

THE ACCEPTANCE OF FUNCTIONAL FOODS IN DENMARK, FINLAND AND THE UNITED STATES

**A STUDY OF CONSUMERS' CONJOINT EVALUATIONS OF THE
QUALITIES OF FUNCTIONAL FOOD AND PERCEPTIONS OF
GENERAL HEALTH FACTORS AND CULTURAL VALUES**

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EXECUTIVE SUMMARY

1. Functional foods is a relatively new concept covering food products enriched with various kinds of (natural) substances (eg vitamins, minerals or probiotic cultures) or modified so as to provide consumers with an additional physiological benefit presumed to prevent disease or promote health, without them having to change their eating habits fundamentally.

2. Health is one of the most important choice criteria, when consumers purchase food products. The fact that most health consequences of food are long term and therefore inaccessible at the time of purchase, the evaluation has to be based on nutritional information, eg health claims and other more accessible food qualities, eg taste, appearance, and processing method (when disclosed) which consumers may associate with health in one way or another. Consumers' acceptance of functional foods therefore depends on the health information available as well as on their associations between wholesomeness and other qualities of functional foods.

3. Experience with functional foods introduced so far has disclosed national differences when it comes to consumer acceptance. One explanation may be that legislation on health claims varies across countries; another explanation may be differences in cultural values, which possibly lead to different associations between wholesomeness and other quality aspects, such as taste, convenience and method of processing.

4. Using conjoint analysis and survey questions (n=1500), the aim of the study presented in this paper is to investigate whether there are differences in the acceptance of functional foods in Denmark, Finland and the United States, and to which extent they are related to differences in consumers' nutritional knowledge, health associations and cultural values. The general results of the study indicate that Finnish consumers accept functional foods more readily than do American and Danish consumers. In all three countries, however, the results also indicate that consumers are more positive towards enrichments with well-known nutritional effects and that the use of health claims, which are restricted by law in all three countries, has a potential, positive effect on the acceptance of functional foods.

1. INTRODUCTION

In the United States, which together with Japan, is the leader with regard to development and marketing of functional foods, the market has experienced growth rates of 15 to 20% (Holm, 1996; Matthews, 1995) compared to the general food market with a growth below or around 1%. Although the total market share for functional foods is still modest in the United States and Japan, the diffusion is without doubt more advanced than in most European countries.

Historically, legislation on food health claims has been very restrictive in the United States as well as in Europe, but in 1985 the Food and Drug Administration deregulated health claim legislation, and this gave the impetus to creating the functional foods market. Due to numerous examples of deceptive marketing practices, the United States restricted their health claim legislation again in 1995, but still it is more liberal than its European counterparts.

To some extent the national differences in consumer attitudes to functional foods can therefore be attributed to the differences in diffusion rates and health claim legislation.

Below we discuss a number of explanations of different attitudes to functional foods, namely cultural differences in

- a) perceived importance and characteristics of wholesome foods
- b) associations between wholesomeness and other quality aspects
- c) general perceptions about health and nutritional awareness
- d) values pertaining to the relationship between man and nature

1.1 Perceived importance and characteristics of wholesome foods

Taste, convenience, naturalness and wholesomeness are the four fundamental quality criteria which determine consumers' food preferences (Grunert, Hartvig Larsen, Madsen & Baadsgaard, 1994). Although cultures differ as regards the relative importance of wholesomeness compared to other quality aspects, food wholesomeness is of major importance in most cultures (eg Nielsen, Grunert & Bech-Larsen, 1998). In some cultures, however, wholesomeness is more strongly associated with traditional production methods and additive-free food products than in other cultures. This is, for example, expressed in the national differences in the acceptance rates of genetically modified products (Bredahl, 2000), which are associated more strongly to health risks in countries with low acceptance rates.

Associations between wholesomeness and other quality aspects

The basic sales proposition for functional foods is that they can prevent disease or promote health, without consumers having to change their eating habits. This proposition assumes that consumers accept that, apart from the

improvement of its health quality, the functional food product is basically identical to a conventional alternative. It is a well-known fact, however, (Grunert, Bech-Larsen & Bredahl, forthcoming) that as a rule the interdependence of consumers' perceptions of the four basic food qualities, ie, health, convenience, taste and naturalness, is very strong.

Due to the cultural differences as regards the aspects of food production, which are associated with health (see above), it is reasonable to expect that the perceptual interdependence between health and the other basic food qualities differ between cultures. If this is the case, it is also conceivable that the acceptance of the proposition of functional food as a healthy and convenient alternative to conventional foods will differ across cultures.

1.2 General perceptions about health and nutritional awareness

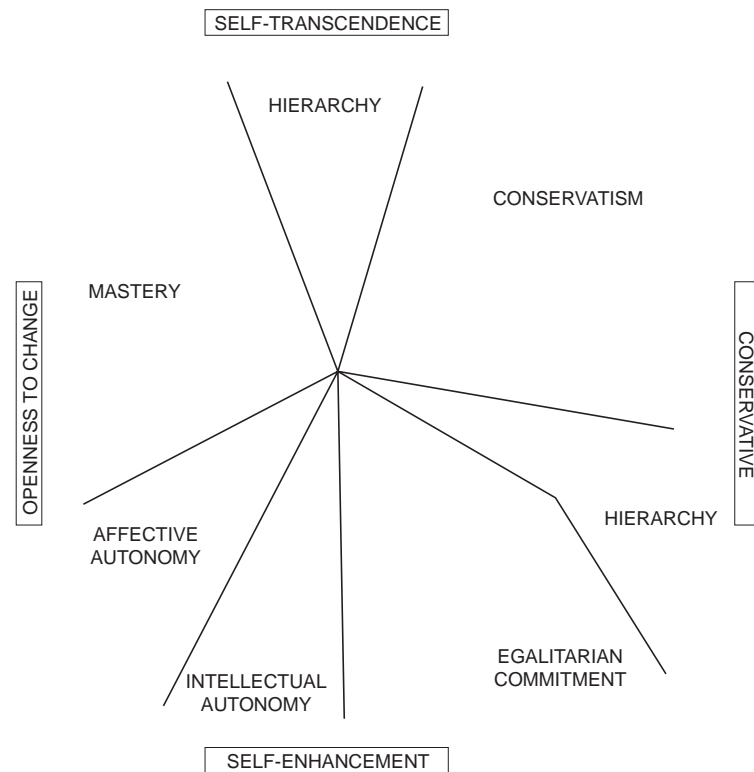
Research has shown there to be cultural differences when it comes to issues such as locus of health control and to which activities such as eating, sleeping, exercising and intake of vitamins, are perceived as most important for the general health condition (Pachter, Sheehan & Cloutier, 2000). Likewise differences in consumers' nutritional knowledge may influence the acceptance of functional foods (Roberts & Ho, 1996). Cultures also vary as regards the perceived seriousness of various diseases (Hilliam, 1996), and this potentially influences cultural variation in the acceptance of functional foods designed to prevent or cure certain types of illnesses.

1.3 Values pertaining to the relationship between man and nature

Compared to conventional food products functional foods can be characterised as processed with a relatively high degree of technological manipulation. Thus, one possible explanation of differences in the acceptance of functional food is differences in cultural values pertaining to the relationship between man and nature. The 'harmony' and 'mastery' dimensions described by Schwartz (1994) are examples of such values (See figure 1). People who score high on the 'mastery' dimension emphasize active mastery of the social and natural environment through self-assertion. This is comparable to the basic idea behind functional foods. The 'mastery' dimension is opposed to 'harmony', which emphasises co-existence with nature and deference of the technological manipulation of natural resources.

Above we have listed four possible explanations (a-d) of cultural differences in the attitudes to functional foods. Because values are abstract beliefs about desirable goals or end-states that transcend specific attitudes and behaviours (Schwartz & Bilsky, 1987, 1990; Schwartz, 1992), it is conceivable that they have considerable influence on consumers' perceptions of food health and interacting characteristics, as well as consumers' beliefs about healthy behaviours and nutrition, that is: a, b and c above. This made it reasonable to use cultural value differences as the basis for selecting the countries to be compared in the study.

Figure 1. The relation structure of Schwartz' seven motivational types of values as well as two higher-order dimensions into which they can be grouped



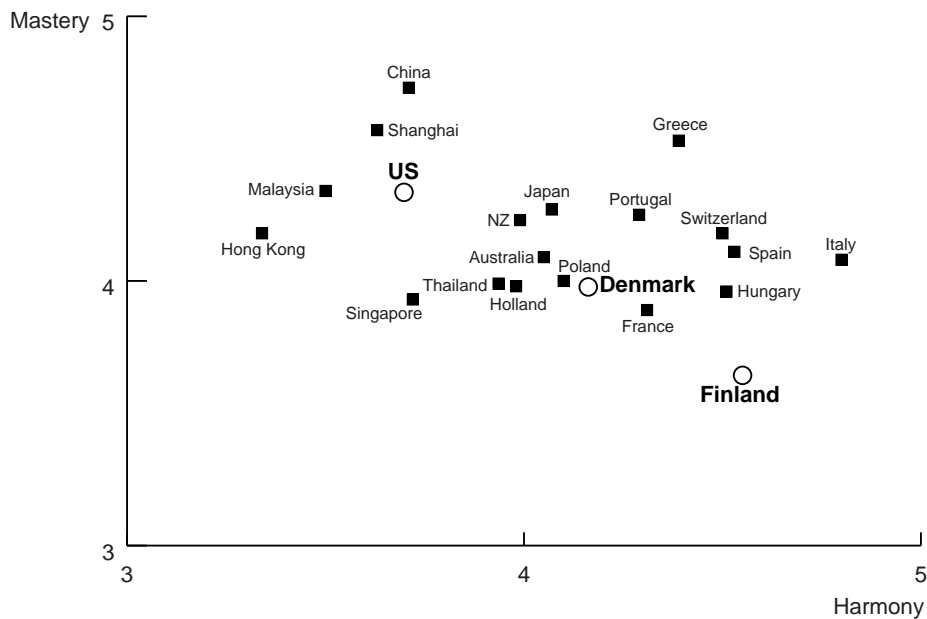
Source: Schwartz (1994)

2. DESIGN AND IMPLEMENTATION

The study was conducted in Denmark, Finland and the United States. In accordance with the discussion in the previous section, the three countries were selected on the basis of their position on Schwartz' value dimensions 'mastery' and 'harmony' (Schwartz, 1994). Figure 2 illustrates to which degree various countries attach importance to the two value dimensions according to results presented by Schwartz (1994).

Selecting Denmark, Finland and the United States made it possible to study cultures with varying diffusion rates and functional foods legislation. As mentioned in section 1, functional foods are more common in the USA than in Europe, but there are also differences within Europe. Thus, whereas Danish consumers' acceptance of the functional foods introduced in the last few years, has been moderate at best, some of the functional foods introduced in Finland have enjoyed considerable success. Raisio, which is one of the most innovative functional foods producers on a global scale, is based in Finland (Financial Times, Food Business, 2000).

Figure 2. Importance attached to the 'mastery' and 'harmony' dimensions in selected countries



Based on results reported by Schwartz (1994)

The basic design of the study involves a conjoint task (approx. n=500 in each country) supplemented with a number of questions on values, health-related perceptions and behaviours and nutritional knowledge.

Three different products were chosen for the conjoint analysis (eg, Green & Srinivasan, 1978; 1990), (from now on called base products), namely spreads (butter and margarine), orange juice and flavoured yogurt. Instead of making a conjoint analysis for each product, a procedure was used in which only one conjoint analysis was conducted using the base products as one of the attributes in the analysis (see figure 3). This enables a respondent to manage an evaluation of all three products. However, this procedure made it necessary to measure the respondent's basic attitudes toward the three conventional products and control for the differences in the analysis, as well as to estimate interaction effects between the attributes 'product' and 'enrichment', which are necessary to analyse whether the respondent's attitude toward enrichment differs between the three product types.

Two different kinds of enrichment components were chosen for the analysis, namely Omega-3s (n-3 fat from fish oil) and oligosaccharides (a kind of fibre). Oligosaccharides were chosen for their 'chemical' connotations, and because we assumed them to be less well known than Omega-3s. This made it possible to investigate to which extent consumers' attitudes depend on how artificial they perceive the enrichment component to be and how familiar they are with the component.

We also wanted to examine to which extent health claims (explicit claims about the effect of the component) affect consumer acceptance of functional foods. Health claims are not allowed in Denmark and Finland, and in the United

States only for certain components. In the analysis, two different kinds of claims were used: a functional claim and a prevention claim. Functional claims describe how the enrichment affects the body, and the prevention claim describes which diseases the enrichment can hinder. The operationalisation of the two types of health claims is shown in figure 3.

Enrichment of food products can be seen as an unnatural process, and therefore it would be reasonable to expect that the more natural consumers perceive the base product to be, the more negative consumers will be with regard to enrichment. Ecologically processed foods are in general perceived as closer to nature than conventionally processed foods (Bech-Larsen & Grunert, 2000). An attribute called 'processing' was therefore included in the analysis and operationalised along two lines: one with no description (the conventional product) and one indicating an ecological product. Whether the perceptual conflict between ecological processing and attitude toward enrichment exists or not is examined by estimating the interaction effects between the attributes 'enrichment' and 'processing'.

Figure 3. Attributes and attribute levels used in the study

Attribute	# of levels	description of levels
Product	3	a) orange juice b) flavoured yogurt c) spread
Enrichment	3	a) no enrichment b) Omega-3s c) oligosaccharides
Claim	3	a) no claim b) physiological claim ^{a)} c) health claim ^{b)}
Processing	2	a) not ecological b) ecological
Price	2	a) normal price b) normal price + 20%
Interaction effects: product x enrichment enrichment x processing		

a) operationalised as 'Omega-3s increase blood circulation in the legs' and 'oligosaccharides encourage growth of beneficial bacteria in the gut'

b) operationalised as 'Omega-3s reduce the risk of heart disease' and 'oligosaccharides reduce risk of cancer in the gut'

The design of the product descriptions was generated by using the SAS programme and resulted in 24 product descriptions, which the respondents had to rate with respect to buying intention and the four basic quality criteria discussed in section 1, ie, expected taste, naturalness, wholesomeness and convenience. All ratings were based on a seven-point scale from completely disagree to completely agree. The convenience variable was operationalised as to which extent the respondents perceived each of the 24 concepts to supply nutrition in a convenient way. In this way the basic selling proposition of functional foods, ie 'convenient wholesomeness', was included in the study.

The products were introduced in a short, written description. Besides the ratings, the respondents were asked about their buying frequency of the base products, their attitudes towards the base products, degree of involvement with the base products, their general attitude towards the concept of functional foods and towards genetically modified food products, their interest in health information, which diseases they were most concerned about, their knowledge of the physiological effect of various components such as vitamins, iron, probiotic cultures etc., which general values they emphasised (based on a subset of Schwartz' Value Survey) and demographics.

In each of the three countries, a representative group of around 500 respondents were interviewed. All respondents were responsible for buying groceries in their households.

3. RESULTS

First, we discuss the results regarding how the four basic food qualities, ie, wholesomeness, taste, naturalness and convenience, influence the buying intention in the three countries. Then the results of the conjoint study are discussed. Finally, we relate these results to the general health perceptions and value priorities of the consumers in the three countries.

3.1 The influence of the four quality aspects on buying intention

As discussed above, the respondents were asked to rate the product descriptions with regard to buying intention, perceived naturalness, healthiness, taste and to which extent eating the product would give the respondent a number of important nutrients in a convenient way. The latter four variables can be regarded as beliefs in a multi-attribute-attitude model with buying intention as the dependent variable (eg Ajzen & Fishbein, 1980). Regression analysis makes it possible to determine how the four beliefs influence consumers' buying intention.

As can be seen from the regression analyses presented in table 1, 'convenience' is the most influential belief for the buying intention in all three countries, although 'taste' is equally important in the United States. Surprisingly, 'wholesomeness' is not important for buying intention in any of the three countries, the reason being that 'wholesomeness' and 'convenience' are strongly correlated (between .85 and .89, see table 2) in all three countries. To a large extent the two variables measure the same information This is illustrated by the fact that another regression analysis excluding 'convenience' leaves 'wholesomeness' as

the most important belief. The results of the regression analysis indicate that the basic selling proposition for functional foods, ie, that they promote health in a convenient way, influences the buying intention in all three countries.

Table 1. Explanatory beliefs for buying intention

	Denmark	Finland	US
	—— standardised beta-coefficients ——		
convenience	.34	.39	.33
taste	.27	.24	.33
naturalness	.15	.15	.14
wholesomeness	ns	ns	ns
adj. r-square	.47	.53	.58

Table 2. Correlation coefficients between the four basic food quality characteristics

	convenience	taste	wholesomeness
taste			
– Denmark	.74		
– Finland	.77		
– US	.81		
wholesomeness			
– Denmark	.85	.70	
– Finland	.86	.75	
– US	.88	.80	
naturalness			
– Denmark	.75	.72	.75
– Finland	.77	.70	.80
– US	.81	.77	.82
Cronbach alpha for scale with all four variables			
– Denmark	$\alpha = .92$		
– Finland	$\alpha = .93$		
– US	$\alpha = .95$		

All correlations significant at .001

Although not as high as the correlations between ‘wholesomeness’ and ‘convenience’, the correlations between the other quality aspects are substantial and not significantly different between the three countries (see table 2). This illustrates that the interdependence between the consumers’ perception of

wholesomeness and the other basic food qualities (see section 1) is strong and very similar across the three countries. Although the results above indicate that 'convenient wholesomeness' does indeed influence buying intentions in all three countries, there is also reason to believe that many consumers are reluctant to accept that functional foods can fulfil this proposition without the functional foods interfering with the other basic food qualities. This issue will be elaborated in section 3.2.

3.2 THE CONJOINT STUDY

In each of the countries, the MANOVA procedure was used to estimate five aggregate utility functions (with wholesomeness, convenience, taste, naturalness and buying intention as dependent variables). In all cases the explained variances were below 0.15. That this is mainly due to heterogeneous perceptions and buying intentions among the respondents in the three countries is documented by the explained variance (0.47) of a latent class segmentation (Glimmix) of the aggregated (n=1533) conjoint data (see Appendix A1). As this paper is concerned with general cross-national comparisons and not with the identification of particular segments, the following discussion is based on the aggregated utility functions.

In spite of the high correlations between the ratings of the basic quality criteria, the analysis in the previous section indicates that 'convenient wholesomeness' does have an influence on buying intention in all three countries. How the perception of 'convenience' and 'wholesomeness' is influenced by functional enrichment, processing method, the use of health claims etc., is elaborated on in a discussion of the conjoint results which are most closely related to this proposition, ie the utility functions with 'convenience' and 'wholesomeness' as dependent variables. After this we discuss the estimated utility functions with taste, naturalness and buying intention as dependent variables. The interpretations offered in the following sections must be seen in the light of the high correlations illustrated in table 2.

Perceptions of wholesomeness and convenience

Table 3 illustrates the main and interaction effects of the conjoint analysis regarding wholesomeness and convenience of functional foods. The results indicate that in general the Finnish respondents accept the 'convenient wholesomeness' of functionally enriched foods more readily than the Americans and especially the Danes. Compared to Americans and Danes, Finnish consumers at the same time seem to be more reluctant to accept that a more expensive product should be more healthy and convenient than a cheaper one.

Compared to enrichment with oligosaccharides, enrichment with Omega-3s is more attractive to Finnish respondents and less repelling to Danes and Americans respectively. As discussed in section 2, this is as expected due to the 'chemical' connotations to oligosaccharides and the fact that only few consumers are familiar with this component (an average of only 8% of the respondents in the three countries knew what oligosaccharides are and 31% knew of Omega-3s, see section 3.3).

Also regarding health claims, the three countries display a remarkably common pattern. Thus, in all three countries both kinds of claims have a positive influence on consumers' perception of the wholesomeness and convenience of the enriched products. The analysis also shows that the more elaborated the claim, the more it affects consumers' buying intention.

As regard the processing characteristics, the Danish and Finnish respondents perceive ecologically processed food as more healthy than conventional foods. The Finns also perceive ecological foods as a more convenient contributor of nutrition than conventionally processed foods. Together with the fact that the Finnish respondents also perceive enriched foods as more wholesome than non-enriched foods, the opposite being true for the Danish respondents, this could indicate that the Finnish consumers may accept the simultaneous use of ecological processing and functional enrichment, whereas such a combination would be rejected by Danish consumers.

The interaction effects between processing and enrichment falsify this expectation, however. A significant positive interaction between non-enrichment and ecological processing exists in both the Finnish and the Danish sample. And both types of enrichment interact negatively with ecological processing in both countries. Thus both Finnish and Danish respondents perceive the simultaneous use of ecological processing and functional enrichment as inconsistent as regards the health consequences of food.

All the interaction effects between the attributes 'product' and 'enrichment' are significant for all three countries. Contrary to what is the case for the main effect of enrichment and the interaction between enrichment and processing method, the interaction results for enrichment and product reveal only modest differences as regards the type of enrichment. A possible explanation is the increased complexity of the knowledge required to evaluate the health consequences of specific enriched products compared to the evaluation of specific enrichments per se.

As regards the interaction between product type and enrichment, a similar pattern appears in the three countries, which all display a negative effect of both kinds of enrichment for juice and flavoured yogurt, but a positive effect of both kinds of enrichment on spreads. A possible explanation for this difference is that in general spread is perceived as a somewhat unwholesome product which could profit from nutritional improvement to a larger extent than juice and yogurt, which are perceived as inherently wholesome. Thus, the results may indicate that consumers in general find enrichment of 'non-healthy' foods more justified than enrichment of foods which are perceived as healthy per se.

Table 3. Utility functions in Denmark, Finland and USA with wholesomeness and convenience as dependent variables

	Denmark		Finland		USA	
	Whole- some- ness	Conve- nience	Whole- some- ness	Conve- nience	Whole- some- ness	Conve- nience
Enrichment						
– no enrichment	0.1	0.8	-0.6	-0.6	0.2	0.4
– Omega-3	0.0	-0.3	0.4	0.4	0.1	0.0
– oligosaccharides	-0.1	-0.5	0.2	0.2	-0.3	-0.4
Claim						
– no claim	-0.9	-1.1	-0.9	-0.9	-1.1	-1.1
– physiological claim	0.4	0.5	0.4	0.4	0.4	0.4
– health claim	0.5	0.6	0.5	0.5	0.7	0.7
Price						
– normal price	0.1	0.1	0.2	0.3	0.1	0.1
– normal price + 20%	-0.1	-0.1	-0.2	-0.3	-0.1	-0.1
Processing						
– conventional	-0.3	0.0	-0.4	-0.3	0.0	0.0
– ecological	0.3	0.0	0.4	0.3	0.0	0.0
Interaction effects						
– juice x Omega-3	-0.8	-0.6	-0.7	-0.7	-0.9	-0.8
– juice x oligosaccharides	-0.8	-0.6	-0.7	-0.7	-0.9	-0.8
– juice x no enrichment	1.6	1.2	1.4	1.4	1.8	1.6
– yogurt x Omega-3	-0.6	-0.6	-0.5	-0.6	-0.6	-0.5
– yogurt x oligosaccharides	-0.6	-0.5	-0.4	-0.5	-0.6	-0.4
– yogurt x no enrichment	1.2	1.1	0.9	1.1	1.2	0.9
– spread x Omega-3	1.4	1.2	1.2	1.3	1.5	1.3
– spread x oligosaccharides	1.4	1.1	1.1	1.2	1.5	1.2
– spread x no enrichment	-2.8	-2.3	-2.3	-2.5	-3.0	-2.5
– conventional x Omega-3	0.2	-0.1	0.3	0.2	0.0	0.0
– conventional x oligosaccharides	0.4	0.0	0.4	0.3	0.0	0.0
– conventional x no enrichment	-0.6	0.1	-0.7	-0.5	0.0	0.0
– ecological x Omega-3	-0.2	0.1	-0.3	-0.2	0.0	0.0
– ecological x oligosaccharides	-0.4	0.0	-0.4	-0.3	0.0	0.0
– ecological x no enrichment	0.6	-0.1	0.7	0.5	0.0	0.0

Figures in bold indicate that coefficients are significant at .05 ($T \geq 2,11$ R-squares ranging from .08 to .11)

Perceived taste and naturalness

All other things being equal, the respondents in all the three countries perceive the non-enriched alternatives as the most tasty. The Danish and American respondents also perceive the non-enriched alternatives as the most natural. That this is not the case in Finland indicates that the concept of naturalness in Finland has less to do with the use of additives and enrichments than in Denmark and the United States.

That the Finnish understanding of naturalness is more closely associated with the processing method than with enrichment is illustrated by the fact that ecological processing has a strong positive effect on perceived naturalness. The same pro-intuitive result, although less pronounced, is found in the Danish and US samples.

As regards health claims, a remarkably consistent pattern is found in the three countries. All of the three samples perceive products with a health claim (irrespective of type) as more tasty and natural than products without health claims. Seemingly therefore the high positive correlations between the ratings of health, naturalness and taste (see table 2 in section 3.1) may be further enforced by health claims. In other words the respondents' confidence in the health claims tend to transcend their evaluation of the other basic food qualities. Research (Bech-Larsen & Grunert, forthcoming) has shown that trusted information about processing method (ie the Danish ecological label) has a positive influence on consumers' perception of the taste and wholesomeness of food products. In a similar fashion the current study indicates that the reverse conclusion holds true, ie that trustworthy health information potentially has a positive influence on perceived taste and naturalness.

The finding in all three countries, that more expensive products are perceived as less natural and tasty than normally priced products, illustrates another type of evaluative inference with potential effect on buying intention. The next section elaborates on the main and interaction effects of conjoint variables on buying intention.

As in the conjoint estimations of wholesomeness and convenience, the Finnish and American results for taste and naturalness suggest a higher utility for functional spread than for functional juice and yogurt. For the Danish respondents the opposite seems to be true.

In accordance with our expectations the respondents in all three countries perceive non-enriched, ecologically processed foods as more natural than the enriched alternative. It is not clear, however, why conventionally processed foods are perceived as more natural when enriched. Another unexpected result is that the respondents in all three countries perceive ecological products without enrichment as less tasty than ecological products with enrichment, whereas non-enriched conventional products are perceived as more tasty (in Finland and the United States, but not in Denmark). The next section will elaborate on the counter-intuitive results of the study.

Table 4. Main effects of utility functions in Denmark, Finland and USA with taste and naturalness as dependent variables

	Denmark		Finland		USA	
	Natural- ness	Taste	Natural- ness	Taste	Natural- ness	Taste
Enrichment						
- no enrichment	2.1	2.5	-0.2	0.2	0.4	1.4
- Omega-3	-0.9	-1.1	0.2	0.0	0.0	0.5
- oligosaccharides	-1.2	-1.4	0.0	-0.2	-0.4	0.9
Claim						
- no claim	-0.6	-0.9	-0.5	-0.6	-0.8	-0.9
- physiological claim	0.3	0.4	0.2	0.3	0.3	0.3
- health claim	0.3	0.5	0.3	0.3	0.5	0.6
Price						
- normal price	0.1	0.1	0.2	0.2	0.1	0.1
- normal price + 20%	-0.1	-0.1	-0.2	-0.2	-0.1	-0.1
Processing						
- conventional	-0.6	0.2	-0.9	0.1	-0.2	0.3
- ecological	0.6	-0.2	0.9	-0.1	0.2	-0.3
- juice x Omega-3	0.0	-0.1	-0.5	-0.6	-0.7	-0.6
- juice x oligosaccharides	0.2	0.0	-0.4	-0.7	-0.7	-0.6
- juice x no enrichment	-0.2	0.1	0.9	1.3	1.3	1.2
- yogurt x Omega-3	0.2	0.0	-0.4	-0.5	-0.4	-0.2
- yogurt x oligosaccharides	0.3	0.2	-0.2	-0.5	-0.4	-0.2
- yogurt x no enrichment	-0.5	-0.2	0.6	1.0	0.8	0.4
- spread x Omega-3	-0.2	0.1	0.9	1.1	1.1	0.8
- spread x oligosaccharides	-0.5	-0.2	0.6	1.2	1.1	0.8
- spread x no enrichment	0.7	0.1	-1.5	-2.3	-2.1	-1.6
- conventional x Omega-3	0.3	-0.3	0.5	-0.1	0.2	-0.2
- conventional x oligosaccharides	0.5	0.0	0.6	-0.1	0.1	-0.2
- conventional x no enrichment	-0.8	0.3	-1.1	0.2	-0.3	0.4
- ecological x Omega-3	-0.3	0.3	-0.5	0.1	-0.2	0.2
- ecological x oligosaccharides	-0.5	0.0	-0.6	0.1	-0.1	0.2
- ecological x no enrichment	0.8	-0.3	1.1	-0.1	0.3	-0.4

Figures in bold indicate that coefficients are significant at .05 ($T \geq 2,11$)
R-squares ranging from .08 to .11

Buying intention

The analysis (see table 5) suggests that there are relatively large differences in buying intention across the three countries. Especially Danish consumers have a negative buying intention towards functional foods and in general prefer the non-enriched base products. Consequently, the Danish consumers attach relatively much importance to the attribute 'enrichment'. In Finland, it seems that whether the products are enriched or not is of little importance, but in general there is a more positive buying intention towards the conventional base products although the difference is small. In all three countries, oligosaccharides are less preferred than Omega-3s, which is in accordance with our expectations and the results of the analyses discussed in the previous sections.

Also in accordance with the previous analysis, both kinds of health claims have a positive influence on consumers buying intention towards the enriched products in all three countries. The more elaborated the claim, the higher the effect on consumer buying intention in all three samples. Furthermore, detailed analysis also indicates that the claims related to oligosaccharides in general have a higher effect than claims related to Omega-3s. We will return to the possible explanations for these findings in section 3.3.

It is not surprising that the lowest price is preferred in all three countries but where the coefficients (and consequently the relative importance of price compared to the other attributes) are relative small in Denmark and the United States, it is rather large in Finland indicating the Finnish consumers in general are more price sensitive.

The interaction effect between the attributes 'product' and 'enrichment' is significant only in Finland and the United States, which means that in Denmark consumer buying intention towards enriched products with either of the two components is independent of the base product. In Finland, however, the fairly neutral buying intention towards enrichment with Omega-3s covers a positive buying intention in the case of spread with Omega-3s but a negative buying intention with regard to Omega-3-enriched yogurt and juice. An almost identical pattern can be seen in the United States where the generally negative buying intention toward enrichment with Omega-3s also covers a positive buying intention in the case of spread with Omega-3s but a negative one with regard to Omega-3-enriched yogurt and juice, although the differences in the United States are much smaller than in Finland.

There is also a positive effect on buying intention towards spreads with oligosaccharides in Finland and a modest positive effect on buying intention in the United States (compared to a generally negative effect towards this component in both countries). These results suggest that effect on buying intention for functional foods in Finland and the United States depend on the base products used.

In Denmark and the United States, the interaction effects between 'naturalness' and 'enrichment' are the opposite of what we expected. From other studies we know that functional foods in general are perceived as less natural than the corresponding conventional products (Jonas & Beckmann, 1998; Poulsen, 1998) and that ecological foods in general are perceived as more natural than the corresponding conventional ones (eg Bech-Larsen & Grunert, forthcoming); con-

sequently a dissonance between enrichment and ecological products would be expected. However, this is only the case in Finland, which is the only country in which the utility of the ecological product alternatives is higher than the utility of the corresponding conventional products. This is somewhat surprising due to the fact that the coefficients are 'all else being equal' estimates and several studies have proved that all else being equal, consumers in general prefer the ecological products to the corresponding conventional ones (Bech-Larsen & Grunert, forthcoming).

A possible explanation for the counter-intuitive result that consumers, *ceteris paribus*, prefer the conventional products to the ecological alternatives is that only to a small degree are the three base products associated with ecology. All three base products are processed to a higher degree than most of the ecological products marketed in the three countries. Since processed foods are negatively associated with ecology (Bech-Larsen & Grunert, forthcoming), the results may reflect a general dissonance, ie a negative interaction effect on buying intention, between the concept of ecology and the base products included in the study.

Table 5. Utility functions in Denmark, Finland and the United States with buying intention as dependent variable

	Denmark n=513	Finland n=513	USA n=507
Enrichment			
- no enrichment	3.3	0.2	1.8
- Omega-3	-1.5	0.0	-0.7
- oligosaccharides	-1.8	-0.2	-1.1
Claim			
- no claim	-1.3	-1.1	-1.2
- physiological claim	0.6	0.5	0.4
- health claim	0.7	0.6	0.8
Price			
- normal price	0.3	0.6	0.3
- normal price + 20%	-0.3	-0.6	-0.3
Naturalness			
- conventional	0.6	-0.2	0.4
- ecological	-0.6	0.2	-0.4
Interaction effects			
- juice x Omega-3	-0.1	-0.4	-0.1
- juice x oligosaccharides	0.0	-0.4	-0.1
- juice x no enrichment	0.1	0.8	0.2
- yogurt x Omega-3	-0.1	-0.6	-0.1
- yogurt x oligosaccharides	0.1	-0.4	-0.1
- yogurt x no enrichment	0.0	1.0	0.2
- spread x Omega-3	0.2	1.0	0.2
- spread x oligosaccharides	-0.1	0.8	0.2
- spread x no enrichment	-0.1	-1.8	-0.4
- conventional x Omega-3	-0.6	0.1	-0.3
- conventional x oligosaccharides	-0.4	0.2	-0.4
- conventional x no enrichment	1.0	-0.3	0.7
- ecological x Omega-3	0.6	-0.1	0.3
- ecological x oligosaccharides	0.4	-0.2	0.4
- ecological x no enrichment	-1.0	0.3	-0.7
R-square	.12	.10	.12

Figures in bold indicate that coefficients are significant at .05 ($T \geq 2,11$)

3.3 GENERAL HEALTH PERCEPTIONS AND NUTRITIONAL KNOWLEDGE

The results of the conjoint analyses discussed in section 3.2 indicate considerable national differences in the evaluation of the basic qualities of functional foods (wholesomeness, convenience, taste and naturalness). In sections 3.3 and 3.4 we elaborate on the possible reasons for these differences. As discussed in section 1, cultures differ in their nutritional knowledge, the perceived severity of specific diseases, and the perception of health promoting value of specific behaviours. In this section we discuss whether such differences can explain some of the results found in the conjoint analysis. More specifically we discuss whether the preferences for specific types of enrichment and health claims are related to general health perceptions and nutritional knowledge.

In connection with the conjoint analysis, the respondents were given a number of multiple choice questions in which they were asked to rate the health effect of a number of enrichment components. For each enrichment component there were four options: one with the correct answer, two erroneous ones and one 'don't know'. Table 6 reveals large differences in consumers' knowledge with regard to the effect of the various enrichment components as well as differences across countries. In general the knowledge of the various enrichment components is about the same in Finland and Denmark and both countries lie significantly higher than the United States.

When evaluating the figures in table 6 it should be taken into account that the knowledge is based on aided knowledge. Therefore it cannot be excluded that the reported knowledge is generally larger than the actual knowledge. The differences among the enrichment components will, however, not be affected by this – or at least only to a small degree.

As it appears from the table there is a considerable difference in the knowledge as regards the various enrichment components. It appears that the knowledge as regards iron and calcium is relatively large in all three countries, whereas only a minority of consumers know about the effect of flavonoids and oligosaccharides. However, there are also variations within the components. Compared with the American and the Finnish respondents, about double the share of Danish respondents are aware of the effect of, for instance, Omega-3 acids. As regards oligosaccharides, the share of Danes aware of their effect is about half of the number of Finns and Americans.

As it was discussed in section 3.2, a positive correlation between accepting an enrichment component and knowing about its nutritional effect should be expected. The observation that the respondents in all three countries were less inclined to dismiss Omega-3s than oligosaccharides is in accordance with this expectation, because the results of the conjoint analysis (see section 3.2) demonstrate that consumers in all three countries have higher utilities for Omega-3s than for oligosaccharides.

In general, the results in table 6 show that claims in connection with for instance iron and calcium only can be expected to have a limited effect on consumers' attitudes, as most consumers already are aware of the information on the claims. On the other hand, claims (consequences) in connection with, for instance, flavonoids, oligosaccharides, Omega-3, selenium, anti-oxidants or

probiotic cultures (the latter especially in the US) may have a potential effect on the acceptance of functional foods.

There are large demographic differences as regards the degree of consumers' knowledge in the three countries. In Denmark, the general pattern is that the younger the consumer, the larger the knowledge. In the United States, it is the other way around and in Finland the middle-aged (31-60 years) in general have the largest knowledge followed by the younger group (<30) whereas senior citizens (>60) in general have less knowledge of the effects of enrichment components. As regards the differences in knowledge of men and women, women both in Denmark and in Finland in general have a larger knowledge of the effect of enrichment components than the men. In the United States, it is the other way around. Excepted for the American consumers are, however, iron, calcium and vitamin D, which probably is due to the fact that these components are more relevant for women than for men as they affect physiological aspects that women in general are more influenced by than men (low blood percentage and osteoporosis).

To study the influence of the knowledge of the health effects of oligosaccharides and Omega-3s on the preferences for these additives, Anova analyses with the corresponding conjoint utilities (buying intention) as dependent variables were performed for the total sample (n=1533). In both cases the proportion of the respondents that were aware of the health effects (30% for Omega-3s and 7% for oligosaccharides) had significantly higher ($p<0.01$) average utilities for the additives than the proportion that was incompetent in this regard. These results support the notion (see section 3.2) that disclosure of health information may improve the acceptance rates for functional foods.

Table 6. Share of consumers aware of the health effect of various enrichment components. In %.

	Denmark	Finland	USA
Fibre	71 ^a	73 ^a	53 ^b
Calcium	88 ^a	96 ^b	87 ^a
Anti-oxidants	35 ^a	35 ^a	29 ^b
Probiotic cultures	48 ^a	44 ^a	32 ^b
Iron	96 ^a	92 ^b	74 ^c
Vitamin D	45 ^a	54 ^b	60 ^b
Selenium	39 ^a	42 ^a	14 ^b
Flavonoids	6 ^a	14 ^b	8 ^a
Omega-3	43 ^a	26 ^b	23 ^b
Oligosaccharides	5 ^a	9 ^b	10 ^b

NB: Different letter indicates significantly different share (chi-square test, $p=.05$)

In conjunction to the conjoint analysis the respondents were furthermore questioned about which diseases/health aspects they would prefer the functional foods to prevent/influence. The results are shown in table 7 in which the prevention of heart/cardiovascular diseases have the highest priority in all three countries. When this is compared to the results in table 6, which show that between 23 and 46% of the respondents in the three countries are aware of the

positive effect of Omega-3 fatty acids on heart/cardiovascular diseases, strengthens the supposition about the correlation between knowledge of health effects and the acceptance of certain enrichment components. The conjoint analysis (see section 3.2) showed that in general the consumers in all three countries were more willing to accept food products enriched with Omega-3 than with oligosaccharides.

As it can be seen from table 7, stomach/intestine cancer is the disease that most respondents in all three countries want functional foods to prevent/influence next after heart/cardiovascular diseases. The use of health claims and especially the strong health claim for oligosaccharides (reduction of risk of stomach/intestine cancer) adds to the acceptance of functional foods in all three countries (see section 3.2).

As shown in table 6, the general knowledge of the various enrichment components is much the same in Finland and in Denmark and both countries lie significantly higher than the United States. This is probably partly related to the fact that the relative volume of publicly financed information on nutrition is markedly larger in the two Nordic countries than in the United States. Other information sources may also influence the general health knowledge, however. Ippolito and Mathios (1994) and Mathios (2000), who have studied the effects of the waves of deregulation and reinstigation of the US legislation on health claims, found strong evidence that deregulation positively influences both the general nutritional knowledge and the choice of more healthy food alternatives.

In general, the results in table 7 are in accordance with studies in Great Britain, France and Germany (see Hilliam, 1996), where consumers most often mention heart/cardiovascular diseases, cancer, the immune system in general as well as cholesterol as the preferred areas of action. In western countries there is a tendency towards a common consent about which diseases are the most important ones. In our study, however, it is noteworthy that Danish consumers to a much lower degree than Finnish and American consumers prefer products whose claimed effect it is to lower cholesterol and blood pressure. Part of the explanation may be that in the United States focus has been on cholesterol and blood pressure for a number of years which is why these aspects are at the top of the American consumer's mind. At the time of the data collection there was a debate in the Finnish media about heart/cardiovascular diseases and the impact of excess cholesterol intake, which probably made Finnish consumer rank these aspects higher.

To study the relation between the preferred influence of functional foods on stomach/intestine cancer and heart/cardiovascular diseases, respectively, and the preferences for additives which such influences, ie, oligosaccharides and Omega-3s, respectively, Anova analyses with the corresponding conjoint utilities as dependent variables were performed for the total sample (n=1533). In both cases the proportion of the respondents that preferred the influences (42% for stomach/intestine cancer and 56% for heart/cardiovascular diseases) had significantly higher ($p < 0.01$) average utilities for the corresponding additives than the proportion that did not mention one of these influences that they prefer functional foods to prevent.

As regards oligosaccharides the result should be interpreted with caution due to the general lack of knowledge of the health effect of this additive (see table 6). In the case of Omega-3 a split sample (knowledge vs. no knowledge of health effect) but otherwise identical Anova, indicates a stronger positive relation between prevention of heart/cardiovascular diseases and utility of Omega-3 for the respondents who know of the effect of the latter compared to those that do not.

Table 7. What is the preferred influence of functional foods. In %

	Denmark	Finland	USA
Heart/cardiovascular diseases	55	54	59
Prevent stomach/intestine cancer	48	44	34
Lower cholesterol	17	31	37
Lower blood pressure	14	26	25
Prevent osteoporosis	19	20	21
Enhance immune system in general	39	36	38
Increase healthy gut bacteria	7	21	7
Enhance digestion	7	10	7
Slimming effect	19	20	29
Strengthen teeth	3	3	6
Increase memory capacity	8	12	10
Other/don't know	2	2	2

NB: Figures do not sum up to 100% as respondents were given the option of mentioning three possibilities.

The results in section 3.1 illustrated that wholesomeness is an important quality aspect in all three countries (see section 3.1). Notwithstanding this, the possibility of cultural differences as regards the perception of the relative merits of various health promoting behaviours (healthy eating, non-smoking etc) do have potential implications for the acceptance of functional foods.

The respondents were therefore asked which aspects they believed to have the greatest impact on health. This was mainly done to uncover whether diet stands out as the most decisive factor in consumers' mind in relation to maintaining their health. As can be seen from table 8, diet is seen as being decisive to health. Especially in Denmark, the importance of diet is central to consumers, and in Finland and the United States the second largest number of respondents mentioned diet as the second most important factor in the pursuit of health.

It is, however, worth noting that while diet plays a central role in all three countries, about 30% in Denmark and Finland and almost 40% in the United States do not mention diet as one of the two most important aspects of health.

The relatively low share of respondents that mention genetic factors as one of the two factors most influential on health, indicates a high level of locus of health control in all three countries. This finding substantiates the possible influence of specific beliefs, attitudes and cultural values on the acceptance of functional foods. In the next section we elaborate on the discussion of the

possible connection between cultural values and the acceptance of functional foods.

Table 8. Share saying that the aspect has the greatest impact on health. In %.

	Denmark	Finland	USA
Wholesome and varied diet	72	70	62
Regular exercise	56	77	70
Avoid stress	23	8	20
Avoid smoking	22	17	24
Regular bed hours	13	12	8
Genetic	8	11	6
Avoid alcohol	4	4	6
Other/Don't know	2	1	4

NB: Figures do not sum up to 100% as it was possible to mention three possibilities.

3.4 CULTURAL VALUES AND THE ACCEPTANCE OF NOVEL FOODS

As discussed in section 2, the three countries were selected due to differences in the importance attached to the value dimensions 'harmony' and 'mastery' (eg Schwartz, 1992, 1994). These value dimensions are closely associated to attitudes to manipulation of nature, and thus presumably to the general attitudes towards high-tech foods. More specifically Finland was selected because, in previous studies (Schwartz 1994) the Finns gave a higher priority to 'harmony' than to 'mastery', the USA was selected because it represented the opposite position, and Denmark was selected because it is placed somewhere in between.

The accordance between our study and that by Schwartz (1994) was assessed by an exploratory factor analysis with the nine items belonging to the two value dimensions, conducted for each country. In all three countries this procedure resulted in two dimensions which by and large reflected the structure as described by Schwartz. In all three countries the items 'self-confidence' and 'choose one's own goals' loaded equally on both factors. Based on a reliability analysis conducted for each country the two items mentioned were excluded from the factor analysis. For each country the final two-factor solution accounted for more than 59% of the variation in data.

As mentioned in section 2, the respondents in the our study rated the value items on a 7-point scale (very important to not important). Schwartz (1992) recommends a procedure, in which the first step for the respondents is to select the two items that they value least. These items are assigned the number 1. Similarly, the two items that are most important to the respondent are assigned the number 9. The rest of the items are rated between -1 and 9. Our use of the simple 7-point scale is, all other things equal, expected to lead to a less polarised use of the scale and to increase the difference between the respondents as to the usage of the scale extremities.

To control for such individual differences, the ratings of the value items for each respondent were standardised by subtracting the individual respondent's

average rating of all the items from the ratings of each of the items. Scores for the two value dimensions, ie, mastery and harmony were then calculated by averaging the standardised scores that according to the factor analysis (4 for mastery and 3 for harmony) correspond with the two dimensions.

For the US respondents the standardised scores on the two value dimensions, see table 9, are in accordance with Schwartz' (1994) results (see section 2), ie, the US respondents score lower on harmony and higher on mastery than the respondents from the two other countries. As opposed to Schwartz' results, the Finnish and the Danish respondents' scores on both value dimensions are very similar, however. As discussed below, the differences between the Schwartz study (1994) and ours can be attributed to different sampling procedures.

Schwartz' study is based on 130 to 200 respondents in each country, whereas this study involves 500 respondents in each country. Add to this that Schwartz only recruited teachers, whereas the study presented in this paper includes a random selection of households (interviewing the person responsible for shopping and cooking). All other things being equal, this implies that the sample used in the current study is more representative concerning average national values, than the sample used by Schwartz (1994).

Table 9 also illustrates the average attitudes towards functional foods (measured by three items, Cronbach $\alpha = .75$) and genetically modified foods (measured by four items, Cronbach $\alpha = .86$). In accordance with the results of the conjoint analysis the Finnish respondents are the most positive towards functional foods, whereas the Danish respondents are the least positive. The US respondents are the most positive towards genetically modified foods and the Danes are the least positive. These results indicate that the relation between the value dimensions and the attitude to genetically modified foods is stronger than the relation to the attitude to functional foods. Below we elaborate on this issue.

Table 9. Mean values for mastery, harmony and general attitude towards functional foods and genetically modified foods

	Denmark	Finland	USA
Harmony *	0,8	0,8	-0,1
Mastery *	-0,7	-0,7	0,1
Functional foods**	3,8	5,1	4,6
Genetically modified foods **	2,2	2,8	3,4

* Standardised as described above. The higher the value, the higher the importance.

** Scale from 1 to 7. The higher the value, the more positive the attitude. Differences are significant (0.05).

As discussed in section 1, functional foods can be characterised as a product category which is processed with a relatively high degree of technological manipulation compared to conventional food products. To an even higher degree this is true for genetically modified foods. Table 10 illustrates the correlations

between the standardised value dimensions ‘mastery’ and ‘harmony’ and the attitudes towards functional and genetically modified foods. The results indicate a positive relation between the mastery dimension and attitudes towards functional and genetically modified foods. The correlation is stronger in the case of genetically modified foods which is in accordance with the relative degree of manipulation discussed above. This also explains the difference in the negative correlations between the harmony dimension and the attitudes to the two food categories.

The rather low correlations between the attitude to functional foods and the two value dimensions indicate that consumer scepticism towards functional foods has less to do with abstract values and moral principles than with lack of knowledge and preferences for concrete products. We will elaborate on this issue in the following section.

Table 10. Correlations between value dimensions and attitude towards functional foods and genetically modified foods, n=1533

	Attitude to FF	Attitude to GMO	MASTERY
Attitude to GMO	.20		
MASTERY	.07	.29	
HARMONY	-.07	-.33	-0.84

All correlations significant at .05

4. DISCUSSION

The results of the conjoint analysis leaves little doubt that the Finnish respondents are more positive towards functional foods than the American and especially the Danish respondents. This finding is surprising considering the wider diffusion of functional foods in the US and their more liberal health claim legislation.

In section 1 we discussed a number of possible explanations for national differences in the attitudes to functional foods, ie, differences in consumers’ perceptions of: (a) the importance of health and the characteristics of wholesome foods, (b) the relations between wholesomeness and other quality aspects, (c) health and nutritional knowledge, and (d) values pertaining to the relationship between man and nature.

In the three countries surveyed (Denmark, Finland and USA), there were no differences as to the importance of food health, and in all three countries wholesomeness was closely associated with taste and naturalness. The Americans were less knowledgeable about nutrition than the Finns and the Danes, but the perceptions of the importance of various health promoting behaviours were similar in the three countries. Hence, the most apparent differences between the three cultures are the results related to the values of ‘mastery’ and ‘harmony’.

As expected, the American respondents scored higher on the mastery dimension and lower on the harmony dimension than the Danish and Finnish respondents, who had equal scores for the two dimensions. Together with the results of the conjoint analysis, viz. that the Finns are more positive towards functional foods than either of the two other countries, this indicates that abstract functional values such as harmony and mastery determine attitudes to functional foods only to a very limited extent. This indication is confirmed by a significant but low correlation between the two value dimensions and the overall attitude to functional foods. This is opposite to the correlation between the two value dimensions and the attitude to genetically modified foods.

All other things being equal the low association between the value dimensions and the attitude to functional foods indicate that the latter can be changed. Thus, if the legislation on health claims were deregulated this could lead to increased acceptance of functional foods. The belief that the attitude to functional foods can be changed by such measures is further strengthened by the results of the conjoint analysis showing that an increased use of health claims influences the acceptance of functional foods positively in all three countries. That this influence is strongest for functional ingredients, of which the health consequences are unknown to most consumers, strengthens the argument even further.

Another important finding in the study is that functional enrichment changes not only the perception of wholesomeness, but also the perception of other qualities such as naturalness and taste. Thus, even if the health claim legislation is deregulated, marketers of functional foods should acknowledge that an implementation of the 'healthy, but all other things equal' sales proposition is an impossible strategy. Thus for many food products enriched with functional ingredients, the application of health claim labels – if legalised – would be insufficient. In most cases it is necessary to develop a new communication strategy based on the consumers' interactive perceptions of food wholesomeness, naturalness and taste.

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**APPENDIX A1. UTILITY FUNCTIONS FOR THE FOUR CROSS-NATIONAL
(N=1533) SEGMENTS WITH BUYING INTENTION AS DEPENDENT VARIABLE**

	Segment 1 (19%)	Segment 2 (32%)	Segment 3 (24%)	Segment 4 (24%)
Enrichment				
- no enrichment	0.8	1.4	3.4	0.4
- Omega-3	-0.3	-0.1	-1.6	-0.1
- oligosaccharides	-0.5	-1.3	-1.8	-0.3
Claim				
- no claim	-0.9	-2.2	0.1	-1.5
- physiological claim	0.4	0.9	-0.1	0.7
- health claim	0.5	1.3	0.0	0.8
Price				
- normal price	0.3	0.5	0.3	0.3
- normal price + 20%	-0.3	-0.5	-0.3	-0.3
Processing				
- conventional	-0.1	0.3	0.8	-0.1
- ecological	0.1	-0.3	-0.8	0.1
Interaction effects				
- juice x Omega-3	-0.1	-0.2	-0.3	-0.3
- juice x oligosaccharides	-0.1	-0.1	-0.3	-0.3
- juice x no enrichment	0.2	0.3	0.6	0.6
- yogurt x Omega-3	-0.3	-0.2	-0.1	-0.4
- yogurt x oligosaccharides	-0.1	-0.1	-0.1	-0.3
- yogurt x no enrichment	0.4	0.3	0.2	0.7
- spread x Omega-3	0.4	0.4	0.4	0.7
- spread x oligosaccharides	0.2	0.2	0.4	0.6
- spread x no enrichment	-0.6	-0.6	-0.8	-1.3
- conventional x Omega-3	-0.1	-0.2	-0.8	0.0
- conventional x oligosaccharides	-0.1	-0.2	-0.7	0.1
- conventional x no enrichment	0.2	0.4	1.5	-0.1
- ecological x Omega-3	0.1	0.2	0.8	0.0
- ecological x oligosaccharides	0.1	0.2	0.7	-0.1
- ecological x no enrichment	0.2	-0.4	-1.5	0.1
Variance for segment	1.15	4.28	2.47	1.20

Figures in bold indicate that coefficients are significant at .05 ($T \geq 1.99$), R-square = 0.47