understood these different claims and reported the results in September of the same year[27]. They examined consumer understanding of claims related to bone, heart and gut health. The results showed that simple straightforward wording facilitated understanding of health claims. For Ca, functional and enhanced function claims ('builds strong bones'; 'strengthens bone structure') were well understood. In contrast, mentions of risk factor reduction and of osteoporosis were often confusing and poorly understood. A simpler version, referring to reducing risk of bone fractures later in life, was well understood. Introduction of qualifiers (for example, 'may help build stronger bones') undermined and weakened the claim. Thus, understanding depended very much on how convincing individuals found the claim and this in turn depended on selected elements (even specific words) and on respondents' personal experiences. For example, claims about Ca and bone health were more convincing if the respondents or someone close to them had osteoporosis.

• Consumer use of nutrition and health claims while shopping

Most studies on consumer understanding of NH claims have specifically asked respondents to read and evaluate claims. In a study by Rayner *et al.*[30], shoppers were asked to think aloud about their food selections while shopping. It was noted that even though respondents had claimed in interviews to use health-related endorsements when shopping, they were rarely used during actual food selection. Although carried out with relatively few consumers (n 44), this study does suggest that in real-life shopping, NH claims may have less impact than implied by the research where consumers are confronted with specific NH claims and then questioned about them.

• Consumer understanding of calcium in milk products

Sanchez[31] illustrated some of the above points in her study of perceptions of Ca in dairy products in France. After tracing the history and evolution of perceptions of milk and minerals (and their influence on current popular communications and beliefs about Ca), she explored mothers' understanding of 'milk products' and their ideas about Ca content. For practically all the twenty-four mothers she interviewed, (homogenised) full-cream milk was the reference dairy product (and was considered to contain the most 'real calcium'), and the further the sensory attributes of other 'milk products' were from this reference, the less Ca they were presumed to contain. This logic led most of the mothers interviewed to consider low-fat skimmed milk and fruit yoghurts to be poor sources of Ca. In addition, most interviewees felt that 'added calcium' was not 'as good' as the Ca naturally present in foods.

Other applications

Qualitative techniques are widely used in medicine[29,32–34] and education[35], and in the study of food choices and beliefs[36–41], food perception and health claims[27,31,42], and food labelling[43], as well as in market research[44,45].

Strengths and limitations

The strengths of qualitative approaches are:

(1) They provide insights into the beliefs individuals have and the logic they use when interpreting NH claims. These insights are practically impossible to obtain by other approaches.
(2) By comparing how individuals in different cultures perceive and respond to different claims in different settings, researchers can identify behaviours, perceptions and rationales that are specific to a particular culture, or that appear to be 'universal' (i.e. shared by all). This is particularly relevant in the context of EU legislation.

The main limitation of broadly qualitative approaches is that the information is often based on a detailed analysis using a relatively small number of subjects. Interviews with twenty-four to thirty carefully selected respondents is usually enough to identify most of the beliefs and representations that will be found in the whole population, but follow-up quantitative studies will be needed to measure the frequencies of the responses.

Quantitative surveys and questionnaires

Quantitative surveys include self-report instruments (questionnaires completed by respondents) and questionnaires administered by a trained interviewer. With specific populations (for example, elderly individuals, children) the trained interviewer can ensure that each question is understood. Surveys and questionnaires are used to compare quantitatively consumers' perceptions, inferences and associations about NH claims with the current scientific consensus of nutritional knowledge. If consumers correctly interpret the beneficial effects expressed in the claim and do not over-generalise or make inappropriate inferences, they can be considered to understand the claim.

Methods

These methods focus on ratings gathered using questionnaires completed by the consumer, which may be complemented with measures obtained by observation (see 'qualitative approaches' section). Almost all of them measure consumer responses after 'forced' exposure to NH claims. How these experimentally obtained responses may relate to consumer attention to NH claims in the market has been largely ignored. A wide range of study designs may be used ranging from purely descriptive to specifically causal.

Applications of the approach

NH claims communicate potential benefits to the consumer but may also be associated with a bias in perception, due to the way a claim is presented or to the beliefs of the individual reading it. Roe *et al.*[28] identified four processes through which such biased inferences can occur:

(1) A 'positivity bias' occurs if a consumer makes a positive inference based on the mere presence of the claim. In this case, almost any claim can be expected to enhance the consumer's ratings for the product[46].
(2) A 'halo effect' occurs if the consumer generalises positive perceptions to other product attributes. For example, a low cholesterol claim may lead someone (via spreading activation) to presume the product is low in fat even though this is not mentioned in the claim.
(3) A 'magic bullet' effect occurs if a consumer attributes inappropriate health benefits to the product. For example, a consumer might infer from a low cholesterol claim that the product will help against cardio-vascular disease.
(4) An 'interactive effect' occurs when the NH claim interacts with the processing of other information on the package. Thus the information in the NH claim might lead the consumer to ignore the nutrition facts panel information that perhaps he/she would normally look at.

In addition, a 'boomerang effect' can occur when, for example, a health warning produces a 'more positive' response to the product in the target population. Along these lines, Kozup *et al.*[47] reported that drinkers of wine had more favourable attitudes towards wine and more positive perceptions of health-related benefits when a warning statement was present.

To explore these possible inferences, Roe *et al.*[28] presented subjects with realistic product mock-ups that systematically varied as to whether they featured (1) no claim (control condition), (2) a nutrient content claim, or (3) a nutrient content claim and a health claim. They unobtrusively observed what information consumers sought at four levels: (1) only looked at the package front panel, (2) only looked at the nutrition facts panel, (3) looked at both, and (4) looked at neither. Consumers rated product healthiness and purchase intent and responded to open- and closed-ended questions about health associations. The results showed that when a product featured a disease risk reduction claim in conjunction with a nutrient content claim or only a nutrient content claim, consumers perceived the product as healthier in terms of health associations (i.e. they showed a halo effect) and were less likely to check the nutrition facts panel. For one of the products there was a 'magic bullet' effect, in that some consumers attributed inappropriate health benefits to it.

Subsequent studies on claims for cholesterol[48], fat and fibre[49] and salt[50] suggested that over-generalisation was restricted to perceptions of non-featured nutrient content (for example, to fat or to Na) and healthiness perceptions and did not extend to specific disease risks (for example, heart disease, cancer, blood pressure). Andrews *et al.*[18] found that the tendency for consumers to over-generalise a low cholesterol claim to imply low fat content could be remedied by adding the disclosure: 'contains 14 grams of total fat per serving, an amount determined by the Food and Drug Administration to be high. Eating a diet low in total fat may reduce the risk of some types of cancer'.

Studies on the self-reported purchase implications of NH claims have found results in different directions. Some studies[13,51,52] have concluded that claims on the front of the package did not positively influence consumers' overall product and purchase intention evaluations. Levy *et al.*[53] and Bech-Larsen & Grunert[54] found that consumer perception of healthiness of a functional food was largely driven by the nutritional quality of the base product to which the claim was attached. In contrast, Roe *et al.*[28] reported that, compared with the no-claim control condition, content and disease risk reduction claims generated similar positive health evaluations and purchase intents. Van Trijp & Van der Lans[26] also found limited differences in perceived healthiness or consumer appeal for different types of claims.

Most studies on consumer perception of NH claims are restricted to samples from one country and the majority come from the USA. Bech-Larsen & Grunert[54] compared NH-claim perceptions of Finnish, Danish and US samples and found a 'remarkably common pattern' (p. 12). Van Trijp & Van der Lans[26] compared health perceptions across four countries (UK, USA, Germany and Italy) and, for perceived health impact and consumer appeal, found large differences between countries, although the relative order of the benefit and claim type effects was quite similar across countries.

Strengths and limitations

In experimental studies using self-reports, consumers are given forced exposure to the NH claim information (i.e. are specifically asked to look at and respond to a claim). This makes it possible to assess understanding, but it is very different from a normal shopping experience. Hence, it is probable that studies in which consumers are specifically asked to respond to NH claims will overestimate the use of claim information relative to most real-life conditions.

A key assumption in most research using questionnaires is that the information provided by respondents reflects their 'true thinking'. There is, however, strong evidence that respondents often construct their responses 'on the spot' based on information that is inadvertently made temporarily accessible to them as a function of the research context[55].

Questionnaire studies and laboratory experiments can control the input and situation that consumers face as they make decisions, allowing rigorous comparison of effects of different claims, packaging and so forth. But such studies rarely use research contexts that are representative of market conditions. Stimuli are usually artificial (for example,

photographs, written text, computer-animated screens or product mock-ups), sampling is selective (for example, students) and not representative of the 'average consumer' as defined in the EU legislation[6], the research environment is artificial (for example, laboratories and research rooms) and not representative of the shopping situation and the measurement instruments may disturb behaviour. Consequently, generalisability of research findings to real-life market conditions is unlikely to be good.

Heuristics

The decision heuristic approach to studying consumer understanding of food NH claims focuses on the psychological mechanisms with which individuals process information about food products and reach their decisions about whether or not to purchase and consume those products. Most studies of decision making in fields such as psychology and economics reflect a traditional definition of human rationality: individuals behaving rationally (should) use optimal decision-making strategies that assume unlimited knowledge, time and information-processing power. But to understand the way that real humans make reasonable decisions in the everyday social and economic tasks they face, we need a more psychologically plausible perspective. Bounded rationality, as articulated by Simon[56], provides exactly such an outlook: humans are able to make good decisions by using computationally realistic shortcuts, or heuristics, that are well matched, like the blades on a pair of scissors, to the structure of information in particular task environments.

Methods

Gigerenzer *et al.*[19] proposed that individuals make decisions using 'fast and frugal' heuristics that are tailored to particular decision environments. These heuristics are fast because they do not involve much computation, and they are frugal because they only search for some of the available information in the environment. To study such heuristics, Gigerenzer *et al.*[19] proposed a methodology that involves first examining the structure of the information available in that environment – what cues are available, how valid or useful they are and so on. Simple decision heuristics are then proposed that will process the available information to come up with a decision for action (for example, buy or do not buy). Each heuristic is composed of building blocks serving the following three functions: (1) specifying the order in which to search for information, (2) indicating when enough information has been found so that search can be stopped and (3) determining how the information found should be processed to make a final decision. Finally, these heuristics are assessed experimentally to see whether, and when, individuals actually use these mechanisms to reach their decisions. Payne *et al.*[57] and Bettman[58] developed an experimental methodology for studying the heuristics that individuals use in choice situations. Their computerised experiment system allows researchers to observe the exact pieces of information that individuals use in making a decision and the order in which they seek those pieces of information, both crucial cues to the underlying heuristics that individuals may be using to make their choices.

Applications of the heuristics approach

The bounded rationality perspective on decision making can readily be applied to the study of how individuals understand food NH claims. This research centres on answering the following questions. First, we must explore how NH claim information is structured in the consumer's environment, and how the consumer thinks the information is structured, which can also influence information search and decision making. For instance, are NH claim 'cues' valid, in the sense of allowing accurate decisions (for example, if one product makes a healthy heart claim and another does not, what is the likelihood that the two products actually differ in their heart effects?), and do consumers believe this to be the case (which can affect how they search for and process NH claim information)? Do these cues have a high discrimination rate, in terms of differentiating between competing products? (If all or none of some type of product have NH claims, then NH claims are not a useful cue in decision making about that product, because their discrimination rate is zero.) And do consumers realise how discriminatory different cues are? More detailed analysis of the environment is also possible, such as asking whether NH claims and some other cues (price, packaging, etc) are positively or negatively correlated with each other. These environment structure questions can be addressed through analysis of the environments that consumers face in different stores or shopping contexts, and through interviews or experiments with individuals to assess their beliefs about the structure of those environments. This research largely remains to be done.

Second, from the decision mechanism side, we can ask about the three heuristic building blocks (for guiding information search, stopping search and deciding): when NH claim information is available along with other nutrition and non-nutrition product information, how do individuals order their search for this information – that is, what do they look at first, second and so on? Is NH claim information privileged in some way? Is the information search more likely to stop if NH claim information is encountered (for example, as found by Roe *et al.*[28])? And once the information is gathered, how is it put together to reach a decision? For instance, if a shopper is comparing two products side by side on a shelf, and one has an NH claim and the other does not, is that single piece of information sufficient to influence a purchase decision (so-called one-reason decision making; Gigerenzer & Goldstein[59])? Or is the NH claim information balanced against price or other factors in some way? Furthermore, are the decisions made in a way that relies on information from others, or in a way that can easily be communicated to others? These kinds of questions could be addressed through laboratory studies, including ones that track where individuals are looking for information about a product (on a label or on a web page description, for instance), or perhaps preferably in a more naturalistic shopping situation, though there the information search steps will be difficult to monitor.

Strengths and limitations

The main advantage of studying the heuristics contributing to consumer understanding of NH claims is that it gives us insight into how individuals are psychologically processing

the information environment they face, which allows generalisation of the results of each study to new situations. Once we determine what heuristic individuals are using for a particular type of choice, we can predict their choices when the inputs to that heuristic have changed. On the other hand, uncovering these heuristics in the first place requires careful experimental tests; individuals usually cannot report how they are making decisions, and in fact they may not be making decisions in any systematic way at all. Even when they are, the mechanisms different individuals use could vary widely and still produce the same outcome, which makes the experimental task even more challenging. Finally, the results determined from experiments in the laboratory may differ from how individuals behave in real-world situations (i.e. they may have low external validity), but studying decision making in such natural situations is much more difficult.

Purchase and consumption data for the monitoring of food uses

Purchase and consumption measures provide information on real market situations. For the understanding of NH claims they provide two main streams of information. First, purchase and consumption data from test markets provide insights into possible influences of claims on purchase behaviour in real markets. Second, panel and retail-checkout data can be used to follow up the possible influence of claims once the products with the claims have been introduced onto the market.

Methods

Consumer panels are groups of consumers who, sometimes over many years, keep daily diaries of purchases or consumption. The size of a panel is determined by the need to calculate statistically significant differences between segments of the panel and may vary from a few hundred to thousands[60].

Field studies are usually unobtrusive observational projects carried out at the point of sale or at the point of consumption. They have the advantage that the consumers are potentially exposed to all the relevant variables that may influence their decisions at the moment of purchase or consumption, without bias from the experiment. If consumers are interviewed after the observation, possible reasons for their behaviour can be explored[61].

Test market studies usually take place in a small town, district or region or even a supermarket (or chain). If the population involved is representative of national structure, the results can be safely generalised to the whole population. Once again, consumers are potentially exposed to the relevant variables with respect to the new product including advertising, promotion and competition. Information on shopping habits of individual families can be collected and the reasons for specific purchases explored.

Finally, retail-checkout data for many products and brands are collected by companies such as Nielsen, GfK, Sema and IRI. This allows researchers to determine consumption structure and trends for almost any product for any consumer group over a wide range of time periods.

Unfortunately, much of the data from consumer panels, field studies, test markets and retail-checkout-data studies are collected for commercial purposes and are not available in the public domain. What has been published is mostly based on governmental statistics of aggregate consumption data.

Applications

Baltas[60] studied panel data of children's breakfast cereals in the London area in the years 1996–7. In all, 7607 purchases of seven major brands by 1090 consumers were analysed as a function of label information and NH claims. Choice was examined first as a function of product information (nutritional content and price), and second as a function of consumer preferences for the products. The results showed that protein, Na, sugar and vitamin and mineral content were positively correlated with choice, while fat, fibre and (higher) price were negatively correlated. Baltas[60] presumed that vitamins, minerals and protein had no evident influence on the sensory characteristics of the products and concluded that nutrition labelling must have influenced product choice. In contrast, the effects of sugar, Na and fibre could have been observed by the senses and hence could have influenced product choice directly. He concluded that product choice was influenced by sensory characteristics and by nutrition labelling, and that product success was the result of finding the right balance between the two. Taking consumers' individual preferences into consideration significantly increased the ability of Baltas's economic model to predict consumer choices, suggesting that the consumers were not a homogeneous population and that nutrition aspects highlighted on labels were more relevant for some consumers than for others.

Strengths and limitations

Purchase and consumption data are obtained in the marketplace without any forced exposure that is likely to influence the behaviour and reactions of the consumer. The data are collected over several years and product categories, enabling the researcher to study long- and short-term trends in consumption of food. In addition, data collection methods, especially for government statistics, are stable, and changes are publicly announced, so that the data can be corrected. The data can be used to obtain quantitative estimates for the relative importance of variables such as NH information with respect to other characteristics of the product for different consumer groups.

The main weaknesses are: (1) data about a particular NH claim's impact are only available after the NH claim has been introduced; (2) the data cover what the consumer has bought (and perhaps eaten), and not why the changes in purchase patterns occurred; (3) small effects that might be relevant are not always detected by the models used; (4) while it is easy to apply many statistical tests and econometric models to analyse this kind of data, it is less easy to be sure that the data are interpreted correctly.

Summary

The different approaches outlined can each contribute to the understanding of consumer judgment and decision making regarding NH claims. The approaches have complementary strengths and limitations – there is no single 'magic'

methodology that simultaneously satisfies the criteria of internal validity (measure of scientific credibility) and external validity (relevance to legislation and public health policy). However, in most cases, a careful combination of qualitative research (to identify the range of possible beliefs and interpretations individuals have with respect to an NH claim) and quantitative research (to assess the proportions of consumers exhibiting each of these different responses or associations) should be sufficient to establish that an acceptable proportion of consumers sufficiently understand a given nutrition or health claim.

Conclusions and recommendations

The new EU legislation on NH claims emphasises that the wording of such claims should be understandable and meaningful to the consumer and they will only be permitted if the average consumer can be expected to understand the beneficial effects as expressed in the claims. This has important implications for industry and for consumer research. In particular, definitions must be specified for what constitutes adequate evidence to demonstrate understanding of the claimed beneficial effects. Furthermore, methods for generating such evidence of understanding must be developed, taking into account the studies discussed in the 'conclusions and recommendations' section, showing that understanding of NH claims can be influenced not only by the specific claim made on the product but also by other sources of information such as the packaging and advertising. Furthermore, with the introduction of the new legislation for approval of NH claims, legislators and companies will need to agree on the appropriate levels of evidence for adequate consumer understanding and the appropriate use of a method(s) to provide this evidence so that it is comparable across countries and products.

In principle, applied market research aims to use the appropriate elements (or their combinations) needed on a case-by-case basis to solve the question at hand. We recommend a similar procedure. This is appropriate because qualitative research will usually be needed to explore the different ways consumers may interpret the claim and quantitative studies will be needed to measure the proportion of target consumers who can demonstrate understanding of the claimed beneficial effects, either by describing them and their limitations in their own words or by selecting appropriate answers from multiple-choice questionnaires.

We recommend, therefore, a step-by-step procedure conforming to the following principles and drawing as needed from all four approaches.

Identify the consumers to be recruited

The legislation specifies that the beneficial effect expressed in a claim must be understandable to an average consumer who is reasonably well informed and reasonably observant and circumspect. For a health claim applying only to a specific group of intended consumers defined by their health status, their lifestyle or their socio-demographic status, these are the only ones likely to be 'reasonably well informed' on the benefits expressed in the claim. Other consumers are unlikely to be interested in the claim or its benefits. This focus on the intended or target consumer is consistent with the interpretation of the European Court of Justice[62] (see 'the consumer and new legislation' section regarding Recital 16).

Define the food–claim–presentation combination to be tested

Understanding of an NH claim may be influenced by the associated food vehicle, presentation and advertising. Thus, while 'understanding' has to be with respect to the wording of the claim, it may also be necessary to test understanding of the claim in association with the appropriate food and packaging.

Identify the range of consumer interpretations of the claim

Even though consumers who understand a claim can be expected to distinguish the intended meaning of the claim from potential effects linked to their own beliefs on the subject, interpretations may be influenced by beliefs about the food and the personal and socio-cultural contexts in which it has been experienced. Qualitative research techniques such as in-depth interviews are appropriate for discovering the range of interpretations. For each study, the test conditions (characteristics of the participants, sample size, procedure for presenting and testing the claim, etc) must be specified to allow replication and validation.

Quantify the accuracy of consumers' understanding of the claim

Qualitative research will usually be insufficient to provide adequate evidence of consumer understanding of the benefit of a claim and it will be necessary to quantify responses. Once again, the test conditions must be specified. The criterion for understanding is that a tested consumer is able to outline, in his or her own words, the beneficial effects expressed in the claim without significantly embellishing or exaggerating them. As there are practically no precedents from earlier research on the proportions of average consumers understanding current NH claims, research is needed to establish expected plausible benchmark proportions.

We have addressed some of the consumer science problems involved in establishing consumer understanding of NH claims. These include specifying (1) the consumers who should participate in the study, (2) the context(s) in which understanding of the claim should be evaluated, (3) the roles of qualitative and quantitative methodologies, and (4) what constitutes 'adequate understanding' and how it should be defined, both in terms of what the individual consumer must do to demonstrate adequate understanding and in terms of the acceptable proportion of consumers who must successfully demonstrate adequate understanding. Our aim has been to provide scientifically defendable answers to these problems and to stimulate the debate on how best to facilitate the creation, testing and practical use of methodologies to measure consumer understanding of NH claims.

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