Consumer perception and understanding of risk from food

Barbara Knox

Northern Ireland Centre for Diet and Health, The University of Ulster, Coleraine, County Londonderry, UK

The study of risk perception has been punctuated with controversy, conflict and paradigm shifts. Despite more than three decades of research, understanding of risk assessment remains fragmented and incoherent. Until recently, food and eating has been viewed as a low-risk activity and perceived risk surrounded matters of hygiene or lack of food. Consequently, theories of risk have been constructed with reference to environmental and technological hazards, such as nuclear power, whilst neglecting food issues. However, following a decade of 'food scares', attention has moved towards the study of food risk. Within this, food risk research has focused almost exclusively upon attempting to explain the divergence of opinion that exists between experts and the lay public whilst neglecting to address it. The following discussion provides a brief historical overview of theories and approaches that have been applied to the study of risk perception, continues with a summary of findings derived from food risk research and concludes with a discussion of methodological issues and some projections for future research.

Risk is an important determinant of food choice and correspondingly, estimates of risk are strongly related to estimates of consumption[1]. Food risk has become particularly salient in the wake of a decade of 'food scares' (such as: alar residue in apples, 1988; salmonella in eggs, 1988; and bovine spongiform encephalopathy (BSE) in beef, 1996), which have served to seriously undermine public confidence in the food industry and government regulatory bodies. Consumer concern over food safety has steadily increased since the 1970s[2,3], yet only recently have risk perceptions been explored in relation to food. This recent attention may well reflect the vested interests of government and funding bodies who are eager to introduce new technology, such as food irradiation and genetically modified foods, into food production in the knowledge that the success of these new technologies will largely depend upon public acceptance.

Correspondence to:
Dr Barbara Knox,
Northern Ireland Centre for Diet and Health, The University of Ulster, Coleraine, County Londonderry BT52 1SA, UK

Risk: a historical perspective

Theories of rational choice/quantitative risk

Historically, theories of risk have assumed that public perception of risk is constructed rationally and have focused upon associated probabilities, costs and benefits, the best example of which is Kahneman and Taversky's expected utility theory[4]. Also known as prospect theory, expected utility theory was derived from Von Neuman and Morgenstern's (1944), mixed-motive game theory which arose out of the experimental study of strategic thinking and decision-making within the context of conflict[5]. Gaming studies were undertaken within laboratory constraints and results were expressed and interpreted in terms of mathematical models. This approach, therefore, failed to embody the social and cultural context of decision-making with the result that the approach has proved to be of little utility for the prediction of behaviour. It is now generally acknowledged that perceived risk is influenced by a wide range of qualitative factors rather than statistical rationale and probabilities, yet attempts to model risk assessment mathematically persist[6–8].

Individual differences approach

The individual-differences approach, which has focused upon the effect of cognitive style upon risk perception through psychometric measures, has also failed to find any evidence that risk is quantitatively or rationally assessed.

Starr (1969) was first to point out the importance of dispositional and cognitive factors, such as volition and perceived control in the perception of technological risk[9]. Following on from Starr, the idea that risk perceptions are biased by heuristics (rules of thumb or operating principles) was suggested by Kahneman and Taversky[4], who then set out to test this idea. Although as far back as 1974, Kahneman and Taversky found no relationship between objectively calculated risk judgements and public risk perceptions, research has persisted in the search for rules through which to predict and influence public response.

Expanding further upon Starr's model of technological risk, Slovic and colleagues treated risk as a psychological construct and set out to define and quantify the nature of heuristic bias in risk perception through psychometric means[10]. Risk was defined in terms of benefit to society, magnitude of risk and acceptability of risk, and assessed in relation to dimensions of risk including voluntariness, dread, perceived control, severity, personal and social consequences and familiarity. However, risk assessments appeared to be related to only two of these dimensions,

'dread' and 'severity', and these factors have yet to be fully defined in relation to food risk concepts.

The work of Frewer and colleagues over the last decade has concentrated almost exclusively upon food risk, much of it devoted to testing Slovic's psychometric model of risk perception and expanding it to include the phenomenon of optimistic bias. The underlying premise in this research is that through better understanding of the rules and biases of perception, communication between food regulatory authorities and the public might be enhanced.

One such optimistic bias is the tendency to overestimate certain risks and underestimate others. Within certain contexts, such as that of health risk behaviour, there is a tendency to view others as more at risk of danger than oneself. This may partly explain why health messages have so little impact. Moreover, there is some evidence to suggest that optimistic bias or 'unrealistic optimism' cannot be countered through information and that it can actually be exacerbated through health promotion messages[11].

Frewer and colleagues have, therefore, attempted to explain optimistic bias in relation to perceived control over risk. Whereas environmental and technical risks, such as potential risk from food biotechnology, are characterised by low perceptions of control, life-style and dietary health risks are associated with greater perceptions of control[12,13]. Man-made hazards, such as BSE and potential hazards from biotechnology are perceived as unlikely to be properly regulated and, therefore, difficult to control. Consequently, it was hypothesised that optimistic bias or 'unrealistic optimism' would be greater in situations perceived as under personal control, such as health or food risk. To test this idea, Frewer and colleagues analysed risk assessments for a range of potential hazards of a technical, bacteriological, chemical and life-style nature that varied in terms of perceived control[14]. However, contrary to what the model would have predicted, the high fat diet, over which perceived control would be high, was rated overall the riskiest hazard. The relationship between perceived risk and perceived control is clearly complex. Later work has suggested that the perception of risk in relation to perceived control may be offset by perception of need and benefit[15]. Another possible explanation is that optimistic bias is related to perceived control, but it is mediated by 'reactance'[16]. In the face of a threatening communication, reactance may occur such that an individual may change his or her attitude in a direction contrary to that advocated in order to restore the perception of control.

Although research into optimistic bias appears equivocal, the evaluation of food risk perceptions has provided some support for Slovic's model. However, questionnaire structure has tended to be biased toward the theory[13,15], allowing only limited scope for unanticipated factors to

arise during the process of inquiry. Furthermore, studies of this type have been criticized for the almost exclusive use of factor analysis and other perceptual mapping techniques, allowing researcher bias to intrude into the analysis through the category labels that are attributed to factors[17]. For example, it has been argued that the 'dread' dimension, defined by Slovic in relation to the psychological construction of risk, is analogous to the discrepancy between 'lay' and 'expert' risk perception, a discrepancy that causes the public to experience anxiety expressed as dread[18]. Furthermore, optimistic bias may represent a proxy for perceived control[14] rather than a separate entity, and may provide an adaptive way of reducing anxiety and coping with a situation that is not perceived as controllable. The model has since been expanded to include 'trust' within the context of risk communication. There is still no theory behind the psychometric approach[19].

The individual differences approach has been favoured politically, because of its potential to explain the apparent irrationality of lay risk perceptions, and the implication that the public can be educated to overcome perceptual bias and to accept more rational assessments of risk. However, psychometric approaches which measure cognitive and dispositional variables have demonstrated only limited explanatory power in the case of food risk[20,21], so that qualitative approaches are gaining increasing favour.

Sociological theory of risk

The sociological view holds that the rich array of social meanings surrounding risk perceptions render the quantitative assessment of risk impossible. Risk, particularly technological risk, which includes food biotechnological risk, is often imposed upon the public by an elite authority such as government, science and industry, hence, power can become the over-riding issue leading to conflict[22,23]. This conflict finds expression not only in the polarization of lay and expert risk assessments, but also in the different schools of academic thought that guide research.

Risk research has concentrated almost exclusively upon the so-called 'irrational' views of the general public, whilst the private beliefs and perceptions of scientists and civil-servants have largely been ignored. This focus upon the lay perception of risk reflects the interests of risk managers and research funding bodies seeking to influence public opinion[24]. In addition, the topic of risk perception has been neglected in favour of risk quantification, and risk assessment based exclusively upon probability and rationality has provided little opportunity for active lay input into research data that have been collected[25]. Sociologists have attempted to

overcome these biases by studying risk within the wider social and ideological context. Recent work looking at the effect of experience upon risk perception suggests that social factors may be more important than physical and psychological factors in determining risk perceptions[26]. The sociological approach takes into account the role and perceptions of regulating and policy bodies, the scientific community and the media.

Cultural theory of risk

Risk assessment is a social phenomenon based upon culturally determined ideas. Social and cultural factors determine what risks are salient. Communication regarding risk probabilities is seldom successful in reducing lay risk concerns because the quantitative construction of risk represents only one aspect of public risk assessment. It has been argued that the quantitative approach has led to a focus upon the failings rather than the richness of human perception[27]. Within this is the implication that the lay view is somehow inferior.

According to cultural theory, risk perception is ideologically driven whether it be the lay public, the media, the government or the scientific elite[28]. Risk perceptions are an expression of four different socially determined 'thought worlds' or ideologies: (i) the 'atomised' perspective, which is expressed through a fatalistic attitude; (ii) the hierarchical view, characterised by trust in authority; (iii) the individualistic or rational view; and (iv) the egalitarian or critical view[29]. These views are dynamic, such that people shift from one perspective to another depending upon the issue.

Food is embedded in our social and cultural practices within which it holds symbolic significance. In particular, meat holds a varying degree of significance across cultures[30]. Food choices and food risk perceptions are, therefore, motivated by culturally relevant ethical concerns. Food-related risk is, therefore, likely to be construed in a way that is unique and may vary by food type. Exploration of food risk perceptions across societies would establish the degree to which risk perceptions are culturally determined. Both social and cultural theories have yet to be fully explored in relation to food risk.

The marketing viewpoint

Having only recently entered the research arena, market researchers have attempted to put risk in context and observe it in relation to different decisions of product choice, including food.

Product involvement, the degree to which a product purchase reflects personal goals, values and needs, is reflected in risk perceptions and this may be particularly true of food. In one study, different product classes including consumable and electrical goods were correlated for both perceived risk and product involvement[31]. The only food item that was included in the study, tinned soup, received highest ratings in terms of both risk and product involvement. Although only one food was evaluated in this study, this high level of product involvement is a reflection of the importance ascribed to food. Food is deeply embedded in our social and cultural fabric and frequently acts as a vehicle through which to express personal, social and cultural identity. Given the high degree of involvement associated with food, it is perhaps not surprising that ethical concerns direct public food risk perceptions.

Schutz and Weidmann (1998)[32] compared perceptions of personal versus environmental risk for a range of 30 different products including electrical goods, clothing items, medicines and food items such as organic vegetables, butter, and genetically modified strawberries[32]. Food tended to be perceived largely in terms of personal risk, except for genetically modified foods, which were considered risky both on a personal and environmental level. However, there was a correlation between personal and environmental risk assessments, suggesting that both personal and environmental issues are considered when making risk judgements.

In one of very few studies to consider emotion in relation to risk, Chaudhuri (1998)[33] attempted to bring together the information processing approach, which is objective and rational, and the experiential approach, which is subjective[33]. It was found that the degree of emotion associated with products varied by product class. Luxuries tended to receive higher risk ratings than essential items, however, essential items, such as food, became viewed as risky if associated with negative emotion. This suggests that objective and subjective factors are considered together and interact in the perception of food risk. Further research is required in order to gain deeper insight into the nature of such interactions.

The perception of risk from food

The bovine spongiform encephalitis (BSE) scare

Recently, consumer confidence in government food regulation has been seriously undermined. Food regulatory bodies had been aware of the potential risk of BSE for some time, an awareness based upon strong epidemiological evidence, however, until 1996, any suggestion of risk to the public was discounted by government, the scientific community and

policy makers through media sources. Denial, indecision and lack of preparation characterised the management of the BSE crisis. In effect, the British government misled the public from 1988 until 1996, while exposing them to serious health risk from beef. Was this a case of ignorance or of putting industrial interests over public health concerns? In hindsight, given the uncertainties associated with the risk from BSE infected meat, the lay public appeared as well placed as the scientific elite to assess and manage the risk[25]. Given the cultural emphasis upon the quantitative rational approach to the assessment of risk, it is of note that no quantitative analysis of the effectiveness of the culling exercise and subsequent risk of BSE transmission, has yet been published[25]. The incident has changed the face of public food risk perception for the future.

The only study that appears to have made direct qualitative inquiry into public perceptions of BSE at the time of the crisis, Keane and Willets (1996) has indicated polarised views[34]. While many viewed BSE as the result of society going against nature, others saw BSE as purely a media creation. Whereas the former attitude may constitute a moral stance against technological interference in natural processes, the latter may reflect an 'atomised' perceptual set, characterised by a fatalistic view of risk.

Attitudes toward meat appear intrinsically linked to ideological beliefs with regard to the natural world[30]. In this sense, the feeding of meat to ruminants represented a flagrant breach of cultural taboo, hence, the strong public reaction. 'Mad cow' disease arose out of unnatural animal husbandry practices, hence, the 'unnaturalness' of genetic modification has proved a major barrier to public acceptance. Consumer rejection of genetically modified (GM) foods may reflect this generally accepted taboo against unnatural food production practices.

Genetic modification and food

Uncertainty typifies lay perceptions of risk from both BSE and GM foods. In the absence of quantitative information, the public must rely almost exclusively on qualitative concerns when deciding whether or not to eat beef or GM foods. Fears of the consequences of science 'meddling with nature' have been brought about through the BSE food scare. The BSE crisis demonstrated the power of 'nature' to 'strike back' and genetic modification seems to have tapped into the same type of fear[35].

Investigation by the Consumers' Association, combining the approaches of survey by interview and focus group discussion, revealed that during 1994 only 21% of people had heard of gene technology and only 17% understood the term[36], but that by 1996, 41% understood the meaning of the term. Since then, a classic risk conflict scenario has evolved, evidenced by the polarized views of experts and the lay public.

As in the case of BSE, public risk perceptions of food biotechnology appear directed towards ecological and ethical issues. Concerns have been raised regarding antibiotic-resistant genes[37] and other environmental issues such as herbicide-resistant plants[38]. On ethical grounds, the public appears more willing to accept genetically modified products in which the genetic material has been derived from a plant source as opposed to taken from an animal source[15,39]. Qualitative studies have clearly demonstrated the nature of consumer ethical concerns. Consumers view genetic modification as 'unnatural', that it is 'meddling with nature' and that science is 'playing God' by altering the genetics of nature[35–37]. This may reflect the apparent cultural taboo against unnatural production processes.

The public believes that the only people to benefit from genetic engineering will be food producers and manufacturers. In contrast, the scientific community and the food industry present genetic modification as a 'saviour' technology capable of solving world food shortage and production problems[40,41]. Genetic modification could also be used to enhance the nutrient content of foods[37] and help to eliminate known food-borne allergens[42]. In attempting to present a philosophical rationale for GM foods, Robert Shapiro, chief executive of the Monsanto Company, drew an analogy between information technology and gene technology arguing that both are merely concerned with the transfer of information[40]. The innovative idea of linking genetic modification conceptually with 'consumer-friendly' information technology assumes a rational approach and appears unfounded given that food attitudes are culturally embedded and construed differently to other types of risk. Consumers are suspicious of the motives of the food industry and biotechnologists because the two groups appear to be working from 'unsound value systems'. Whereas science and industry view the consumer as lacking understanding, a problem which could be overcome through public education, the consumer views science and industry as commercially driven and the technology as being imposed upon them without consultation.

During 1996, two genetically modified products, tomato puree and soya produced by the Monsanto Company for use as an ingredient in other food products, went on sale for the first time in Europe[36]. Although there was no legal requirement to label such products, the companies concerned took the decision to do so voluntarily. Nevertheless, conflict between consumers and industry surrounds the issue of the labelling of GM foods and ingredients. A recent survey found that 62% of scientists oppose mandatory labelling of foods containing GM ingredients[43]. The Food Advisory Committee and the Advisory Committee on Novel Foods and Processes saw no requirement for labelling herbicide-resistant soya produced by the Monsanto Company. They argued that labelling was

unnecessary as the ingredient was safe and that is was impossible to determine the approximate amount of GM soya contained, as it was unsegregated from normal soya.

The Novel Food and Novel Ingredients Regulation came into force during 1997 allowing food manufacturers, if they wished, to label products as 'may contain GM ingredients'. However, consumers do not want ambiguous statements but clear and precise labelling to indicate which foods have been genetically modified[36,44,45]. Food labelling increases consumer perceived control. Information enables the public to choose or to reject GM foods if desired, otherwise the risk becomes involuntary, beyond personal control and thus may be perceived as more threatening[46]. The current debate surrounding GM foods provides a unique opportunity through which to study food risk perceptual processes prospectively both in context and in relation to existing theory.

The communication of food risk perception

Consumer concern over food risk has increased while at the same time trust in government and industry to control and monitor technological development has been seriously eroded, further amplifying risk perceptions. This has driven research into the communication of risk perception.

Communication appears to enhance trust only under certain conditions[6]. Frewer and colleagues have applied the elaboration likelihood model[47] to the study of risk communication and the effect of trust in the information source upon attitudes to GM foods. According to the theory, persuasion can occur on one or both of two interacting levels or channels – deep and peripheral. Information itself is processed at a deep level, while contextual factors surrounding the information, such as perceived credibility of the source, are processed at a peripheral level, influencing how the information is interpreted. An initial study that considered perceived risk from food poisoning and from excessive alcohol consumption found that the perceived credibility of the source had no effect upon persuasiveness of the risk message[48]. More recently, comparison was made between information sourced either from a consumer organization (trusted) or government (less trusted). The persuasiveness of the information was also varied. However, contrary to what the model would predict, it was information which was 'high in persuasiveness' from the consumer organisation, and 'low in persuasiveness' from government sources, which was most trusted[49]. Perhaps government authorities come across to the public as 'trying too hard' when attempting to communicate risk messages, and in doing so, appear dishonest.

Consistent with the idea of 'trying too hard', qualitative exploration

has suggested that the least trusted sources are those perceived to exaggerate or distort information, those with an apparent vested interest, and those motivated to self-protection. The most trusted sources were those which are moderately accountable to others, those which have little vested interest in promoting the viewpoint and those which are only somewhat self-protective[12].

Understanding of public perception of risk is crucial to the success of food safety communication and the uptake of new technology. Toward this end, we need to know more about how people define and interpret risk and the ideological framework within which risk decisions are expressed.

Conclusions

Whereas quantitative and psychometric models of risk perception provide some insight into how risk perceptions are constructed at the cognitive and dispositional level, social and cultural theories provide a framework through which to understand such perceptions. However, people do not think and behave in mechanistic ways, consequently, appreciation of public response to food safety issues requires some understanding of the subjective perceptions and meanings ascribed to such issues, as well as the wider cultural and social forces operating to determine public response to food safety issues. Taken together, the evidence implies that risk cannot be studied in isolation as a discrete entity, but that risk concepts run like a common thread, linking a diverse range of decision-making factors.

Despite the importance of risk perception in determining food choice, very few studies of risk have been applied to food specifically. Theories and models have been adapted from research into financial, nuclear or environmental risk. Given that health risk, and particularly food risk, is likely to be uniquely construed, even food product specific, it would seem appropriate to first go back and explore food risk qualitatively within the context of food purchase and choice, and to develop specific theoretical models accordingly. Theories of food choice provide a framework through which to understand and predict human dietary behaviour. Models of food choice clearly must incorporate the perception of risk as a decisional factor.

The private views of scientists, civil servants and industrialists have been largely ignored[2]; however, what little research there is, suggests that scientists hold ethical arguments against genetic engineering and share many consumer reservations[43]. Given the suggestion that the public perception of risk is subject to optimistic bias, is it not conceivable that government and scientific personnel representing official groups are

expressing the same optimistic bias through their emphasis upon the probabilities of risk, whilst apparently disregarding the intuitive ethical views of consumers, when communicating risk messages? This apparent neglect of consumer concerns has served to undermine consumer confidence in the safety of the food supply. Risk perceptions require exploration within the social and cultural context in which they are embedded. This means that the views and interactions of all parties involved in the risk assessment and management forum need to be fully considered. Only then can it be determined if the discrepancy between lay and expert assessments of risks is perceived or actual.

Risk is a 'fuzzy' concept[19], which has yet to be described or explored in all its facets. Co-ordinated interdisciplinary collaboration is required in the endeavour to encompass the scope and complexity of risk perception and the nature of any interactions therein. Furthermore, risk assessment is dynamic, the processes of which require definition by means of prospective, longitudinal research[51], surrounding food-related 'live issues'. Meanwhile, there is a growing market for food products with enhanced safety attributes.

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