Impact of consumers' health beliefs, health involvement and risk perception on fish consumption

A study in five European countries

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Abstract

Purpose – The purpose of this paper is to investigate the impact of consumers' health beliefs, health involvement, and risk perception on fish consumption behaviour in five European countries.

Design/methodology/approach – Cross-sectional data were collected through a pan-European consumer survey ($n = 4{,}786$) with samples representative for age and region in Belgium, The Netherlands, Denmark, Spain and Poland. First, the cross-cultural validity and cross-cultural differences in health beliefs, health involvement and risk perception in relation to fish have been tested. Next, structural equation modelling (LISREL) was used in order to simultaneously estimate the strength and direction of relationships between health beliefs, health involvement and risk perception in relation to fish consumption.

Findings – Health involvement links up indirectly with subjective health and with total fish consumption, in both cases through increased interest in healthy eating. Interest in healthy eating positively and directly influences fish consumption. Increased risk perception from fish consumption negatively influences consumers' subjective health, as well as consumers' total fish consumption. Finally, subjective health positively relates to satisfaction with life.

Research limitations/implications – This study focused on fish as a product category, and included only a limited number of attitudinal constructs.

Originality/value – This paper provides a unique model relating health beliefs, health involvement and risk perception to fish consumption, which has been tested and validated using a large pan-European consumer sample.

Keywords Consumer behaviour, Fish (food), Personal health, Consumer risk

Paper type Research paper

Introduction

Several studies have proven that physical and sensory properties (bones, smell, and taste), together with price, availability, convenience, as well as personal involvement,

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and interest in health and nutrition are important factors that influence seafood consumption behaviour in general, and fish consumption in particular (Juhl and Poulsen, 2000; Leek *et al.*, 2000; Myrland *et al.*, 2000; Olsen, 2003; Olsen *et al.*, 2007; Scholderer and Grunert, 2001; Trondsen *et al.*, 2003, 2004; Verbeke and Vackier, 2005). The image of fish among consumers is predominantly healthy and attitudes towards eating fish are strongly favourable (Olsen, 2003; Trondsen *et al.*, 2004). Fish is beneficial for human health, as it is an important source of a number of nutrients, particularly protein, retinol, vitamin D, vitamin E, iodine, selenium and the essential long-chain polyunsaturated fatty acids. On the other hand, fish may include contamination with pathogenic bacteria, viruses, toxins, chemical and other environmental hazards (Sumner and Ross, 2002). Recently, several studies concentrated on the question whether it is possible to follow dietary recommendations of eating two portions of fish a week, of which one should be fatty fish, without exceeding tolerable intakes of chemical contaminants (Mozaffarian and Rimm, 2006; Sioen *et al.*, 2008a, b; Smith and Sahyoun, 2005). Their results showed that health benefits of eating fish outweigh the potential risks. Nevertheless, consumers may feel confused. In a Belgian study, gaps between consumer perception and scientific evidence related to fish were identified. Despite conclusive evidence about the content and positive effect of omega-3 fatty acids in fish, consumer awareness and beliefs about the fact that fish contains omega-3 fatty acids and that these nutrients are beneficial for human health were found to be rather poor (Verbeke *et al.*, 2005).

Although health beliefs and (health) involvement have been reported to associate with fish consumption and despite the recommendation that models of food choice should incorporate multiple constructs, including risk perception as a decisional factor (Knox, 2000), to our knowledge, no study has investigated health beliefs (subjective health and satisfaction with life – SWL) together with involvement-related constructs (health involvement and interest in healthy eating) as well as risk perception in the same setting. In the era of increased focus on potential risks versus health benefits of eating fish, the aim of the current study is to investigate to what extent health and risk constructs actually associate with fish consumption behaviour in different European countries.

The purpose of this study is twofold. First, this paper intends to test for cross-cultural differences and cross-cultural validity of constructs relating to health involvement, interest in healthy eating, subjective health, SWL, and risk perception in five European countries: Belgium, Denmark, The Netherlands, Poland and Spain. The second objective is to conceptualise and validate a model incorporating the above mentioned constructs and associate these constructs with fish consumption behaviour. Finally, based on the results from this modelling exercise, the aim is to explore and discuss to what extent health beliefs can be considered drivers to fish consumption.

Theoretical background

Several studies have yet suggested or demonstrated the existence of associations between constructs relating to health, risk, food and fish consumption, and consumer well-being. Whereas some links between perceptions and beliefs relating to health, risk and well-being are well-documented in literature, others are less straightforward. In particular, the directionality of relationships is often unclear. In order to shed light on these issues, the present study will first briefly review the links that have been documented so far.

In consumer behaviour research literature, the concept of involvement has been widely used. Involvement has been shown to have robust effects on explaining consumers' purchase and eating decisions (Beharrell and Denison, 1995; Marshall and Bell, 2004; Verbeke and Vackier, 2004; Zaichkowsky, 1985), including fish consumption behaviour in particular (Juhl and Poulsen, 2000; Olsen, 2001). Health involvement refers to the personal relevance and importance attached to health issues, based on inherent needs, values and interests (Zaichkowsky, 1985).

Diehr and Beresford (2003) demonstrated that a healthy diet was associated with better nutrition, better health behaviour, and in some cases also with better factual baseline health. Several cross-sectional studies have shown a positive relationship between following a recommended diet and better health perception (Blaxter, 1990; Manderbacka *et al.*, 1999), although at least two other studies indicated that food intake patterns or quality of the diet did not associate with self-rated health (Goodwin *et al.*, 2006; Osler *et al.*, 2001). Based on previous studies, we anticipate to find a relationship between health involvement and subjective health, and between interest in healthy eating and subjective health.

However, interest in healthy eating and health involvement are not always a driver for purchasing and consuming a particular food with a predominantly healthy image, such as fish. A healthy diet may consist of a number of different foods, often excluding fish (Foxall *et al.*, 1998), e.g. for the simple reason of disliking or being allergic to fish or seafood (Brunsø *et al.*, 2007). Nevertheless, a positive relationship between (health) involvement (covering also aspects of pursuing a healthy diet, therefore also referred to as importance attached to healthy eating) and seafood consumption has yet been reported (Olsen, 2001, 2003). Furthermore, Verbeke and Vackier (2004, 2005) found that food involvement, or the perceived importance attached to food, was a significant factor in explaining fish consumption frequency and intention to eat fish. Additionally, product involvement was found to positively influence the frequency of product usage in the case of fish (Foxall *et al.*, 1998; Juhl and Poulsen, 2000). Hence, we expect interest in healthy eating to associate with fish consumption frequency. Furthermore, since the aim of healthy eating is most likely to maintain health and prevent chronic diseases, such as cardiovascular diseases and cancers, we expect to find a relationship between health involvement and interest in healthy eating, as well as a direct relationship between health involvement and total fish consumption. Subjective health is an individual's assessment or self-rating of her/his health in general (Baron-Epel and Kaplan, 2001). Subjective health is considered to be a valid and reliable indicator of personal health, particularly in studies where other forms of health information are not included (Ferraro *et al.*, 1997; Larue *et al.*, 1979). Silvers and Scott (2002) reported a significant positive relationship between fish intake and self-reported mental health, which may have been driven by beliefs relating to the relatively high content of poly-unsaturated fatty acids in (fatty) fish. Therefore, a specific hypothesis is that fish consumption associates with subjective health in general.

Subjective well-being is a general construct with a cognitive dimension (Andrews and Withey, 1976), namely life satisfaction, and an affective dimension (Cummins, 2000; Ryff, 1989; Sagiv and Schwartz, 2000), namely feeling of happiness. Research has mainly focused on the affective component of well-being (Diener *et al.*, 1991; Tellegen *et al.*, 1999; Watson *et al.*, 1988); whilst life satisfaction has received less attention (Diener *et al.*, 1985). Life satisfaction has been defined as a "global evaluation by the person of

her/his life" (Pavot *et al.*, 1991). It refers to a conscious cognitive judgmental process, in which individuals assess the quality of their lives on the basis of their own criteria (Pavot and Diener, 1993; Shin and Johnson, 1978). This judgment includes the evaluation of one's health, wealth, friendship and romantic relationships (Diener *et al.*, 1985). Furthermore, life satisfaction (also called SWL) has been used as an indicator of self-rated well-being (Munoz-Sastre and Ferriere, 2000). Subjective health is strongly correlated with subjective well-being (George and Landerman, 1984; Wilson, 1967). Brief *et al.* (1993) found that subjective health was positively associated with life satisfaction. Arrindell *et al.* (1991) reported that health status among others was correlated with SWL. Hence, we expect to find relationship between subjective health and SWL.

Consistent with recent relevant literature, risk perception is defined as people's cognitive and affective responses to hazards – food poisoning from eating fish in this particular case – consumers are or might be exposed to (Loewenstein *et al.*, 2001; Raude *et al.*, 2005; Slovic *et al.*, 2004). This definition incorporates feelings, emotional components (e.g. uncertainty, worry, anxiety) and probabilistic-consequentialistic components (subjective risk assessment). Rozin *et al.* (1999) stated that food is a major contributor to physical well-being and a source of pleasure, but also causing worry and stress. Concerns about diets with respect to health may produce worry and anxiety (Polivy and Herman, 2002). There are studies that show links between experiencing pleasure and good health, and between stress and poor health (Netter, 1996). Therefore, the expectation is that different emotions, such as worry and anxiety, which associate with risk perception, might correlate with subjective health, more specifically behave as a factor that reduces subjective health.

Recently, consumers have been confronted a number of times with food safety incidents, such as among others BSE, dioxins, avian influenza, pesticide residues, genetically modified organisms or methyl mercury contamination in fish. As already mentioned before, such experiences can lead to anxiety among consumers. Previous studies reported declining meat consumption during beef safety crises (Verbeke *et al.*, 1999a, b). Risk perception also had a strong negative influence on chicken purchase likelihood (Yeung and Morris, 2006). Therefore, the hypothesis is that owing to increasing exposure to information about potential risks from eating fish, people might perceive higher risk of food poisoning from eating fish, which might associate with their fish consumption behaviour.

Method

Data collection

Information was obtained from randomly selected consumers from five European countries through survey questionnaires during November-December 2004. The countries included are Belgium, Denmark, The Netherlands, Poland and Spain. A total sample of 4,786 participants ($n = 800$-1,100 respondents per country) was obtained. The sample was composed of 3,652 women (76.3 per cent) and 1,134 men (23.7 per cent). This gender distribution reflects the criterion that all respondents were the main responsible people for food purchasing within their household. A quota sampling procedure with age and region as main control variables was applied. The age of the respondents ranged from 18 to 84 years, with a mean of 42.7 (SD = 12.6). Recruitment procedures differed between countries depending on cost efficiency, time effectiveness and best practice of the market research agencies that performed the fieldwork.

In Denmark and Belgium, mail surveys were conducted, with a response rate of 79 per cent (Denmark) and 53 per cent (Belgium), respectively. In Poland and in Spain, the recruitment was conducted face-to-face in participants' homes, whereas in The Netherlands, data were collected electronically by means of a web-based survey. All questionnaires were self-administered by the participants without interference from researchers or interviewers.

Measures

A questionnaire was developed in English and further translated into Dutch and French (Belgium), Danish (Denmark), Dutch (The Netherlands), Polish (Poland) and Spanish (Spain) by professional translation services within each country. The back-translation method was used to verify the multilingual versions of the questionnaire. The questionnaires, measuring a wide variety of constructs with relation to fish including behaviour, attitudes and beliefs, knowledge, and use of information sources, have been pre-tested in the national languages through pilot studies.

Fish consumption behaviour was a self-reported item, which was measured as total fish consumption frequency per week, i.e. the sum of fish consumed at home and fish consumed out of home. A nine-point frequency scale ranging from "never" to "daily or almost every day" was used. This response scale was recoded into frequencies per week (e.g. "never" became 0; "once a week" became 1; and "daily or almost daily" became 6.5 and so on) and aggregated in order to compute one behavioural measure, namely total fish consumption frequency (per week).

Involvement is often measured by terms expressing importance, relevance, caring, concern, or interests associated with the attitude object, issue or action (O'Cass, 2000). "Important/unimportant" is, both in psychology and consumer behaviour, by far the most-used semantic differential for assessing involvement (Beatty and Kahle, 1988; Boninger *et al.*, 1995; Zaichkowsky, 1985). In our study, where health was the attitude object, health involvement was measured using three items based on Zaichkowsky (1985): "Health is very important to me", "I care a lot about health", and "Health means a lot to me". All these items were scored on a seven-point Likert-scale anchored by totally disagree – 1, neither agree nor disagree – 4, and totally agree – 7. This procedure for measuring involvement also with the (food) involvement scale suggested by Bell and Marshall (2003).

Interest in healthy eating was measured on a seven-point Likert scale using three items:

> It is important to me that the food I eat on a typical day [. . .] (1) is good for my psychical and mental health; (2) keeps me healthy; and (3) is nutritious.

Those items were adapted from the food choice questionnaire (Steptoe *et al.*, 1995). Only the most appropriate and relevant items for the case of fish were included based on findings from exploratory focus group discussions (Brunsø *et al.*, 2007; Pieniak *et al.*, 2007).

Four items with regard to subjective health were included, each to be answered on a seven-point Likert scale: "Compared with people at my age, my health is excellent"; "Compared with people at my age, my current physical health is excellent"; "I am as healthy as anyone I know at my age"; and "Compared with people at my age, my current mental health is excellent". The items were mainly based on the general health perception scale from the short-form health survey (Ware *et al.*, 1993).

SWL was measured using a seven-point Likert scale consisting of four items: "I am satisfied with my life"; "The general conditions of my life are excellent"; "In most ways my life is close to my ideal"; and "If I could live my life over, I would change almost nothing", as developed by Diener *et al.* (1985). This SWL scale is available in several languages and was suggested as a potential cross-cultural index of life satisfaction (Pavot and Diener, 1993).

Based on a review of literature related to risk perception (FifeSchaw and Rowe, 1996; Slovic *et al.*, 1980) and the results from the exploratory focus group discussions (Brunsø *et al.*, 2007; Pieniak *et al.*, 2007) three statements were chosen to assess risk perception related to fish consumption. One item with regard to chemical ("I do not want to eat fish too often because I am afraid of food poisoning from chemical contamination (heavy metals, dioxins, residues))"; and one with regard to bacterial contamination ("I do not want to eat fish too often because I am afraid of food poisoning from bacterial contamination (*salmonella*, *campylobacter*, *listeria*, *botulism*)") were included. Additionally, one general statement about possible food contaminations from eating fish "I am very concerned about the possibility of getting ill from eating fish" was included. A seven-point Likert scale ranging from "totally disagree" – 1 to "totally agree" – 7 was used for all items.

Data analysis

First, data were analysed using the statistical software SPSS version 12.0. Missing data were imputed by means of the expectation-maximization algorithm. Owing to the cross-cultural nature of the study, analysis of the measurement invariance and cross-cultural validity of the constructs requires attention. Therefore, a confirmatory factor analysis on the pooled sample, followed by five multi-group confirmatory factor analyses per construct, have been performed using the robust maximum likelihood procedure in LISREL 8.72.

The mean scores of the constructs across the countries were calculated and ANOVA *F*-tests with Tukey post hoc comparison of mean scores were used to detect differences in consumers' health beliefs, health involvement and risk perception across the countries. Next, the total sample has been randomly split into two equally sized subsamples ($n = 2{,}393$). In the first subsample, the so-called "learning sample", the tetrad IV program has been used to identify the best fitting causal structure and direction of paths between health beliefs, involvement, risk perception and fish consumption frequency. This procedure is deemed relevant since current empirical evidence mainly suggests what constructs "matter" in this specific case, but do not allow hypothesising all relationships and the directionality between the considered constructs. Then, in the second subsample, the so-called cross-validation sample, the model parameters have been estimated and the general fit of the model has been assessed by means of LISREL 8.72. With the use of structural equation modelling (LISREL), the examination of all the relationships between constructs and items is performed simultaneously, which is a substantial advantage compared with single equation modelling (Bollen, 1989).

Empirical findings

Measurement model

Confirmatory factor analysis of the five latent constructs, namely health involvement, interest in healthy eating, subjective health, SWL and risk perception confirmed that

all items in the measurement model reflect the theoretical constructs as expected and a five factor solution is best suited for the data. Standardised factor loadings and reliability estimates are presented in Table I. The individual item loadings on the constructs were all highly significant with values ranging from 0.63 to 0.95 and *t*-values from 36.69 to 78.03. No cross loadings worth mentioning appeared. Hence, all the items were considered in the interpretation of the factors (Hair *et al.*, 2006). Cronbach's α internal reliability coefficients ranged from 0.85 to 0.94, thus well above the threshold value for satisfactory scales.

Measurement validity (invariance)

The data were collected in five different EU countries, which implies some concerns related to the cross-cultural validity of the collected information. In order to establish whether direct comparison of measurement means (health beliefs and risk perception) across the countries are meaningful, measurement invariance needs to be tested. Additionally, in order to perform structural equation modelling and to pool the sub-samples, the procedure for testing measurement invariance as recommended by Steenkamp and Baumgartner (1998) has been followed.

Constructs and items	Factor loadings
Health involvement	(0.94)
Health means a lot to me	0.90
I care a lot about health	0.91
Health is very important to me	0.93
Interest in healthy eating	(0.92)
It is important to me that the food I eat on a typical day is good for my psychical and mental health	0.92
It is important to me that the food I eat on a typical day keeps me healthy	0.89
It is important to me that the food I eat on a typical day is nutritious	0.85
Subjective health	(0.86)
Compared with people at my age, my health is excellent	0.90
Compared with people at my age, my current physical health is excellent	0.86
I am as healthy as anyone I know at my age	0.72
Compared with people at my age, my current mental health is excellent	0.63
Satisfaction with life	(0.85)
I am satisfied with my life	0.85
The general conditions of my life are excellent	0.83
In most ways my life is close to my ideal	0.78
If I could live my life over, I would change almost nothing	0.67
Risk perception	(0.90)
I do not want to eat fish too often because I am afraid of food poisoning from bacterial contamination (*Salmonella*, *Campylobacter*, *Listeria*, *botulism*)	0.95
I do not want to eat fish too often because I am afraid of food poisoning from chemical contamination (heavy metals, dioxins, residues)	0.85
I am very concerned about the possibility of getting ill from eating fish	0.79
Total fish consumption frequency	1.00 (fixed)

Notes: Internal construct/composite reliabilities are reported in parentheses; all factor loadings are significant at $p < 0.001$; fit-statistics for the pooled data: $\chi^2(109) = 977.86$, $p < 0.001$; RMSEA = 0.041; GFI = 0.97; CFI = 0.99

Table I.
Factor loadings and reliability estimates for construct measures related to seafood risk and health

Five independent multi-group confirmatory factor analysis models were estimated, for each of the constructs considered in this study: health involvement (three items, one factor), interest in healthy eating (three items, one factor), subjective health (four items, one factor), SWL (four items, one factor) and risk perception (three items, one factor). The model parameters were estimated by means of robust maximum likelihood (Satorra and Bentler, 1988) using LISREL 8.72. The goodness-of-fit statistics indicated that the scalar invariance assumption was acceptable for the health involvement items (Satorra-Bentler $\chi^2 = 79.34$, df = 16, root mean square error of approximation – RMSEA = 0.064, goodness-of-fit index – GFI = 0.99, comparative fit index – CFI = 0.99), the interest in healthy eating items (Satorra-Bentler $\chi^2 = 107.50$, df = 16, RMSEA = 0.077, GFI = 0.98, CFI = 0.99) and the risk perception items (Satorra-Bentler $\chi^2 = 112.27$, df = 16, RMSEA = 0.079, GFI = 0.999, CFI = 0.99). Hence, common interval scales can be assumed to exist for these items, and direct comparisons of measures' means across countries are meaningful. Unfortunately, the goodness-of-fit statistics indicated that scalar invariance was unacceptable for subjective health and for SWL. In a next step, the invariance constraints on the item intercepts were dropped, and metric invariance models were estimated. The goodness-of-fit statistics indicated that the metric invariance assumption was tentatively acceptable for the subjective health items (Satorra-Bentler $\chi^2 = 179.71$, df = 22, RMSEA = 0.09, GFI = 0.98, CFI = 0.99) and the SWL items (Satorra-Bentler $\chi^2 = 210.81$, df = 22, RMSEA = 0.09, GFI = 0.99, CFI = 0.98). Taken together, it can be concluded that the nature of the underlying factors is invariant across countries, and that the responses vary in terms of the same scale units, but that the items measuring the validation criteria are additively biased across countries (Scholderer *et al.*, 2005). This bias will be eliminated by standardising all validation criteria within countries before further analysis are conducted.

Cross-cultural differences

The cross-cultural differences can either be real differences related to the cultural background and the social and marketing environment in the different countries, or simply stem from different interpretations and response behaviours to the questions posed. In order to verify that the first explanation holds, i.e. to rule out the latter possibility that would basically indicate that scales have been interpreted differently in different countries, cross-cultural validity of the data obtained has been tested and confirmed in the previous section. Metric invariance implies that the observed variables are measured according to the same scale units and these observed item differences are indicative of similar cross-national differences in the underlying construct.

In order to test whether there exist cross-cultural differences in health involvement, subjective health, SWL, risk perception and fish consumption between the countries, ANOVA *F*-tests were conducted. The tests revealed significant differences for all constructs. Polish respondents were the least satisfied with their life, whereas Danish consumers were the most satisfied with life. People living in the other three countries (Belgium, The Netherlands and Spain) scored nearly on the same level, though lower than Denmark. Although in general, the respondents from all countries were interested in healthy eating (mean scores between 5.30 and 6.16), some differences were noticed. Consumers from Poland and Spain attached most interest to healthy eating, whereas

consumers from The Netherlands displayed the lowest interest in healthy eating. Danish and Spanish consumers considered themselves healthier as compared to people from Belgium, The Netherlands and Poland.

In general, consumers from all countries did not consider their health and well-being as really excellent (mean scores between 4.80 and 5.33 on seven-points scale). Nevertheless, respondents from all countries reported high-personal relevance attached to health (mean scores between 5.90 and 6.36). Consumers from Poland, Spain and Belgium were the most involved with health, whereas Danish consumers showed the lowest involvement with health. With regard to the risk perception construct related to fish, Danish and Spanish consumers scored the lowest, whereas Belgian and Dutch respondents scored the highest, meaning that the latter perceive fish as more risky to consume compared with the other respondents (Figure 1).

Model determination

As already described above, in recent years lots of research has been done in the field of health beliefs and risk perception in relation to food consumption behaviour (Diehr and Beresford, 2003; Knox, 2000; Yeung and Morris, 2006). Nevertheless, although some paths and possible relationships between the considered constructs have been previously confirmed, a number of relationships have never been investigated before, specifically the:

- relationships with fish consumption frequency;
- sequence of the variables in the model; and
- direction of relationships between the different variables; in this case between subjective health and SWL; and between health involvement and interest in healthy eating, when entered into one model together.

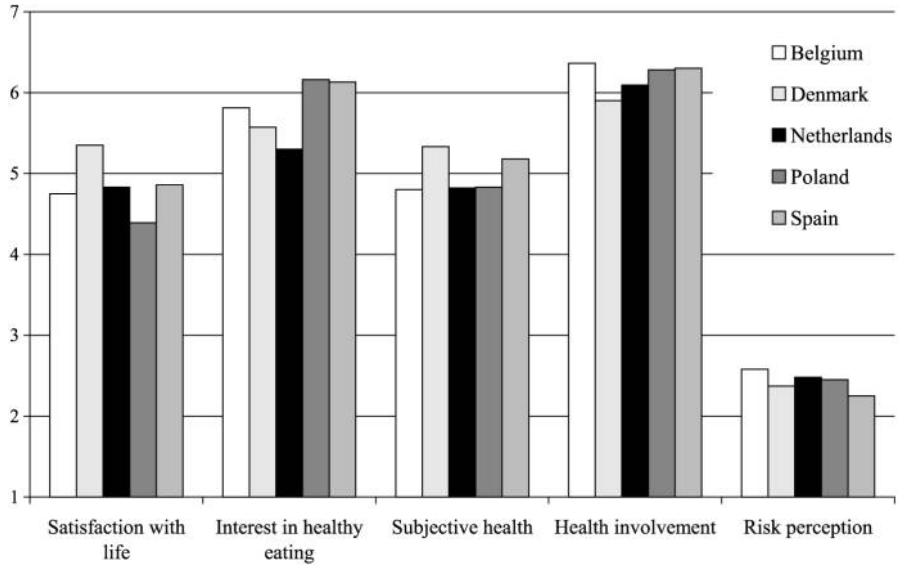

Figure 1.
Cross-cultural comparison of health beliefs, health involvement, and risk perception in relation to fish consumption (mean scores on seven-point scales)

Therefore, the use of the data-driven analysis procedure tetrad is justified, since the tetrad procedure provides an idea of the best possible model fitting the data, which is then further validated through structural equation modelling using LISREL.

Tetrad is an analysis tool introduced by a team of researchers at Carnegie Mellon University[1] led by Spirtes *et al.* (2000). Tetrad facilitates the development of new theories through the systematic development of causal relationships in datasets (Lee *et al.*, 1997). More specifically, tetrad tests sets of constraints on input data which, if they hold, allow the drawing of causal relationships. The algorithm performs an exhaustive set of Bonferroni-corrected tests of all possible univariate and multivariate mediation patterns in the data. The output is an equivalence class of models, also referred to as a "pattern". Recently, several researchers have applied the tetrad tool in their studies (Bessler, 2003; Bessler and Lopper, 2001; Eshghi *et al.*, 2007; Haigh *et al.*, 2004).

To help the initial model development, the covariance matrix of the six constructs (SWL, subjective health, health involvement, interest in healthy eating, risk perception and total fish consumption) was inputted. Tetrad allows the user to specify which directional links are forbidden and which are known. In our specific case, we opted for not imposing any particular restriction. Based on the aforementioned literature review, only one straightforward "previous knowledge" issue has been defined, namely the link between subjective health and SWL. The results confirmed the majority of the paths identified through the literature review. Only the direct relationship between health involvement and total fish consumption has not been suggested. The resulting model, to be further validated by means of structural equation modelling (LISREL) is shown in Figure 2.

Model validation

The hypothesised structural model was estimated by means of robust maximum likelihood. In general, the model performed well. The χ^2 for the model was 1,861.32 with 162 degrees of freedom ($p < 0.001$). However, due to the large sample size the χ^2 is not an appropriate measure of goodness-of-fit (Browne and Cudeck, 1993). Therefore, three other indices are reported: the RMSEA value was 0.066, which is below the

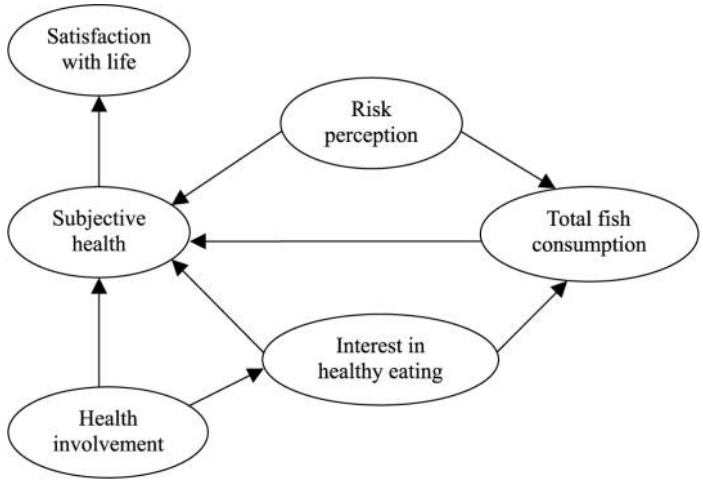

Figure 2.
Conceptual model resulting from tetrad analysis relating health beliefs, health involvement and risk perception to fish consumption

recommended level of 0.08 (Browne and Cudeck, 1993); the GFI was 0.91 and the CFI was 0.96, which both exceed the recommended level of 0.90 (Bollen, 1989). Also the other goodness-of-fit indices were satisfactory. Hence, it may be concluded that the model shown in Figure 2 fits the data well.

Standardised estimates of the paths are presented in Table II. Health involvement failed to have a significant effect on subjective health, indicating that the extent to which a person attaches importance to her/his personal health is not directly associated with the subjective evaluation of her/his personal health. On the other hand, the relationship between interest in healthy eating and subjective health is confirmed. Hence, it is not really interest in health in general, but rather the more concrete interest in healthy eating in particular that provides people with the subjective belief or feeling of being healthy.

Second, the results of the structural equation analysis supported that interest in healthy eating has a direct positive effect on total fish consumption, and additionally, that health involvement has a significant and relatively highly sized direct effect on interest in healthy eating. Since, the relationship between health involvement and fish consumption has already been rejected in the exploratory tetrad stage; interest in healthy eating can be upheld as a full mediator between health involvement and total fish consumption.

Third, the results also show that total fish consumption failed to significantly associate with subjective health, which indicates that people do not feel healthier or unhealthier because of eating fish frequently or infrequently.

Fourth, the relationship between subjective health and SWL is confirmed. People who feel healthier will actually be more satisfied with their life as well. This is the strongest association that has been found within our model ($r = 0.59$).

Finally, the results of the structural model analysis also confirmed the important role of risk perception. Subjective health is found to be negatively affected by risk perception, meaning that people who perceive higher risk of food poisoning from eating fish felt themselves as less healthy. Additionally, risk perception of food poisoning from eating fish had a direct negative effect on total fish consumption. Although significant, this effect was rather weak.

Discussion

The objective of this study was twofold: first, to explore cross-cultural differences in health beliefs, health involvement and risk perception in relation to fish consumption.

Table II.
Standardised solutions for hypothesised relationships in the conceptual model ($n = 2,393$)

Construct	Path	Construct	Standardised solution	*t*-value	*p*-value
Health involvement	→	Subjective health	0.01	0.50	NS
Interest in healthy eating	→	Subjective health	0.26	9.79	<0.001
Interest in healthy eating	→	Total fish consumption	0.14	6.34	<0.001
Health involvement	→	Interest in healthy eating	0.46	13.32	<0.001
Total fish consumption	→	Subjective health	0.02	1.16	NS
Subjective health	→	Satisfaction with life	0.59	21.63	<0.001
Risk perception	→	Subjective health	-0.06	2.74	<0.001
Risk perception	→	Total fish consumption	-0.12	5.88	<0.001

Notes: NS – Not significant. Goodness-of-fit statistics for the pooled data: $\chi^2(162) = 1,861.32$, $p < 0.001$; RMSEA = 0.066; GFI = 0.91; CFI = 0.96

Second, to develop and validate a model in order to test the relationships between health involvement, interest in healthy eating, subjective health, SWL, risk perception, and fish consumption based on data obtained from consumers in five European countries.

The results indicate that the considered constructs, i.e. health involvement, interest in healthy eating, subjective health, SWL and risk perception, have a similar meaning and structural characteristics across cultures within Europe. Those constructs are proven to be cross-culturally valid. This means that observed differences are real differences, in the sense that they do not stem from cross-cultural differences in the interpretation of concepts.

Furthermore, our findings indicate that in general consumers are very involved with their health and very interested in healthy eating. However, significant differences in the health beliefs exist between countries. Danish respondents evaluated themselves as the healthiest and the most satisfied with their life; Polish respondents were the most interested in healthy eating, whereas Belgian respondents were the most involved in health. Our results confirm findings from the pan-European Eurobarometer survey (Eurobarometer, 2007) where Danes were found to be the happiest and the most satisfied with their life. Although, consumers in general perceive rather low risk of food poisoning from eating fish across the countries, Belgian and Dutch consumers perceived fish as slightly more risky to eat as compared to consumers from the other countries. This finding might result from higher and potentially confounding exposure of Benelux consumers to food safety incidents during the last decade (Verbeke and Viaene, 2001; Verbeke *et al.*, 1999a; Verbeke and van Kenhove, 2002).

To our knowledge, the present study was the first one to establish a cross-culturally valid model on health beliefs, involvement and risk perception constructs in the context of fish consumption. Our model was derived from a large consumer sample using the tetrad methodology (Spirtes *et al.*, 2000), and refined and validated using structural equation modelling. By using structural equation modelling, we were able to estimate the strength and direction of direct and indirect relationships between the different constructs identified to be relevant based on literature review. The strongest relationship was found between subjective health and SWL, which is consistent with previous empirical findings (Arrindell *et al.*, 1991; Brief *et al.*, 1993); and between health involvement and interest in healthy eating. Although, health involvement had no direct relationship with subjective health, health involvement had an indirect relationship through interest in healthy eating on subjective health and further on SWL. This contributes towards a deeper understanding of factors determining subjective perceptions and feelings of personal health in a food-health context.

Furthermore, the proposed model contributes to a better understanding of factors influencing fish consumption behaviour. Recommendations about healthy eating have been shown to influence consumers' beliefs about food and health as well as their food consumption decisions and eating patterns (Harel *et al.*, 2001; Nayga, 2000). In our study, consumers' interest in healthy eating is shown to positively influence fish consumption behaviour, which confirms previous studies (Gempesaw *et al.*, 1995; Olsen, 2001, 2003), and indicates that consumers perceive fish effectively as a part of healthy eating patterns. On the contrary, risk perception of food poisoning from eating fish negatively influences fish consumption. Also this relationship has been reported

previously, though more specifically in the case of beef (Verbeke *et al.*, 1999a, b) and poultry (Yeung and Morris, 2006) rather than for fish.

Interest in healthy eating and risk perception influenced consumers' self-rated health. On the one hand, people who are more interested in healthy eating evaluate themselves as healthier. One possible explanation for this significant link is that people who are involved in healthy eating do indeed follow dietary recommendations and/or adhere to so-called (or so-believed) healthy eating patterns. The positive relationship between following a healthy diet and better self-reported health has already been reported previously (Blaxter, 1990; Diehr and Beresford, 2003; Manderbacka *et al.*, 1999).

On the other hand, consumers who perceived higher risk of food poisoning from eating fish felt themselves less healthy. This finding supports results from previous studies where links between pleasure experiences and good health, and between stress or worry and poor health were suggested (Netter, 1996). Total fish consumption and health involvement have not been found to be significant determinants of subjective health. A better understanding of factors influencing the way people assess their own health is important to improve public (subjective) health in a global objective of improving quality of life and subjective well-being.

Conclusions

This paper provides a unique model relating health beliefs, involvement and risk perception to fish consumption, which was tested and validated using a large pan-European sample of consumers. Our findings indicate that European consumers are very interested in health and healthy eating. Health involvement is found to be an indirect driver of both subjective health and fish consumption, whilst interest in healthy eating emerges as a direct driver of fish consumption behaviour. Hence, reinforcing or confirming existing health beliefs might be important in the development of effective strategies for stimulating fish consumption. Furthermore, people do not perceive high risk of food poisoning from eating fish. Nevertheless, risk perception is significantly and negatively influencing fish consumption. This study exemplifies the need for more effective communication about healthy eating and fish consumption as a part of healthy eating pattern to the broader public. Additionally, the findings provide cross-culturally validated measures of health beliefs (subjective health, SWL), involvement (health involvement and interest in healthy eating) and risk perception.

Further research to explore consumers' actual eating patterns in order to see whether people who are very interested in healthy eating actually follow the advocated healthy eating patterns is recommended. A limitation of our study is that it does not account for differences in knowledge between consumers. Moorman and Matulich (1993) indicated that health knowledge together with health motivation can lead to a raise in healthy behaviour. Furthermore, our study focused on fish as a product category, without differentiating between different fish species or fish from different origins (e.g. geographic, or wild versus farmed). Future research using similar survey questionnaires could focus on a more specific product level. Additionally, future research could focus particularly on chemical contaminants on the risk side, such as methyl mercury, polychlorinated biphenyls or dioxins, to see whether perceptions relating to specific chemical components have a similar impact on fish consumption as risk perception in general. Finally, the model developed in this study is only one example for modelling complicated relationships between potential determinants of

fish consumption and choice behaviour. In the future research, additional variables such as knowledge, convenience or more general attitudes, could be included and validated in more complex models.

Note

1. See also the Tetrad homepage at: www.phil.cmu.edu/projects/tetrad/index.html

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