

Research Report

The perceived healthiness of functional foods A conjoint study of Danish, Finnish and American consumers' perception of functional foods

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Abstract

Functional foods presumably enable the consumer to lead a healthier life without changing eating habits. Whether consumers accept this proposition or not is potentially influenced by their perceptions of the healthiness of the processing methods, enrichment components, food-types, and health claims used in the production and marketing of functional foods. Because consumers may perceive functional enrichment as interfering with nature, cultural values pertaining to man's manipulation of nature may also influence consumer acceptance of functional foods.

The purpose of the study described here is to clarify to which extent Danish, Finnish and American consumers' perceptions of the healthiness of functional foods are explained by the factors mentioned above. The general results indicate that values pertaining to man's manipulation of nature is only modestly related to the acceptance of functional foods, whereas the use of different health claims, processing methods, enrichments, product types, and especially the interactions between the two latter, are important determinants of consumers' perceptions of the healthiness of functional foods.

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1. Introduction

Definitions of 'functional foods' range from the very simple: 'Foods that may provide health benefits beyond basic nutrition' to the more complex: 'Food similar in appearance to conventional food that is intended to be consumed as part of a normal diet, but has been modified to subserve physiological roles beyond the provision of simple nutrient requirements' (Roberfroid, 2000). The latter definition, which we follow here, excludes therapeutic foods. This definition is also in accordance with the major selling proposition for functional foods, i.e. that such foods enable the consumer to lead a healthier life without changing eating habits (Jonas and Beckmann, 1998). As consumers generally want to buy healthy foods (Brunso et al., 1996), but at the same time are reluctant to change eating habits, even when these are known to be unhealthy

(Williamson et al., 2000), the potential for functional foods should be promising.

Experience indicates that compared to American consumers, Europeans and especially Danes are less inclined to accept functional foods as the solution to the dilemma between health and habits (Poulsen, 1999; Euromonitor, 2000). As consumers can only be expected to consider substituting conventional with functional foods if the latter are perceived as comparatively healthy, international differences in acceptance rates may be explained by different perceptions of what determine the healthiness of food.

The perception of the healthiness of food in general, and consequently also of functional foods, is influenced by a host of factors. This includes type and processing of raw materials, origin, production date, conservation method, packaging, use of additives, etc. (Bonner and Nelson, 1985; Bech-Larsen and Grunert, 2001). In this study we want to focus on the factors that are particular to the perception of the healthiness of functional foods. This involves the types

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of enrichments, processing methods, health claims and base products (i.e. basic food types) used (Poulsen 1999; Jonas and Beckmann, 1998).

Due to the chemical connotations to certain types of enrichments and a general scepticism towards food additives, Danish consumers tend to perceive functional enrichments as 'unhealthy artificial additives'¹ (Poulsen, 1999). Therefore, there is a risk that the effect of functional enrichment on consumers' perceptions of food healthiness may be the opposite of what was intended. Probably, this risk is especially outspoken for foods, which consumers tend to classify as healthy per se, e.g. vegetables. Similarly, because certain processing methods are perceived as more natural and healthy, e.g. organic compared to conventional processing (Bech-Larsen and Grunert, 2001), there is also a risk that functional enrichment may be detrimental to the perceived healthiness of foods processed by such methods.

Consumers' perceptions of the healthiness of the processes and enrichments involved in the production of functional foods may be altered by the use of health claims. Therefore, it is generally accepted that the deregulation of the USA health claim legislation in 1985 gave the impetus to the creation of the functional foods market. In the following years this market experienced growth rates of up to 20% compared to the general USA food market with a growth below or around 1% (Mathios, 2000). After numerous examples of deceptive marketing practices the USA health claim legislation was again made more restrictive in 1995.

Current international health claim legislation distinguishes between physiological and prevention claims (Poulsen, 1999). Physiological claims describe how a functional enrichment affects the body, whereas prevention claims explicate the disease, which is prevented by the enrichment. Physiological claims for certain enrichment components are allowed in the USA, whereas both types of claims are generally forbidden in the EU. Compared to most other EU countries, Danish authorities, however, interpret the legislation rather strictly (Poulsen, 1999).

Having studied the aggregated effects of deregulation and re-imposition of health claim legislation in USA (cf. above), Ippolito and Mathios, 1994 and Mathios, 2000 concluded that deregulation was positively correlated with American consumers' general nutritional knowledge as well as the consumption of functional foods. On the individual level, however, the results of an experiment by (Levy et al. 1997) indicated, that American consumers' perceptions of the healthiness of functional foods are rather based on prior beliefs about the type of base product than on specific health claims.

Perceptions and attitudes, which are strongly founded in cultural values, are difficult to change by informative means such as health claims (Frewer et al., 2003), i.e. the effectiveness of health claims depends among other things

on the strength of the association between consumers' values and their attitudes to functional foods.

The 'harmony' and 'mastery' values (Schwartz, 1994) are examples of cultural dimensions that may influence consumers' attitudes to functional foods (cf. Figure 1). 'Mastery' implies active and self-assertive manipulation of the social and natural environment, whereas 'harmony' emphasises co-existence with nature and reject the manipulation of natural resources. Although other consumer values may also be associated with functional enrichment, research has shown that 'mastery' and 'harmony' influence consumers' attitudes to novel foods (Bredahl, 2000) as well as the dominance of the health aspect in their food related life-style (Brunso et al., 2003).

2. Methods

The aim of the study is to assess to which extent consumers' perception of food healthiness depends on different types of health claims, functional enrichments, base-products and processing methods. Furthermore, it will be studied to which extent American consumers differ from Danish and Finnish consumers with regard to perceived healthiness and general attitudes to functional foods and to which extent such differences can be explained by the 'mastery' and 'harmony' values described above.

The choice of Denmark, Finland and the USA as the outset of the study was based on these countries' relative position in (Schwartz, 1994) study of cultural values (cf. Figure 2). Finland was selected because of the high priority of 'harmony' as opposed to 'mastery'; the USA was selected because it represented the opposite position. Denmark was selected because it represented an intermediary position and because of the authors' affiliation to Denmark.

Because functionally enriched foods and health claims are new concepts to many consumers, it was chosen to implement the study by a conjoint task (Green and Srinivasan, 1978, 1990) with 500 randomly selected households in each country (interviewing the person responsible for buying groceries). The factors included in the conjoint design were: base-products, health claims, functional enrichments, processing methods, price and two interactions (between enrichments and base products respectively processing methods).

The inclusion of base-products in the conjoint design made it possible to study the interaction between different types of enrichments and base-products, without claiming too much of the respondents' time. Therefore, instead of making a separate conjoint design for each base-products, the analysis was conducted using base-product as a factor, and adjusting (cf. Section 3) for differences in the respondents' individual attitudes to the involved base-products. These attitudes were obtained before the implementation of the conjoint task.

¹ The common use of 'enrichment' rather than 'additive' in this article is not reflecting author attitudes but industry terminology.

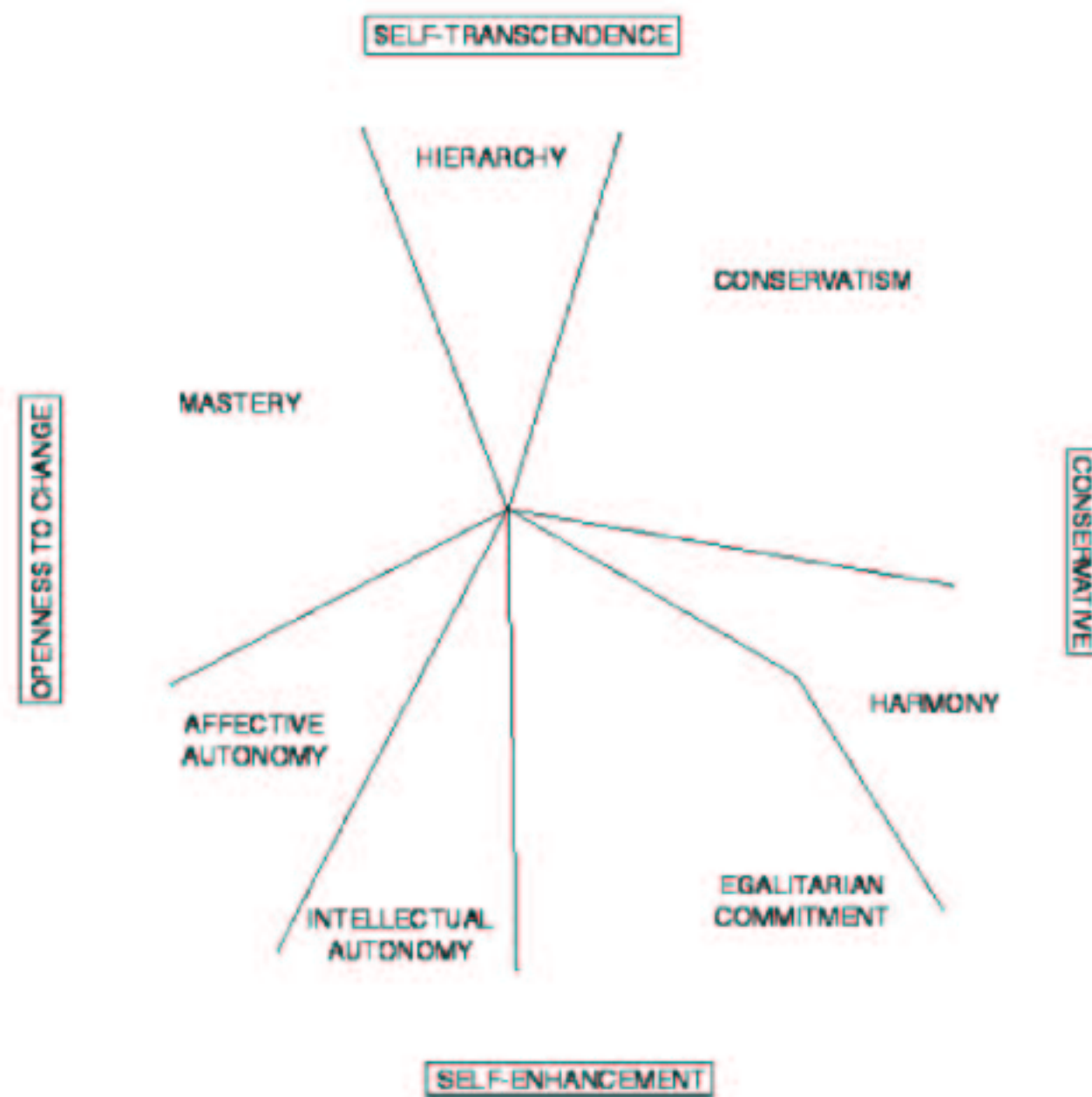


Fig. 1. The structure of relations among Schwartz' seven motivational types of values as well as two higher-order dimensions which they can be grouped into.

With help from the SAS programme, we generated 24 standard full profile stimuli (Green and Srinivasan, 1978), which the respondents were asked to rate on a seven-point scale of perceived healthiness. Some of the 24 profiles represented 'new to the world' concepts, but according to a group of food engineering experts all of them were technologically feasible.

Before the implementation of the conjoint task the respondents were asked about their general attitudes to functional and genetically modified foods (on a seven-point scale), and their positions on the 'mastery' and 'harmony' dimensions' were estimated. As we only included two of Schwartz' seven value dimensions (cf. Appendix 1), the estimation procedure recommended by (Schwartz, 1992)² was not feasible. Instead the respondents rated nine items representing the 'mastery' and 'harmony' dimensions (Schwartz, 1994) on a seven-point importance-scale. Also, before the conjoint task, data on the respondents' aided knowledge (one correct answer, two erroneous answers and one 'don't know') of the specific physiological effects of the 'enrichments' included in the conjoint design (i.e. oligosaccharides and Omega 3) were obtained.

Because many consumers perceive yoghurt and orange juice as inherently healthy whereas the opposite is true for spreads (Poulsen, 1999), these three foods were selected to represent the 'base-product' factor in the conjoint task. Apart from the 'health claim' factor, which involved a physiological as well as a prevention claim (cf. Section 1

Table 1
Attributes and operationalisation of the conjoint study

Attribute	No. of levels	Description of levels
Health-claim	3	(a) No claim (b) Physiological claim ^a (c) Prevention claim ^b
Enrichment	3	(a) No enrichment (b) Omega-3s (c) Oligosaccharides
Base-product	3	(a) Orange juice (b) Flavoured yoghurt (c) Spread
Processing	2	(a) Not organic (b) Organic
Price	2	(a) Normal price (b) Normal price + 20%
Interaction effects: product \times enrichment and enrichment \times 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'.

and Fig. 1), the operationalisation of the other factors is self-explicatory (cf. Fig. 1 and Table 1).

3. Results

Below, we first discuss the general attitudes to functional and genetically modified foods and the relation between these attitudes and the cultural values of 'harmony' and 'mastery'. Consecutively, the results of the conjoint analysis, i.e. the determinants of the perceived healthiness of functional foods, are discussed.

Table 2 illustrates the average attitudes towards functional foods (measured by three items, Cronbachs $\alpha = 0.75$) and genetically modified foods (measured by four items, Cronbachs $\alpha = 0.86$). On the average Danish and especially Finnish respondents expressed a more negative attitude towards genetically modified foods than American respondents. Regarding functional foods, however, the Finnish

Table 2
General attitudes towards functional and genetically modified foods; average values for 'mastery' and 'harmony'

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

^a Scale: 1–7 (less to more positive). National differences are significant (0.05).

^b By subtracting each respondent's average rating of all the items from his ratings of each item and averaging the standardised scores across the items. Higher values are more important.

² Schwartz (1992) recommends that the respondents select the two items that they value the least and assign them the number -1. The two most valued are assigned the number 9. The rest of the items are rated between -1 and 9. The resulting polarization would be unfeasible for our study.



Fig. 2. Importance attached to the dimensions 'mastery' and 'harmony' in selected countries. Based on results reported by (Schwartz 1994).

were more positive than the American and particularly the Danish respondents.

Considering the fact that the market shares for functional foods are generally higher in the USA than in Europe (Euromonitor, 2000), it is surprising that the Finnish respondents are more positive towards functional foods than the American respondents. In the later years, however, some of the functional foods introduced in Finland have enjoyed considerable success, whereas acceptance rates in Denmark has been moderate at the best.

As regards the structure of cultural values, the accordance between our study and that of (Schwartz, 1994) was assessed by a country-specific exploratory factor analysis with the nine value items representing the 'harmony' and 'mastery' dimensions. In all three countries, the factor analysis resulted in two dimensions that by and large reflected the structure as described by Schwartz.³

Table 2 illustrates the average scores for 'harmony' and 'mastery' in the three countries. In accordance with (Schwartz, 1994) results (cf. Appendix 2 and Fig. 2), the average-score for the USA sample was lower for harmony and higher for mastery compared to the Finnish and the Danish samples. Disaccoring with Schwartz' results, however, the latter two samples scored equally on both value dimensions. The discordance may be attributed to the fact that Schwartz' interviewed 130–200 teachers in each country, whereas we randomly sampled 500 households in each country.

The correlations between the individual respondents' value scores for 'mastery' and 'harmony' and their attitudes towards functional and genetically modified foods is illustrated in Table 3 below. The results indicate a positive relation between the mastery dimension and attitudes towards functional and genetically modified foods.

³ In all three countries, the items 'self-confidence' and 'choose one's own goals' loaded equally on both factors. A reliability analysis resulted in exclusion of these items. For all three countries the final two-factor solution accounted for more than 59% of the variation in data (1 factor less than 43%).

Table 3

Correlations between value dimensions and attitude towards functional foods and genetically modified foods (full sample, $n = 1533$)

	Attitude to FF	Attitude to GMO	'Mastery'
Attitude to GMO	0.20		
'Mastery'	0.07	0.29	
'Harmony'	−0.07	−0.33	−0.84

All correlations significant at 0.001.

The fact that the correlation is stronger in the case of genetically modified foods is in accordance with the fact that it has proven almost impossible to change the attitudes to genetically modified foods by informative means (Frewer et al., 2003). Conversely, the comparatively modest association between the cultural values and the attitudes to functional foods may indicate that these attitudes can be influenced. The discussion of the results of the conjoint analysis will elaborate on this issue.

Table 4 illustrates the OLS-estimated⁴ main and interaction effects for the aggregated conjoint function for each country. To improve the readability of the table, we report only two levels for each three level factor and one level for each two-level factor (as the scores sum to 1 for each factor). Furthermore, because the design implicates diametrical interaction between the two types of enrichment and the two types of processing, i.e. conventional and organic, only the latter interactions are reported.

In accordance with the general attitudes to functional foods (cf. Table 2), the results of the conjoint analysis indicate that the Finnish consumers accept the healthiness of specific functional enrichments more readily than the Americans and especially the Danes. Comparing enrichments, oligosaccharides were more attractive to Finnish respondents and less repelling to Danes and Americans than Omega-3s. This result is probably due to the fact that more respondents in all three countries knew about the physiological effects of Omega-3s (30% as compared to 7% for oligosaccharides, $n = 1533$). Respondents knowing the effects also had significantly higher ($p < 0.01$) average utilities for the corresponding enrichments (full sample ANOVA, $n = 1533$, for each of the two types of enrichments). Another explanation for the general scepticism towards oligosaccharides is the chemical connotations to the concept.

Regarding the main effects of health claims, the three countries also display a remarkably common pattern: In all three countries both kinds of claims have a positive influence on consumers' perception of the healthiness of foods. For Danish and Finnish respondents, the score for the prevention claim is only marginally higher than the score for

⁴ For each respondent, the ratings of the profiles with orange juice, flavoured yoghurt and spread were divided with the respondent's attitude towards each of these products. The base-product factor was excluded from the estimation of the conjoint functions.

Table 4
Utility functions in Denmark, Finland and the USA (healthiness as dependent variable)

	Denmark	Finland	USA
Health claim			
Physiological	0.4	0.4	0.4
Prevention	0.5	0.5	0.7
Enrichment			
Omega-3	0.0	0.4	0.1
Oligosaccharides	−0.1	0.2	−0.3
Processing			
Organic	0.3	0.4	0.0
Price			
Normal price + 20%	−0.1	−0.2	−0.1
Interaction effects			
Juice × Omega-3	−0.8	−0.7	−0.9
Juice × oligosaccharides	−0.8	−0.7	−0.9
Yoghurt × Omega-3	−0.6	−0.5	−0.6
Yoghurt × oligosaccharides	−0.6	−0.4	−0.6
Spread × Omega-3	1.4	1.2	1.5
Spread × oligosaccharides	1.4	1.1	1.5
Organic × Omega-3	−0.2	−0.3	0.0
Organic × oligosaccharides	−0.4	−0.4	0.0

The low explained variances (R-squares ranging from 0.17 to 0.19) were partly due to heterogeneity in respondent preferences. Therefore, a latent class segmentation (Glimmix) of the aggregated ($n = 1533$) conjoint data resulted in an explained variance of 0.47.

the physiological claim. The fact that the American respondents differentiate comparatively more between the claims may be explained by American consumers having experience of both types of claims, whereas EU consumers only have marginal experience of physiological claims and not at all of prevention claims (cf. Section 1).

The finding that Danish and Finnish respondents perceived organically processed food as more healthy than conventional foods, whereas American respondents were indifferent in this regard, is possibly related to the fact that the Nordic markets for organic foods and especially the Danish market (Bech-Larsen and Grunert, 2001) are among the most developed on a global scale. Although significant, the effects of price are smaller than the effects of any of the other factors. Therefore, the results indicate that price differences have only modest effects on perceived healthiness.

The most interesting result of the conjoint analysis is that all interactions between enrichment and base-product are larger than any of the main effects. In accordance with the results of (Levy et al., 1997), this indicates that the perception of food healthiness has less to do with health claims and functional ingredients than with the perception of the nutritional quality of the base product. The plausibility of this interpretation is further strengthened by the fact that the interaction effects between both kinds of enrichments and the base-product 'spread' are positive, whereas the interactions are negative for the other two base-products. Therefore, a likely explanation is that

consumers depreciate the enrichment of juice and yoghurt, because these products are perceived as healthy per se, whereas spread could benefit from functional enrichment, because this product is perceived as inherently unhealthy.

Although the interactions between enrichment and processing (the two bottom rows in Table 4) are less pronounced than the enrichment-product interactions, a similar conclusion can be drawn. The fact that the Danish as well as the Finnish results display a negative interaction between organic processing and both types of enrichments indicate that consumers in these countries are unlikely to accept functional enrichment of foods (e.g. organic) otherwise perceived as comparatively healthy. The fact that the interaction effect of processing on perceived healthiness is zero for the American respondents is in accordance with the fact that organically processed functional foods have already been successfully marketed in the USA.

4. Discussion

Although the Finnish respondents were generally more positive towards functional foods than the Americans and especially the Danes, the three samples showed only little differences as regards the determinants of the perception of the healthiness of functional foods. Furthermore, compared to the attitudes to genetically modified foods, the attitudes towards functional foods were only modestly associated with cultural values. Because of these findings, we recommend that further studies in the area should aim at the detection of cross-cultural segments rather than the identification of international differences.

As an information based strategy of attitude change is comparatively more effective for attitudes, which are modestly associated with cultural values, the finding showing that this is the case for attitudes towards functional foods, indicates that health claims could be used to change such attitudes. In accordance with this the results of the conjoint experiment leave little doubt that the use of health claims can enhance consumers' perception of the healthiness of functional foods. At the same time, however, the conjoint results also clearly indicate that consumers' perception of the healthiness of functional foods is more dependent on their perception of the nutritional qualities of the base-product than on any type of health claim. Therefore, the results imply that food producers considering marketing a functionally enriched alternative should be very particular in their research of consumer attitudes to the particular base-product and enrichment involved.

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