

## Young Adults and Seafood

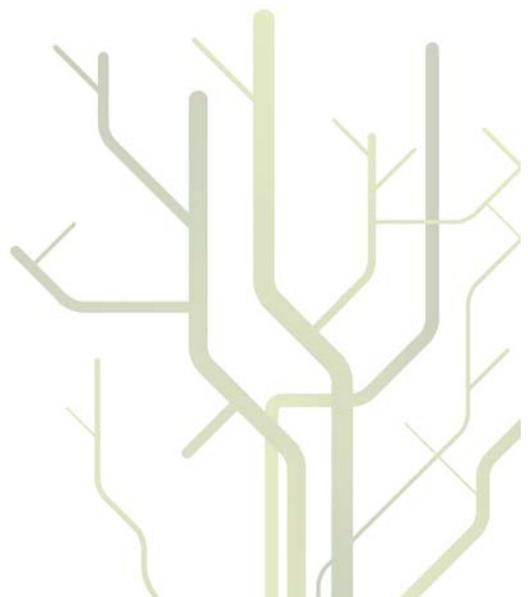
**Using the voice of consumers to develop new seafood product concepts aimed at increasing consumption**



### **Themistoklis Altintzoglou**

A dissertation for the degree of  
Philosophiae Doctor

May 2010





UNIVERSITY OF TROMSØ UIT

Faculty of Health Sciences

Department of Community Medicine

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## Table of Contents

Table of Contents .....	5
Acknowledgements .....	6
List of papers .....	8
Additional papers .....	9
Summary .....	10
1 Introduction.....	13
1.1 Food choice.....	13
1.1.1 Liking and food choice .....	13
1.1.2 Habits and food choice .....	14
1.1.3 Parents and food choice.....	14
1.1.4 Health and food choice .....	15
1.1.5 Young adults and food choice.....	16
1.1.6 Barriers and food choice.....	17
1.2 Seafood .....	17
1.2.1 Health and seafood .....	17
1.2.2 Consumers and seafood .....	19
1.2.3 New seafood product development .....	20
1.3 Aims .....	21
2 Summaries of papers .....	23
2.1 Paper I.....	23
2.2 Paper II .....	24
2.3 Paper III .....	25
2.4 Paper IV .....	26
3 Discussion.....	27
3.1 Methodological considerations .....	27
3.2 Discussion of main findings .....	31
4 Conclusions.....	39
5 Future prospects and suggestions.....	43
6 References .....	44
Appendix .....	54
PAPER I .....	57
PAPER II.....	81
PAPER III.....	111
PAPER IV .....	139

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Themistoklis Altintzoglou, Tromsø, 'green winter' of 2010

## List of papers

This thesis is based on the following papers and they are referred to in the text by their roman numerals.

### Paper I

Altintzoglou T., Vanhonacker, F., Verbeke, W. & Luten J. (2010). Association of health involvement and attitudes towards eating fish on farmed and wild fish consumption in Belgium, Norway and Spain. *Aquaculture International*. Accepted with revisions.

### Paper II

Altintzoglou T., Birch-Hansen K., Valsdóttir T., Odland J. Ø., Martinsdóttir E., Brunso K. & Luten J. (2010). Translating barriers into potential improvements: the case of healthy seafood product development. *Journal of Consumer Marketing*, 27(3), 224-235.

### Paper III

Altintzoglou T., Einarsdóttir G., Valsdóttir T., Schelvis R., Skåra T. & Luten J. (in press). A voice-of-consumer approach in development of new seafood product concepts. *Journal of Aquatic Food Product Technology*, in press.

### Paper IV

Altintzoglou T., Sveinsdóttir K., Einarsdóttir G., Schelvis R. & Luten J. (2010). Evaluation of seafood product concepts by young adults and families with young children from Denmark, Norway and Iceland. *Journal of Aquatic Food Product Technology*, Submitted, under review.

## **Additional papers**

In addition to the papers that this PhD thesis is based on, I have authored and co-authored other papers for international peer reviewed journals. These articles may serve as background material on the explanation of food choice of humans. However, they are not regarded as part of this thesis.

Kole A.P.W., Altintzoglou T., Schelvis-Smit R.A.A.M. & Luten J.B. (2009). The effects of different types of product information on the consumer product evaluation for fresh cod in real life settings. *Food Quality and Preference*, 20(3), 187-194.

Vanhonacker, F., Altintzoglou T., Luten J. & Verbeke, W. (in press). Does fish origin matter to European consumers? Insights from a consumer survey in Belgium, Norway and Spain. *British Food Journal*. in press.

Altintzoglou T., Verbeke, W., Vanhonacker, F. & Luten J. (in press). The image of fish from aquaculture among Europeans: impact of exposure to balanced information. *Journal of Aquatic Food Product Technology*, in press.

Perrea T., Brunsø K., Birch-Hansen K., Altintzoglou T., Einarsdóttir G. & Luten J. (2010). Decomposing the (seafood vs. meat) evening meal decision-making sequence: insights from a diary study in Norway, Iceland and Denmark. *Appetite*, under review.

## Summary

Consumers in many European countries do not equally meet the recommended daily intake levels for seafood. Various factors that can influence seafood consumption behaviour have been identified. However, the exploration of potential barriers to seafood consumption could provide knowledge that can assist the development of new seafood product concepts that fulfil the needs of consumers. There is a difference in seafood consumption frequency between age groups. In particular, young adults consume seafood less frequently than older consumers and thus are the point of focus for this thesis.

The main aim of this PhD thesis was to contribute to the understanding of young adults' preference or avoidance of seafood. Additionally, to define and pre-test the relationship of health involvement and attitudes towards eating fish with fish consumption behaviour. Furthermore this thesis can provide input for future seafood product development by exploring barriers and opportunities for increasing seafood consumption. Moreover, advice will be given on how the existing seafood products can be improved through the NPD process in order to increase their acceptability and attractiveness. Finally, insight into young adults' seafood acceptance and potential choices, as well as confidence in seafood preparation and consumption when exposed to specific new seafood product concepts will be given. The results will be used for a next step towards a consumer led development of seafood product prototypes. To reach these aims, four studies were performed in several European countries.

The results of the first study, carried out in Belgium, Norway and Spain, suggested a discrimination of consumer groups, indicating a lower health involvement by younger consumers. Additionally, the results showed a positive association between health involvement and attitudes towards seafood consumption. Furthermore, it was shown that health involvement and attitudes towards seafood consumption were positively associated with total seafood consumption.

The second study used focus group discussions in Denmark, Iceland and Norway and was aimed at a deeper understanding of the barriers towards seafood consumption young adults are facing. The results of this study indicated that the participants thought of seafood as either healthy or convenient, although there were concerns about the amount of effort required to

prepare it. These concerns resulted in an expression of their need for products that are attractive, healthy, palatable and convenient. In particular, newly developed products should be accompanied by clear advice on preparation methods and ingredients. Additionally, an increase in seafood availability coupled with lower prices would encourage these consumers to add seafood to their diet. This study's results led to nine consumer values which were used as input for the development of new seafood product concepts.

In the third study, carried out in Iceland and Norway, various seafood product concepts were developed and tested on a web-based experimental survey. The development of the seafood product concepts was based on the values which were reported by the consumers in our focus group study. The young consumer's evaluations of the seafood product concepts showed a number of preferences for the experimental seafood product concepts. The products which were visible in their packaging, not minced, familiar by means of proposed recipes and consisting of only one or more fish species were preferred. Young consumer's attitudes indicated high interest in natural, new and convenient products.

In the fourth study, carried out in Denmark, Iceland and Norway, a smaller number of seafood product concepts than the previous study were further developed and tested on a web-based experimental survey. The development of the seafood product concepts was based on the evaluations which were reported by the consumers in the previous concept test study. The consumer's evaluations of the seafood product concepts showed a clear ranking of seafood product concepts. The innovative cod and salmon portions with wild berries were on the top of the list together with the Nordic cod fillets. As the size and shape of the fish in the seafood product concept decreased, the product concepts were less appreciated. The least appreciated product concepts were the ones based on minced fish.

The knowledge from the four studies led to the development of new seafood product concepts that can decrease the distance between young adults and their final choice for seafood products.

Keywords

Young adults; consumers; liking; attitudes; food choice; seafood; new product development



# **1 Introduction**

Food is a source of necessary nutrients and regular satisfaction. In a day, each individual consumes a significant amount of food and drinks in order to satisfy specific physiological needs. However, since human senses are associated with positive and negative affective reactions, food is also a source of pleasure or aversion. Individuals are naturally attracted to sweet and salty food while they experience an aversion to bitter and sour food (Capaldi and Privitera, 2008; Clark, 1998; Messer, 1989).

Increased availability of convenient food with high energy content combined with the aforementioned in-built or learned preferences make individuals more prone to choose less healthy, energy-dense food such as fast-food (Birch, 1999). The regular consumption of fast-food is known to lead to a decrease in the intake of specific nutrients which are known to be beneficial for a person's health (Paeratakul et al., 2003).

## ***1.1 Food choice***

Food that ends up in the daily meals is in most cases chosen by the persons that consume the meal or someone who prepares the meal for them. Food choice behaviour is influenced by many factors (Kamphuis et al., 2006; Köster, 2009; Shepherd and Dennison, 1996). Some of the main factors that influence food choice relevant to the studies described in this thesis will be described below.

### **1.1.1 Liking and food choice**

Whether a food item is liked or not can certainly predict a large part of food choice (Brug et al., 2008; Tuorila and Pangborn, 1988). Liking of food can be aroused and influenced by a combination of affective and/or cognitive processes, but is mainly dominated by the affective ones (Cantin and Dubé, 1999). Liking can be strongly influenced by expectations individuals have based on their past experiences with the same food item or a relevant food category or combination of foods (Deliza and MacFie, 1996; Schifferstein et al., 1999). Furthermore, liking is considered to be a stronger predictor of a choice for a food item than intention to

consume a product (Saba et al., 1998). On the other hand, any type of pressure against one's own liking has been considered to lead individuals away from the pleasure of eating and to generate over-occupation with the subject of food (Mela, 2001). Eventually, disliking a food, without doubt, creates aversion to the consumption of that food (Rozin and Zellner, 1985). One could conclude that independent of the origin of the feelings of affection and/or aversion towards a specific food, the resulting choice and pleasant consumption of the specific food can only take place when affection is at least higher than aversion.

### **1.1.2 Habits and food choice**

Another important predictor of food choice is habit. Habit essentially originates in repetitive past consumption and satisfaction through repetitive confirmation or positive disconfirmation of expectations. Past behaviour has been proposed as a better predictor of actual behaviour than attitudes towards the behaviour or intentions to realise the action in many circumstances (Bem, 1972; Köster, 2009; Wilson, 2002). Furthermore, intention to consume seafood is found to be predicted partly by habit and the associated past consumption behaviour (Honkanen et al., 2005). In particular, Honkanen et al. (2005) showed that the effect of habit on intended behaviour was stronger than the effect of attitudes due to the strong association between past behaviour and reported intentions. There is evidence that most individuals are subjects to this habitual behaviour, which is associated with specific environments and consequences. This habitual behaviour is strongly related to the availability of specific food items and the type of food that these individuals were exposed to in their childhood (Birch, 1999). In practice, past food consumption behaviour and frequency have been considered as one of the appropriate variables which can be used to measure food habits.

### **1.1.3 Parents and food choice**

Since habits are associated with past behaviour, the types of food that an individual is exposed to during upbringing can play an important role in future food consumption. Consequently, parental promotion, prohibition or avoidance of specific foods can influence food choice behaviour (Sondergaard and Edelenbos, 2007). In particular, parents have an influence on shaping the tendencies for specific food preferences in children (Benton, 2004). Furthermore, it has been demonstrated that obesity in young adults can be highly associated

with parental obesity due to behavioural and genetic factors (Whitaker et al., 1997). Additionally, resemblance in fat and food consumption behaviour is found between parents and their adolescent children as well as between spouses (Feunekes et al., 1998). Furthermore, parental healthy food habits and concerns about children's weight have been found to be an environmental factor with a negative influence on child overweight (Birch and Fisher, 2000; Birch et al., 2003). Finally, parental behaviour as role models and as providers of healthy food has been shown to increase adolescents' consumption of fruit, vegetables and dairy products (Hanson et al., 2005). Parental control of food preferences is associated with food practices in late adolescence in specific cultural settings (Unusan, 2006). However, young consumers also seem to react negatively to parental advice about healthy food such as fish and choose less healthy meals (Honkanen et al., 2004). Suggesting and not imposing food choices may be a promising method to achieve long term food choice changes (Mela, 2001; Tuorila, 2000). Summarising, one could argue that children's and young adults' food choices are influenced by their parents in many ways.

#### **1.1.4 Health and food choice**

There is evidence that consumers report positive attitudes towards healthier products and report high scores on intentions to consume those (Kozup et al., 2003). However, the possibility that healthier products are not the final choice is also described (Köster et al., 1987; Weijzen et al., 2008). This may be due to the implicit tendency to report behavioural intentions based on past behaviour and not based on deliberate descriptions of plans (Bem, 1972). Young consumers in particular are less influenced by information about health related attributes of food (Roininen et al., 1999). However, environmental changes such as increased availability could increase convenience and access to healthier choices (Wiegersma et al., 2000).

Information about the healthiness of food does not always have a positive effect on food choice behaviour. Negative effects of health information on the choice of a snack in a canteen have been reported in the past (Köster et al., 1987). Additionally, Raghunathan, Naylor and Hoyer (2006) discussed that there is an implicit positive association between unhealthy and tasty food products. In the case of snacks such as chips, healthier versions of the product could not win consumers' preferences due to the strong effect that taste had on food choice

(Tepper and Trail, 1998). Furthermore, Jansen et al. (2008) demonstrated that restriction of a food can lead to changes in children's behaviour. When a food item was described as forbidden, the total intake of this item was increased, irrespective of its attraction or health qualities. Even though a part of the young consumer population could be approached by additional health information, this approach would not reach out to those that are not interested in or are negative about healthy food choices. A way to attract the attention of the latter group might be by using appropriate images of relevant and entertaining role models (Bruhn, 2008).

### **1.1.5 Young adults and food choice**

There are differences between food choices among different age groups due to variations in the relevance of health concerns (Wandel and Fagerli, 1999). These differences go along with changes in identity development (Hill, 2002). Young adulthood represents the transition from the complete development of the singular self and identity to the social out-reach (Erikson, 1968). It has been suggested that this stage of life is the point where all cognitive development starts being expressed in behaviours which determine each person's character (Piaget, 2008). Furthermore, it is apparent that moving into adulthood is accompanied by changes in reasoning and the perception of ethics. Young adults have a better understanding of the consequences of their choices and the obligations and responsibilities that come along with commitments than do adolescents (Gilligan and Murphy, 1979). This interaction between structured rules and emotions leads to the ability to exercise more supple judgment of situations. This is a fertile ground for food choices which correspond more to young adults' hedonistic preferences than healthy ones due, to their clear understanding of the differences between what is socially acceptable and what they personally prefer.

One of the changes in life that define an actual and not only historical or numerical change in age and maturation is a change in the household situation. Some of these changes may be moving out of home to live alone, living together with a partner, having the first or following child and of course losing household members due to their relocation or passing away. Research shows the most common relocation time (change in residence) for Western societies occurs at about 20 years of age (Arnett, 2000). Moving out of the parental home, for example, to study at a university, has been shown to influence food habits of young adults towards the

development of personal consumption patterns which fit the situation in which they are living (Papadaki et al., 2007). Young adults tend to obtain more energy at fast-food restaurants than at home when compared to older adults or children under the influence of parents (Nielsen et al., 2002). As a result, young adult university students tend to decrease their consumption of fresh fruit, cooked and raw vegetables, fatty fish, seafood and olive oil and increase their sugar, alcohol and fast-food intake (Papadaki et al., 2007). These changes in food habits deriving from their household change indicate that young adults could benefit from a positive shift in their food choice behaviour, such as an increase in fruit, vegetable and seafood consumption.

### **1.1.6 Barriers and food choice**

Two of the most common barriers for young adults in preparing their own healthy meals are the lack of time and cooking skills (Shepherd et al., 2006). Young adults who prepare their own meals tend to consume less fast-food and their food intake is closer to the common dietary recommendations for fat, calcium, fruit, vegetables and dietary fibre (Larson et al., 2006). These practices could be more stimulated if young consumers were advised on how to prepare healthy meals in an easy way. Additionally, advice on how to identify healthier readymade snacks and meals would increase the overall healthiness of their diet (Larson et al., 2008).

## ***1.2 Seafood***

The term seafood is used in this thesis to encompass wild and farmed, fish, crustaceans and shellfish, both of marine and freshwater origin in fresh, frozen and processed product forms (Jaffry et al., 2004).

### **1.2.1 Health and seafood**

Seafood and particularly, fish has been repeatedly described as a health promoting food category (Mozaffarian and Rimm, 2006; Sidhu, 2003). The health benefits of seafood consumption have recently been reviewed (Undeland et al., 2009) showing regular seafood

consumption lowers the risk for coronary heart disease. For many other diseases (diabetes II, cancer, cognitive decline or development) more research is needed to demonstrate the health beneficial effects of eating seafood.

Public health organisations in various countries recommend that fish should be consumed at least two times per week ("Advice on fish consumption: Benefits and Risks," 2004). However, the average fish consumption in Europe is considerably less frequent than recommended by the public health organisations daily intake and estimated to be around once per week (Brunsø, 2003; Myrland et al., 2000; Scientific Advisory Committee on Nutrition and Committee on the toxicity of chemicals in food, 2004; Similä et al., 2003; Welch et al., 2002). Based on the fish supplies, the average fish consumption in Europe was reported as 20.8 kg (live weight equivalent per capita) in 2005 (FAO, 2009), which indicated that fish consumption frequency was on average around one time per week, estimated from average fish serving sizes (Einarsdottir et al., 2007).

These findings are further supported by self reported questionnaires about seafood consumption among European consumers. Fish consumption frequencies reported by the consumers confirmed the estimated mean consumption of once per week and in countries like the Netherlands, Belgium and Poland were even lower (Honkanen et al., 2005). In particular, it has been documented that fish consumption is even lower for young adults, when compared to older consumers. It is estimated that young adults consume almost half or the amount of fish when compared to older consumers (Li et al., 2001; Nayga and Capps, 1995; Steingrimsdóttir et al., 2002). This low seafood consumption frequency of young adults is partly caused by the barriers described in a previous paragraph.

However, one of the ways to improve this situation is consumer oriented new seafood product development. The development of seafood products that are tailor made based on the preferences of the specific consumer group will increase the probability that these products are chosen by these consumers. This increase of available products that are liked by the consumers will decrease the possibility of disappointment due to disconfirmed expectations for an attractive seafood product. Eventually, the latter change will lead to a realisation of their willingness for a change in food habits towards eating more seafood.

### **1.2.2 Consumers and seafood**

Various factors that can influence consumers' seafood eating behaviour have been identified. One of these factors is product quality, a label of which is found to determine the products that various types of consumers choose in the market place (Verbeke et al., 2007c). Furthermore, attitudes towards choosing fish for a meal have been found to lead to the actual choice for fish in many cases (Brunsø, 2003). Additionally, a high involvement with seafood is shown to lead to a higher seafood consumption frequency (Olsen, 2001). Food choice habits and past behaviour have been presented as strong determinants of seafood choices as well (Honkanen et al., 2005). Furthermore, beliefs about benefits and risks related to health that originate from the frequent consumption of fish have been shown to influence fish consumption positively or negatively (Verbeke et al., 2005). An important factor that is shown to act as a barrier to the consumption of fish is convenience. Consumers that believed fish is not convenient to prepare also reported a low fish consumption frequency (Olsen, 2003; Rortveit and Olsen, 2007). An important factor which determines seafood consumption frequency is age. Older consumers consume fish more frequently (Olsen, 2003), mainly due to their higher involvement with health (Olsen, 2003; Pieniak et al., 2008). Additionally, some particular groups of consumers are highly interested in animal welfare practices and are positively influenced if they are made aware of animal friendly practices during the growth, catch and handling of fish (Vanhonacker et al., 2006a; Vanhonacker et al., 2006b). Finally traditions with specific types of products such as frozen fish have a positive effect on the re-use of the same type of products (Sveinsdóttir et al., 2009).

Some consumer research has been performed on the overall image of seafood products, the image of seafood production methods and their impact on fish consumption behaviour. Consumers perceive farmed fish as being of lower quality when compared to fish captured in the wild (Kole, 2003; Verbeke et al., 2007a; Verbeke et al., 2007c). It was recently shown that the less positive image of fish from aquaculture does not correspond with actual taste preferences. It was shown that despite its possibly preferable sensory properties, the image of fish from aquaculture can influence the perception of fish products negatively (Kole et al., 2009; Luten et al., 2002). The image of farmed fish has usually been suggested to be less positive than the image of wild fish. However, consumers do not generally consider nor are they aware and knowledgeable of the farmed origin of fish (Vanhonacker et al., in press).

### **1.2.3 New seafood product development**

The development of new seafood products for young consumers is a challenge and may contribute to their behavioural change towards choices of healthier meals. The combination of the diversity of seafood raw material, expertise in the production of traditional seafood products, new emerging seafood technologies and consumer science is a strong basis for the development of new seafood products to meet young consumer's demands. However, new product development (NPD) is a high risk activity. This is demonstrated by the high probability of failure (70%) in the NPD process (Cooper, 1999; Cooper and Edgett, 2005). However, examples of the successful use of consumer oriented seafood product development have been reported (Morrissey, 2006; Sirois, 2006). A number of studies have focused on advice for successful NPD. Some factors that influence new product performance suggest a number of variables that can distinguish new product success from failure mainly depending on processes, resources and strategies. Some of the key requirements for success in NPD are speed to market, quality management, multifunctional teamwork, sense of commitment and a systems approach (Cooper and Edgett, 2005; March-Chordà et al., 2002; Xueli et al., 2002). Van Trijp and Steenkamp (2005) reviewed determinants for success and failure of new products, which were analysed in different studies. They distinguished determinants related to consumers, such as the proper definition of product concepts and adding value to products for specific target consumers. Additionally, they reported important organisational aspects, such as proper structuring of the design process, appropriate embedding in the organisation and commitment from top management. Furthermore, they distinguished competition-related factors which include competitive activity and turbulence, size and attractiveness of the market. Finally, they referred to the accurate measurement of market size and desired positioning as typical marketing-related determinants of new product success.

Recently, four main factors for the failures in new seafood product development were identified by Ottesen and Grønhaug (2006; 2007). The first factor was that products were mainly invented within the firm and not based on inputs from consumers. Second, several products did not gain sufficient distribution through retail chains, who also were rather impatient and removed products that did not perform well within a few months. Third, several products were priced higher than consumers' willingness to pay. This was related to production costs which were much higher than the companies had planned. A final failure factor was that products that had been successful in a specific market where presumed to be

as successful in another market. However, success was not repeated due to different consumer preferences in different cultures as well as lack of ‘understanding’ of the actual products.

Taking all the risks during NPD, one must be well prepared and take all necessary precautions before a new product is launched in the market. One model which incorporates all the necessary precautions while leaving space for innovation is Cooper’s Stage-Gate<sup>®</sup> model for NPD (2008). Based on the principle behind the Stage-Gate<sup>®</sup> model, the development of new products follows a sequence of actions which can secure market success by using the voice-of-the-consumers. First ideas are created in the discovery stage. Then, consumers’ opinions and values are used to develop and fine tune product concepts. These product concepts are then tested by means of virtual tests (web-based concept-tests). When the virtual testing is conclusive the product development can begin. A short scale development of the product concept can be performed in order to survey consumers’ opinions on the final product test. When all these steps lead to a specific product, it can be launched and the post-launch increased success rate can then be evaluated (figure 1).

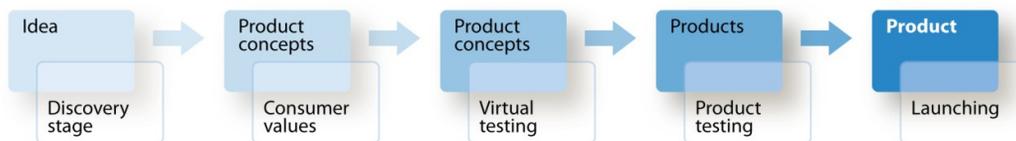


Figure 1. An overview of a new product development system inspired by the Stage-Gate<sup>®</sup> model (Cooper, 2008)

### ***1.3 Aims***

The aims of this PhD thesis were:

- a. To contribute to the understanding of young adults’ preference or avoidance of seafood.

- b. To define and pre-test the relationship of health involvement and attitudes towards eating fish with fish consumption behaviour.
- c. To provide input for seafood product development by exploring barriers and opportunities for increasing seafood consumption.
- d. To advise how existing seafood products can be improved through the NPD process in order to increase their acceptability and attractiveness.
- e. To test young adults' seafood acceptance and potential choices, as well as confidence in seafood preparation and consumption when exposed to specific new seafood product concepts.

The results will be used for a next step towards a consumer led development of seafood product prototypes.

## **2 Summaries of papers**

### ***2.1 Paper I***

#### **Association of health involvement and attitudes towards eating fish on farmed and wild fish consumption in Belgium, Norway and Spain.**

Consumers in European countries often do not meet the recommended daily intake levels for fish consumption. Various factors that can influence fish consumption behaviour have been identified, but limited research has been performed on fish consumption behaviour, discriminating between farmed and wild fish.

The present survey study confirmed differences in total fish consumption, farmed fish and wild fish consumption behaviour in Belgium, Norway and Spain. Spanish consumers more frequently consumed fish in each category than Norwegian consumers. Belgian consumers reported the lowest fish consumption frequency. Accordingly, health involvement and attitudes towards fish consumption decreased from Spain over Norway to Belgium, suggesting a positive association of health involvement and attitudes towards fish consumption with total fish consumption. Similar effects were found for farmed and wild fish consumption. In general consumers in all countries were poorly aware of the origin of the fish they consume, despite the mandatory indication of origin on fish labels. Across countries, an increased awareness about fish origin was found with increased fish consumption.

The findings of the study indicate that farmed and wild fish consumption should be further stimulated among Belgian, Norwegian and Spanish consumers in association with a healthy and positive meal. Additionally, given the limited awareness of the origin of fish, transparency on the issue of farmed origin will be important in order to anticipate potential adverse communication.

## ***2.2 Paper II***

### **Translating barriers into potential improvements: The case of new healthy seafood product development**

The aim of this study is to explore potential barriers to seafood consumption among young adults and the parents of young children. Knowledge of these barriers will be used to assist in the development of new seafood product concepts that fulfil the needs of consumers.

To gather this information, twenty-eight infrequent consumers of seafood participated in three semi-structured, two-hour focus group discussions in Denmark, Norway and Iceland. The results were then linked to the Stage-Gate model for consumer-based new product development (NPD).

The participants thought of seafood as either healthy or convenient, although there were concerns about the amount of effort required to prepare it. These concerns resulted in an expression of their need for products that are attractive, healthy, palatable, and convenient. In particular, the newly developed products should be accompanied by clear advice on preparation methods and materials. An increase in seafood availability coupled with lower prices would encourage these consumers to add seafood to their diet. Purchase-point-marketing and habitual behaviour were found to implicitly skew planned behaviour. Inputs for NPD related to convenience, attractiveness, quality, trustworthiness, knowledge and requirements about seafood preparation are discussed.

The present study combines qualitative methods to lead to practical input for NPD focusing on overcoming the barriers that keep consumers from choosing existing healthy seafood products. The importance of the consumers' confidence in their ability to successfully prepare a seafood meal was revealed and can be used in Stage-Gate based NPD.

## ***2.3 Paper III***

### **A voice-of-consumer approach in development of new seafood product concepts**

This paper describes a consumer based approach for development of new seafood product concepts among young adults in Norway and Iceland. The aim of the study was to gain insight into how young adults determine their acceptance of seafood and make potential product choices. Additional insights measured were confidence in seafood preparation and consumption choices when exposed to specific new seafood concepts.

Based on consumer-reported values, three seafood product concepts were evaluated by 354 consumers in a web-based, conjoint experiment in Norway and Iceland.

Consumers' evaluations showed a number of consumer preferences for specific seafood product concepts partly associated with and partly conflicting with their original values. Understanding consumer attitudes can help to explain these results.

The results of this study will be used as a guide for the next step in developing seafood product concepts.

## ***2.4 Paper IV***

### **Evaluation of seafood product concepts by young adults and families with young children from Denmark, Norway and Iceland.**

This paper describes the results of a study that tested fourteen seafood concepts among young adults and families with young children in Denmark, Norway and Iceland. This study aimed at gaining insight into the acceptance of new seafood product concepts by individuals with low seafood consumption. Based on consumer-reported values and previous concept-testing, fourteen seafood product concepts were tested by 296 consumers in a web-based experiment.

Consumers' preferences depended on the size of fish offered, the presence of information and fish species offered. Young adult consumers evaluated the product concepts differently than parents of young children. Three consumer clusters, based on attitudinal variables, were identified explaining the differences in the evaluation of the product concepts. The outcome of this study will be used to develop product for realistic in-home testing.

## **3 Discussion**

As previously described, the first aim of this PhD thesis was to contribute to the understanding of young adults' preference for or avoidance of seafood. Additionally, to define and pre-test the relationship of health involvement and attitudes towards eating fish with fish consumption behaviour. Furthermore this thesis provides input for future NPD by exploring barriers to and opportunities for increasing seafood consumption. Moreover, advice will be given on how the existing seafood products can be improved through the NPD process in order to increase their acceptability and attractiveness. Finally, insight into young adults' seafood acceptance and potential choices, as well as confidence in seafood preparation and consumption when exposed to specific new seafood product concepts will be given. The results will be used for a next step towards a consumer led development of seafood product prototypes.

### ***3.1 Methodological considerations***

In order to work towards the aims of this thesis, the most appropriate research methods had to be chosen. The typical scientific approach would be to directly design questionnaires and experiments based on existing literature. However, being aware of the differences between reported planned behaviour (Ajzen, 1991, 2001, 2002; Ajzen and Driver, 1991, 1992) and actual behaviour (Fiates et al., 2008; Fox and Ward, 2008; Roos et al., 2005; Weijzen et al., 2008) led to a more detailed investigation of the most appropriate methods for the studies in this thesis. First, the fact that food choice is sometimes a cognitive, but mainly an implicit process (Köster, 2003) was considered. Additionally, the fact that researchers that design and interpret the results are directed to expected results was taken into account (James, 1890). The decrease in implicit bias from both participants and researchers was targeted by the use of qualitative methods to define the variables to be used in the product evaluation. Additionally, the design of each step was based on the results of the previous step in order to decrease researchers' bias and follow a consumer oriented approach.

Furthermore, the matter of individualism and generalisation of the results was considered. It is commonly accepted that results found in a certain group, country or time in history cannot

be extrapolated to a bigger group or to population level without caution. Additionally, each model has been designed to reach a specific aim and led to encoding and decoding of the behaviour of interest in the best way for each study (figure 2). However, each behavioural system is different. In order to secure accuracy and decrease bias in the studies presented in this thesis, relevant variables were not only based on the literature but were mainly defined based on pretesting and in-depth exploration. This way of securing the study design can prevent misleading influences on a study of a specific group, in a specific time and place (Köster, 2009).

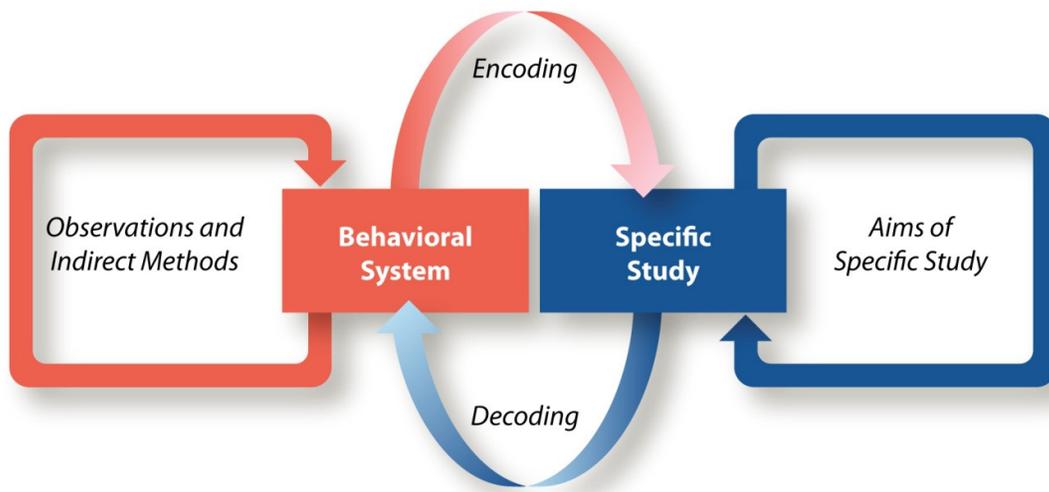


Figure 2. General structure of research

The methods that were chosen were: 1) survey based definition and verification of variables and target groups 2) in-depth qualitative exploration by means of focus groups and in depth interviews and 3) web-based product concept testing and re-testing (figure 3). Starting with a clear definition of target groups and the problem on various versions of the target product (i.e. farmed or wild fish in paper I), followed by an in-depth exploration of consumers' barriers and values related to seafood consumption (paper II) and closing this study with consumer oriented, experimental test verification (paper III & IV) was considered as an appropriate approach for our subject of interest.

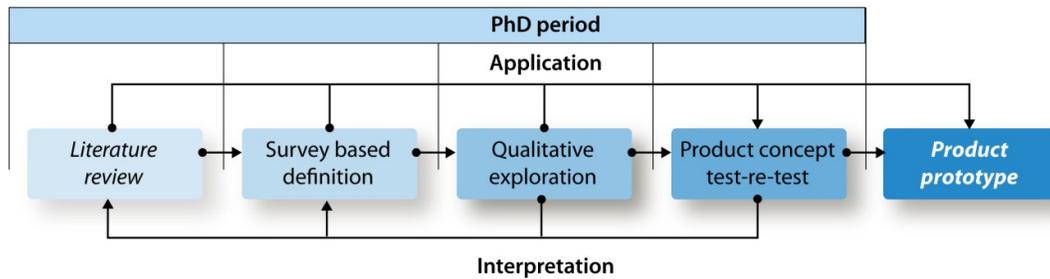


Figure 3. Time sequence of the methods that were used in the four studies

Our first method was the use of questionnaires about attitudes and personality traits and their associations with food consumption behaviour and socio-demographic characteristics. This is a method which has been commonly used in consumer research and the development of products for many years (Cox et al., 2008; Grunert and Scholderer, 2000; Saba et al., 1998; Scholderer and Grunert, 2001; Verbeke et al., 2007b). This method is considered convenient and fruitful, since a carefully chosen list of questions can generate extensive, quantifiable insights. Due to its broad acceptance and convenience, this method was used to direct our understanding of the relationship between young adults and seafood and clearly define and pre-test the relevance of attitudes and health involvement across three European countries (Belgium, Norway and Spain) two product categories (i.e. farmed or wild fish) and all adult age groups. By following this pre-testing procedure, the relevance of studying attitudes towards fish of any origin and health involvement of young adults in the Nordic countries was secured.

Focus group discussions and in-depth interviews including participants that have experienced a specific phenomenon (i.e. barriers to seafood consumption) were considered the appropriate method to use as a second step in the process of understanding consumers and their views of seafood (Endacott, 2008; Mays and Pope, 2000). This method provides invaluable insight into realistic and complex perceptual matrices that can later be used to explain behavioural patterns and lead to fruitful conclusions (Draper, 2004; Meyrick, 2006). Using qualitative consumer data as input for NPD is not as common as in other fields of research (van Kleef et al., 2005a, b). However, a careful exploration of the consumers' discussions on the subject of our interest provides valuable input. Analysing the information that is provided by the

consumers can lead to a better understanding of the current market situation (Søndergaard, 2005; Søndergaard and Harmsen, 2007). In addition, consumer perspectives are captured without being directed by pre-selected items in a questionnaire. This information can then be used as the voice of the consumer when ideas for new products are generated.

Our choice for a final method was a web-based product concept test and re-test with a questionnaire on evaluations of the concepts and a questionnaire about attitudes and personality traits. This type of test does not expose the participants to the actual products. Nevertheless, the high value of this method is in its convenience with testing various products in order to identify which is the most successful one to be used in further testing (Dahan and Srinivasan, 2000). The design of such a method is usually a cross-over between case-control and conjoint designs (modified Greco-Latin square design), due to the number of varying factors that are present in complete product concepts. Usually, participants answer questions on seven or nine point Likert scales. Some examples of commonly used questionnaire evaluation scales are: a) general liking, b) overall appreciation, c) perceived trustworthiness of the product, and so on. Some examples of commonly used attitudinal questionnaire scales are: a) the health orientation scale (Ophuis, 1989) which can be used to measure health interest, b) the personal health scale (Schifferstein and Oude Ophuis, 1998) which can be used to measure the perceived need to take action in improving personal health, c) the food neophobia scale (Pliner and Hobden, 1992) which can be used to measure food curiosity, d) the attitudes towards naturalness (Grunert et al., 1993) which can be used to measure interest in the naturalness of food and e) other items from the literature which can measure convenience orientation, perceived convenience of seafood, etc. (Olsen et al., 2007). Finally, questions about socio-demographic characteristics and consumption frequency are presented to the participants in order to capture a detailed description of the specific study group and assist in groupings and comparisons during the analyses. The questionnaire used in the latest study in this thesis (paper IV) is presented in the appendix as an example.

Once one broad concept test is successfully completed, it indicates directions for a more specific follow-up concept test. The follow-up concept test can then be directed precisely at the point on which further development of a product concept should focus. Following this procedure, the selection of product concepts and variables to be included in further experimental designs are purely based on the consumers' evaluations. The use of consumers' evaluations in the design and definition of each step of product concept development is what

defines it as a pure consumer oriented new product concept development. Consumer oriented product concept development has a minimised amount of researcher bias and secures market success for the developed product. Additionally, consumer oriented product concept development aims at removing the bias that originates from industry oriented new product development. Focusing solely on the needs of the industry without paying close attention to the needs of the consumers could lead to products that may not be appreciated by the consumers.

After the completion of the two concept tests of the third and experimental part of the study, the previous exploratory steps can be recited. At that final stage, the interpretation of the results could be performed based on the input from the participants, the existing literature and to some extent personal interpretation (figure 4). Following this strategy, the design of the detailed method to extract information from the participants' input and the final interpretation can be considered moderately closer to real life settings. Additionally, the interpretations of the researchers that perform the study and the authors of the existing literature can be considered indirectly filtered by the data produced by the participants in the studies.

Considering the importance of the confirmation of the results in different countries and the potential conclusions on an international level led to the decision to study various countries within the European continent.

### ***3.2 Discussion of main findings***

In paper I involvement in health was found to be a matter that varies with age which is in agreement with Olsen (2003). It was indicated that single, young males were the least involved in health and the consumption of healthy food, as opposed to the less young, non single females. Additionally, it was shown that attitudes towards the consumption of fish were significantly associated with the consumption of fish from wild or farmed origin. In the present study it was found that health involvement was a predictor of consumers' attitudes towards fish consumption in Belgium, Norway and Spain, which is in agreement with the study by Olsen (2003) in Norway. Pieniak et al (2008) showed that involvement in health affects interest in healthy eating, which influences total fish consumption. The latter was clearly exemplified before, when younger subjects were found to be weakly influenced by

health related attributes of food (Roininen et al., 1999) or by environmental changes that could increase convenience and access to healthier choices (Wiegersma et al., 2000). Combining the present findings and those from Olsen (2003) and Pieniak et al (2008), we conclude that health involvement is associated with age. Furthermore, there is a direct positive relationship of health involvement with fish consumption. Additionally, attitudes towards fish consumption were positively associated with the actual consumption of fish and as has been previously discussed, this relationship could be amplified by a high involvement in health. The results from this study indicated that a further exploration of health involvement and attitudes towards fish consumption of young adults in the Nordic countries (Norway, Iceland and Denmark) was relevant within the frame of new seafood product development.

As expected, the use of focus group discussions as a starting point for in-depth exploration led to new insights regarding seafood perception by the participants. The overall value of this method was the understanding of some consumers' values regarding seafood products. These values were: healthiness, satiation, convenience, visibility & trust, freedom of choice, successful preparation, image improvement, availability and price. These nine consumer values were used in order to understand barriers to and opportunities towards the increase in seafood consumption by young adults and to design product concepts that would increase their final choice for seafood.

One of the findings of the focus groups study (paper II) was that participants linked food with their health and discussed the trade-off between health and convenience. They reported feelings of guilt that accompanied their choices for a meal focused more on convenience than on healthiness. This type of guilt is not a new notion (Soetens et al., 2008; Wardle and Solomons, 1994), but the participants talked about it as leading them to some minor interest in being involved in the preparation of the meal in order to feel closer to having a healthy diet (Larson et al., 2006). They also indicated that when a product was convenient, they were suspicious about its quality and healthiness. Information about the quality and the healthiness of a convenient product would improve its image and increase their willingness to choose the product. Most participants were aware of the positive health benefits of seafood. The general idea that "seafood is good for you" was present and led to willingness to consume more seafood (Roosen et al., 2007). However, the final choice for seafood was not necessarily made due to inconsistency between planned and actual behaviour (Köster, 2009). The latter

resulted in a feeling of guilt about not being cautious with regards to personal health, together with the feeling of their actions being inconsistent with their knowledge (Paisley et al., 2001). Feelings of a lack of time to prepare a meal are probably an indication of food being a lower priority than work, education and hobbies (Jabs et al., 2007). A factor that could influence the choice for a seafood meal was the presence of children in the household. It was believed that “good habits” should be taught to and performed when they start having children, which involved healthy eating (Fiates et al., 2008).

When seafood product concepts were tested for the first time (paper III), they were rated at the midpoint of the scales for convenience. This medium convenience of the seafood product concepts could be an indication that consumers are unsure about the convenience because they could not use the product in reality but only evaluate images of and information about the product concepts. Moreover, since the consumers considered seafood as not convenient, a rating around the scale’s mid-point could be an indication that the product concepts were perceived to be relatively more convenient than the participants expected. This was clearly illustrated in Iceland, where consumers reported the lowest scores in overall convenience of seafood and the highest perceived convenience of the experimental seafood product concepts. This outcome is of significant value due to the fact that the participants of this study were selected for having a low seafood consumption frequency due to barriers related to convenience.

In paper II, the outcome of the focus groups showed that seafood was strongly associated with healthiness, but also led to negative associations. Across the three countries the participants mentioned poor access to seafood of high quality, the high price of seafood and insecurity related to their own cooking skills and in judging what good quality seafood is. This finding is in agreement with a previous study in Norway (Myrland et al., 2000). It was shown that convenience and availability alone could not persuade the participants into purchasing a product even though they were willing to do so. Trust in the quality and their cooking skills would increase the market potential of healthy seafood products. When product concepts with various preparation guidelines were presented to the participants of the study described in paper III, it was shown that there was low appreciation of additional information. Combining this outcome with the results of paper II, it could be concluded that although information availability is appreciated, it may lead to some aversion and decrease trust in the product, when an overload of information is presented directly with the product.

In paper II, it was shown that past exposure and habits influenced participants' present food choice behaviour positively and negatively. Regular past consumption increased their liking of and trust in, seafood products. However, very frequent exposure to seafood resulted in product boredom which is known to affect food choice negatively (Köster and Mojet, 2007). Hence, it can be concluded that both high and low consumption of seafood during childhood had a negative influence on the consumption in later life (Fox and Ward, 2008). Finding a good balance in the frequency of having or serving seafood to others is a challenge. Furthermore, in this paper, the concept of a "consumption circle" was used by participants to describe the consumption and eating habits of participants. The participants described the common practice of having 10-15 dishes that are randomly prepared during the year. It appeared that seafood does not play a major role in the consumption circle. In order to increase seafood consumption the challenge is to break into this habitual circle. This concept provided practical insight on the previously presented issue of the strength of habit in food choice behaviour (Honkanen et al., 2005).

One of the main messages extracted from the focus groups (paper II) was that an improvement of the image and an increase in the availability of seafood could increase intake. Sources of promotional information were explicitly mentioned as a reason for remembering to purchase more seafood. There was a general agreement that more promotional strategies would lead to an increase in the consumption of seafood and seafood products. As participants primarily select their main meal during shopping, the results indicated that more seafood promotion at the purchase points could be a way to influence consumer choices. Additionally, based on the discussions, seafood was considered to be a product that is too expensive to risk preparing inappropriately. Hence, information about the preparation method and the choice of additional ingredients or accompaniments would improve the image of new healthy seafood products. The participants were willing to add more seafood to their consumption circle and they would act accordingly if they would be informed about the availability of healthy and convenient seafood products of guaranteed high quality (Pieniak et al., 2007). The participants also showed an overall preference for being reminded at the purchase points of new recipes and guidance on how to prepare them to break out of their long trusted habits. Demand for new products that would describe on the packaging in simple terms the necessary steps to a successful meal was reported.

One of the main results of the first concept test (paper III) was that visible products were considered to be more attractive and increased consumers' trust in them compared to products that were not visible at all. It was also shown that the visible products were perceived as more convenient and generated higher willingness to buy. This confirms the results of paper II where consumers reported the need for visibility in order to make them feel more confident about the quality of the product while buying. Another focus groups study has reported this result (Dantas et al., 2005), showing that consumers clearly describe products that are visible in their packaging as preferable. The results presented in this paper empirically support the positive effect of visibility of the seafood product for young consumers, which is important for further seafood product development.

Participants in the study described in paper III also reported a preference for the "natural Nordic" and "French herbs" themes in contrast to the "hot & spicy" and "fish & fruit" themes. Similarly, the concept of a mixture of fish species seemed to be perceived more positively than the concept of a mixture of seafood species. The less appreciated product concepts ( i.e. "hot & spicy", "fish & fruit" and "mixed seafood") were suggested as being more innovative. Perhaps consumers considered these seafood product concepts less trustworthy due to the fact that they were not familiar with comparable concepts. This result of less appreciation of the unfamiliar products conflicted with the relatively high food curiosity consumers reported in the attitudinal part of this study. However, this conflict between reported preference and reported attitude may be present due to the tendency of young adults to report an interest in new product concepts but still reject them at the moment of choice as shown in paper II. In the focus group study, participants described this phenomenon as a balance between an attractive new image and the feeling of trust and security about the successful preparation of the meal.

A general observation throughout the first seafood product concept evaluations (paper III) was that the scores were around the scales' mid-point. This result can be an indication of low acceptance of existing seafood product concepts by the specific target group (young adults) and a possible explanation of their low consumption which is repeatedly reported in the literature (Myrland et al., 2000; Similä et al., 2003; Steingrimsdóttir et al., 2002). Keeping in mind that the participants of this study were young adults and thus infrequent consumers of seafood, it could be suggested that the concepts were relatively well accepted. However, further development and improvement of the seafood product concepts in the second concept

test (paper IV) would increase the probability of accepting the products and eventually increase seafood consumption. Additionally, raw seafood products might appear less appetising when not shown as part of a prepared meal. Product concepts could benefit from a visualisation of the prepared meal on the product's packaging. This was included in the second seafood concept test.

In the first concept test (paper III), Icelanders evaluated all seafood product concepts as more convenient, but were less sure of how to prepare a meal based on them (concepts, themes, species, shape and size, guide, visibility). Regarding willingness to buy, Icelanders reported higher scores except for one product concept, "mixed bites", which Norwegians were more willing to buy. Additionally, Norwegians were less trustful towards the different seafood product types (concepts, visibility, guide, species, shape and size). From the results regarding consumers' attitudes (paper III) it can be seen that Norwegians find seafood in general as quick and convenient to prepare as well as being more interested in naturalness than Icelanders. This may be an indication of increased familiarity with and exposure to seafood of the participants from Norway, as shown by the higher frequency of consumption of seafood. Increased familiarity with and knowledge about a product are reported to influence product evaluation and attention to some product characteristics (Cordel, 1997). Therefore, it is reasonable to speculate that an increased familiarity may be associated with the appreciation of fresh raw seafood. However, this association was not tested. These differences between Iceland and Norway can be used to provide input for further targeted seafood product development and confirm the importance of cross-cultural research.

Based upon the outcome of the first three studies, new seafood product concepts were designed and retested in the second concept test study (paper IV). In this test it was shown that there are differences in the evaluations of the product concepts on all variables evaluated by the participants (figure 4). Significant and corresponding differences were found between the various product concepts with and without information about the product. These differences showed that the Nordic cod fillet concept was the most preferred, followed by the fish portions concept. The innovative fish portions (cod or cod and salmon) and wild berries product concept scored about as high as the very familiar traditional cod fillets product concept. Further development of the of the cod and salmon fish portions with wild berries product concept could lead to a successful product in the market which will eventually lead to an increase of fish consumption by young adults.

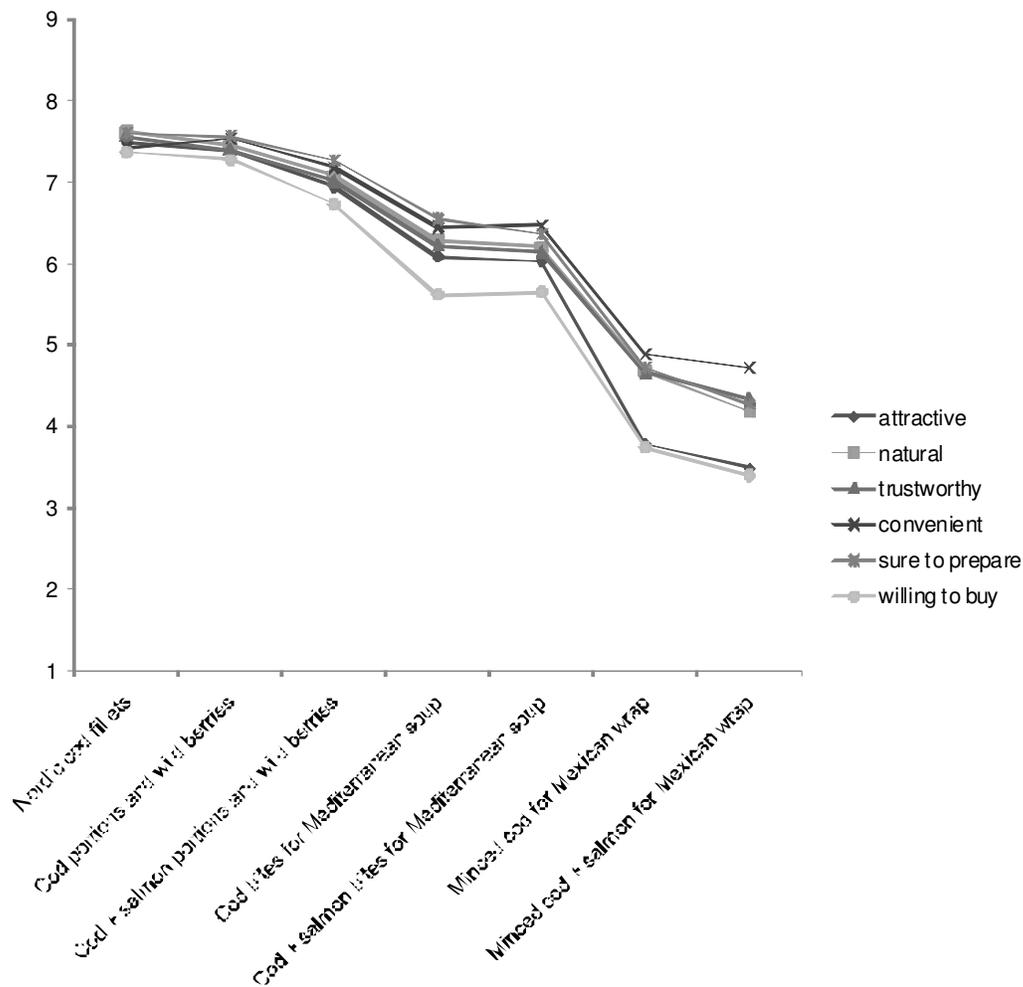


Figure 4. Product concepts evaluated by the consumers on six variables on nine-point Likert scales with one (1) denoting a low evaluation of the specific product characteristic and nine (9) a high one.

Lower in the evaluations were the fish bites and finally the minced fish. The consumers involved found seafood product concepts less attractive, natural, trustworthy or convenient when they were offered in small pieces or minced. Small portions of fish, not deviating too much from fillet size were evaluated as almost as good as the fillet concept.

The participants in the last study (paper IV) showed higher preference for the product concepts with additional textual information about the product including a recipe as well as a

photo illustration emphasising the naturalness and attractiveness of the final prepared dish. This effect was significant for the variables: perceived attractiveness, trustworthiness and willingness to buy the product concept. However, the positive effect on the preference for products with information was not as high as expected. The limited information effect in the case of naturalness was probably due to the fact that the fresh product was so visible in the packaging that the participants perceived both versions of the product concept to be very natural. Convenience and sureness about the successful preparation of a meal using this product may not have been significantly affected by the packaging label because the information about the preparation of the meal was only described on the back of the package, without actually being presented to the consumers in the test.

Looking at the differences between fish species (cod and salmon), we can conclude that the combination of cod and salmon was well accepted. It was shown that the evaluations between the cod and cod & salmon product concepts were either equal or sometimes in favour of either one. The cod product concepts were slightly more appreciated in the case of fish portions. However, when the evaluations for the product concept “Fish bites for Mediterranean soup” were analysed, it was shown that cod & salmon bites were preferred. Finally, the use of cod or salmon for the minced fish product did not lead to any significantly positive change in consumers’ preference for this product. Minced fish was not appreciated regardless of the species or the accompanying information and the expected added value as a healthy replacement for popular minced meat in convenient dishes.

An interesting outcome of the second concept test study (paper IV) was the definition of three consumer clusters, based on attitudinal variables. The analysis of these attitudinal variables revealed the existence of the groups “totally positive health oriented consumers”, “non health-action fish consumers” and “fast-convenient non-fish consumers”. There was a non significant tendency for young adults to belong to the “fast-convenient non-fish consumers” cluster. The results suggested that there was an overall trend that “totally positive health oriented consumers” rated the seafood product concepts higher than “non health-action fish consumers”. The lowest product concept evaluations were reported by the “fast-convenient non-fish consumers”. These differences were comparable to the differences between the two target groups (young adults and families with young children) in this study. Again, the low evaluations were not significantly different but the highly rated seafood product concepts were different between groups on willingness to buy and sureness about preparation.

## 4 Conclusions

The results of paper I verified the relevance some of the variables which were explored and described in paper II. The consumers' values extracted from the study described in paper II were used as an input for testing new seafood product concepts in paper III. The results of the third study (paper III) directed towards the design of new healthy seafood product concepts such as fish portions from one or a mix of species, in improved packaging with appropriately targeted package information which were tested in the study described in paper IV.

The main outcome of paper I was that involvement in health issues and attitudes towards fish consumption are associated with fish consumption in a positive manner. This influence is present for farmed and wild fish consumption equally across Belgium, Norway and Spain. It was also shown that younger consumers are less involved in health and thus consume less fish. In summary, this study demonstrated that different types of consumers in Belgium, Norway and Spain may chose farmed and wild fish based on their involvement in health issues and their attitudes towards fish consumption.

Healthy eating requires some complex choices, especially when it comes to seafood. However, the participants discussed the need for a balance between health, pleasure and convenience (paper II). Individuals with a low consumption of seafood from countries with traditionally high seafood consumption face barriers related to the price and quality of their traditional seafood products. It was suggested that promotional material would assist consumers in staying consistent with their intended food choice behaviours. The promotional material at the point of purchase should offer information on preparation methods. Eventually, this additional information will redirect consumers' attention to food choices which are based on their knowledge on health. Considering the increasing necessity for innovative seafood products that focus on healthiness, convenience, palatability and food preparation knowledge, an overall improvement in the image of seafood is required. In summary, the nine consumer values regarding seafood were: a) healthiness, b) satiation, c) convenience, d) visibility & trust, e) freedom of choice, f) successful preparation, g) image improvement, h) availability and i) price.

The knowledge on attitudes across age groups from paper I and nine consumer values from paper II were used to develop seafood product concepts for young adults that were then tested

(paper III). The results indicated that “thematic fillets” and “mixed bites” were liked more than “minced fish”. Further development and improvement of the seafood product concepts would increase the probability of success in the market. Although information availability was appreciated, it may lead to some aversion and decrease trust in the product, when this information is presented directly with the product as shown in paper III.

The results from the first three studies led to the second concept test which indicated the potential market success of an innovative seafood product concept (figure 5). This product concept was portions of cod and salmon with wild berries. The product concept was presented in a package with information about the Nordic origin, a recipe guide and a visual representation of the dish that can be prepared by using the ingredients. This innovative seafood product concept scored about as high as the very familiar traditional cod fillets product concept. This close evaluation indicated that the cod and salmon fillet portions with wild berries concept can be further developed into a successful product in the market which will eventually lead to an increase in fish consumption by young adults.



Figure 5. The product type and concept “Cod and salmon portions and wild berries” with information.

This product seems to fit perfectly to the consumer target groups and their values by means of variation of species, freedom of choice between species and its attractive, innovative image which is created by pure, fresh and traditional ingredients. This product with a recipe to assist

in preparation is expected to be rated high on trustworthiness, convenience and successful preparation.

The results discussed in this thesis (figure 6) and the accompanying papers show various new insights towards the understanding of young adults' preference for or avoidance of seafood. Additionally, these insights can further be used in the final development of new seafood products in order to fulfil the needs of young adult consumers. This knowledge can also be used to redirect existing products more precisely to the specific consumer group. When the needs of young adults are further understood and used into the development of new products, directed balanced communication about seafood can also be developed, taking into account the specific attitudes of young adults towards the consumption of fish and their low involvement in health. Once all these variables and insights are taken into account, final testing of the resulting concepts, including communication strategies, should be performed in order to increase the probability of an increase in seafood consumption by young adults.

# Young Adults

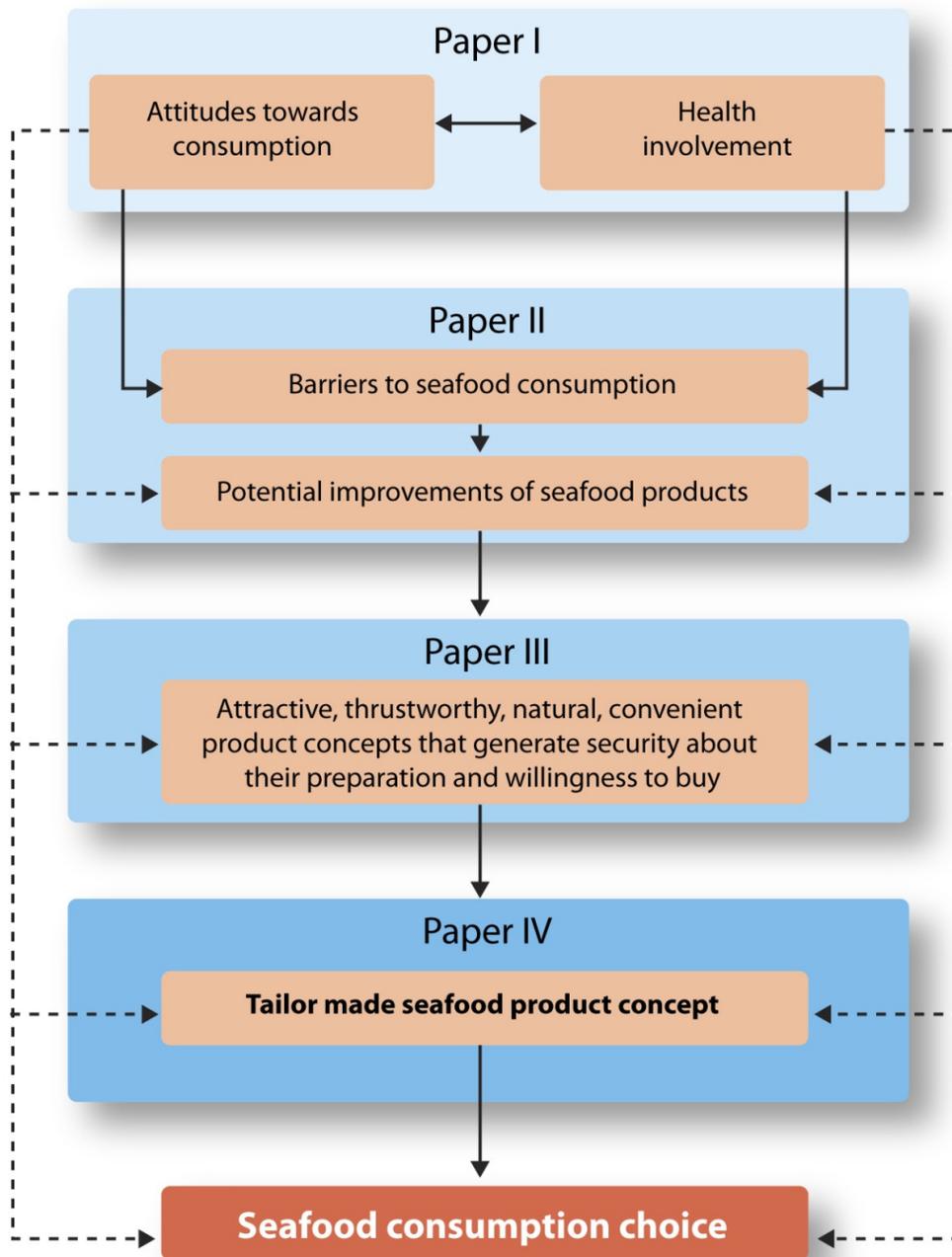


Figure 6. Summarised outcome of the thesis

## **5 Future prospects and suggestions**

On an applied level, this research led to some suggestions for future seafood product development in order to approach young adults and increase the probability that they choose a healthy seafood meal. All of the information extracted from this research can be applied in order to retest seafood products (concepts) that will reflect what young consumers really need. Finally, cross cultural research would direct targeted seafood product development and increase the scope of the applicable results.

On a theoretical level, various new issues can be extracted from these results for use in further exploration and possible quantification. Promising areas for further research might be: a) past and habitual behaviour, b) the interaction between time perception and convenience, c) perception of safety and trust with respect to risk factors and transparent communication, d) the image of healthy products that are influencing health behaviour and finally e) the interaction between age and household size. Furthermore, the gap that is left from past psychological attitudinal models (e.g. Ajzen, 1991) could be the main focus of further research. In all three countries implicit factors like past experiences and situations where choices were made quickly appeared to have an impact on the present liking and consumption level of seafood. These behaviours might have been overlooked if the intention to behave in a socially desirable manner has not been explored. Further qualitative and quantitative exploration of the steps in food choice that are made between the intention to behave in one way and the actual behaviour studied in longitudinal intervention and observation based case-studies in real life settings is needed.

## 6 References

- Advice on fish consumption: Benefits and Risks, 2004. In: Office, T.S. (Ed.). Scientific Advisory Committee on Nutrition. Committee on Toxicity of Chemicals in Food, London, pp. 222.
- Ajzen, I., 1991. The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes* 50: 179-211.
- Ajzen, I., 2001. Nature and operation of attitudes. *Annu Rev Psychol* 52: 27-58.
- Ajzen, I., 2002. Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Social Psychology* 32: 665-683.
- Ajzen, I., Driver, B.L., 1991. Prediction of Leisure Participation from Behavioral, Normative, and Control Beliefs - an Application of the Theory of Planned Behavior. *Leisure Sciences* 13: 185-204.
- Ajzen, I., Driver, B.L., 1992. Application of the Theory of Planned Behavior to Leisure Choice. *Journal of Leisure Research* 24: 207-224.
- Arnett, J.J., 2000. Emerging Adulthood: A Theory of Development From the Late Teens Through the Twenties. *American Psychologist* 55: 469-480.
- Bem, D.J., 1972. Constructing Cross-Situational Consistencies in Behavior - Some Thoughts on Alkers Critique of Mischel. *J Pers* 40: 17-&.
- Benton, D., 2004. Role of parents in the determination of the food preferences of children and the development of obesity. *Int J Obesity* 28: 858-869.
- Birch, L.L., 1999. Development of food preferences. *Annu Rev Nutr* 19: 41-62.
- Birch, L.L., Fisher, J.O., 2000. Mothers' child-feeding practices influence daughters' eating and weight. *American Journal of Clinical Nutrition* 71: 1054-1061.
- Birch, L.L., Fisher, J.O., Davison, K.K., 2003. Learning to overeat: maternal use of restrictive feeding practices promotes girls' eating in the absence of hunger. *American Journal of Clinical Nutrition* 78: 215-220.
- Brug, J., Debie, S., van Assema, P., Weijts, W., 1995. Psychosocial determinants of fruit and vegetable consumption among adults: Results of focus group interviews. *Food Quality and Preference* 6: 99-107.
- Brug, J., Tak, N.I., Velde, S.J.T., Bere, E., de Bourdeaudhuij, I., 2008. Taste preferences, liking and other factors related to fruit and vegetable intakes among schoolchildren: results from observational studies. *British Journal of Nutrition* 99: S7-S14.

- Bruhn, M., 2008. Lifestyle characteristics and health promotion. *Ernahrungs-Umschau* 55: 20-27.
- Brunsnø, K., 2003. Consumer research on fish in Europe, in: Luten, J.B., Oehlenschlaeger, J., Olafsdottir, G. (Eds.), *Quality of fish from catch to consumer: Labelling, monitoring and traceability*. Wageningen Academic Publishers, Wageningen, pp. 335-344.
- Brunsnø, K., 2003. Consumer research on fish in Europe, in: Luten, J.B., Oehlenschlaeger, J., Olafsdottir, G. (Eds.), *Quality of fish from catch to consumer: Labelling, monitoring and traceability*. Wageningen Academic Publishers, Wageningen, pp. 335-344.
- Cantin, I., Dubé, L.L., 1999. Attitudinal Moderation of Correlation between Food Liking and Consumption. *Appetite* 32: 367-381.
- Capaldi, E.D., Privitera, G.J., 2008. Decreasing dislike for sour and bitter in children and adults. *Appetite* 50: 139-145.
- Clark, J.E., 1998. Taste and flavour: their importance in food choice and acceptance. *Proceedings of the Nutrition Society* 57: 639-643.
- Cooper, R.G., 1999. From experience - The invisible success factors in product innovation. *Journal of Product Innovation Management* 16: 115-133.
- Cooper, R.G., 2008. Perspective: The Stage-Gate (R) idea-to-launch process-update, what's new, and NexGen systems. *Journal of Product Innovation Management* 25: 213-232.
- Cooper, R.G., Edgett, S.J., 2005. *Lean, Rapid, and Profitable New Product Development*. Product Development Institute.
- Cordell, V.V., 1997. Consumer knowledge measures as predictors in product evaluation. *Psychology & Marketing* 14: 241-260.
- Cox, D.N., Evans, G., Lease, H.J., 2008. Australian consumers' preferences for conventional and novel sources of long chain omega-3 fatty acids: A conjoint study. *Food Quality and Preference* 19: 306-314.
- Dahan, E., Srinivasan, V., 2000. The predictive power of Internet-based product concept testing using visual depiction and animation. *Journal of Product Innovation Management* 17: 99-109.
- Dantas, M.I.S., Minim, V.P.R., Deliza, R., Puschmann, R., 2005. The Effect of Packaging on the Perception of Minimally Processed Products. *Journal of International Food & Agribusiness Marketing* 16: 71 - 83.
- Deliza, R., MacFie, H.J.H., 1996. The generation of sensory expectation by external cues and its effect on sensory perception and hedonic ratings: A review. *Journal of Sensory Studies* 11: 103-128.

- Draper, A.K., 2004. The principles and application of qualitative research. *Proceedings of the Nutrition Society* 63: 641-646.
- Einarsdottir, G., Sveinsdottir, K., Martinsdottir, E., F.H., J., Thorsdottir, I., Thorsdottir, F., 2007. Attitudes and fish consumption of 18-25 year olds-descriptive statistics, *Skýrsla MATIS 05-07. MATIS, Reykjavik, Iceland.*
- Endacott, R., 2008. Clinical research 4: Qualitative data collection and analysis. *International Emergency Nursing* 16: 48-52.
- Erikson, E.H., 1968. *Identity, Youth and Crisis.* W. W. Norton, New York.
- FAO, 2009. *The state of the world fisheries and aquaculture 2008.* FAO fisheries and Aquaculture Department. Food and Agriculture Organization of the United Nations, Rome.
- Feunekes, G.I.J., de Graaf, C., Meyboom, S., van Staveren, W.A., 1998. Food Choice and Fat Intake of Adolescents and Adults: Associations of Intakes within Social Networks. *Preventive Medicine* 27: 645-656.
- Fiates, G.M.R., Amboni, R.D.M.C., Teixeira, E., 2008. Television use and food choices of children: Qualitative approach. *Appetite* 50: 12-18.
- Fox, N., Ward, K., 2008. Health, ethics and environment: A qualitative study of vegetarian motivations. *Appetite* 50: 422-429.
- Gilligan, C., Murphy, J.M., 1979. Development from adolescence to adulthood: The philosopher and the dilemma of the fact. *New Directions for Child and Adolescent Development* 1979: 85-99.
- Grunert, K., Scholderer, J., 2000. Generic advertising for fish: results from a research-based campaign.
- Grunert, K.G., Brunsø, K., Bisp, S., 1993. Food-Related Life-Style: Development of a cross-culturally valid instrument for market surveillance. MAPP Århus.
- Hanson, N.I., Neumark-Sztainer, D., Eisenberg, M.E., Story, M., Wall, M., 2005. Associations between parental report of the home food environment and adolescent intakes of fruits, vegetables and dairy foods. *Public Health Nutrition* 8: 77-85.
- Hill, A.J., 2002. Developmental issues in attitudes to food and diet. *Proceedings of the Nutrition Society* 61: 259-266.
- Honkanen, P., Olsen, S.O., Myrland, Ø., 2004. Preference-based segmentation: a study of meal preferences among Norwegian teenagers. *Journal of Consumer Behaviour* 3: 235-250.

- Honkanen, P., Olsen, S.O., Verplanken, B., 2005. Intention to consume seafood--the importance of habit. *Appetite* 45: 161-168.
- Jabs, J., Devine, C.M., Bisogni, C.A., Farrell, T.J., Jastran, M., Wethington, E., 2007. Trying to Find the Quickest Way: Employed Mothers' Constructions of Time for Food. *Journal of Nutrition Education and Behavior* 39: 18-25.
- Jaffry, S., Pickering, H., Ghulam, Y., Whitmarsh, D., Wattage, P., 2004. Consumer choices for quality and sustainability labelled seafood products in the UK. *Food Policy* 29: 215-228.
- James, W., 1890. *The principles of psychology*. Holt, New York.
- Jansen, E., Mulkens, S., Emond, Y., Jansen, A., 2008. From the Garden of Eden to the land of plenty: Restriction of fruit and sweets intake leads to increased fruit and sweets consumption in children. *Appetite* 51: 570-575.
- Kamphuis, C.B.M., Giskes, K., de Bruijn, G.-J., Wendel-Vos, W., Brug, J., van Lenthe, F.J., 2006. Environmental determinants of fruit and vegetable consumption among adults: a systematic review. *British Journal of Nutrition* 96: 620-635.
- Kole, A., 2003. Consumer opinions towards farmed fish, accounting for relevance and individual knowledge., in: Luten, J.B., Oehlenschlaeger, J., Ólafsdóttir, A.S. (Eds.), *Quality of fish from catch to consumer*. Wageningen academic publisher, Wageningen, pp. 393-400.
- Kole, A.P.W., Altintzoglou, T., Schelvis-Smit, R.A.A.M., Luten, J.B., 2009. The effects of different types of product information on the consumer product evaluation for fresh cod in real life settings. *Food Quality and Preference* 20: 187-194.
- Köster, E.P., 2003. The psychology of food choice: some often encountered fallacies. *Food Quality and Preference* 14: 359-373.
- Köster, E.P., 2009. Diversity in the determinants of food choice: A psychological perspective. *Food Quality and Preference* 20: 70-82.
- Köster, E.P., Beckers, A., Houben, J.B., 1987. The influence of health information on the acceptance of a snack in a canteen test, in: Martens, M., Dalen, G.A., Russwurm, H. (Eds.), *Flavour Science and Technology* Chichester: Wiley. John Wiley & Sons, New York, pp. 391-398.
- Köster, E.P., Mojet, J., 2007. Boredom and the reasons why some new food products fail, in: Hal, M. (Ed.), *Consumer-led food product development*. Woodhead publishing ltd, Cambridge, pp. 262-280.

- Kozup, J.C., Creyer, E.H., Burton, S., 2003. Making healthful food choices: The influence of health claims and nutrition information on consumers' evaluations of packaged food products and restaurant menu items. *Journal of Marketing* 67: 19-34.
- Larson, N.I., Neumark-Sztainer, D.R., Story, M.T., Wall, M.M., Harnack, L.J., Eisenberg, M.E., 2008. Fast food intake: Longitudinal trends during the transition to young adulthood and correlates of intake. *J Adolescent Health* 43: 79-86.
- Larson, N.I., Perry, C.L., Story, M., Neumark-Sztainer, D., 2006. Food preparation by young adults is associated with better diet quality. *Journal of the American Dietetic Association* 106: 2001-2007.
- Li, H.S., Houston, J.E., Wang, S.M., Lee, H.J., 2001. Factors Affecting Consumer Preferences for Fish in Taiwan IIFET 2000 Conference. International Institute of Fisheries Economics and Trade, Corvallis, Oregon, (USA).
- Luten, J., Kole, A., Schelvis, R., Veldman, M., Heide, M., Carlehoeg, M., Akse, L., 2002. Evaluation of wild cod versus wild caught, farmed raised cod from Norway by Dutch consumers. *Økonomisk Fiskeriforskning* 2002: 44-60.
- March-Chordà, I., Gunasekaran, A., Lloria-Aramburo, B., 2002. Product development process in Spanish SMEs: an empirical research. *Technovation* 22: 301-312.
- Mays, N., Pope, C., 2000. Qualitative research in health care: Assessing quality in qualitative research. *BMJ* 320: 50-52.
- Mela, D.J., 2001. Why do we like what we like? *J Sci Food Agr* 81: 10-16.
- Messer, E., 1989. Methods for determinants of food intake. In: Pelto, G.H., Pelto, P.J., Messer, E. (Eds.), *Research Methods in Nutritional Anthropology*.
- Meyrick, J., 2006. What is Good Qualitative Research?: A First Step towards a Comprehensive Approach to Judging Rigour/Quality. *J Health Psychol* 11: 799-808.
- Morrissey, M., 2006. Culinary based product development for seafood and the stage gate principle, The Third SEAFOOD Conference, Tromsø, Norway. [http://www.seafoodplus.org/fileadmin/files/events/2006-Third\\_SFplus/s1\\_02%20Mike%20Morrissey%20SEAFOODplus%20Conference%202006%20Oral\\_reduced.pdf](http://www.seafoodplus.org/fileadmin/files/events/2006-Third_SFplus/s1_02%20Mike%20Morrissey%20SEAFOODplus%20Conference%202006%20Oral_reduced.pdf)
- Mozaffarian, D., Rimm, E.B., 2006. Fish intake, contaminants, and human health - Evaluating the risks and the benefits. *Jama-Journal of the American Medical Association* 296: 1885-1899.

- Myrland, Ø., Trondsen, T., Johnston, R.S., Lund, E., 2000. Determinants of seafood consumption in Norway: lifestyle, revealed preferences, and barriers to consumption. *Food Quality and Preference* 11: 169-188.
- Nayga, R.M., Capps, O., 1995. Factors Affecting the Probability of Consuming Fish and Shellfish in the Away from Home and At Home Markets. *Journal of Agricultural and Applied Economics* 27: 161-171.
- Nielsen, S.J., Siega-Riz, A.M., Popkin, B.M., 2002. Trends in Food Locations and Sources among Adolescents and Young Adults. *Preventive Medicine* 35: 107-113.
- Olsen, S.O., 2001. Consumer involvement in seafood as family meals in Norway: an application of the expectancy-value approach. *Appetite* 36: 173-186.
- Olsen, S.O., 2003. Understanding the relationship between age and seafood consumption: the mediating role of attitude, health involvement and convenience. *Food Quality and Preference* 14: 199-209.
- Olsen, S.O., Scholderer, J., Brunsø, K., Verbeke, W., 2007. Exploring the relationship between convenience and fish consumption: A cross-cultural study. *Appetite* 49: 84-91.
- Ophuis, P.A.M.O., 1989. Measuring health orientation and health consciousness as determinants of food choice behaviour: development and implementation of various attitudinal scales in: Ailonits, G.J., Papavasiliou, N.K., Kouremenus, A.G. (Eds.), *Marketing Thought and Practice in the 1990's. EMAC XVIII*, Athens School of Economics and Business, Athens, Greece, pp. 1723–1725.
- Ottesen, G.G., Grønhaug, K., 2006. Pursuing opportunities - Why so many fail and so few succeed. *European Journal of Marketing* 40: 100-112.
- Ottesen, G.G., Grønhaug, K., 2007. Do SMEs influence their markets? An exploratory study. *Journal of Small Business and Enterprise Development* 14: 36-47.
- Paeratakul, S., Ferdinand, D.P., Champagne, C.M., Ryan, D.H., Bray, G.A., 2003. Fast-food consumption among US adults and children: Dietary and nutrient intake profile. *Journal of the American Dietetic Association* 103: 1332-1338.
- Paisley, J., Sheeshka, J., Daly, K., 2001. Qualitative Investigation of the Meanings of Eating Fruits and Vegetables for Adult Couples. *Journal of Nutrition Education and Behavior* 33: 199-207.
- Papadaki, A., Hondros, G., Scott, J.A., Kapsokefalou, M., 2007. Eating habits of University students living at, or away from home in Greece. *Appetite* 49: 169-176.
- Piaget, I., 2008. Intellectual evolution from adolescence to adulthood. *Human Development* 51: 40-47.

- Pieniak, Z., Verbeke, W., Scholderer, J., Brunsø, K., Olsen, S.O., 2007. European consumers' use of and trust in information sources about fish. *Food Quality and Preference* 18: 1050-1063.
- Pieniak, Z., Verbeke, W., Scholderer, J., Brunsø, K., Olsen, S.O., 2008. Impact of consumers' health beliefs, involvement and risk perception on fish consumption: A study in five European countries. *British Food Journal* 110: 898 - 915.
- Pliner, P., Hobden, K., 1992. Development of a scale to measure the trait of food neophobia in humans. *Appetite* 19: 105-120.
- Raghunathan, R., Naylor, R.W., Hoyer, W.D., 2006. The unhealthy equal tasty intuition and its effects on taste inferences, enjoyment, and choice of food products. *Journal of Marketing* 70: 170-184.
- Roininen, K., Lähteenmaki, L., Tuorila, H., 1999. Quantification of consumer attitudes to health and hedonic characteristics of foods. *Appetite* 33: 71-88.
- Roos, G., Dulrud, A., Norberg, H.M., 2005. Political Consumerism: Its motivations, power, and conditions in the Nordic countries and elsewhere. In: Boström, M., Føllesdal, A., Klintman, M., Micheletti, M., Sørensen, M.P. (Eds.), *The 2nd International Seminar on Political Consumerism*, Oslo.
- Roosen, J., Marette, S., Blanchemanche, S., Verger, P., 2007. The effect of product health information on liking and choice. *Food Quality and Preference* 18: 759-770.
- Rortveit, A.W., Olsen, S.O., 2007. The role of consideration set size in explaining fish consumption. *Appetite* 49: 214-222.
- Rozin, P., Zellner, D., 1985. The Role of Pavlovian Conditioning in the Acquisition of Food Likes and Dislikes. *Annals of the New York Academy of Sciences* 443: 189-202.
- Saba, A., Moneta, E., Nardo, N., Sinesio, F., 1998. Attitudes, habit, sensory and liking expectation as determinants of the consumption of milk. *Food Quality and Preference* 9: 31-41.
- Schiffenstein, H.N.J., Kole, A.P.W., Mojet, J., 1999. Asymmetry in the disconfirmation of expectations for natural yogurt. *Appetite* 32: 307-329.
- Schiffenstein, H.N.J., Oude Ophuis, P.A.M., 1998. Health-related determinants of organic food consumption in The Netherlands. *Food Quality and Preference* 9: 119-133.
- Scholderer, J., Grunert, K., 2001. Does generic advertising work? A systematic evaluation of the Danish campaign for fresh fish. *Aquaculture Economics and Management* 5: 253-271.

- Scientific Advisory Committee on Nutrition, Committee on the toxicity of chemicals in food, 2004. Advice on fish consumption: Benefits and risks. TSO, London.
- Shepherd, J., Harden, A., Rees, R., Brunton, G., Garcia, J., Oliver, S., Oakley, A., 2006. Young people and healthy eating: a systematic review of research on barriers and facilitators. *Health Education Research* 21: 239-257.
- Shepherd, R., Dennison, C.M., 1996. Influences on adolescent food choice. *Proceedings of the Nutrition Society* 55: 345-357.
- Sidhu, K.S., 2003. Health benefits and potential risks related to consumption of fish or fish oil. *Regulatory Toxicology and Pharmacology* 38: 336-344.
- Similä, M., Fagt, S., Vaask, S., Thorgeirsdottir, H., Pudule, I., Petkeviciene, J., Johansson, L., Becker, W., Ovesen, L., Steingrimsdottir, L., Moltchanova, E., Valsta, L., 2003. The NORBAGREEN 2002 study; Consumption of vegetables, potatoes, fruit, bread and fish in the Nordic and Baltic countries, TemaNord Copenhagen, pp. 172.
- Sirois, M., 2006. Proven methods of developing successful new value added seafood products in an ever changing market place, 2nd TAFT meeting, Quebec, Canada.
- Soetens, B., Braet, C., Van Vlierberghe, L., Roets, A., 2008. Resisting temptation: Effects of exposure to a forbidden food on eating behaviour. *Appetite* 51: 202-205.
- Søndergaard, H.A., 2005. Market-oriented new product development. How can means-end chain approach affect the process? *European Journal of Innovation Management* 8: 79-90.
- Søndergaard, H.A., Edelenbos, M., 2007. What parents prefer and children like - Investigating choice of vegetable-based food for children. *Food Quality and Preference* 18: 949-962.
- Søndergaard, H.A., Harmsen, H., 2007. Using market information in product development. *Journal of Consumer Marketing* 24: 194-201.
- Steingrimsdóttir, L., Þorgeirsdóttir, H., Ólafsdóttir, A.S., 2002. Könnun á mataræði Íslendinga 2002: Helstu niðurstöður, Rannsóknir Manneldisráðs Íslands V.
- Sveinsdóttir, K., Martinsdóttir, E., Green-Petersen, D., Hyldig, G., Schelvis, R., Delahunty, C., 2009. Sensory characteristics of different cod products related to consumer preferences and attitudes. *Food Quality and Preference* 20: 120-132.
- Tepper, B.J., Trail, A.C., 1998. Taste or health: A study on consumer acceptance of corn chips. *Food Quality and Preference* 9: 267-272.
- Trijp, J.C.M.v., Steenkamp, J.B.E.M., 2005. Consumer-oriented new product development, in: Jongen, W.M.F., Meulenberg, M.T.G. (Eds.), *Innovation in agrifood systems:*

- Product quality and consumer acceptance. Wageningen Academic Publishers, Wageningen, pp. 87-124.
- Tuorila, H., 2000. Pressure to change and resistance against it: consumer perceptions and acceptance of nutritionally modified foods. *Agr Food Sci Finland* 9: 165-176.
- Tuorila, H., Pangborn, R.M., 1988. Prediction of reported consumption of selected fat-containing foods. *Appetite* 11: 81-95.
- Undeland, I., Lindqvist, H., Chen-Yun, Y., Falch, E., Luten, J.B., 2009. Seafood and health: what is the full story? In: *Marine Functional Food*. Luten, J.B. (Ed.). Wageningen academic press, Wageningen. pp. 17-87.
- Unusan, N., 2006. University students' food preference and practice now and during childhood. *Food Quality and Preference* 17: 362-368.
- van Kleef, E., van Trijp, H.C.M., Luning, P., 2005a. Consumer research in the early stages of new product development: a critical review of methods and techniques. *Food Quality and Preference* 16: 181-201.
- van Kleef, E., van Trijp, H.C.M., Luning, P., 2005b. Functional foods: health claim-food product compatibility and the impact of health claim framing on consumer evaluation. *Appetite* 44: 299-308.
- Vanhonacker, F., T, A., J, L., Verbeke, W., in press. Does fish origin matter to European consumers? Insights from a consumer survey in Belgium, Norway and Spain. *British Food Journal*.
- Vanhonacker, F., Van Poucke, E., Braeckman, J., Verbeke, W., Tuytens, F., 2006a. Definiëring van het begrip dierenwelzijn. Rapport ALT/AMS/2005/1, pp. 103.
- Vanhonacker, F., Verbeke, W., Sioen, I., 2006b. Consumer perception about ethical and sustainability issues of fish, in: Kaiser, H.M., Lien, M. (Eds.), *Ethics and the politics of food*. Wageningen Academic Publishers, Wageningen, The Netherlands, pp. 464-469.
- Verbeke, W., Sioen, I., Brunsø, K., De Henauw, S., Van Camp, J., 2007a. Consumer perception versus scientific evidence of farmed and wild fish: exploratory insights from Belgium. *Aquaculture International* 15: 121-136.
- Verbeke, W., Sioen, I., Pieniak, Z., Van Camp, J., De Henauw, S., 2005. Consumer perception versus scientific evidence about health benefits and safety risks from fish consumption. *Public Health Nutrition* 8: 422-429.
- Verbeke, W., Vanhonacker, F., Sioen, I., Van Camp, J., De Henauw, S., 2007b. Perceived importance ethics related to fish perspective. *Ambio* 36: 580-585.

- Verbeke, W., Vermeir, I., Brunsø, K., 2007c. Consumer evaluation of fish quality as basis for fish market segmentation. *Food Quality and Preference* 18: 651-661.
- Wandel, M., Fagerli, R.A.A., 1999. Norwegians' Opinions of a Healthy Diet in Different Stages of Life. *Journal of Nutrition Education* 31: 339-346.
- Wardle, J., Solomons, W., 1994. Naughty but Nice - a Laboratory Study of Health Information and Food Preferences in a Community Sample. *Health Psychology* 13: 180-183.
- Weijzen, P.L.G., de Graaf, C., Dijksterhuis, G.B., 2008. Discrepancy between Snack Choice Intentions and Behavior. *Journal of Nutrition Education and Behavior* 40: 311-316.
- Welch, A., Lund, E., Amiano, P., Dorronsoro, M., Brustad, M., Kumle, M., Rodriguez, M., Lasheras, C., Janzon, L., Jansson, J., Luben, R., Spencer, E., Overvad, K., Tjønneland, A., Clavel-Chapelon, F., Linseisen, J., Klipstein-Grobusch, K., Benetou, V., Zavitsanos, X., Tumino, R., Galasso, R., Bueno-de-Mesquita, H., Ocké, M., Charrondière, U., Slimani, N., 2002. Variability of fish consumption within the 10 European countries participating in the European Investigation into Cancer and Nutrition (EPIC) study. *Public Health Nutrition* 5: 1273-1285.
- Whitaker, R.C., Wright, J.A., Pepe, M.S., Seidel, K.D., Dietz, W.H., 1997. Predicting Obesity in Young Adulthood from Childhood and Parental Obesity. *N Engl J Med* 337: 869-873.
- Wiegersma, P.A., Hofman, A., Zielhuis, G.A., 2000. Prevention of unhealthy behaviour by youth health care in The Netherlands. *Journal of Public Health Medicine* 22: 386-392.
- Wilson, T.D., 2002. *Strangers to Ourselves: Discovering the Adaptive Unconscious*. Belknap Press of Harvard University Press Cambridge, Massachusetts.
- Xueli, H., Geoffrey, N.S., Alan, B., 2002. New Product Development Processes in Small and Medium-Sized Enterprises: Some Australian Evidence. *Journal of Small Business Management* 40: 27-42.

# Appendix

The questionnaire used in the study presented in paper IV

Please fill out the information below

Name	
Year of birth	
e-mail	

Gender	Female	Male
	<input type="checkbox"/>	<input type="checkbox"/>

Education level (last completed)	High school	Technical high school	Further technical education	Higher education	BSc	MSc or higher
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Education type (subject)	
--------------------------	--

Household situation	Single living with parents	Single living alone	Couple without children	Couple with children at home	Single parent
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If you consider/think about your consumption during the past months, how frequently did you eat...

	Never	1-6 times a year	Once a month	2-3 times a month	Every week	2 times a week	>2 times a week
...fish in general	<input type="checkbox"/>						
...fish as a main meal	<input type="checkbox"/>						
...fish as cold lunch	<input type="checkbox"/>						
...fish as warm lunch	<input type="checkbox"/>						
...fish as a snack	<input type="checkbox"/>						

**This page repeated 14 times in order to expose the participants to each of the 14 product concepts.**

**Here an image of the product concept was presented on the top of the screen and the 6 questions which are presented bellow were asked each time.**

**Please answer the following questions about the product**

How appealing do you find this product?	Totally not appealing	<input type="checkbox"/>	Totally appealing							
How natural do you find this product?	Totally not natural	<input type="checkbox"/>	Totally natural							
How trustworthy do you find this product?	Totally not trustworthy	<input type="checkbox"/>	Totally trustworthy							
How convenient do you find this product?	Totally not convenient	<input type="checkbox"/>	Totally convenient							
How sure do you feel with respect to preparing a meal using this product in a successful way?	Totally not sure	<input type="checkbox"/>	Totally sure							
Would you buy this product, for yourself or for others?	Totally not	<input type="checkbox"/>	Totally yes							

Please rate your agreement or disagreement to the statements below

	totally disagree		Neither agree nor disagree			totally agree	
If I don't know what is in a food, I won't try it	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I feel that I need to improve my health	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I have the impression that I sacrifice a lot for my health	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I try to avoid food products with additives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am constantly sampling new and different foods	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am not very occupied with my health	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
To me the naturalness of the food that I buy is not an important quality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I consider myself very health conscious	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I prefer meals that are quick to plan, buy (provide), prepare and cook	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I really don't think often about whether everything I do is healthy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It is difficult to plan, provide, prepare and cook seafood for a meal (dinner)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I don't trust new foods	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I feel that my health status is extremely good	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Thank you for your participation!

## **PAPER I**

Altintzoglou T., Vanhonacker, F., Verbeke, W. & Luten J. (2010). Association of health involvement and attitudes towards eating fish on farmed and wild fish consumption in Belgium, Norway and Spain. *Aquaculture International*. Accepted with revisions.



**Association of health involvement and attitudes towards eating fish on farmed and wild fish consumption in Belgium, Norway and Spain.**

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## Abstract

Consumers in many European countries do not equally meet the recommended daily intake levels for fish consumption. Various factors that can influence fish consumption behaviour have been identified but limited research has been performed on fish consumption behaviour, discriminating between farmed and wild fish. The present survey study confirmed differences in total fish consumption, farmed fish and wild fish consumption behaviour in Belgium, Norway and Spain. Spanish consumers consumed more frequently fish of each category than Norwegian consumers. Belgian consumers reported the lowest consumption frequency of fish. Accordingly, health involvement and attitudes towards fish consumption decreased from Spain over Norway to Belgium, suggesting a positive association of health involvement and attitudes towards fish consumption with total fish consumption. Similar effects were found for farmed and wild fish consumption. In general consumers in all countries were poorly aware of the origin of the fish they consume, despite the mandatory indication of origin on fish labels. Across countries, an increased awareness about fish origin was found with increased fish consumption. The findings of the study indicate that farmed and wild fish consumption should be further stimulated among Belgian, Norwegian and Spanish consumers in association with a healthy and positive meal. Additionally, given the limited awareness of the origin of fish, transparency on the issue of farmed origin will be important in order to anticipate potential adverse communication.

## Keywords

Attitudes; consumers; fish consumption; health involvement; farmed fish; wild fish

## **Introduction**

Fish has been repeatedly described as a health promoting food category (Mozaffarian and Rimm 2006; Sidhu 2003). However, consumers in many European countries do not equally meet the recommended daily intake levels of consuming two servings of fish per week (Scientific Advisory Committee on Nutrition, Committee on toxicity of chemicals in food 2004; Welch et al. 2002).

Various factors that can influence consumers' fish eating behaviour have been identified. Among them are product quality (Verbeke et al. 2007b), attitudes towards choosing fish for a meal (Brunsvold 2003), involvement in seafood (Olsen 2001), food choice habits (Honkanen et al 2005), beliefs about benefits and risks related to health (Verbeke et al. 2005), convenience (Olsen et al. 2007; Rortveit and Olsen 2007), age (Olsen 2003) and health involvement (Olsen 2003; Pieniak et al. 2008).

It is generally acknowledged that the intrinsic sensory characteristics of a food product and the extrinsic characteristics such as health claims influence considerably eating and drinking behaviour (Köster 2009). Consumers report positive attitudes towards healthier products and strong intentions to consume them (Kozup et al 2003). However, the possibility that those healthier products do not end up being the final choice is a reality (Köster et al. 1987; Weijzen et al. 2008). This is a result of the implicit tendency to report behavioural intentions based on past behaviour and not based on deliberate descriptions of plans (Bem 1972).

Some research has been performed on the image of seafood products, the image of seafood production methods and its impact on fish consumption behaviour. Consumers perceive farmed fish as being of lower quality as compared to fish captured in the wild (Kole 2003; Verbeke et al. 2007a,b). It was recently suggested that despite its possibly preferable sensory properties, the image of fish from aquaculture can influence the perception of fish products negatively (Kole et al. 2009; Luten et al. 2002). The image of farmed fish has been suggested to be less positive than the image of wild fish. Even though the overall image of farmed fish is still positive, the difference relative to wild fish might be a bottleneck for the development of economically viable and sustainable aquaculture and one of the reasons behind stabilising fish consumption.

One of the aims of the present study was to describe the reported total fish consumption, farmed fish consumption and wild fish consumption in Belgium, Norway and Spain. Additionally, the aim of this study was to assess consumers' involvement in health issues and consumers' attitudes towards fish consumption. Moreover, the relationship of health involvement and attitudes towards eating fish with fish consumption behaviour in the three countries will be analysed. Furthermore, this study aims at describing the latter effects on the consumption of farmed and wild fish. Finally, consumers' awareness of the origin of the fish they consume will be discussed.

## **Material and Methods**

### *Research approach and sampling*

Quantitative descriptive data were collected through a cross-sectional consumer survey in Belgium, Norway and Spain. The selection of the countries was informed by their partial representation of Northern, Mid and Southern Europe and the considerable differences in the fish consumption levels and habits between those countries (Welch et al. 2002). The population was defined as the main responsible for food purchasing in the household in the age range between 20 and 60 years. Total sample size was 1,319 respondents, i.e. around over 400 participants in each of the three considered European countries. The fieldwork for the study was performed by a professional market research agency (IPSOS).

Participants were randomly selected from the representative IPSOS European online access consumer panel (Malhotra & Peterson 2006). Such an online access panel, which was used as the sampling frame for this study, is a large-scale and representative panel of individuals (used as sampling unit), who have been recruited through off-line recruitment procedures. The use of an off-line recruitment procedure is meant to reduce possible selection bias in web-based surveys. Thus, the panel consists of more than 600,000 individuals in Europe who were previously approached by the research agency for instance in shopping malls or in the street and asked about their willingness to participate on a regular basis in market researches. Participants for this specific study were selected from the panel using stratified random sampling and proportionate stratification in line with the national population distributions for age (in the range 20-60 years) and region. All contact and questionnaire administration

procedures were electronic and web-based. The fieldwork was performed in the beginning of December 2007.

Detailed socio-demographic characteristics of the national and pooled samples are provided in Table 1. Gender distribution reflects the selection of the main responsible for food purchasing with a majority of females. Different age groups from the range 20-60 years were nearly equally represented. The sample further varies in terms of household size, education level, presence of children and regional distribution (Table 1).

Table 1  
Socio-demographic characteristics of samples of the different countries (n=1319)

	Belgium	Norway	Spain	Total
n	440	442	437	1,319
<i>Gender (%)</i>				
Females	64.8	63.8	65.4	64.7
<i>Age distribution (%)</i>				
20-29 years old	24.8	24.2	24.7	24.6
30-39 years old	25.2	25.1	24.5	24.9
40-49 years old	24.3	25.3	25.2	24.9
50-60 years old	25.7	25.3	25.6	25.5
<i>Education level (%)</i>				
Secondary and lower	47.9	30.8	44.2	40.9
Higher	52.1	69.2	55.8	59.1
<i>Presence of children in the household (%)</i>				
Yes	60.4	54.9	55.4	56.9
No	39.6	45.1	44.6	43.1
<i>Household size (%)</i>				
1 person	18.0	23.8	9.6	17.1
2 persons	31.6	36.7	32.0	33.4
3 persons	23.0	18.8	27.5	23.1
≥4 persons	27.5	20.8	30.9	26.4
<i>Regional distribution (%)</i>				
Rural area or village	45.9	40.4	19.0	35.1
Small or middle sized town	31.1	31.4	43.8	35.4
Large town	23.0	28.2	37.2	29.5

*Questionnaire content, measurement and scaling*

A master questionnaire was developed in English and translated in the national languages using the procedure of back-translation to ensure linguistic equivalence (Brislin 1970; Maneesriwongul et al. 2004). Following back-translation, the questionnaire was extensively pre-tested by the researchers in order to identify and eliminate potential problems. Fieldwork started after editing, correcting, electronic programming and additional pre-testing of the electronic version of the questionnaire.

Participants were asked to complete the structured electronic questionnaire on their own. Four survey questions were relevant within the scope of the present study. First, consumers' self-reported consumption frequency of fish was registered on a 13-point scale that ranged from 'never' (1) to 'seven times per week' (13). The question was asked for fish in general as well as for farmed and wild fish. For convenience-matters, the scale was rescaled to average weekly consumption frequency, thus ranging from zero to seven. An indirect measurement for consumer awareness of fish origin was derived from the relationship between the three reported consumption frequencies as indicated in formula (1), which results in a percentage. The closer the percentage fits to 100, the higher the awareness of fish origin.

$$\text{Awareness of fish origin} = \frac{\left( \left( \frac{\text{Self reported farmed fish consumption frequency} + \text{Self reported wild fish consumption frequency}}{\text{Self reported total fish consumption frequency}} \right) * 100 \right)}{\quad} \quad (1)$$

Second, consumers' general attitude towards eating fish was measured, applying a derivative of Sparks and Guthrie's scale (1998). Attitude was measured on seven point semantic differentials for four bipolar items, with the negative item at the scale's left hand side. The bipolar items used in the construct were bad-good, unsatisfied-satisfied, unpleasant-pleasant and negative-positive.

Third, consumers were probed for their involvement in health. Involvement in health was measured using the six statements: *health means a lot to me, I care a lot about health, I do whatever I can to stay healthy, healthy food is important for me, I am very involved in health issues and it is important for me to have variation in my diet*. Statements were rated on a

seven point Likert agreement scale with extreme values ‘totally disagree’ (1) and ‘totally agree’ (7).

Fourth, personal data in terms of socio-demographics were questioned.

### *Statistical analyses*

Questionnaires were quality-checked and edited by the field research agency (IPSOS) in order to ensure accuracy and precision of the response prior to coding and transcription of the data. Statistical analyses were performed using the statistical software SPSS version 15.0. Principal component analysis (PCA) with varimax rotation and Cronbach’s alpha reliability checks are performed to confirm unidimensionality of the items relating to general attitude and health involvement and to allow further analyses with the averaged construct scores. Both constructs had an alpha value of 0.92, indicating ample internal reliability consistency, thus allowing the computation of a single construct score for each construct. Statistical analyses include descriptive statistics (reporting of means and standard deviations); bivariate correlation analysis; One-Way ANOVA with Bonferroni post-hoc testing for analysing between-country differences of mean scores on relevant variables; and cross-tabulations with Chi-square statistics for testing associations between categorical variables.

Considering the differences between countries, subjects from each country were then separated into groups of low and high involvement in health within each country, using the estimated medians of the construct. When reported values for health involvement were below the median, participants were allocated to the low health involvement group. When the reported values were above the median, the participant was allocated to the high involvement group. Group socio-demographics were described using cross-tabulation and differences were tested using Pearson chi-square test. When health involvement group means were compared, differences were tested in ANOVA models (Hair et al. 2006).

Finally, the effect of the health involvement on fish consumption was tested in a separate general linear model (GLM) for each country. In these models the categorical variable related to health involvement was the independent factor and fish consumption the dependent one. Differences and associations were considered statistically significant if the p-value was lower than 0.05.

## Results

### *Data reduction*

Using PCA, the items that represented health involvement and attitudes towards fish consumption were grouped into two factor variables (Table 2).

Table 2

Principle Component Analysis (PCA) results for the factor variables health involvement and attitudes towards fish consumption, to confirm data reduction.

Factor*	Variable	factor loading	Cronbach $\alpha$	explained variance
Health involvement	<i>Health means a lot to me</i>	0.89	0.92	71.7%
	<i>I care a lot about health</i>	0.88		
	<i>I do whatever I can to stay healthy</i>	0.87		
	<i>Healthy food is important for me</i>	0.86		
	<i>I am very involved in health issues</i>	0.84		
	<i>It is important for me to have variation in my diet</i>	0.74		
Attitudes towards fish consumption	<i>When I eat fish, I am feeling unpleasant-pleasant</i>	0.93	0.92	81.2%
	<i>When I eat fish, I am feeling unsatisfied-satisfied</i>	0.92		
	<i>When I eat fish, I am feeling bad-good</i>	0.89		
	<i>When I eat fish, I am feeling negative-positive</i>	0.87		

\* Varimax rotated

### *Cross-country differences in fish consumption*

Significant differences in fish consumption frequency and awareness of the origin of fish were reported by consumers across the three countries (Table 3). Total fish consumption was the highest in Spain, and did not differ between Norwegians and Belgians 16.1% of the Belgians, 31.2% of the Norwegians and 58.4% of the Spaniards met the food recommendations of 2 or more servings of fish per week. Wild fish consumption was the lowest in Belgium, followed by Norway and the highest in Spain. Consumers in Spain were

the most aware of the type of fish they consume, followed by the Norwegian and Belgian consumers. However, this difference was only significant between the Spaniards and the Belgians.

Table 3

Mean (standard deviation) differences in total fish consumption\*, farmed fish consumption\*, wild fish consumption\* and consumers' awareness of the origin of consumed fish between countries.

	Country			F <sub>2, 1318</sub>
	Belgium	Norway	Spain	
Total fish consumption per week	0.89(0.76) <sub>c</sub>	1.24(1.09) <sub>b</sub>	2.10(1.45) <sub>a</sub>	131.744** *
Farmed fish consumption per week	0.39(0.60) <sub>b</sub>	0.47(0.68) <sub>b</sub>	0.94(1.13) <sub>a</sub>	56.075***
Wild fish consumption per week	0.24(0.49) <sub>c</sub>	0.42(0.68) <sub>b</sub>	0.79(1.13) <sub>a</sub>	52.754***
% Awareness of fish origin	69.9(78.9) <sub>b</sub>	78.6(59.8) <sub>ab</sub>	85.2(68.38) <sub>a</sub>	5.169**

a-c indicate significantly different means using Bonferoni post hoc tests, with country as a factor variable, \* Consumption is measured in consumption occasions per week, \*\* p<0.01 based on Analysis of variance, \*\*\* p<0.001 based on Analysis of variance

*Cross-country differences in health involvement and attitudes towards fish consumption.*

Involvement in health was significantly higher in Belgium and Spain than in Norway (Table 4). Attitudes towards fish consumption were generally positive, resulting to a mean above the scales mid-point. In particular, Spanish consumers held more positive attitudes towards fish consumption than the Belgians.

Table 4

Differences in involvement in health and attitudes towards fish consumption between countries (mean scores and standard deviation)

	Country			F <sub>2, 1318</sub>
	Belgium	Norway	Spain	
Involvement with health	5.44(1.14) <sub>a</sub>	4.74(1.26) <sub>b</sub>	5.57(1.10) <sub>a</sub>	63.984*
Attitudes towards fish consumption	5.28(1.48) <sub>b</sub>	5.50(1.59) <sub>ab</sub>	5.66(1.47) <sub>a</sub>	7.254**

a-c indicate significantly different means using Bonferoni post hoc tests, with country as a factor variable, \* p<0.001 based on Analysis of variance, \*\* p<0.01 based on Analysis of variance

*Relationships with fish consumption*

The correlations between health involvement, attitudes towards fish consumption and fish consumption are shown in Table 5. The data suggested that the relationships between the variables are comparable between the countries. In Belgium, Norway and Spain, involvement in health and attitudes towards fish consumption were significantly and positively correlated with all three fish consumption variables. Despite these significant results, no significant association between health involvement and attitudes with the awareness of the origin of the fish was found.

Table 5. Correlations between the variables attitudes, health involvement and fish consumption, per country

		Total fish consumption	p	Farmed fish consumption	p	Wild fish consumption	p	Awareness origin	p
Belgium	Health involvement	$r_{438}=0.252$	<0.001	$r_{438}=0.098$	0.020	$r_{438}=0.122$	0.005	$r_{414}=0.003$	0.476
	Attitudes towards fish consumption	$r_{438}=0.411$	<0.001	$r_{438}=0.198$	<0.001	$r_{438}=0.156$	0.001	$r_{414}=-0.024$	0.312
Norway	Health involvement	$r_{440}=0.295$	<0.001	$r_{440}=0.181$	<0.001	$r_{440}=0.155$	0.001	$r_{430}=0.032$	0.252
	Attitudes towards fish consumption	$r_{440}=0.399$	<0.001	$r_{440}=0.225$	<0.001	$r_{440}=0.235$	<0.001	$r_{430}=-0.024$	0.311
Spain	Health involvement	$r_{435}=0.286$	<0.001	$r_{435}=0.204$	<0.001	$r_{435}=0.123$	0.005	$r_{431}=-0.011$	0.410
	Attitudes towards fish consumption	$r_{435}=0.276$	<0.001	$r_{435}=0.232$	<0.001	$r_{435}=0.093$	0.027	$r_{431}=0.023$	0.317

*Differences between health involvement groups*

Consumers from each country were separated into groups of low and high involvement in health, using the median split procedure within each country. The medians for Belgium, Norway and Spain were respectively 5.63; 4.79 and 5.70. Differences regarding socio-demographic characteristics were found between the two health involvement groups in all countries (Table 6).

In all three countries, high health involved consumers were associated more with being female and older, as shown by significant chi-square tests in table 6. In Belgium and Norway, the higher health involved group was also composed of a higher share of households with children.

Table 6.  
Socio-demographic characteristics\* between high and low health involvement groups within each country

Country	Characteristic	Health involvement			P value**
		Low	High	Total	
<i>Belgium</i>	n	218	222	440	
	<i>Gender</i>				
	Females	57.3	72.1	64.8	0.001
	<i>Age</i>				
	20-29	31.3	18.5	24.8	0.001
	30-39	24.3	26.1	25.2	
	40-49	26.1	22.5	24.3	
	50-60	18.3	32.9	25.7	
	<i>Education</i>				
	Secondary and lower	46.8	49.1	47.9	0.628
	<i>Children</i>				
In household	54.2	66.3	60.4	0.002	
Not in household	10.7	15.2	13.0		
No children	35.1	18.5	26.6		
<i>Norway</i>	n	221	221	442	
	<i>Gender</i>				
	Females	54.8	72.9	63.8	<0.001
	<i>Age</i>				
	20-29	28.5	19.9	24.3	0.031
	30-39	24.9	25.3	25.1	
	40-49	26.7	24.0	25.3	
	50-60	19.9	30.8	25.3	
	<i>Education</i>				
	Secondary and lower	34.4	27.1	30.8	0.099
	<i>Children</i>				

<i>Spain</i>	In household	49.1	60.2	54.9	0.090
	Not in household	18.0	16.5	17.2	
	No children	32.9	23.3	27.9	
	n	219	218	437	
	<i>Gender</i>				
	Females	59.4	71.6	65.4	0.007
	<i>Age</i>				
	20-29	24.2	25.2	24.7	0.096
	30-39	28.8	20.2	24.5	
	40-49	25.6	24.8	25.2	
	50-60	21.4	29.8	25.6	
	<i>Education</i>				
	Secondary and lower	42.9	45.4	44.2	0.600
	<i>Children</i>				
	In household	53.8	57.1	55.4	0.318
Not in household	7.1	10.1	8.7		
No children	39.1	32.8	35.9		

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\*% of the respondents, \*\* Pearson chi<sup>2</sup> test

Consumers' attitudes towards fish consumption (Figure 1) differed significantly between health involvement groups. In each of the countries, consumers that were involved in health had more positive attitudes towards fish consumption (Belgium:  $F_{1,439}=31.494$ ;  $p<0.001$ , Norway:  $F_{1,441}=17.742$ ;  $p<0.001$  and Spain:  $F_{1,439}=31.494$ ;  $p<0.001$ ).

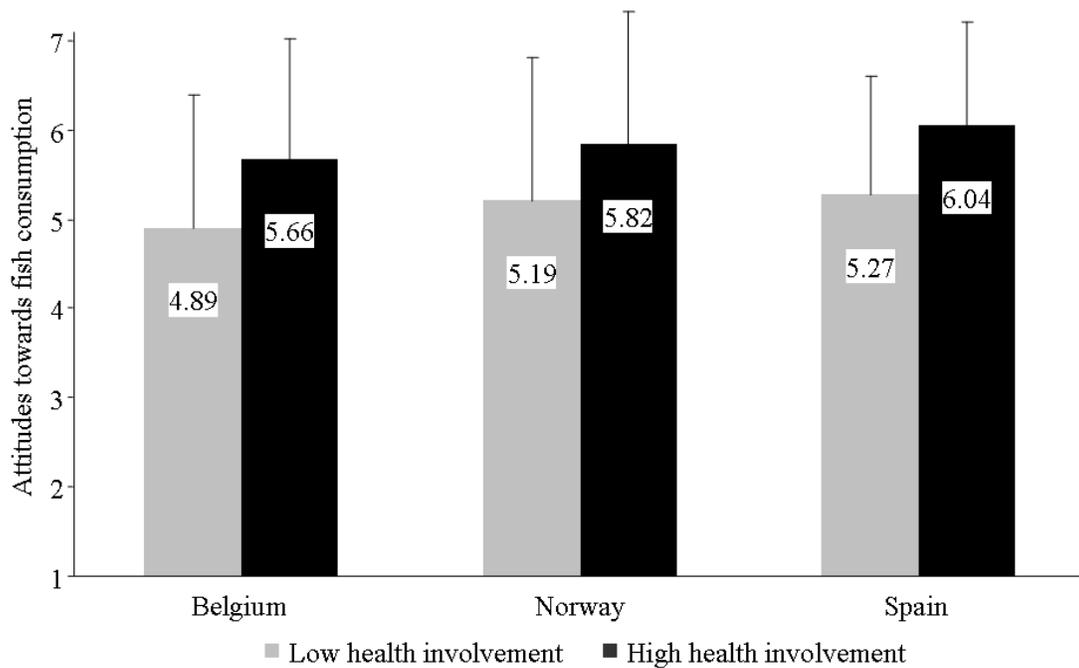


Figure 1. Mean (standard deviation) attitude towards fish consumption, rated on a 7 point scale from negative attitude (1) to positive attitude (7)

In Belgium, total fish consumption ( $F_{1,439}=19.95$ ;  $p<0.001$ ), farmed fish consumption ( $F_{1,439}=6.13$ ;  $p=0.014$ ) and wild fish consumption ( $F_{1,439}=10.58$ ;  $p=0.001$ ) were significantly higher for the group with a higher involvement in health (Figure 2).

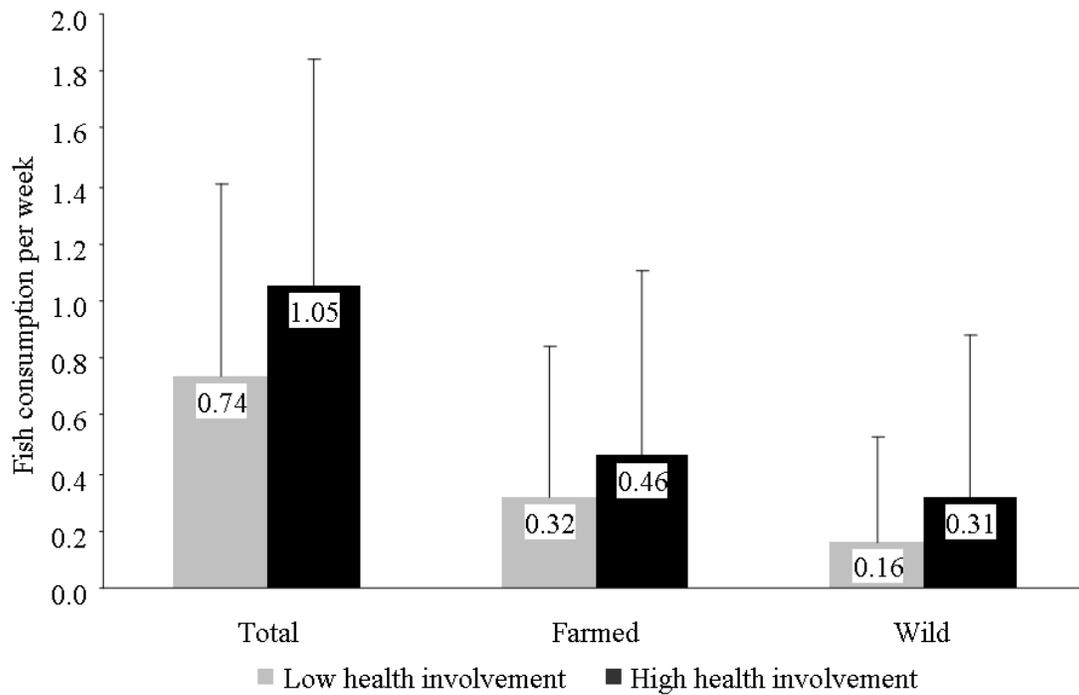


Figure 2. Mean (standard deviation) total, farmed and wild fish consumption (meals per week) by health involvement group in Belgium.

In Norway, total fish consumption ( $F_{1,441}=31.41$ ;  $p<0.001$ ), farmed fish consumption ( $F_{1,441}=9.38$ ;  $p=0.002$ ) and wild fish consumption ( $F_{1,441}=14.19$ ;  $p<0.001$ ) were significantly higher for the group with a higher involvement in health (Figure 3).

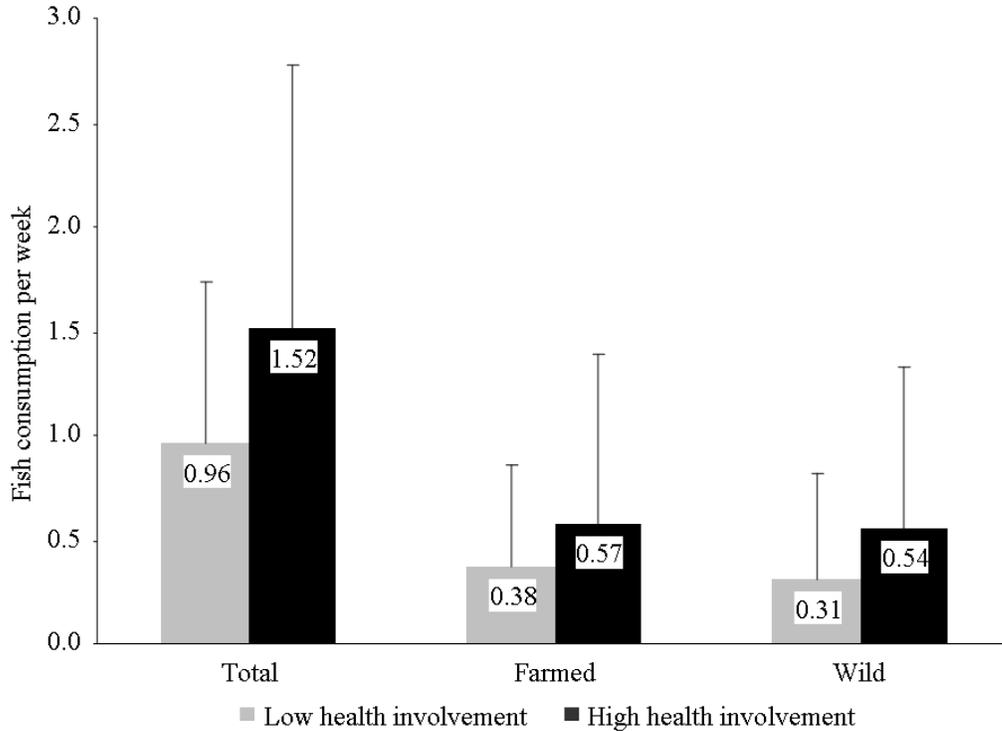


Figure 3. Mean (standard deviation) total, farmed and wild fish consumption (meals per week) by health involvement group in Norway.

Finally in Spain we found a higher total fish consumption ( $F_{1,436}=20.20$ ;  $p<0.001$ ) and farmed fish consumption ( $F_{1,436}=5.71$ ;  $p=0.017$ ) for the group with a higher involvement in health (Figure 4). Even though wild fish consumption followed a similar trend, it was not significantly different between the groups of high and low involvement in health ( $F_{1,436}=2.51$ ;  $p=0.114$ ).

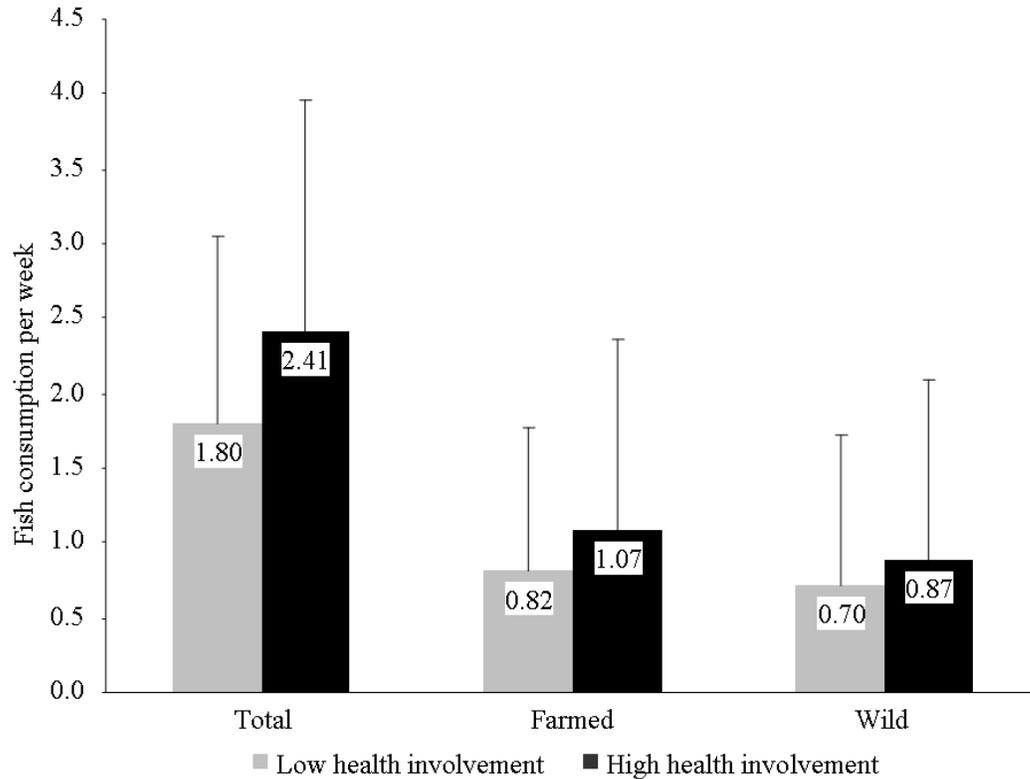


Figure 4. Mean (standard deviation) total, farmed and wild fish consumption (meals per week) by health involvement group in Spain.

A comparison of consumers' awareness of the origin of the fish they consume is presented in Figure 5. The data from Belgium and Norway suggested a tendency that consumers' health involvement was associated with awareness of the origin of the fish they consume. However, none of these differences were significant and an opposite trend was observed for Spain (Belgium:  $F_{1, 415}=2.42$ ;  $p=0.120$ ; Norway:  $F_{1, 431}=1.68$ ;  $p=0.195$ ; Spain:  $F_{1, 432}=0.33$ ;  $p=0.568$ ).

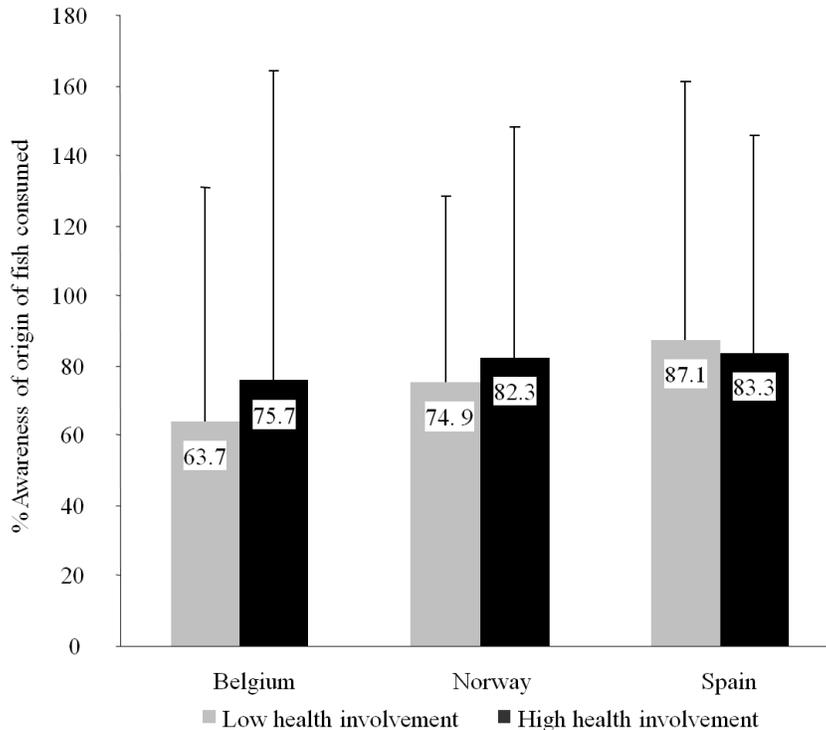


Figure 5. Consumers' awareness of the origin of the fish they consume in Belgium, Norway and Spain.

### Discussion and conclusion

The present study showed differences in reported total, farmed and wild fish consumption frequency in people responsible for food purchasing in the age range 20-60 years from Belgium, Norway and Spain. Spanish consumers consumed fish most frequently, Belgian consumers least frequently. Accordingly, health involvement and attitudes towards fish consumption were the lowest in Belgium, higher in Norway and the highest in Spain. Both, high health involvement and more positive attitudes towards fish consumption were suggested to positively associate with total fish consumption. In line with the lower fish consumption rates, we found Belgians also to be least aware of the fish's origin. The level of health involvement did not associate with the level of awareness within countries. In general consumers appeared to be rather poorly aware of the fish they consume being farmed or wild.

In agreement with Olsen (2003) the present study presented that involvement in health is an issue that varies with age. It was indicated that single, young males were the least involved in health and the consumption of healthy food, opposing the less young, non single females. Additionally, it was shown that attitudes towards the consumption of fish were significantly associated with fish consumption. Health involvement was found by Olsen to be a strong predictor of the attitudes towards fish consumption, which in the present study was expanded as being present in Belgium, Norway and Spain. Pieniak et al (2008) showed that involvement in health affects interest in healthy eating, which influences total fish consumption. This was clearly exemplified before, when younger subjects were found to be weakly influenced by health related attributes of food (Roininen et al. 1999) or by environmental changes that could increase convenience and access to healthier choices (Wiegersma et al. 2000).

Combining the present findings with the previous two by Olsen (2003) and Pieniak et al (2008), we conclude that health involvement is associated with age. Furthermore, there is a direct relationship of health involvement with fish consumption. Additionally, attitudes towards fish consumption were positively associated with fish consumption and as it has been previously discussed, that could be amplified by a high involvement in health. The present study expanded these findings by showing that the same effects are present in Belgium, Norway and Spain. Additionally, this study explored fish consumption in depth and presented that health involvement and attitudes towards fish consumption are associated with the consumption of both farmed and wild fish.

Interesting tendencies towards the explanation of discrepancies between the effects of socially desirable product characteristics on actual eating behaviour were presented, in a correlational manner. Experimental validation of these results would provide stronger evidence on the potency of the impact of the sensory and health related image of farmed fish on fish consumption.

The main outcome of this study is that involvement in health issues and attitudes towards fish consumption are associated with fish consumption in a positive manner. This influence is present for farmed and wild fish consumption. Belgium, Norway and Spain are three countries which are located in the central, the northern and southern part of Europe and represent low, medium and high fish consumption behaviour respectively. However, health

involvement and attitudes are associated with fish consumption equally across them. Self reported consumption frequency was also found to be associated with the awareness of the origin of the consumed fish. In summary, this study demonstrated that different types of consumers in Belgium, Norway and Spain may chose for farmed and wild fish based on their involvement in health issues and their attitudes towards fish consumption.

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## **References**

- Bem D J (1972) Self-perception theory. In *Advances in experimental social psychology*. vol.6 Academic press, Inc., New York and London, pp. 1-62
- Brislin, R.W. (1970). Back-translation for cross-cultural research. *Journal of Cross-cultural Psychology* 1, 185-216.
- Brunso K (2003) Consumer research on fish in Europe. In J. B. Luten, J. Oehlenschlaeger & G. Olafsdottir (Eds.), *Quality of fish from catch to consumer: Labelling, monitoring and traceability*. Wageningen Academic Publishers, Wageningen, pp. 335–344
- Hair, J., Black, B. Babin, B., Anderson, R. and Tatham, R. (2006). *Multivariate Data Analysis* (6<sup>th</sup> edition). Upper Saddle River, NJ: Prentice-Hall. Honkanen P, Olsen S O, Verplanken B (2005) Intention to consume seafood--the importance of habit. *Appetite*, 45(2), 161-168
- Kole A (2003) Consumer opinions towards farmed fish, accounting for relevance and individual knowledge. In J. B. Luten, J. Oehlenschlaeger & A. S. Ólafsdóttir (Eds.), *Quality of fish from catch to consumer*. Wageningen academic publisher, Wageningen, pp. 393-400
- Kole A P W, Altintzoglou T, Schelvis-Smit R A A M et al (2009) The effects of different types of product information on the consumer product evaluation for fresh cod in real life settings. *Food Quality and Preference* 20(3), 187-194
- Köster, E.P., Beckers, A., Houben, J.B. (1987) The influence of health information on the acceptance of a snack in a canteen test, in: Martens, M., Dalen, G.A., Russwurm, H.

- (Eds.), *Flavour Science and Technology* Chichester: Wiley. John Wiley & Sons, New York, pp. 391–398.
- Köster E P (2009) Diversity in the determinants of food choice: A psychological perspective. *Food Quality and Preference* 20(2), 70-82
- Kozup J C, Creyer E H, Burton S (2003) Making healthful food choices: The influence of health claims and nutrition information on consumers' evaluations of packaged food products and restaurant menu items. *Journal of Marketing* 67(2), 19-34
- Luten J, Kole A, Schelvis R et al (2002) Evaluation of wild cod versus wild caught, farmed raised cod from Norway by Dutch consumers. *Økonomisk Fiskeriforskning*, 2002(12) 44-60
- Malhotra, N.K., Peterson, M. (2006). *Basic marketing research: A decision-making approach*. Upper Saddle River: Pearson Education, Prentice Hall.
- Maneesriwongul, W., Dixon, J.K. (2004) Instrument translation process: a methods review. *Journal of Advanced Nursing* 48, 175-186.
- Mozaffarian D, Rimm E B (2006) Fish intake, contaminants, and human health - Evaluating the risks and the benefits. *Jama-Journal of the American Medical Association* 296(15), 1885-1899.
- Olsen S O (2001) Consumer involvement in seafood as family meals in Norway: an application of the expectancy-value approach. *Appetite* 36(2), 173-186
- Olsen S O (2003) Understanding the relationship between age and seafood consumption: the mediating role of attitude, health involvement and convenience. *Food Quality and Preference* 14(3), 199-209
- Olsen S O, Scholderer J, Brunsø K et al (2007) Exploring the relationship between convenience and fish consumption: A cross-cultural study. *Appetite*, 49(1), 84-91
- Pieniak Z, Verbeke W, Scholderer J et al (2008) Impact of consumers' health beliefs, involvement and risk perception on fish consumption: A study in five European countries. *British Food Journal*, 110(9), 898 - 915
- Roininen K, Lahteenmaki L, Tuorila H (1999) Quantification of consumer attitudes to health and hedonic characteristics of foods. *Appetite*, 33(1), 71-88
- Rortveit A W, Olsen S O (2007) The role of consideration set size in explaining fish consumption. *Appetite*, 49(1), 214-222
- Scientific Advisory Committee on Nutrition, Committee on toxicity of chemicals in food (2004) *Advice on fish consumption: Benefits and risks*. London: TSO

- Sidhu K S (2003) Health benefits and potential risks related to consumption of fish or fish oil. *Regulatory Toxicology and Pharmacology*, 38(3), 336-344
- Sparks, P., Guthrie, C.A. (1998) Self-Identity and the Theory of Planned Behavior: A Useful Addition or an Unhelpful Artifice? *Journal of Applied Social Psychology*, 28, 1393-1410.
- Verbeke, W., Sioen, I., Brunsø, K., De Henauw, S., & Van Camp, J. (2007a). Consumer perception versus scientific evidence of farmed and wild fish: exploratory insights from Belgium. *Aquaculture International*, 15(2), 121-136.
- Verbeke W, Sioen I, Pieniak Z et al (2005) Consumer perception versus scientific evidence about health benefits and safety risks from fish consumption. *Public Health Nutrition*, 8(4), 422-429
- Verbeke W, Vermeir I, Brunsø K (2007b) Consumer evaluation of fish quality as basis for fish market segmentation. *Food Quality and Preference*, 18(4), 651-661
- Weijzen P L G, de Graaf C, Dijksterhuis G B (2008) Discrepancy between Snack Choice Intentions and Behavior. *Journal of Nutrition Education and Behavior*, 40(5), 311-316
- Welch A, Lund E, Amiano P et al (2002) Variability of fish consumption within the 10 European countries participating in the European Investigation into Cancer and Nutrition (EPIC) study. *Public Health Nutrition*, 5, 1273-1285
- Wieggersma P A, Hofman A, Zielhuis G A (2000) Prevention of unhealthy behaviour by youth health care in The Netherlands. *Journal of Public Health Medicine*, 22(3), 386-392



## **PAPER II**

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## **Translating barriers into potential improvements: the case of new healthy seafood product development**

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## **Abstract**

**Purpose:** The aim of this study is to explore potential barriers to seafood consumption by young adults and the parents of young children. Knowledge of these barriers will be used to assist the development of new seafood product concepts that fulfil the needs of consumers.

**Design/methodology/approach:** To gather this information, twenty-eight infrequent consumers of seafood participated in three semi-structured two-hour focus group discussions in Denmark, Norway and Iceland. The results were then linked to the Stage-Gate model for consumer-based new product development (NPD).

**Findings:** The participants thought of seafood as either healthy or convenient, although there were concerns about the amount of effort required to prepare it. These concerns resulted in an expression of their need for products that are attractive, healthy, palatable, and convenient. In particular, the newly developed products should be accompanied by clear advice on preparation methods and materials. An increase in seafood availability coupled with lower prices would encourage these consumers to add seafood to their diet.

**Research limitations/implications:** Purchase-point-marketing and habitual behaviour were found to implicitly skew planned behaviour.

**Practical implications:** Inputs for NPD related to convenience, attractiveness, quality, trustworthiness, knowledge and requirements about seafood preparation are discussed.

**Originality/value:** The present study combines qualitative methods to lead to practical input for NPD focusing on overcoming the barriers that keep consumers from choosing existing healthy seafood products. The importance of the consumers' confidence in their ability to successfully prepare a seafood meal was revealed and can be used in Stage-Gate based NPD.

**Key words:** New seafood product development, consumers, seafood, food choice, health, young adults, families with young children.

**Paper type:** Research paper

## Introduction

To combine the diversity of Nordic seafood raw material, the expertise in the production of traditional seafood products and new emerging seafood technologies is an excellent basis for the development of new seafood products to meet consumer's demands. However, new product development (NPD) is a risky activity. This is exemplified by the high percentage of failure (70%) in the NPD process (Cooper, 1999). Nevertheless, examples of the successful use of the stage gate (SG) approach in seafood NPD has recently appeared in the literature (Morrissey, 2006; Sirois, 2006).

The basic principle behind the Stage Gate model (figure 1) is that each stage of the NPD is evaluated to increase the overall NPD success rate. The evaluation of ideas created in the discovery stage and stage 1 takes place in gates 1 and 2. During stage 2 the input given by the consumers is used to build business cases. These cases are then screened in gate 3 and the product development begins. Products passing gate 4 are tested for consumer acceptance. Products that pass gate 5 are launched and the post-launch success rate is then evaluated.

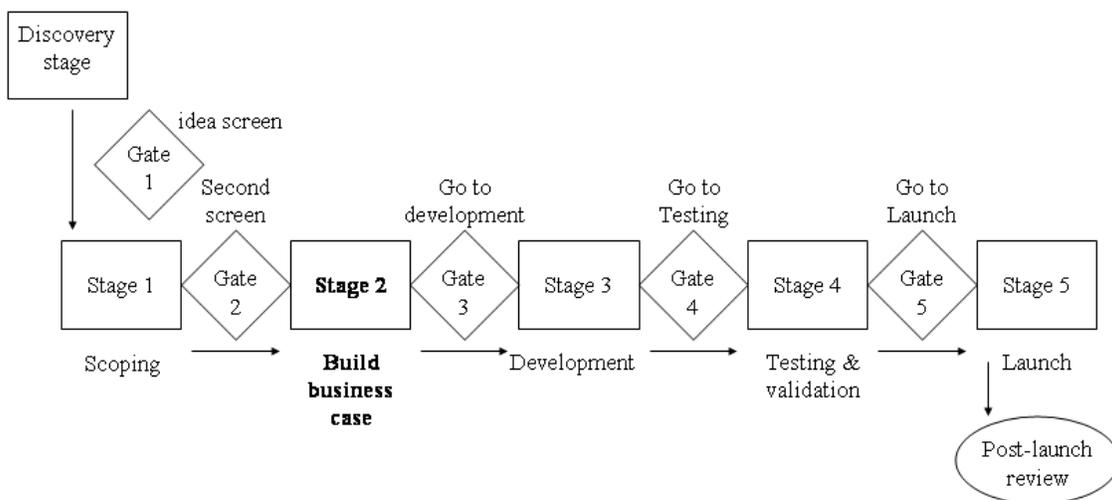


Figure 1. An overview of a typical Stage-Gate<sup>®</sup> system for new product development (Cooper, 2008)

The main purpose of our study was to provide input for future NPD by exploring barriers and opportunities for increasing seafood consumption. To achieve this goal, we utilised focus groups among young adults and families with young children. In our study we wanted to explore the possibilities of using qualitative interviewing techniques as input for NPD of innovative seafood products that may appeal to a particular consumer segment. Thus, our aim was to gain insight into their attitudes towards food, as well as seafood preparation and consumption in order to understand the emphasis they place on eating healthy food products. Ultimately, the results can be used as the first step towards a consumer led NPD (Brunsø and Grunert, 2007) and inspire the design of new healthy seafood product concepts according to Cooper's (2008) Stage Gate approach with particular emphasis on stage 2 (see figure 1).

### *The Seafood Challenge*

Fish and seafood have been repeatedly described as health promoting products (Mozaffarian and Rimm, 2006; Sidhu, 2003). Nevertheless, consumers in Europe do not successfully meet the recommended daily intake levels of two servings of seafood per week (Welch et al., 2002).

Various barriers to the consumption of seafood have previously been identified as: product quality (Verbeke et al., 2007); consumer attitudes (Brunsø, 2003); involvement with seafood (Olsen, 2001); consumer habits (Honkanen et al.2005); beliefs (Verbeke et al., 2005); and convenience (Olsen, 2003; Olsen et al., 2007; Rortveit and Olsen, 2007).

In Nordic countries like Iceland and Norway, fish and seafood used to be the main protein source, especially in coastal regions. Despite historical habits and traditions, the seafood consumption of young consumers is low (Steingrimsdóttir et al., 2002). The development of new innovative Nordic seafood product concepts, targeted towards younger consumers might increase seafood consumption and its associated health benefits.

However, limited research has been performed using qualitative methods to explore these complex issues with a focus on the case of young adults and parents of young children who face barriers in consuming seafood regularly.

The term seafood is used in this paper to encompass wild and farmed, finfish, crustaceans and shellfish, both of marine and freshwater origin in fresh, frozen and processed product forms (Jaffry et al., 2004).

In this paper, a further analysis of the barriers that keep younger consumers and parents of young children below the recommended seafood intake will be presented. This will provide a better understanding on how the existing seafood products can be improved through the NPD process in order to increase their acceptability and attractiveness.

## **Methods**

The present study is based on qualitative data collection. Therefore, focus group discussions among participants that have experienced the phenomenon (i.e. having barriers to seafood consumption) was considered the appropriate method to use (Mays and Pope, 2000; Endacott, 2008). This method is used because it provides invaluable insight into realistic and complex perceptual matrices that can later be used to explain total behaviours and lead to fruitful conclusions (Draper, 2004; Meyerick, 2006).

In this paper the main findings from three focus group discussions conducted in spring 2008 are presented. The main emphasis of the group discussions was on the attitudes of young adults and parents of young children towards food, cooking and consumption patterns, focusing on seafood.

Participants were recruited by contacting people from a random sample drawn from the national registry and through news items drawing interest in a gift voucher incentive. To participate, subjects had to be actively involved in shopping for and the preparation of the main meal in the household. They had to have a low consumption of seafood, less than two times per week in Norway and Iceland and less than once per week in Denmark, respective to the mean seafood consumption for each country. Consumers that absolutely avoid, dislike or were allergic to seafood were excluded. Additionally, participants were screened out if they were employed in the seafood industry, consumer and sensory research, market analysis, advertising or marketing. Finally, they had to fit in one of the two groups of relevance to the study, the single young adults, aged from eighteen to twenty five, or the parents of young children, with children aged three to thirteen years. This resulted in a group of 28 participants

of which most were undergoing or have completed some post high school education (Table 1).

Table 1.  
Description of the participants in the focus groups in the three countries.

Characteristic	# participants		
	Iceland	Norway	Denmark
<i>age (years)</i>			
18-25	-	3	5
26-35	5	1	-
36-45	4	2	3
46-55	2	-	3
<i>gender</i>			
male	4	2	4
female	7	4	7
<i>#children</i>			
0	-	4	4
1	4	-	3
2	3	2	3
≥3	4	-	1
<i>age of youngest child (years)</i>			
<5	6	1	1
≥5-10	3	1	4
≥11-13	2	-	2
<i>seafood consumption (times/month)</i>			
<1	-	3	-
1	2	-	-
2	4	-	3
3	-	1	8
4	5	2	-

All focus groups were conducted during spring of 2008 in Denmark (Aalborg), Norway (Tromsø) and Iceland (Reykjavik). The discussions lasted approximately two hours, were lead by trained focus group moderators and were conducted in the native language of each group. All discussions took place in locations related to the researchers and thus special attention was given to making the participants feel comfortable. A comfortable setting was reached by providing refreshments and arranging the meeting room so that the participants would sit in a circle (Kitzinger, 1995). The discussions followed a semi-structured protocol

which was developed in cooperation between the three research institutes that were involved in the study and was common across countries.

The discussions were divided into four sessions. In the first session, some general aspects of the importance of food, cooking and health were discussed via open questions. In the second session, issues varying from attitudes towards seafood and seafood consumption to preferences about shopping locations were discussed. The third session focused on barriers to the consumption of seafood and possible solutions were raised and discussed. In the final session the aspect of convenience was discussed. During this session the participants aimed to formulate a definition of convenience, which was then linked to eating seafood. An overall opinion on convenient products was compared to their opinion about convenient seafood products. Additionally, they were asked to give their thoughts about positive and negative aspects of seafood and matters that prevent them from eating more seafood, together with possible solutions. Lastly, they were asked for proposals for new convenient seafood products. Combining all these different methods of retrieving data we can assume that the information was verified by means of triangulation (Mays and Pope, 2000; Cohen and Crabtree, 2008).

The discussions were recorded and typed into a transcript by the moderator shortly after they were finished (Rabiee, 2004). Later the data were manually analyzed. The analysis was comparative, with attention given to differences and similarities between the participants within and between the three countries (Mays, 1995). Due to the number of similarities between countries and participants results are mainly presented without a description of their origin. However, an indication of the origin of the data was provided whenever it was judged as appropriate to describe an opinion as country or target group specific (Korzen-Bohr and O'Doherty Jensen, 2005). The researchers involved from each country reported the outcomes of the basic interpretive analyses. Subsequently, these reports were distributed to the researchers in the other two countries for comparative analyses aiming at a cross country discussion and consensus. At this point parts of the data were also analysed by more than one researcher, from different institutes, to ensure the reliability of the results (Mays, 1995; Greenhalgh and Taylor, 1997). The transcripts were read repeatedly and in the process, relevant points and concepts were coded and condensed into interconnected themes. As the interviews followed a semi-structured interview guide the coding process was partially selective from the beginning. Themes that derived from the data were then organized into

three categories: a) concepts, b) product characteristics and c) marketing strategy. These categories were selected because they were considered valuable while building a business case (stage 2, figure 1) within the Stage-Gate model. Furthermore, these specific categories were chosen for their potential to directly inform a consumer oriented NPD. The existing extensive reports are referred to by presenting participants' quotes in the results section.

## **Results**

### *General aspects*

In the first session, the participants discussed that food is in general perceived as important. However, the balance between considering food as a pure energy provider and as something more related to hedonic liking differed among participants. They tended to differentiate between healthy food, pleasant food and convenient food. Many factors can influence the level of involvement in food, cooking and health, but responsibilities that accompany the existence of children in the household increased this involvement the most:

“There are fewer easy solutions after you've had children. Life just...life changes a lot when you have small children who kind of make you structure things much more than you did before.”

In Iceland and Denmark a “consumption circle” was described. The idea of a consumption circle developed because participants mentioned that they tend to prepare the same 10-15 dishes which they “know by heart”, distributed over the whole year. The reason for this habitual consumption circle was the aim to “make their everyday life flow as smoothly as possible”. In Iceland, external factors, such as school meals, had a major influence on the consumption circle:

“I possibly feel like having fish, but my boys have already had fish twice or three times that week [at school], I feel I can't do it to them [to make them eat it more often].”

Some consumers plan for the evening meal while having dinner one day before or “when something has to be taken out of the freezer”. Others decide what to prepare for dinner on their way to the retail store or even in it.

Some participants put an effort into involving their children in the preparation of the meals. They believed that this could be a learning experience for their children, as it was for them. Conversely, others preferred that “children stay out of the kitchen” in order to “get things done quickly”.

The time spent on preparing the main meal varied among participants and situations. The average time spent on preparation of an evening meal was believed to be from 15 minutes to one hour. When “meeting and preparing” a meal with friends or for guests, the preparation of a meal was considered “a project” instead of “just something that needs to be done” and could take longer.

#### *Attitudes and preferences*

During the second session the participants reported overall positive attitudes towards seafood. Childhood experiences were thought to influence their present attitudes towards seafood and their seafood consumption. When their past consumption was “almost every day” or “five times a week”, they described having a seafood meal as a negative experience. In this case they would not consume seafood frequently in the present. Moreover, these consumers were careful not to “overdose” their children as their parents sometimes did to them. However, consumers who did not grow up with seafood as part of their childhood ‘consumption circle’ tended to like seafood less than others.

Seafood was associated with both positive and negative aspects, as presented in figure 2.

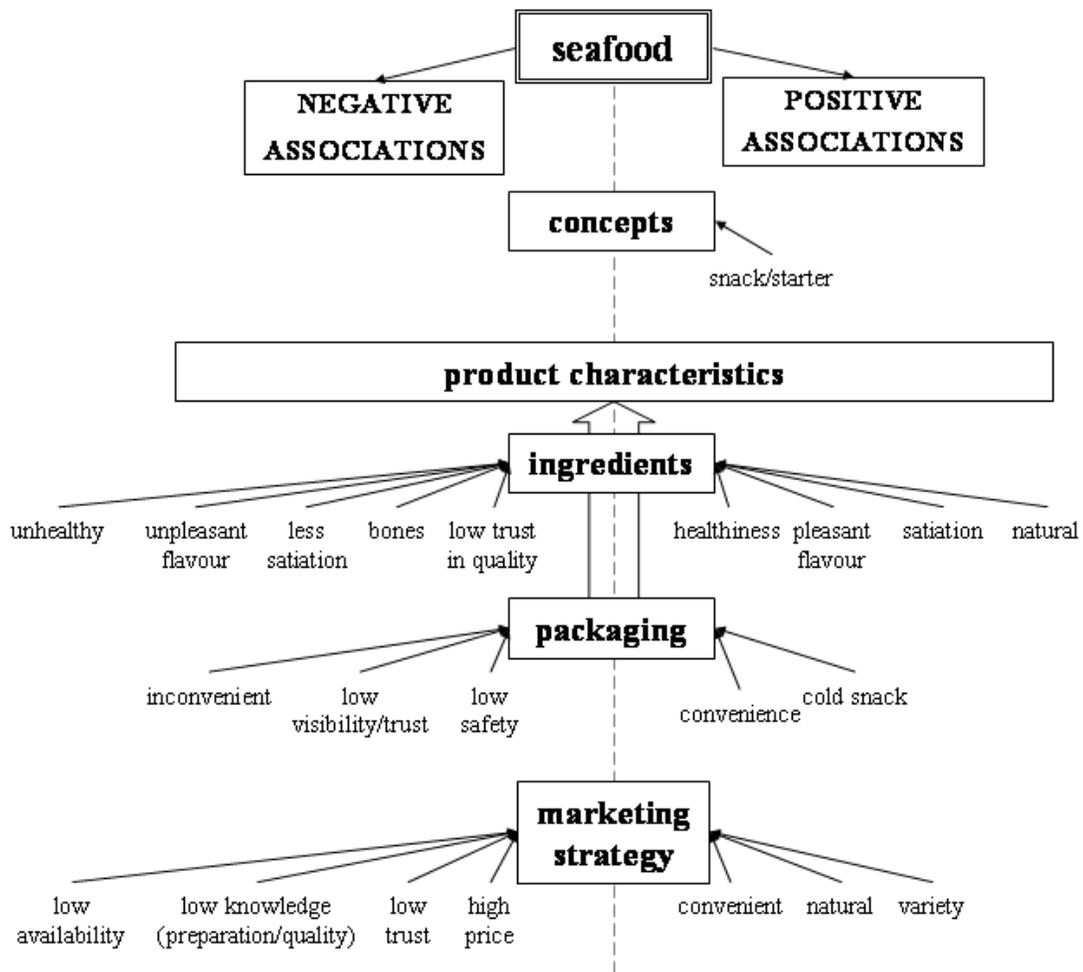


Figure 2. Negative and positive issues associated with seafood.

The results from this consumer study suggest that the most important aspects associated with seafood consumption were high price, healthiness, satiation, convenience, trust in safety, lack of knowledge on ways of judging the product quality and in preparing the product, fish bones, the flavour of seafood and the perceived low availability of good fresh seafood.

The focus group participants had the opinion that seafood could be consumed throughout the week. Lower cost seafood products were used during both lunch and dinner. Products of higher quality and price were considered as something they would have at the weekend, at home or in restaurants.

They mentioned that they were affected by information and marketing campaigns, which they considered inadequate:

“When there is some advertising for fish, I tend to think, well you may try some proper fish tonight instead of all that canned fish, and these are also the situations that tend to catch my attention.”

“You walk through the [supermarket] store and there is nothing that tells you to buy seafood.”

They added that the image of seafood in the supermarkets was not positive. This was in their opinion based on the shelf space designated for seafood and also because of the low quality and appearance of the usually frozen supermarket products. This was the main reason that they buy seafood at specialty shops instead of supermarkets:

“It is way too common that the fish is dry and ugly in the [supermarket] stores.”

Nevertheless, visiting a supermarket was considered a convenient way to purchase various products at once. The participants expressed their need for high quality seafood products in supermarkets.

“If I plan to buy good seafood, I go to the fish monger... I want to be able to buy it in the supermarket, but I can't [because the quality is not sufficient].”

The above results showed that consumers associate seafood to positive and negative aspects that can lead to realistic adaptations of the product design during the NPD process.

### *Barriers and solutions*

In the third session the intention to consume more seafood was discussed. However, some critical issues such as price, availability and the lack of cooking skills functioned as barriers for adding more seafood to their habitual ‘consumption circle’ (Figure 3).

Potential improvements in order to overcome the barriers to seafood consumption are also presented in figure 3. Lower prices, increased knowledge of preparation methods and quality, convenience and accessibility were the aspects that were raised most frequently. As expected, some of the potential improvements for increasing seafood consumption mirrored main barriers.

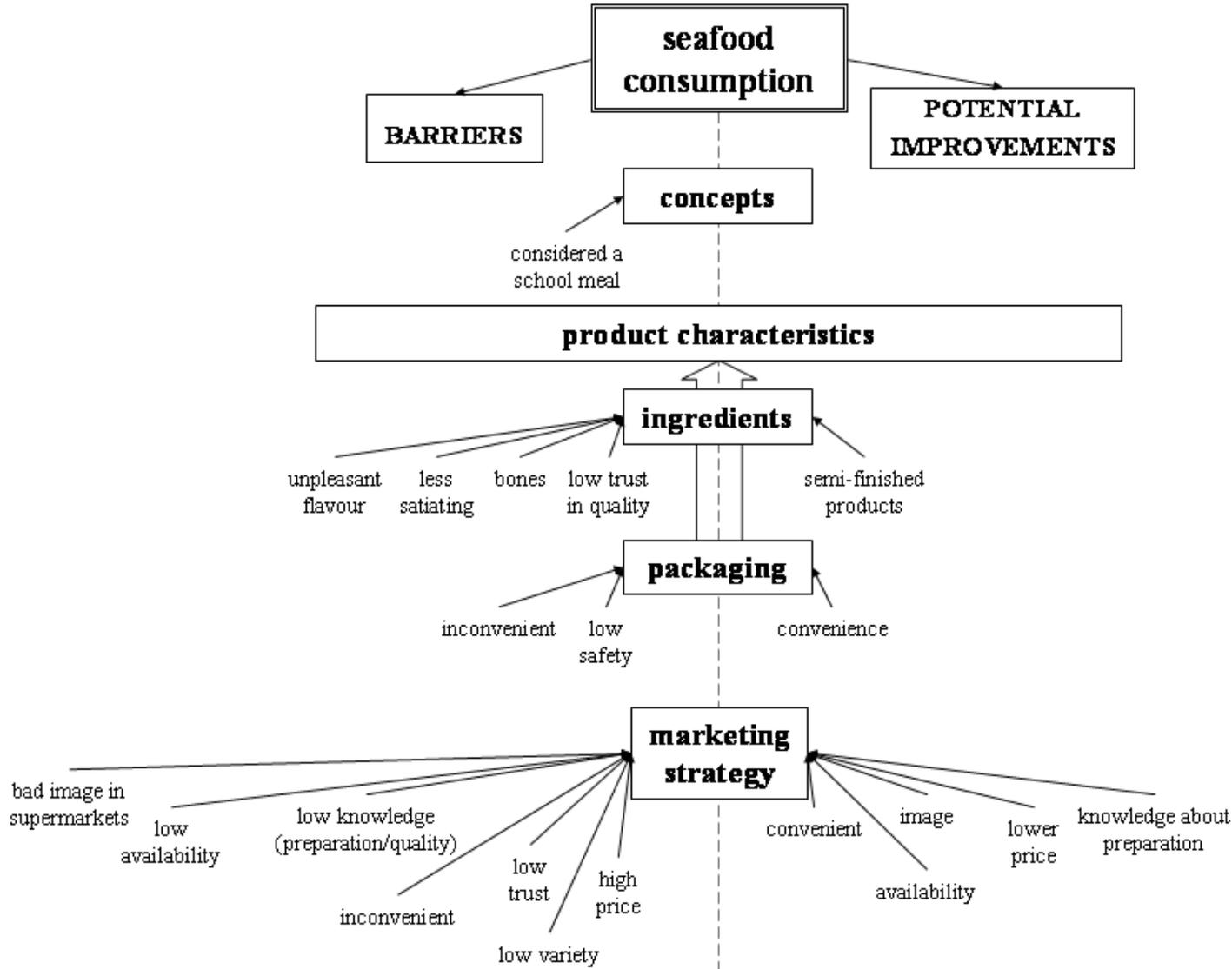


Figure 3. Barriers to seafood consumption and potential areas of improvement.

The relationship between price and quality was repeatedly stressed as a crucial aspect affecting consumers' shopping habits. Consumers also stated that some variation in the quality would be acceptable if it was openly communicated. The price tag functioned as a key indicator of quality:

“In the old days you would get good [quality] fish. Today you don't know how to distinguish... firm flesh and eyes with shine... the quality [markers] have often been cut off.”  
Translating all these results into potential improvements indicated promising innovation pathways for NPD.

### *Convenience*

During the fourth session, convenience was strongly linked to the time needed to prepare a meal. Most participants had some experience with convenience products. Some of the participants reported frequent use of convenience products. However, several participants had negative attitudes towards convenience products. If the preparation of a meal was effortless, it could lead to an increase in the guilt related to healthy food habits. A clear distinction between pre-cooked or frozen products and fresh, partly or fully, prepared products was also made. The latter had a much more positive image and many participants were regular buyers of such seafood products.

“I believe that food that has been processed as little as possible is the healthiest.”

Seafood was described as “the ideal fast food when one could keep it simple”. However, it was explicitly described as a food category that does not fit into the “fast food restaurants”. When focusing on more complicated dishes, seafood was considered as a more inconvenient food category than meat.

“A tasty, complex seafood dish takes mostly more time than a complex meat dish.”

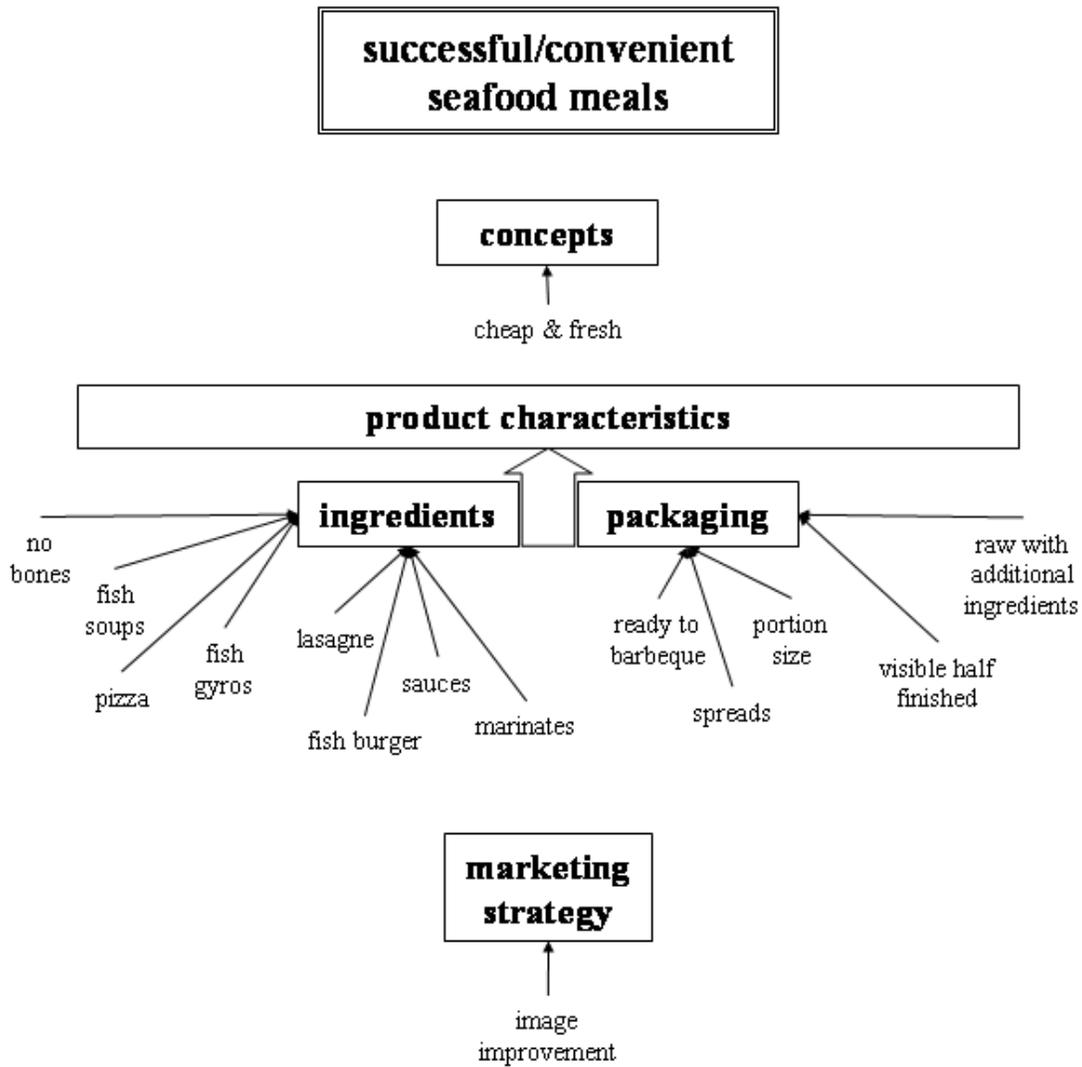


Figure 4. Ideas for acceptable convenient seafood meals.

In general the participants were positive towards convenience products (Figure 4). However there were some differences in how a “good convenient product” was perceived. Some participants did not like the idea of pre-cooked dishes, such as fish lasagne, fish burgers or pizza while others were more open towards this type of product. Although negative attitudes towards some convenience products were reported, it was stressed that these products were an important and popular choice when they tried to balance time, money, knowledge and good taste.

“I do think it is expensive [seafood], don’t know how to cook it in various ways...and therefore end by buying ready-to-cook seafood meals, which I do actually admit is very convenient.”

The participants mentioned that they would prefer convenience products that they could add their “personal touch” to. In this way, they would feel that convenience food could also be “real food” and not only “emergency food”.

The focus group discussions have generated information based upon the participants’ attitudes towards health and healthy food, especially related to the preparation and consumption of seafood. The results showed that the aspects to consider during the generation of the business case for NPD according to the Stage Gate approach can be related to the product characteristics, the marketing strategy and some product concepts (Figure 5). The participants demonstrated a high demand for products that were healthy, attractive, satiating and convenient. The products have to be visible through their packaging and accompanied by clear advice on how to prepare them. Finally, the products should be varied, widely available and not highly priced.

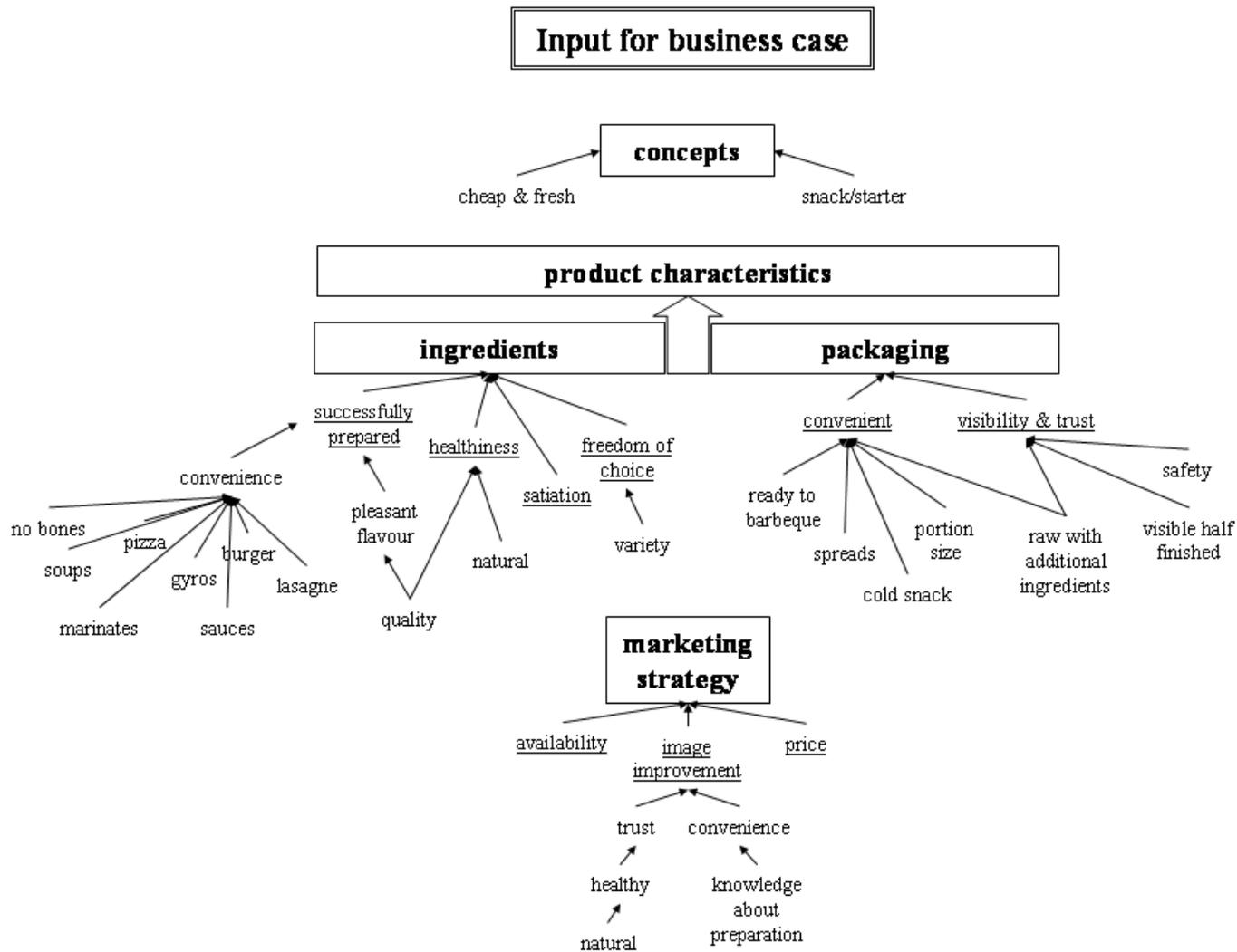


Figure 5. Summarized input for the part of building the business case in the Stage Gate new product development process.

Incorporating the values that were presented above into NPD is an approach to the way the consumers formulate their needs, from an abstract level to a concrete one.

## **Discussion**

The central aim of this study was to gain insight into the attitudes and behaviour of young adults and parents of young children in addition to exploring the barriers and opportunities for seafood consumption. Some of the results presented in the present paper are in agreement with previous findings. However, new notions were extracted from the interaction between the participants. The results were used as input for NPD according to the Stage Gate approach to inspire the design of new healthy seafood product concepts.

### *Health related food-choices*

The participants linked food with their health and discussed the trade-off between health and convenience. They reported feelings of guilt that accompanied their choices for a meal focused more on convenience than on healthiness. This type of guilt is not a new notion (Soetens et al., 2008; Wardle and Solomons, 1994), but the participants talked about it as leading them to new insights. They indicated that when a product was convenient, they were suspicious about its quality and healthiness. Information about the quality and the healthiness of a convenient product would improve its image and increase their willingness to choose the product. Seafood products were purchased from supermarkets and fish mongers. Seafood meals were considered to be attractive and fresh and could be purchased from a canteen or a restaurant. Most participants were aware of the positive health benefits of seafood. The general idea that “seafood is good for you” was present and led to willingness to consume more seafood (Roosen et al., 2007). However, the final choice for seafood was not necessarily made due to discrepancies between planned and actual behaviour (Köster, 2009). The latter resulted in a feeling of guilt about not being cautious with regards to personal health, together with the feeling of being inconsistent with their knowledge (Paisley et al., 2001). Feelings of a lack of time to prepare a meal are probably an indication of food being a lower priority than work, education and hobbies (Jabs et al., 2007).

Seafood was strongly associated with healthiness but also led to negative associations. Across the three countries the participants mentioned poor access to seafood of high quality, the high

price of seafood and insecurity related to their own cooking skills and in judging what good quality seafood is. This finding is in agreement with a previous study in Norway (Myrland et al., 2000).

It was shown that convenience and availability alone could not persuade the participants into purchasing a product even though they were willing to do so. Trust in the quality and their cooking skills would increase the market potential of healthy seafood products.

### *Children and childhood*

A factor that strongly influenced the choice of a seafood meal was the presence of children in the household. It was believed that “good habits” should be taught to and performed with the children, which involved healthy eating (Fiates et al., 2008). Parents of young children indicated that it is difficult to convince their children to eat seafood. Peer influence at school leads to children adopting a negative attitude towards seafood and finally to refusal to consume it (Ross, 1995). Once they express their dislike of seafood at the dinner table, their pre-school siblings start mirroring the negative attitude towards seafood (Barthomeuf et al., 2009). Parents then decrease the frequency of seafood meals due to this rejection. Additionally they are not willing to prepare something during a busy day and then receive negative feedback (Jabs et al., 2007).

Past exposure and habits influenced their present food choice behaviour positively and negatively. Regular past consumption increased their liking of and trust in, seafood products. However, high exposure resulted in product boredom (Köster and Mojet, 2007). Hence, it can be concluded that both high and low consumption of seafood during childhood had a negative influence on the consumption in later life (Fox and Ward, 2008) and finding a good balance in the frequency of serving seafood is a challenge for the parents of young children.

The input given from this part of the discussion led to a conclusion about NPD aiming at consumers in their childhood. The group discussed that the opinion of the parents is not only related to their caring attitudes towards their children, but is also dependent on their own past experiences. A successful product should be developed on the basis of parents’ confidence in a successful meal that would not bore their children in the long term.

### *“Consumption circle” of familiar recipes*

During qualitative analysis, the concept of a consumption circle was used to describe the consumption and eating habits of participants. The participants described the common practice of having 10-15 dishes that are randomly prepared during the year. It appeared that seafood does not play a major role in the consumption circle. In order to increase seafood consumption the challenge is to break into this habitual circle. This concept provided practical insight on the previously presented issue of the strength of habit in food choice behaviour (Honkanen et al., 2005).

One of the main messages extracted from the focus groups was that an improvement of the image and an increase in the availability of seafood could increase intake. Sources of promotional information were explicitly mentioned as a reason for remembering to purchase more seafood. There was a general agreement that more promotional strategies would lead to an increase in the consumption of seafood and seafood products. As participants primarily select their main meal during shopping, the results indicated that more seafood promotion at the purchase points could be a way to influence consumer choices.

Based on the discussions, seafood was considered to be a product that is too expensive to risk preparing inappropriately. Hence, information about the preparation method and the choice of additional ingredients or accompaniments would increase the marketability of new healthy seafood products. The participants were willing to add more seafood to their consumption circle and they would act accordingly if they had access to healthy and convenient seafood products of guaranteed high quality (Pieniak et al., 2007).

The participants showed an overall preference to be reminded at the purchase points of new recipes and guided on how to prepare them to break out of their long trusted habits. There was a demand for new products that would simply describe the necessary steps to a successful meal on the packaging.

### *Concluding remarks*

We can conclude that healthy eating requires some complex choices (Brug et al., 1995), especially when it comes to seafood. However, the participants discussed the need for a

balance between health, pleasure and convenience. Light-users of seafood from countries with traditionally high seafood consumption face barriers related to the price and quality of their traditional seafood products. The group suggested that promotional material would assist them in staying consistent with their intended food choice behaviours. The promotional material should offer information on preparation methods at the purchase point. Eventually, this additional information will redirect their attention to food choices which are based on their knowledge on health.

A potential limitation of the current study may be the inability to control for an optimal group dynamic. It was considered that involving two groups of consumers, i.e. young adults and families with young children, may lead to a loss of discussion points that could arise if the groups discussed seafood separately. However, the interesting suggestions that could be elicited from the interaction of the groups have led to the final choice of groups (Kitzinger, 1995; Greenhalgh and Taylor, 1997). Moreover, the fact that participants could describe the phenomenon of interest in the present study from various perspectives was considered to be utterly beneficial (Collingridge and Gantt, 2008). Another possible limitation was the external validity of our findings. It is generally considered that results of qualitative research should not be used to formulate generalised conclusions for the general public. However, it is considered an extremely valuable method for retrieving realistic, real-life data. Information from focus group discussions can help guide efforts to quantify behaviour and also help to interpret the findings (Draper, 2004; Meyerick, 2006).

Using qualitative consumer data as input for NPD is not as common as in other fields of research (Van Kleef et al, 2005a, b). However, a careful exploration of the consumers' discussions on the subject of our interest provides valuable input. Analysing the information that is provided by the consumers can lead to a better understanding of the current market situation (Søndergaard, 2005; Søndergaard and Harmsen, 2007). In addition, the consumer perspectives are captured without being directed by pre-selected items of a questionnaire. This information can then be used as the voice of the consumer when ideas for new products are generated.

### **Implications for research and practice**

Considering the increasing need for innovative seafood products that focus on healthiness, convenience, palatability and food preparation knowledge, an overall improvement in the image of seafood is required.

On a theoretical level, various new issues can be extracted from these results for use in further exploration and possible quantification. Promising issues for further research are: a) past and habitual behaviour, b) the interaction between time perception and convenience, c) perception of safety and trust with respect to risk factors and transparent communication, d) the image of healthy products that are influencing health behaviour and finally e) the interaction between age and household size. Furthermore, the gap that is left from psychological attitudinal models of the past (Ajzen, 1991) could be the main focus of further research. In all three countries implicit factors like past experiences and situations where choices were made quickly appeared to have an impact on the present liking and consumption level of seafood. These behaviours might have been overlooked if the intention to behave in a socially desirable manner was not explored. Further qualitative and quantitative exploration of the steps in food choice that are made between the intention to behave in one way and the actual behaviour is needed.

On an applied level, our results were used as an input for NPD according to the Stage Gate approach. The results inspired the design of new healthy seafood product concepts such as fish fillets from one or a mix of species, in improved packaging with appropriately targeted package information. Our results suggest that the image and availability of seafood products needs to be improved in order to attract consumers to incorporate a seafood meal into their habitual consumption circle. The participants showed a high demand for a variety of healthy products and would like to be advised on how to prepare them properly. They indicated that convenient products would be a choice that they would make for a weekday meal. The products would preferably be visible in their packaging, trustworthy and would demand some preparation effort, to decrease the guilt feelings that are related to convenience and the responsibility for the health of their family or themselves. The interest in being involved in the preparation of the meal is in line with the findings of Larson et al. (2006). Nevertheless, weekend meals were accepted as being more complicated and demanding, but consumers would like to have appropriate advice and recommendations accompanying the product.

The successful interaction of the participants in the focus groups was confirmed by several results being in agreement with the existing literature. However, new and useful insight into the interaction between freedom of choice of a food product that consumers would confidently prepare and eventually add to their habitual consumption circle was given. The latter can also be used in the further steps of Stage-Gate based NPD and inform the design of a product concept test of which the results will be reported in the future.

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### **References**

- Ajzen, I. (1991), "The Theory of Planned Behaviour", *Organizational Behavior and Human Decision Processes*, Vol. 50 No. 2, pp. 179-211.
- Barthomeuf, L., Rousset, S. and Droit-Volet, S. (2009), "Emotion and food: Do the emotions expressed on other people's faces affect the desire to eat liked and disliked food products?", *Appetite*, Vol. 52 No. 1, pp. 27-33.
- Brug, J., Debie, S., van Assema, P. and Weijts, W. (1995), "Psychosocial determinants of fruit and vegetable consumption among adults: Results of focus group interviews", *Food Quality and Preference*, Vol. 6 No. 2, pp. 99-107.
- Brunso, K. (2003), "Consumer research on fish in Europe", In J. B. Luten, J. Oehlenschlaeger and G. Olafsdottir (Eds.), *Quality of fish from catch to consumer: Labelling, monitoring and traceability*, Wageningen Academic Publishers, Wageningen, pp. 335-344.
- Brunso, K. and Grunert, K. G. (2007), "Consumer attitude measures and food product development", In H. MacFie (Ed.), *Consumer-led food product development*, Woodhead publishing ltd, Cambridge, pp. 197-222.
- Cohen, D.J., Crabtree, B.F. (2008), "Evaluative criteria for qualitative research in health care: controversies and recommendations", *Annals of Family Medicine*, Vol. 6 No. 4, pp. 331-339.

- Collingridge, D.S. and Gantt E.E (2008), "The quality of qualitative research", *American Journal of Medical Quality*, Vol. 23 No. 5, pp. 389-395.
- Cooper, R. G. (1999), "From experience - The invisible success factors in product innovation", *Journal of Product Innovation Management*, Vol. 16 No.2, pp. 115-133.
- Cooper, R. G. (2008), "Perspective: The Stage-Gate (R) idea-to-launch process-update, what's new, and NexGen systems", *Journal of Product Innovation Management*, Vol. 25 No.3, pp. 213-232.
- Draper, A. K. (2004), "The principles and application of qualitative research", *Proceedings of the Nutrition Society*, Vol. 63 No.4, pp. 641-646.
- Endacott, R.R.N. (2008), "Clinical research 4: Qualitative data collection and analysis", *International Emergency Nursing*, Vol. 16, pp. 48-52.
- Fiates, G. M. R., Amboni, R. D. M. C. and Teixeira, E. (2008), "Television use and food choices of children: Qualitative approach", *Appetite*, Vol. 50 No.1, pp. 12-18.
- Fox, N. and Ward, K. (2008), "Health, ethics and environment: A qualitative study of vegetarian motivations", *Appetite*, Vol. 50 No. 2-3, pp. 422-429.
- Greenhalgh, T. and Taylor, R. (1997), "How to read a paper: Papers that go beyond numbers (qualitative research)", *BMJ*, Vol. 315, pp. 740-743.
- Honkanen, P., Olsen, S. O. and Verplanken, B. (2005), "Intention to consume seafood--the importance of habit", *Appetite*, Vol. 45 No.2, pp. 161-168.
- Jabs, J., Devine, C. M., Bisogni, C. A., Farrell, T. J., Jastran, M. and Wethington, E. (2007), "Trying to Find the Quickest Way: Employed Mothers' Constructions of Time for Food", *Journal of Nutrition Education and Behavior*, Vol. 39 No. 1, pp. 18-25.
- Jaffry, S., Pickering, H., Ghulam, Y., Whitmarsh, D. and Wattage, P. (2004), "Consumer choices for quality and sustainability labelled seafood products in the UK", *Food Policy*, Vol. 29, pp. 215-228.
- Kitzinger, J. (1995), "Qualitative Research: Introducing focus groups", *BMJ*, Vol. 311, pp. 299-302.
- Korzen-Bohr, S. and O'doherty Jensen, K. (2005), "Heart disease among post-menopausal women: Acceptability of functional foods as a preventive measure", *Appetite*, Vol. 46, pp. 152-163.
- Köster, E. P. (2009), "Diversity in the determinants of food choice: A psychological perspective", *Food Quality and Preference*, Vol. 20 No. 2, pp. 70-82.

- Köster, E. P. and Mojet, J. (2007), "Boredom and the reasons why some new food products fail", In M. Hal (Ed.), *Consumer-led food product development*, Woodhead publishing ltd, Cambridge, pp. 262-280.
- Larson, N. I., Perry, C. L., Story, M. and Neumark-Sztainer, D. (2006), "Food preparation by young adults is associated with better diet quality", *Journal of the American Dietetic Association*, Vol. 106 No. 12, pp. 2001-2007.
- Mays, N. (1995), "Qualitative Research: Rigour and qualitative research", *BMJ*, Vol. 311, pp. 109-112.
- Mays, N. and Pope, C. (2000), "Qualitative research in health care. Assessing quality in qualitative research", *BMJ*, Vol. 320, pp. 50-52.
- Meyerick, J. (2006), "What is good qualitative research? A first step towards a comprehensive approach to judging rigour/quality", *Journal of Health Psychology*, Vol. 11 No. 5, pp. 799-808.
- Morrissey, M. (2006), "Culinary based product development for seafood and the stage gate principle", *The Third SEAFOOD Conference*. Tromsø, Norway.
- Mozaffarian, D. and Rimm, E. B. (2006), "Fish intake, contaminants, and human health - Evaluating the risks and the benefits", *Jama-Journal of the American Medical Association*, Vol. 296 No. 15, pp. 1885-1899.
- Myrland, Ø., Trondsen, T., Johnston, R. S. and Lund, E. (2000), "Determinants of seafood consumption in Norway: lifestyle, revealed preferences, and barriers to consumption", *Food Quality and Preference*, Vol. 11 No. 3, pp. 169-188.
- Olsen, S. O. (2001), "Consumer involvement in seafood as family meals in Norway: an application of the expectancy-value approach", *Appetite*, Vol. 36 No. 2, pp. 173-186.
- Olsen, S. O. (2003), "Understanding the relationship between age and seafood consumption: the mediating role of attitude, health involvement and convenience", *Food Quality and Preference*, Vol. 14 No. 3, pp. 199-209.
- Olsen, S. O., Scholderer, J., Brunsø, K. and Verbeke, W. (2007), "Exploring the relationship between convenience and fish consumption: A cross-cultural study", *Appetite*, Vol. 49 No. 1, pp. 84-91.
- Paisley, J., Sheeshka, J. and Daly, K. (2001), "Qualitative Investigation of the Meanings of Eating Fruits and Vegetables for Adult Couples", *Journal of Nutrition Education and Behavior*, Vol. 33 No.4, pp. 199-207.

- Pieniak, Z., Verbeke, W., Scholderer, J., Brunsø, K. and Olsen, S. O. (2007), "European consumers' use of and trust in information sources about fish", *Food Quality and Preference*, Vol. 18 No. 8, pp. 1050-1063.
- Rabiee, F. (2004), "Focus-group interview and data analysis", *Proceedings of the Nutrition Society*, Vol. 63 No. 4, pp. 655-660.
- Roosen, J., Marette, S., Blanchemanche, S. and Verger, P. (2007), "The effect of product health information on liking and choice", *Food Quality and Preference*, Vol. 18 No. 5, pp. 759-770.
- Rortveit, A. W. and Olsen, S. O. (2007), "The role of consideration set size in explaining fish consumption", *Appetite*, Vol. 49 No. 1, pp. 214-222.
- Ross, S. (1995), "Do I really have to eat that?": A qualitative study of schoolchildren's food choices and preferences", *Health Education Journal*, Vol. 54 No. 3, pp. 312-321.
- Sidhu, K. S. (2003), "Health benefits and potential risks related to consumption of fish or fish oil", *Regulatory Toxicology and Pharmacology*, Vol. 38 No. 3, pp. 336-344.
- Sirois, M. (2006), "Proven methods of developing successful new value added seafood products in an ever changing market place", Paper presented at the 2nd TAFT meeting, Quebec, Canada.
- Soetens, B., Braet, C., Van Vlierberghe, L. and Roets, A. (2008), "Resisting temptation: Effects of exposure to a forbidden food on eating behaviour", *Appetite*, Vol. 51 No. 1, pp. 202-205.
- Steingrímisdóttir, L., Þorgeirsdóttir, H. and Ólafsdóttir, A. S. (2002), "Könnun á mataræði Íslendinga 2002: Helstu niðurstöður", *Rannsóknir Manneldisráðs Íslands V*, from: <http://www.lydheilsustod.is/media/manneldi/rannsoknir/skyrsla.pdf> (accessed 28 March 2008)
- Søndergaard, H. A. (2005), "Market-oriented new product development. How can means-end chain approach affect the process?", *European Journal of Innovation Management*, Vol. 8 No. 1, pp. 79-90.
- Søndergaard, H. A. and Harmsen H. (2007), "Using market information in product development", *Journal of Consumer Marketing*, Vol 24 No. 4, pp. 194-201.
- Van Kleef, E., Van Trijp, H.C.M., and Luning, P. (2005a), "Consumer research in the early stages of new product development: a critical review of methods and techniques", *Food Quality and Preference*, Vol. 16, pp. 181-201.

- Van Kleef, E., Van Trijp, H.C.M., and Luning, P. (2005b), “Functional food: health claim-food product compatibility and the impact of health claim framing on consumer evaluation”, *Appetite*, Vol. 44, pp. 299-308.
- Verbeke, W., Sioen, I., Pieniak, Z., Van Camp, J. and De Henauw, S. (2005), “Consumer perception versus scientific evidence about health benefits and safety risks from fish consumption”, *Public Health Nutrition*, Vol. 8 No. 4, pp. 422-429.
- Verbeke, W., Vermeir, I. and Brunso, K. (2007), “Consumer evaluation of fish quality as basis for fish market segmentation”, *Food Quality and Preference*, Vol. 18 No. 4, pp. 651-661.
- Wardle, J. and Solomons, W. (1994), “Naughty but Nice - a Laboratory Study of Health Information and Food Preferences in a Community Sample”, *Health Psychology*, Vol. 13 No. 2, pp. 180-183.
- Welch, A., Lund, E., Amiano, P., Dorronsoro, M., Brustad, M., Kumle, M., Rodriguez, M., Lasheras, C., Janzon, L., Jansson, J., Luben, R., Spencer, E.A., Overvad, K., Tjønneland, A., Clavel-Chapelon, F., Linseisen, J., Klipstein-Grobusch, K., Benetou, V., Zavitsanos, X., Tumino, R., Galasso, R., Bueno-de-Mesquita, H.B., Ocké, M.C., Charrondière, U.R. and Slimani, N. (2002), “Variability of fish consumption within the 10 European countries participating in the European Investigation into Cancer and Nutrition (EPIC) study”, *Public Health Nutrition*, Vol 5, pp. 1273-1285.



## **PAPER III**

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## **A voice-of-consumer approach in development of new seafood product concepts**

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## **Abstract**

This paper describes a consumer based approach for development of new seafood product concepts among young adults in Norway and Iceland. The study aim was to gain insight in how young adults determine their acceptance of seafood and make potential product choices. Additional insights measured were confidence in seafood preparation and consumption choices when exposed to specific new seafood concepts.

Based on consumer-reported values, three seafood product concepts were evaluated by 354 consumers in a web-based, conjoint experiment in Norway and Iceland.

Consumers' evaluations showed a number of consumer preferences for specific seafood product concepts partly associated with and partly conflicting with their original values. Understanding consumer attitudes can help to explain these results.

The results of this study will be used as a guide for the next step in developing seafood product concepts.

## **Keywords**

Attitudes; seafood-product-development; product-concept-evaluation; young adults.

## **Title**

A voice-of-consumer approach in development of new seafood product concepts

## **Introduction**

The health benefits of seafood consumption are well known; especially with respect to lowering the risk of coronary heart disease. For many other diseases (such as diabetes II, cancer, cognitive decline or development), more research is needed to demonstrate the health effects of eating seafood (Undeland et al. 2009).

Public health organizations in various countries recommend that fish should be consumed at least two times per week. However, the average fish consumption in Europe is considerably less frequent than recommended by the public health organizations. The average fish consumption in Europe was reported as 20.8 kg (live weight equivalent per capita) in 2005 (FAO, 2009), which indicated that fish consumption frequency was on average around one time per week, estimated from average fish serving sizes (Einarsdóttir et al. 2007). These findings are further supported by self reported questionnaires about seafood consumption among European consumers (Honkanen et al. 2005).

Various barriers to the consumption of seafood have previously been identified as: product quality (Verbeke et al., 2007); consumer attitudes towards choosing fish for a meal (Brunso, 2003); involvement with seafood (Olsen, 2001); consumer food choice habits (Honkanen et al., 2005) ; beliefs about risks and benefits related to health (Verbeke et al., 2005); and convenience (Olsen, 2003; Olsen et al., 2007; Rortveit and Olsen, 2007).

It has been documented that fish consumption is even lower for young adults, when compared to older consumers (Li et al., 2001; Nayga and Capps, 1995). Even in countries with a significant fisheries sector like Iceland and Norway, fish consumption of young consumers is considerably below the recommendations (Myrland et al., 2000; Similä et al., 2003; Steingrimsdóttir et al., 2002).

Research shows the most common relocation time (change in residence) for Western societies occurs at about 20 years of age (Arnett, 2000). Moving out of the parental home, for example

to study at a university, has been shown to influence the food habits of young adults. As a result, the consumption of fresh fruit, cooked and raw vegetables, fatty fish, seafood and olive oil is decreased and the consumption of sugar, alcohol and fast-food is increased (Papadaki et al., 2007).

Two of the most common barriers for young adults in preparing their own healthy meals are the lack of time and cooking skills (Shepherd et al., 2006; Altintzoglou et al., in press). Young adults who prepare their own meals tend to consume less fast-food and their food intake is closer to the common dietary recommendations for fat, calcium, fruit, vegetables and dietary fiber (Larson et al., 2006). These practices can stimulate young adults to prepare healthier meals in a convenient manner. Additionally, advice on how to identify healthier readymade snacks and meals would increase the overall healthiness of their diet (Larson et al., 2008).

Therefore development of new seafood product concepts for young adults is a challenge and may contribute to a change in their diet and healthier life style. The combination of the diversity of available seafood in Nordic countries, the production expertise in traditional products, emerging technologies applied to seafood and consumer behavior are considered to be an excellent basis for the development of new seafood products to meet young consumer's demands. However, new product development (NPD) is a risky activity. This is exemplified by the high percentage of failure (70%) in the NPD process (Cooper and Edgett, 2005; Cooper, 1999). Nevertheless, examples of the successful use of a consumer oriented seafood product development have been reported (Morrissey, 2006; Sirois, 2006).

The aim of this study was to evaluate various new seafood product concepts among young adults in Norway and Iceland. In this study we gain insight into young adults' seafood acceptance and potential choices, as well as confidence in seafood preparation and consumption when exposed to specific new seafood product concepts. The results will be used for a next step towards consumer-led development of seafood product prototypes.

## **Methods**

### *From consumer values to seafood product concepts*

In a previous study with consumer focus groups in Norway, Iceland and Denmark (Altintzoglou et al., in press) nine consumer values were identified for development of new seafood products; i.e. healthiness, satiation, convenience, visibility & trust, freedom of choice, successful preparation, image improvement, availability and price. An idea-generation workshop with a multi-disciplinary team of seafood product developers, sensory scientists, consumer scientists, seafood technologists, seafood retailers, product designers and nutritionists led by an expert in innovation was held. This innovation expert was not otherwise associated to the research project. In this workshop a combination of card-sorting (Heaton et al., 1993), brainstorming of ideas for seafood products and narrowing down to a small number of concepts (Lerdahl, 2007) was carried out. The multidisciplinary team members collected prior to the workshop photos representing the nine consumer values from the focus groups, based on their personal understanding of the meaning of the values. A standard card-sorting procedure led to reorganization of the photos, in order to arrive at a mutual understanding of the consumer values. Next, a brainstorming session for product ideas was carried out. Each team member was asked to write down in a few lines or keywords ideas for new seafood products. Thereafter each team member could add comments to all ideas. Next similar ideas were grouped to a number of main concepts. Each team member gave a score (1-5) for the most relevant consumer values (healthiness, satiation, convenience, visibility & trust, freedom of choice, successful preparation, image improvement, availability and price) and for the innovative character of the concept. Those seafood concepts with the highest average scores were selected for the evaluation as described in this paper.

### *Seafood product concepts*

Three seafood product concepts (“thematic fillets,” “mixed bites” and “minced fish”) were developed with the overall image that seafood was produced from fish caught in clean arctic waters. This was aimed to generate an image of naturalness and purity. This image was visualised on a banner present on the package showing a small fishing vessel on the sea in the Nordic surroundings. All species used for the seafood concept evaluation were presented as fresh raw material.

Furthermore, the three product concepts were presented in two different types of packaging; one with a transparent window where the product could be seen and one without the window.

These variations in the packaging aimed at the confirmation of the consumers' demand for visibility of the seafood product in order to increase their feeling of trust in its quality.

The concept "thematic fillets" aimed at fulfilling the consumers' need for freedom of choice between four themes. Cod (*Gadus morhua*) was selected as the fish species and the four themes were a) "natural Nordic," (NN) with attention to the purity and naturalness of the Nordic environment, b) "French herbs," (FH) with attention to the use of aromatic herbs in combination with fish, c) "hot & spicy," (HS) with attention to the use of a chili sauce in combination with fish and d) "fish & fruit," (FF) with attention to a meal with fish and fruit. The thematic concepts were also enhanced by the picture shown on the package. In case of the NN theme a photo of a typical Nordic fishing village along the coast was shown. In case of FH a picture of a French house was shown, with attention to an outdoors table and plants. In case of HS a picture of a Mexican environment with cactuses was shown. Finally, in case of FF a picture of a tropical beach with palm trees was shown.

The concept "mixed bites" aimed at the fulfillment of the consumers' need for variation and freedom of choice, as well as increased convenience with regards to cutting the product into small portions. The dimensions of the fish bites were approx. 2x2x2 cm. For the "mixed bites" concept, different species were used across countries, based on national consumer consumption behaviour. The condition of three mixed fish species included cod (*Gadus morhua*), salmon (*Salmo salar*) and halibut (*Hippoglossus hippoglossus*) for Norway and cod (*Gadus morhua*), salmon (*Salmo salar*) and haddock (*Melanogrammus aeglefinus*) for Iceland. When the condition was mixed seafood, the species used were cod (*Gadus morhua*), mussels (*Mytilus edulis*) and shrimps (*Pandalus borealis*) for Norway and haddock (*Melanogrammus aeglefinus*), scallops (*Pecten maximus*) and shrimps (*Pandalus borealis*) for Iceland.

Finally, the concept "minced fish" aimed at consumers' demand for convenience, as a healthy alternative for minced beef or pork. The species used for this concept was cod (*Gadus morhua*) which was ground. The "minced fish" concept was presented to the consumers as a package of a) one portion of uniformly minced fish (approx. 500 g) comparable to minced beef and pork products, b) three portions (approx. 180 g/portion) of minced fish and c) 17 portions (approx. 30 g/portion) of minced fish.

Some concepts were used to measure the effect of a proposed recipe and/or preparation method on consumers' confidence in a successful preparation of the meal. When provided, this additional information was presented as separate text on the screen during the test. All seafood concepts described above were the basis for the study design. Figure 1 shows an example of one of the concepts ("mixed bites") presented to the consumers involved in the test.



Figure 1. Example of the "mixed bites" product concept visualisation

#### *The participants in the concept test*

The recruitment of the participants was done via posters on campuses of universities in Reykjavik and Tromsø, open advertisements on public internet pages of open recruitment web-pages and the web-pages of the participating research organisations and by group e-mails to individuals that have permitted our communication. The emphasis of the invitation was on overall food choices and preferences. No reference to the beneficial health effects of seafood was made and a small incentive was offered. The participants, registered via the internet link

mentioned in the advertisement, were sorted for socio-demographic characteristics such as age (<30 years old) and household situation that allocated them in the study's target population.

### *Study design*

The nine consumer values from the relevant focus group studies were used in the design of experimental conditions and evaluative questions. This study was based on a modified Greco-Latin square design (Table 1) which resulted in 33 experimental conditions of semi-conjoint nature. Seven of these conditions were the control conditions and contained no descriptive information about the seafood product concepts. The control conditions were the first to be randomly presented to the participants. Hereafter the rest of the experimental concepts were presented to the participants in a random order. The grouping of the randomization code between control and experimental conditions was performed in order to avoid any carry-over effect of knowledge from the experimental conditions to the control conditions. The experimental conditions (see table 1) were combinations of the three product concepts (thematic fillets vs. mixed bites vs. minced fish), the two visibility conditions (partly visible product vs. not visible product), the three types of meal preparation information for the mixed bites (no guide vs. preparation method vs. recipe), the four fish fillet themes (NN vs. FH vs. HS vs. FF), the three types of species combinations for the mixed bites (only cod vs. mixed fish vs. mixed seafood) and the three types of presentation of the minced fish (1 portion 500 g vs 3 portions of 180 g each vs 17 portions of 30 g each).

Table 1.  
Description of the study design and the experimental conditions

Cond.	Concept	Product visibility	Guide	Theme	Cod,mixed fish (MF), mixed seafood (MS)	Number of portions – weight per portion	Descriptive text
1	Thematic fillets	+					*
2		+	R+PM	NN			+
3			R+PM	NN			+
4		+	R+PM	FH			+
5			R+PM	FH			+
6		+	R+PM	HS			+
7			R+PM	HS			+
8		+	R+PM	FF			+
9			R+PM	FF			+

10	Mixed	+			Cod	*
11	bites	+			MF	*
12		+			MS	*
13		+	PM	NN	Cod	+
14			PM	NN	Cod	+
15		+	PM	NN	MF	+
16			PM	NN	MF	+
17		+	PM	NN	MS	+
18			PM	NN	MS	+
19		+	R	NN	Cod	+
20			R	NN	Cod	+
21		+	R	NN	MF	+
22			R	NN	MF	+
23		+	R	NN	MS	+
24			R	NN	MS	+
25	Minced	+			1-500 g	*
26	fish	+			3-180 g	*
27		+			17-30 g	*
28		+	R+PM	NN	1-500 g	+
29			R+PM	NN	1-500 g	+
30		+	R+PM	NN	3-180 g	+
31			R+PM	NN	3-180 g	+
32		+	R+PM	NN	17-30 g	+
33			R+PM	NN	17-30 g	+

\* Control conditions without a descriptive text were randomly presented before the rest experimental conditions were randomly presented. Product visibility is marked with a + for the visible products. The existence of a guide is marked by an R for recipe and PM for preparation method. The “natural Nordic” theme is symbolized by NN, the “French herbs” theme by FH, the “hot & spicy” theme by HS and the “fish & fruit” theme by FF.

### *The questionnaire*

A questionnaire was developed in English and translated into Norwegian and Icelandic. The first edition of the questionnaire was distributed to a small pilot group of evaluators who were representative of the target group in the study. The input and comments received from the small pilot group was used to refine the final version of the questionnaire. Fieldwork started after editing, correcting, electronic programming and pre-testing of the electronic version of the questionnaire.

The web-based questionnaire included a welcome and instruction for participants to complete the form. The main part of the questionnaire included questions aimed at evaluating the product concepts on attractiveness, naturalness, trustworthiness, convenience, confidence about the preparation of a meal using the product and finally willingness to buy the product.

All items were measured by means of self reported nine point scales with one (1) denoting the lowest evaluation for each variable (e.g. totally not attractive) and nine (9) the opposite extreme (e.g. totally attractive).

After the evaluation of the product concepts, participants were exposed to questions about some of their attitudes and personality traits. Four items of the health orientation scale (Ophuis, 1989) were used to measure health interest. Two items of the personal health scale (Schifferstein and Oude Ophuis, 1998) were used to measure the perceived need to take action on improving their personal health. Three items of the food neophobia scale (Pliner and Hobden, 1992) were used to measure food curiosity. Two items were used to measure convenience orientation and the perceived convenience of seafood (Olsen et al., 2007). Two items were used to measure interest in naturalness of food (Grunert et al., 1993). All items were measured by means of self reported ratings about their agreement to statements, with seven point likert scales with one (1) denoting “totally disagree” and seven (7) totally agree. Finally, questions about socio-demographic characteristics and fish consumption frequencies were presented to the participants.

### *Statistical analysis*

The original questions (items) of each attitudinal scale were used to calculate one mean variable for each scale (group of questions). This decreased number of attitudinal variables was used in the analysis of consumers’ attitudes and personality traits.

General linear model (GLM) analyses of variance (ANOVA) were performed to detect main effects and interactions between the independent variables (i.e. concept, visibility, theme, guide, species and portion) and country on the dependent evaluation variables (i.e. attractive, trustworthy, natural, convenient, sure to prepare, willing to buy). Hochberg GT2 tests for large sample sizes were used to define differences when ANOVA indicated so.

Paired samples t-tests were performed to reveal differences between countries.

Differences were considered statistically significant when  $p < 0.05$ . When  $p \leq 0.001$ , the differences were reported as significant, without the presentation of a p-value.

## Results

### *Participants*

The socio demographic characteristics of the participants in this study are presented in Table 2. More young females than males participated in the study. There was no difference between education levels of the participants between countries. Approx. 52% of the participants have a secondary, lower or technical education. Most participants lived outside their parental residences and half of these participants were single. A small proportion of the participants were living with their parents and few had children. The consumption of fish as a main meal was just above once a week for both countries. Only a few occasions of consumption of fish as snacks or lunches were reported.

Table 2.  
Socio-demographic characteristics of the participants from Norway and Iceland

	Norway	Iceland	Total
N	173	181	354
Gender (%)			
Males	30.8	36.2	33.5
Females	69.2	63.8	66.5
Age (years)	24.2	25.1	24.7
Education level (%)			
Secondary, lower or technical	52.8	52.2	52.5
Higher	47.2	47.8	47.5
Household situation (%)			
Single, living with parents	0.0	22.9	11.5
Single, living alone	52.8	24.4	38.6
Couple without children	36.1	40.2	38.2
Couple with children at home	11.1	10.4	10.8
Single parent	0.0	2.1	1.1
Fish consumption (times/week)	1.5	1.0	1.3

### *Comparison between concepts*

Regarding main effects of the experimental conditions related to the three concepts (i.e. “thematic fillets” vs. “mixed bites” vs. “minced fish”), statistically significant differences were observed (Figure 2) in perceived attractiveness, naturalness, trustworthiness and

convenience with “minced fish” being rated significantly lower for all these values than “thematic fillets” and “mixed bites”. Participants also reported different levels of security regarding the preparation of a meal between the various concepts. Specifically, “minced fish” led to significantly less security about the preparation than “thematic fillets” and “mixed bites”. Finally, differences in willingness to buy the various concepts was found with “minced fish” leading to significantly less willingness to buy than “thematic fillets” and “mixed bites”.

Looking at differences between countries, the data suggested differences in trustworthiness, convenience and willingness to buy each of the products with Norway scoring lower than Iceland. For security about the preparation of a meal using the product concepts Norwegian respondents scored higher than the Icelanders.

A significant interaction was found between countries and the three concepts. Participants evaluated “minced fish” as less convenient in Norway when compared to “mixed bites,” “thematic fillets” and the relevant evaluations of the Icelandic participants. Additionally, in Iceland “minced fish” did not lead to less security about the preparation of a meal when compared to “thematic fillets” and “mixed bites”. On the contrary, “minced fish” was the only concept making the Icelanders surer about the preparation of a meal than the Norwegians. Finally, the concept “minced fish” led to even less willingness to buy the product among the participants in Norway when compared to “thematic fillets” and “mixed bites” and compared to the participants from Iceland ( $p = 0.006$ ).

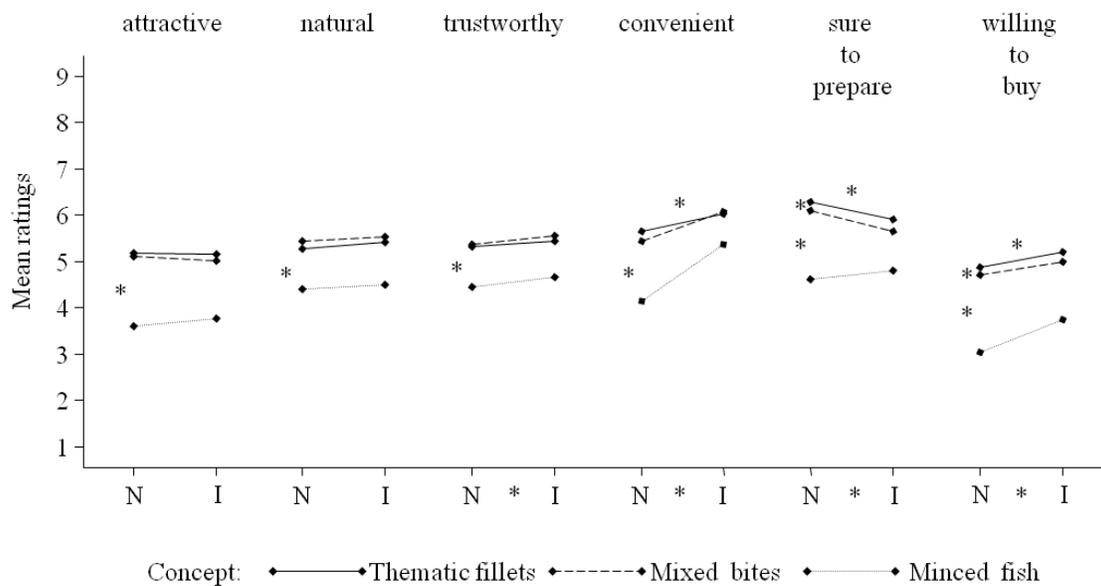


Figure 2. Evaluation of product concept conditions in Norway (N) and Iceland (I) on self reported nine point scales with one (1) denoting the lowest evaluation for each variable (e.g. totally not attractive) and nine (9) the opposite extreme (e.g. totally attractive). \* Indicates significant differences (p<0.05) a) between N and I between countries and b) between data points for the specific comparison; c) \* on top of data points indicates interaction between the dependent variable and the countries.

### Product visibility

As regards main effects of the experimental conditions related to visibility (i.e. partly visible product vs. not visible product), significant differences (Figure 3) on attractiveness, naturalness, trustworthiness and convenience were found with the partly visible product being rated by the participants as significantly higher than the not visible product. Moreover, the three product categories were rated different in willingness to buy them with the partly visible product leading to significantly more willingness than the not visible product.

Comparing the data between countries indicated differences in naturalness, trustworthiness, convenience and willingness to buy the products, with Norwegian respondents scoring lower than Icelandic respondents. However, Norwegians rated the concepts higher on security about the preparation of a meal using the experimental product concepts than Icelanders.

Regarding interactions, a significant interaction between countries and the two visibility conditions showed that the partly visible product was perceived as less convenient than the not visible product in Norway compared to Iceland ( $p = 0.004$ ).

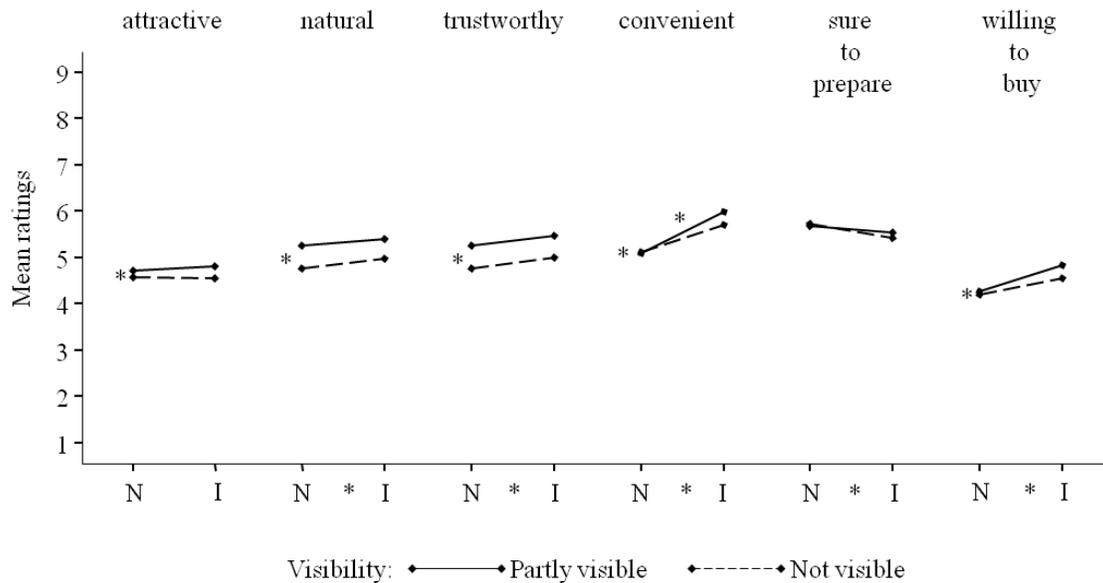


Figure 3. Evaluation of visibility conditions in Norway (N) and Iceland (I) on self reported nine point scales with one (1) denoting the lowest evaluation for each variable (e.g. totally not attractive) and nine (9) the opposite extreme (e.g. totally attractive). \* Indicates significant differences ( $p < 0.05$ ) a) between N and I between countries and b) between data points for the specific comparison; c) \* on top of data points indicates interaction between the dependent variable and the countries.

Differences between product concept themes

Concerning main effects of the experimental conditions related to the four fish fillet themes (i.e. NN vs. FH vs. HS vs. FF), significant differences were found (Figure 4) in perceived attractiveness ( $p = 0.015$ ), naturalness ( $p = 0.002$ ), trustworthiness ( $p = 0.008$ ) and convenience ( $p = 0.048$ ), with HS and FF being rated significantly higher than NN and FH. Additionally, FH was rated by the respondents as less natural ( $p = 0.002$ ) and less trustworthy ( $p = 0.008$ ) than NN. Furthermore, FF was perceived as less attractive than HS ( $p = 0.003$ ). The various products were also differently evaluated with regard to how confident the participants felt about in preparing a meal in a successful way ( $p = 0.006$ ) and willingness to buy the products with FF leading to significantly lower scores than NN, FH and HS. Finally, NN led the participants to significantly more confidence about preparation than FH ( $p = 0.028$ ) and HS.

It was also shown that the participants from the two countries evaluated the products differently in convenience and willingness to buy the products with Norway scoring lower than Iceland. Furthermore, significant differences were found on security about the preparation of a meal using the products ( $p = 0.005$ ) as the Norwegian respondents rated higher than the Icelanders.

No significant interaction between the experimental variable and the two countries was found.

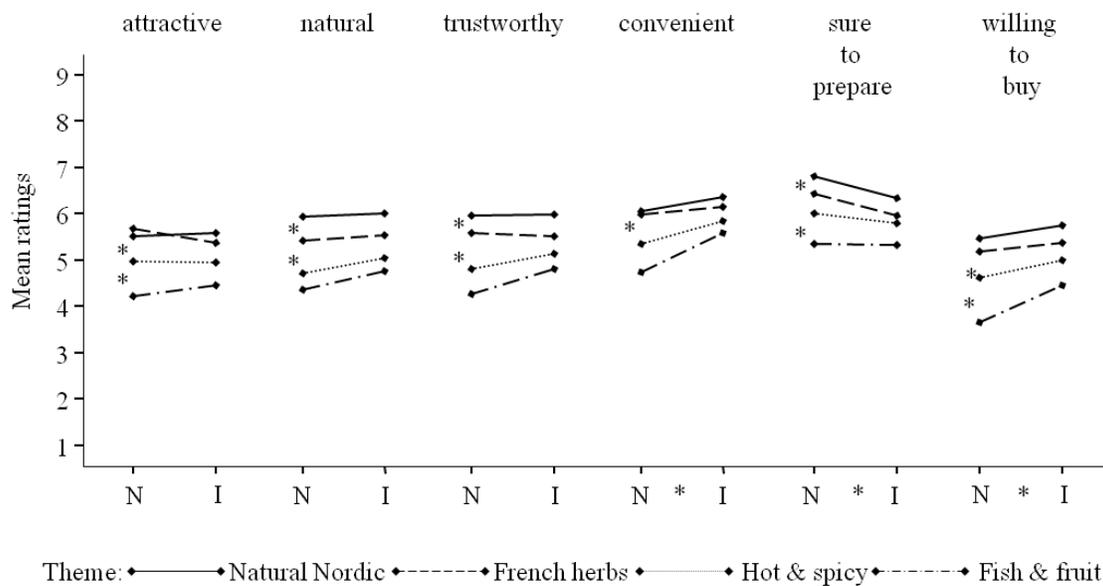


Figure 4. Evaluation of theme conditions only on the fillets concept in Norway (N) and Iceland (I) on self reported nine point scales with one (1) denoting the lowest evaluation for each variable (e.g. totally not attractive) and nine (9) the opposite extreme (e.g. totally attractive). \* Indicates significant differences (p<0.05) a) between N and I between countries and b) between data points for the specific comparison.

#### *Effect of preparation guidance*

Regarding the three types of preparation guidance for the mixed bites (i.e. no guide vs. preparation method vs. recipe), it was found that the three product categories were significantly different in naturalness and trustworthiness with the product without a guide being perceived as significantly more natural and trustworthy than the product with a preparation method and a recipe. Finally, the participants reported different willingness to buy the various products with the product without a guide leading to significantly more willingness to buy than the product with a recipe (p = 0.007).

Investigating the data from each country showed that the participants perceived the products as different in naturalness ( $p = 0.022$ ), trustworthiness and convenience with Norway scoring lower than Iceland. The participants from the two countries felt differently about how sure they were of their ability to prepare a meal using the test concepts with Norway scoring higher than Iceland. Finally, the Norwegian respondents were less willing to buy the products than Icelanders.

Only one significant interaction between countries and the three conditions related to preparation guides was found, showing that the product without a guide was perceived as less convenient than the product with a preparation method and a recipe in Norway when compared to Iceland where no guide scored higher than the product with a preparation method and a recipe ( $p = 0.009$ ).

#### *Effect of species*

Comparing the three types of species combinations for the mixed bites (i.e. only cod vs. mixed fish vs. mixed seafood) showed that the three product categories were significantly different in attractiveness, naturalness ( $p = 0.036$ ), trustworthiness and convenience with mixed seafood being rated by the participants of this study as significantly lower than the not mixed and mixed fish. When the respondents reported how sure they were about preparation of a meal including the different products, mixed seafood led to significantly less security about the preparation than the not mixed and mixed fish. Finally, the participants reported how willing they were to buy the three products and mixed seafood led to significantly less willingness to buy than the not mixed and mixed fish products.

Furthermore, the data suggested differences in trustworthiness ( $p = 0.016$ ), convenience and willingness to buy with Norway scoring lower than Iceland. However, Norwegian respondents were surer about the successful preparation of a meal including the product concepts than the Icelanders.

One of the significant interactions between countries and the three species combinations showed that the mixed fish product was not perceived as more convenient than the not mixed in Iceland when compared to Norway ( $p = 0.002$ ). Additionally, there was greater difference in Norway between mixed seafood and the not mixed or mixed fish products regarding

confidence in preparing a meal based on it ( $p = 0.014$ ). Finally, in Iceland the mixed fish product led the participants to less willingness to buy than the not mixed ( $p = 0.002$ ).

#### *Effect of portion size*

Regarding the main effects of the experimental conditions related to the three types of presentation of minced fish (i.e. 1 portion of 500 g vs. 3 portions of 180 g each vs. 17 portions of 30 g each) on the evaluation variables, no significant differences were observed.

Looking at the data between countries, significant differences were found in trustworthiness ( $p = 0.029$ ), convenience and willingness to buy the products with Norwegian participants scoring lower than the Icelanders.

Finally, no significant interactions between the independent variables were found.

#### *Attitudes and personality traits in Norway and Iceland*

An exploration of the attitudes and personality traits in each of the two countries revealed significant differences in most variables (Figure 5). In particular, it was found that Norwegian respondents rated higher in linking convenience with meals that are quick to prepare. Furthermore, Norwegians reported that preparing a meal with seafood is convenient whereas Icelanders considered the opposite. Icelanders partly considered it necessary to take action in improving their personal health, but Norwegians did not agree. Moreover, Icelanders were found to be more curious about unfamiliar food and less interested in the naturalness of food than the Norwegians.

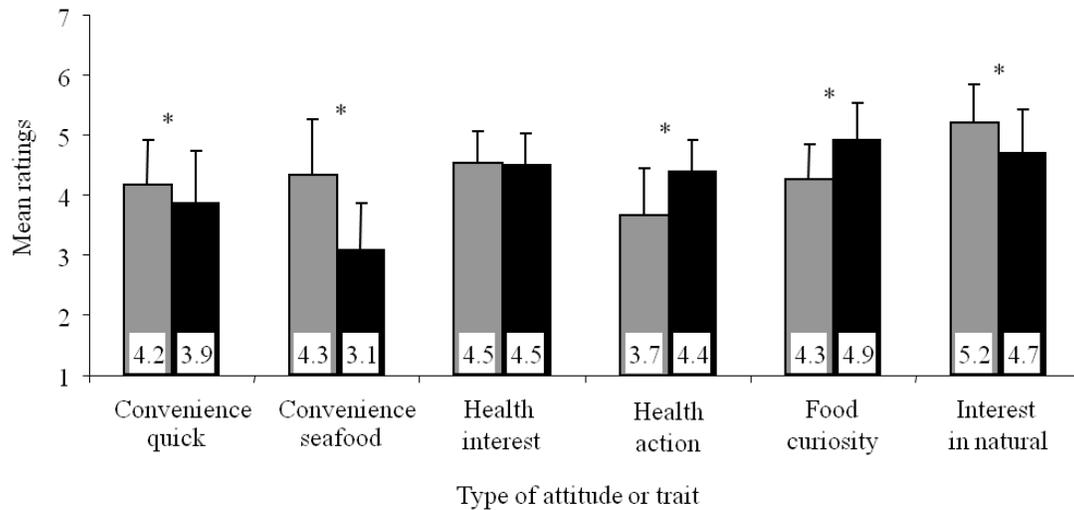


Figure 5. Attitudes and personality traits (mean & SD) in Norway (grey) and Iceland (black) on seven point likert scales with one (1) denoting “totally disagree” and seven (7) totally agree. \* Indicates significant differences ( $p < 0.001$ )

## Discussion

In the present study nine consumer values regarding seafood (healthiness, satiation, convenience, visibility & trust, freedom of choice, successful preparation, image improvement, availability and price) were used to develop three seafood product concepts which were then tested. These three product concepts were: “thematic fillets”, “mixed bites” and “minced fish”. The results indicated that “thematic fillets” and “mixed bites” were liked more than “minced fish”. However, the minced fish product concept of this study could be targeted to convenient use in various meals. This could place this product concept in a category of lower overall appreciation, yet frequently used due to a convenient orientation. Considering the increasing demand for convenience in the preparation of a meal and the consumer values in the previous focus group studies, these results indicated that continuation with an improved minced fish concept remains relevant.

One of the main results of this study was that visible products were considered to be more attractive and increased consumers' trust in them. It was also shown that the visible products were perceived as more convenient and generated higher willingness to buy. This is in line with the results of the relevant focus group study where consumers reported the need for visibility in order to make them feel more confident about the quality of the product while buying. Another focus groups study has reported this result (Dantas et al., 2005), showing that consumers clearly describe products that are visible in their packaging as preferable. The results presented in this paper empirically support the positive effect of visibility of the seafood product for young consumers, which is important for further seafood product development.

Consumers also reported a preference for the NN and FH themes in contrast to the HS and FF themes. Similarly, the concept of a mixture of fish species seemed to be perceived more positively than the concept of a mixture of seafood species. The less appreciated product concepts (i.e. HS, FF and "mixed seafood") were suggested as being more innovative. Perhaps consumers considered these seafood product concepts less trustworthy due to the fact that they were not familiar with comparable concepts. This result of less appreciation of the unfamiliar products conflicted with the relatively high food curiosity they reported in the attitudinal part of this study. However, this conflict between reported preference and reported attitude may be present due to the tendency of young adults to report an interest in new product concepts but still reject them at the moment of choice in the retail store as shown in the relevant focus group study. In the same focus group study, participants described this phenomenon as a balance between an attractive new image and the feeling of trust and security about the successful preparation of the meal (Altintzoglou et al., in press).

Most of the tested seafood product concepts were rated as medium for convenience. The fact that consumers did not use the product concepts in reality could be the exaltation of these inconclusive ratings. However, based on the consumers' reports (figure 5) and the literature (Olsen 2003) seafood is in general perceived as not convenient. Thus, a rating around the scale's mid-point could be an indication that the product concepts were perceived to be relatively more convenient than the participants expected. This was clearly illustrated in Iceland, where consumers reported the lowest scores in overall convenience of seafood and the highest perceived convenience of the experimental seafood product concepts. This

outcome is of significant value due to the fact that the participants of this study were selected for having a low seafood consumption frequency due to barriers related to convenience.

A general observation throughout the seafood product concept evaluations was that the scores were not very high. This result can be an indication of low acceptance of existing seafood product concepts by the specific target group (young adults) and a possible explanation of their low consumption which is repeatedly reported in the recent literature (Myrland et al., 2000; Similä et al., 2003; Steingrimsdóttir et al., 2002). Keeping in mind that the participants of this study were young adults and thus infrequent consumers of seafood, it could be suggested that the concepts were relatively well accepted. However, further development and improvement of the seafood product concepts would increase the probability of success in the market. Additionally, seafood products could be classified as a category which is less appetising when not prepared in a meal. Future products may benefit from a visualisation of the prepared meal on the product's packaging.

Regarding the results on the various preparation guides, it was shown that there was low appreciation of additional information. Combining this outcome with the results of the focus group studies, it could be concluded that even if information availability is appreciated, when this information is presented directly with the product, it may lead to some aversion and decrease trust in the product, as shown in the present study. This result is comparable to a study on risk communication (Verbeke, 2005) in which it was clearly discussed that consumers do not appreciate information overflow, which leads them to indifference or loss of confidence about the subject they are informed about.

In general, Icelanders evaluated all product concepts as more convenient, but were less sure of how to prepare a meal based on them (concepts, themes, species, portion size, guide, visibility). Regarding willingness to buy, Icelanders reported higher scores except for one product concept, "mixed bites," which Norwegians were more willing to buy. Additionally, Norwegians were less trustful towards the different product types (concepts, visibility, guide, species, portion size). These differences between the two countries can be used to inform further targeted seafood product development.

From the results regarding consumers' attitudes it can be seen that Norwegians find seafood in general as quick and convenient to prepare as well as being more interested in naturalness

than Icelanders. This may be an indication of increased familiarity with and exposure to seafood of the participants from Norway, as shown by the higher frequency of consumption of seafood. Increased familiarity and knowledge about a product are reported to influence product evaluation and attention to some product characteristics (Cordel, 1997). Therefore, it could be speculated that an increased familiarity may be associated with the appreciation of fresh raw seafood. However this association was not tested.

The present study provided valuable information about the evaluation of various seafood product concepts by young adults. The products were designed based on the values and needs of the specific target group and returned to them for a first evaluation. The several outcomes of this study led to guidelines for the selection of specific seafood product concept elements that will be present in follow-up experimental testing. The products for the follow-up concept test will be visible, natural, accompanied with visual representations of prepared attractive dishes, have less information attached and last but not least, be with or without combinations of fish species preferred by consumers. This study led one step closer to the development of products that may lead to a better chance of market success among young adult consumers.

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### **References**

- Altintzoglou, T., Birch-Hansen, K., Valsdóttir, T., Odland, J.Ø., Martinsdóttir, E., Brunsø, K., Luten, J., in press. Translating barriers into potential improvements: the case of healthy seafood product development. *Journal of Consumer Marketing*.
- Arnett, J.J., 2000. Emerging Adulthood: A Theory of Development From the Late Teens Through the Twenties. *American Psychologist* 55: 469-480.
- Brunso, K. 2003. Consumer research on fish in Europe. In: *Quality of fish from catch to consumer: Labelling, monitoring and traceability*. Luten, J.B., Oehlenschlaeger, J., Olafsdottir, G. (Eds.) Wageningen Academic Publishers, Wageningen. pp. 335–344.

- Cooper, R.G., 1999. From experience - The invisible success factors in product innovation. *Journal of Product Innovation Management* 16: 115-133.
- Cooper, R.G., 2008. Perspective: The Stage-Gate (R) idea-to-launch process-update, what's new, and NexGen systems. *Journal of Product Innovation Management* 25: 213-232.
- Cooper, R.G., Edgett, S.J., 2005. *Lean, Rapid, and Profitable New Product Development*. Product Development Institute.
- Cordell, V.V., 1997. Consumer knowledge measures as predictors in product evaluation. *Psychology & Marketing* 14: 241-260.
- Dantas, M.I.S., Minim, V.P.R., Deliza, R., Puschmann, R., 2005. The Effect of Packaging on the Perception of Minimally Processed Products. *Journal of International Food & Agribusiness Marketing* 16: 71 - 83.
- Einarsdóttir G., Sveinsdóttir K., Martinsdóttir E., Jónsson F.H., Þórsdóttir I., Þórsdóttir F., 2007. Viðhorf og fiskneysla ungs fólks á aldrinum 18 til 25 ára – Lýsandi tölfræðiúrvinnsla (In Icelandic). (Attitudes and fish consumption of 18-25 year olds – descriptive statistics). Skýrsla MATÍS 05-07, ISSN 1670-7192. MATÍS, Reykjavik, Iceland
- FAO, 2009. The state of world fisheries and aquaculture 2008. FAO Fisheries and Aquaculture Department. Food and Agriculture Organization of the United Nations. Rome, 2009. ISBN 978-92-5-106029-2. Available: Accessed 19.04.2009.
- Grunert, K.G., Brunsø, K., Bisp, S., 1993. Food-Related Life-Style: Development of a cross-culturally valid instrument for market surveillance. MAPP Århus.
- Heaton, R. K., Chelune, G.J., Talley, J.L., Kay, G.G., Curtiss, G., 1993. *Wisconsin Card Sorting Test Manual: Revised and Expanded*. Psychological Assessment Resources, Odessa, FL.
- Honkanen, P., Olsen, S.O., Verplanken, B., 2005. Intention to consume seafood-the importance of habit. *Appetite* 45: 161-168.
- Honkanen P., Olsen S.O., Brunsø K., Verbeke W., Scholderer J., Fruensgaard L., Pieniak Z., 2005. Deliverable 5: Report on cross-cultural eating habits and segments. Project 2.1 CONSUMERSURVEY. Integrated Project FOOD-CT-2004-506359
- Jaffry, S., Pickering, H., Ghulam, Y., Whitmarsh, D., Wattage, P., 2004. Consumer choices for quality and sustainability labelled seafood products in the UK. *Food Policy* 29: 215-228.

- Larson, N.I., Neumark-Sztainer, D.R., Story, M.T., Wall, M.M., Harnack, L.J., Eisenberg, M.E., 2008. Fast food intake: Longitudinal trends during the transition to young adulthood and correlates of intake. *J Adolescent Health* 43: 79-86.
- Larson, N.I., Perry, C.L., Story, M., Neumark-Sztainer, D., 2006. Food preparation by young adults is associated with better diet quality. *Journal of the American Dietetic Association* 106: 2001-2007.
- Lerdahl, E., 2007. *Håndbok i ideutvikling*. Guldendal Norsk Forlag AS.
- Li, H.S., Houston, J.E., Wang, S.M., Lee, H.J., 2001. Factors Affecting Consumer Preferences for Fish in Taiwan IIFET 2000 Conference. International Institute of Fisheries Economics and Trade, Corvallis, Oregon, (USA).
- Morrissey, M., 2006. Culinary based product development for seafood and the stage gate principle, The Third SEAFOOD Conference, Tromsø, Norway.  
[http://www.seafoodplus.org/fileadmin/files/events/2006-Third\\_SFplus/s1\\_02%20Mike%20Morrissey%20SEAFOODplus%20Conference%202006%20Oral\\_reduced.pdf](http://www.seafoodplus.org/fileadmin/files/events/2006-Third_SFplus/s1_02%20Mike%20Morrissey%20SEAFOODplus%20Conference%202006%20Oral_reduced.pdf)
- Mozaffarian, D., Rimm, E.B., 2006. Fish intake, contaminants, and human health - Evaluating the risks and the benefits. *Jama-Journal of the American Medical Association* 296: 1885-1899.
- Myrland, Ø., Trondsen, T., Johnston, R.S., Lund, E., 2000. Determinants of seafood consumption in Norway: lifestyle, revealed preferences, and barriers to consumption. *Food Quality and Preference* 11: 169-188.
- Nayga, R.M., Capps, O., 1995. Factors Affecting the Probability of Consuming Fish and Shellfish in the Away from Home and At Home Markets. *Journal of Agricultural and Applied Economics* 27: 161-171.
- Olsen, S.O., 2001. Consumer involvement in seafood as family meals in Norway: an application of the expectancy-value approach. *Appetite* 36: 173-186.
- Olsen, S.O., 2003. Understanding the relationship between age and seafood consumption: the mediating role of attitude, health involvement and convenience. *Food Quality and Preference* 14: 199-209.
- Olsen, S.O., Scholderer, J., Brunsø, K., Verbeke, W., 2007. Exploring the relationship between convenience and fish consumption: A cross-cultural study. *Appetite* 49: 84-91.
- Ophuis, P.A.M.O., 1989. Measuring health orientation and health consciousness as determinants of food choice behaviour: development and implementation of various attitudinal scales. In: *Marketing Thought and Practice in the 1990's*. Avilonits, G.J.,

- Papavasiliou, N.K., Kouremenus, A.G. (Eds.) EMAC XVIII, Athens School of Economics and Business, Athens. pp. 1723–1725.
- Papadaki, A., Hondros, G., Scott, J.A., Kapsokefalou, M., 2007. Eating habits of University students living at, or away from home in Greece. *Appetite* 49: 169-176.
- Pliner, P., Hobden, K., 1992. Development of a scale to measure the trait of food neophobia in humans. *Appetite* 19: 105-120.
- Rortveit, A.W., Olsen, S.O., 2007. The role of consideration set size in explaining fish consumption. *Appetite* 49: 214-222.
- Schifferstein, H.N.J., Oude Ophuis, P.A.M., 1998. Health-related determinants of organic food consumption in The Netherlands. *Food Quality and Preference* 9: 119-133.
- Shepherd, J. Harden, A. Rees, R. Brunton, G. Garcia, J. Oliver, S. Oakley, A., 2006. Young people and healthy eating: a systematic review of research on barriers and facilitators. *Health education research* 21: 239-257
- Sidhu, K.S., 2003. Health benefits and potential risks related to consumption of fish or fish oil. *Regulatory Toxicology and Pharmacology* 38: 336-344.
- Similä, M., Fagt, S., Vaask, S., Thorgeirsdottir, H., Pudule, I., Petkeviciene, J., Johansson, L., Becker, W., Ovesen, L., Steingrimsdottir, L., Moltchanova, E., Valsta, L., 2003. The NORBAGREEN 2002 study; Consumption of vegetables, potatoes, fruit, bread and fish in the Nordic and Baltic countries, TemaNord Copenhagen, pp. 172.
- Sirois, M., 2006. Proven methods of developing successful new value added seafood products in an ever changing market place, 2nd TAFT meeting, Quebec, Canada.
- Steingrimsdóttir, L., Þorgeirsdóttir, H., Ólafsdóttir, A.S., 2002. Könnun á mataræði Íslendinga 2002: Helstu niðurstöður, Rannsóknir Manneldisráðs Íslands V.
- Undeland, I., Lindqvist, H., Chen, Y., Falch, E., Ramel, A., Cooper, M., Gildberg, A., Luten, J., Stenberg, E., Hauch Nielsen, H., Elvevoll, E., 2009. Seafood and health what is the full story? In: *Marine Functional Food*. Luten, J.B. (Ed.). Wageningen academic press, Wageningen. pp. 17-87.
- Verbeke, W., 2005. Agriculture and the food industry in the information age. *European Review of Agricultural Economics* 32: 347-368.
- Verbeke, W., Sioen, I., Pieniak, Z., Van Camp, J., De Henauw, S., 2005. Consumer perception versus scientific evidence about health benefits and safety risks from fish consumption. *Public Health Nutrition* 8: 422-429.
- Verbeke, W., Vermeir, I., Brunsø, K., 2007. Consumer evaluation of fish quality as basis for fish market segmentation. *Food Quality and Preference* 18: 651-661.

- Wandel, M., Fagerli, R.A.A., 1999. Norwegians' Opinions of a Healthy Diet in Different Stages of Life. *Journal of Nutrition Education* 31: 339-346.
- Welch, A., Lund, E., Amiano, P., Dorronsoro, M., Brustad, M., Kumle, M., Rodriguez, M., Lasheras, C., Janzon, L., Jansson, J., Luben, R., Spencer, E., Overvad, K., Tjønneland, A., Clavel-Chapelon, F., Linseisen, J., Klipstein-Grobusch, K., Benetou, V., Zavitsanos, X., Tumino, R., Galasso, R., Bueno-de-Mesquita, H., Ocké, M., Charrondière, U., Slimani, N., 2002. Variability of fish consumption within the 10 European countries participating in the European Investigation into Cancer and Nutrition (EPIC) study. *Public Health Nutrition* 5: 1273-1285.

## **PAPER IV**

Altintzoglou T., Sveinsdottir K., Einarsdottir G., Schelvis R. & Luten J. (under review).  
Evaluation of seafood product concepts by young adults and families with young children  
from Denmark, Norway and Iceland. *Journal of Aquatic Food Product Technology*,  
Submitted, under review.



**Evaluation of seafood product concepts by young adults and families with young children from Denmark, Norway and Iceland**

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## **Abstract**

This paper describes the results of a study that tested fourteen seafood concepts among young adults and families with young children in Denmark, Norway and Iceland. This study aimed at gaining insight into the acceptance of new seafood product concepts by individuals with low seafood consumption. Based on consumer-reported values and previous concept-testing, fourteen seafood product concepts were tested by 296 consumers in a web-based experiment.

Consumers' preferences depended on the size of fish offered, the presence of information and fish species offered. Young adult consumers evaluated the product concepts differently than parents of young children. Three consumer clusters, based on attitudinal variables, were identified explaining the differences in the evaluation of the product concepts. The outcome of this study will be used to develop a product for realistic in-home test.

## **Keywords**

Consumer attitudes; fish consumption; new-seafood-product-development; Nordic; product-concept-evaluation; seafood.

## **Introduction**

Seafood has been an important source of protein and fatty acids in Nordic countries. The importance of seafood has been especially evident in coastal regions, resulting in significant occupation and expertise with respect to its acquisition and handling. The term seafood is used in this paper to describe wild and farmed, finfish, crustaceans and shellfish, both of marine and freshwater origin in fresh, frozen and processed product forms (Jaffry et al., 2004). Besides the established tradition with seafood in the specific region, seafood has been broadly known for its health benefits. A recent review (Undeland et al., 2009) described that regular seafood consumption lowers the risk for coronary heart disease.

Due to the benefits of seafood consumption on health, public health organisations in various countries recommend that fish should be consumed at least two times per week ("Advice on fish consumption: Benefits and Risks," 2004). However, the average fish consumption in Europe is considerably less frequent than recommended by the public health organisations. The average fish consumption in Europe was reported as 20.8 kg (live weight equivalent per capita) in 2005 (FAO, 2009), which means that fish consumption frequency was around once per week, estimated using average fish serving sizes (Einarsdottir et al., 2007). Even in Nordic countries with a significant fisheries sector, fish consumption is below the recommendations, especially for young adults and/or families with young children (Myrland et al., 2000; Similä et al., 2003; Steingrimsdóttir et al., 2002). These measured findings match what European consumers report about their seafood consumption (Honkanen et al., 2005).

Seafood consumption can be influenced by many factors. Factors reported are product quality (Verbeke et al., 2007), consumer attitudes towards choosing fish for a meal (Brunsø, 2003), involvement with seafood (Olsen, 2001), consumer food choice habits (Honkanen et al., 2005), beliefs about risks and benefits related to health (Verbeke et al., 2005), convenience (Olsen, 2003; Olsen et al., 2007; Rortveit and Olsen, 2007) and finally, available time and cooking skills (Altintzoglou et al., 2010; Shepherd et al., 2006). These factors can lead to barriers to seafood consumption. However, these are also the parameters one can improve in order to increase the acceptance of new products, including seafood products, by the consumers (Cooper, 1999; Morrissey, 2006). A recent study with consumer focus groups in Norway, Iceland and Denmark (Altintzoglou et al., 2010) resulted in nine consumer values

which are relevant for the development of new seafood products. These values were: healthiness, satiation, convenience, visibility & trust, freedom of choice, successful preparation, image improvement, availability and price. On basis of these results 33 new seafood product concepts were tested among young adults and families with young children to identify the most important factors relevant for further development of seafood concepts. Important attributes that represent these consumer values in a product appear to be naturalness and freshness, choice from one or two species, visibility of the product in the packaging and information available for the preparation as a meal (Altintzoglou et al., in press).

The aim of the second concept test study presented in this paper was to test a smaller number of further developed new seafood product concepts among consumers with low seafood consumption in Denmark, Iceland and Norway in order to get closer to the final products accepted by the target groups.

## **Materials and Methods**

### *Product concepts*

The 14 product concepts to be tested in this study were defined based on the knowledge from the focus group study and the first concept test (CT1). Each concept was presented as an image (photo) looking as a product offered to the consumer would look. Figure 1 shows the product type and concept “Cod and salmon portions and wild berries” with information as an illustration.



Figure 1. The product type and concept “Cod and salmon portions and wild berries” with information, as presented on screen to the participants in this study.

The consumer values from the first concept test convenience, visibility & trust, freedom of choice, successful preparation and image improvement were used to define dependent and independent variables in this study. The main independent variables were , product type , product concept and fish species (table 1). The product type was presented with and without information about the product concept. This information was presented on a sleeve around the package. The sleeve contained a photo of a small fishing vessel in a fjord in Norid fjord, a short description of the product, a photo of the product after preparation, a made-up brand name ‘Fresh!Fish’ and a text that a recipe and preparation instructions was presented on the back of the package.

Table 1.

Description of the product type, product concepts and fish species used in the second concept test.

Product type	Product concept	Fish species
Natural fish fillets	Nordic fish fillets	Cod
Natural fish portions	Fish portions and wild berries	Cod
Natural fish portions	Fish portions and wild berries	Cod + Salmon
Natural fish bites	Fish bites for Mediterranean soup	Cod
Natural fish bites	Fish bites for Mediterranean soup	Cod + Salmon
Natural minced fish	Minced fish for Mexican wraps	Cod
Natural minced fish	Minced fish for Mexican wraps	Salmon

The value convenience was conceptualised by mentioning that a recipe and preparation instructions were available on the back of the packaging. The value visibility and trust was represented by using a transparent packaging with a sleeve which covers only a small part of the product. Freedom of choice was represented by offering cod and/or salmon. Successful preparation was represented by the indication for a preparation guide on the back of the packaging as well as by a photo of a successfully prepared dish on the sleeve.

The variable *information* varied by means of presenting the product with or without the product concept information on the sleeve as described above. Both products were presented in a plastic tray. However, the products with information had a sleeve. The information included was presented on the sleeve (figure 1).

The products without information were the first to be randomly presented to the participants. Thereafter the rest of the product concepts were presented to the participants in a random order. The grouping of the randomization code between control and experimental conditions was performed in order to avoid any carry-over effect of knowledge from the product concepts with information to those without.

The variable *product concept* varied by means of the presentation of the four product concepts. These product concepts were a) Nordic fish fillets, focusing on the simplicity and purity of Nordic cuisine, b) fish portions and wild berries, focusing on the use of local ingredients such as wild berries in an innovative recipe, c) fish bites for a Mediterranean soup, combining Nordic fish with Mediterranean spices in a soup recipe and finally, d) minced fish for Mexican wraps, combining minced Nordic fish with a Mexican wrap recipe. The size and form of the fish in the concepts decreased from fillets (approx. 400 gram), portion (approx. 150 gram each), bites (approx. 20 gram each) to minced. The variable *fish species* varied by presenting various product concepts based on cod (*Gadus morhua*), salmon (*Salmo salar*), or cod and salmon, as shown in table 1.

### *Participants*

The participants in this study were recruited through advertisements on public internet pages of the participating research institutes, open recruitment internet pages and social networking internet pages like Facebook. Additionally, participants were directed to this study by e-mails and by posters on university campuses. The emphasis of the invitation was on overall food

choices and preferences. No reference to the beneficial health effects of fish was made. A small incentive of a gift card was given to three participants by means of a random poll. The participants were selected for socio-demographic characteristics such as age and household situation. Young adults were defined as persons being younger than 30 years. Parents of young children were defined as those who have at least one child between the ages of three to thirteen years.

### *The questionnaire*

The web based questionnaire (Dahan and Srinivasan, 2000) used in this study is described in detail in a previous study (Altintzoglou et al., in press). The English questionnaire was translated into Danish, Norwegian and Icelandic. Consistency of the contents of the three versions of the questionnaire was assured by following the process of back translation until the point of absolute agreement between them. Fieldwork started after editing, correcting, electronic programming and pre-testing of the electronic version of the questionnaire.

The questionnaire started with welcome instructions for filling in the questionnaire, questions about socio-demographic characteristics and fish consumption frequencies. The main part of the questionnaire included questions aimed at evaluating the product concepts on attractiveness, naturalness, trustworthiness, convenience, confidence about the preparation of a meal using the product and finally willingness to buy the product. All items were measured by means of self reported nine point Likert scales with one (1) denoting a low evaluation of the specific product characteristic and nine (9) a high one. After the evaluation of the product concepts, participants were exposed to questions about some of their attitudes and personality traits. Four questions were used to measure health interest (Ophuis, 1989), two to measure the perceived need to take action on improving their personal health (Schifferstein and Ophuis, 1998), three to measure food curiosity (Pliner and Hobden, 1992), two to measure convenience orientation and the perceived convenience of seafood (Olsen et al., 2007) and two to measure interest in naturalness of food (Grunert et al., 1993). All items were measured by means of self reported seven point Likert scales with one (1) denoting disagreement to a statement and seven (7) denoting agreement.

### *Statistical analysis*

To compare the socio-demographic characteristics of the participants from different countries, target groups and clusters, cross tabulation and chi square tests were used. Analyses of variance (ANOVA) and least square differences (LSD) post-hoc tests were used to identify differences between groups on the attitudinal and fish consumption frequency variables.

The negative attitudinal data were transposed in order to reverse the direction and match with the positive ones. Following this procedure, the items that originated from the same scales were grouped and the estimated mean value of the grouped variables was used from then on. A cluster analysis was performed to identify different groups based on their attitudinal reports. A hierarchic cluster analysis based on Ward's method was performed first in order to identify the appropriate number of clusters. A large increase in agglomeration coefficient indicated a three-cluster solution as being the most appropriate. The hierarchic cluster analysis was followed by a K-means cluster analysis on the pooled sample from Denmark, Norway and Iceland.

Repeated measures ANOVA was used to compare within and between subjects effects of the independent variables information and product, across the two types of groups, i.e. target groups and clusters. Interactions between variables were tested in the same manner, after reporting the main effects of the previous analyses.

Differences in product evaluations between groups were tested by means of ANOVA tests. When the differences were significant, post-hoc LSD tests were performed to identify where the differences were.

Differences were considered statistically significant when  $p < 0.05$ .

## **Results**

### *Participants and clusters*

This study was performed on 296 participants, almost equally distributed across Iceland, Denmark and Norway (100, 97 and 99 respectively). There were no large differences between countries in most of the socio-demographic characteristics. The mean age was around 30 years, and around 65 percent of the participants were females. However, Norwegian

participants consumed more fish as a main meal (1.58 times per week) than the Icelanders (1.03 times per week) and the Danes 1.00 time per week). On the contrary, Icelanders consumed more fish as a warm lunch or as a snack. Finally, slightly more Norwegian participants had higher education than the Icelanders and the Danes.

Due to socio-demographic similarities between countries, the information was pooled and the focus was put on the target groups of this study, i.e. young adults and families with young children. Significant differences in fish consumption were found between the two groups. Parents reported higher fish consumption than young adults' for main meal (1.31 vs. 0.86 times per week), cold lunch (0.72 vs. 0.48 times per week) and warm lunch (0.39 vs. 0.23 times per week).

The attitudinal information was analyzed in order to create clusters and explain the differences in fish consumption. In the first step of the clustering procedure three clusters were defined (stage 293-295 of the Agglomeration Schedule). The results (table 2) indicated the cluster membership of each participant. The clusters found were different on all the attitudinal variables and in the reported fish consumption. The members of the first cluster reported the most positive attitudes towards health, food in general and seafood (“the total positive health oriented consumers”) and the highest consumption of seafood as a warm lunch. The second cluster reported health and convenience orientation and a high interest in seafood and food, (“the non health-action fish consumers”) and the highest consumption of seafood as a main meal. Finally, the third cluster reported the highest interest in fast meal preparation and the lowest interest in food, seafood and health (“the fast-convenient non-fish consumers”). This group reported the lowest seafood consumption. The three clusters were not significantly different in any of the socio-demographic characteristics.

Table 2.  
Description of participants by cluster defined by their attitudes

variable	clusters			total	p-value
	total positive health oriented consumers	non health-action fish consumers	fast-convenient non-fish consumers		
n	87	95	114	296	
age	31	32	30	30	0.167
<i>attitudes (used in clustering)*</i>					

health action	6.69a	2.84c	4.89b	4.76	<0.001
occupied with health	6.46a	5.37b	5.01b	5.55	<0.001
health status	6.61a	5.28b	5.19b	5.64	<0.001
convenience = quick	6.20b	5.29c	7.04a	6.23	<0.001
seafood is convenient	6.46a	6.62a	2.85b	5.12	<0.001
food curiosity	5.71a	5.52a	4.95b	5.35	<0.001
natural food	6.69a	5.88b	5.47b	5.96	<0.001
<i>fish consumption frequency*</i>					
overall	1.41ab	1.54a	1.15b	1.35	0.026
main meal	1.14ab	1.26a	0.88b	1.08	0.010
cold lunch	0.71	0.61	0.50	0.60	0.247
warm lunch	0.43a	0.22b	0.29ab	0.31	0.033
snack	0.18	0.16	0.13	0.15	0.420
<i>target groups**</i>					
young adults	48	47	55	51	0.455
parents	52	53	45	49	
<i>country**</i>					
Iceland	34	27	39	34	0.530
Denmark	38	27	33	33	
Norway	28	46	28	33	
<i>gender**</i>					
female	72	58	63	64	0.119
male	28	42	37	36	
<i>education category**</i>					
primary school	7	6	11	8	0.338
high school	30	37	36	34	
technical education	7	7	5	6	
further technical education	8	1	4	4	
BSc	23	22	26	24	
MSc	25	27	18	24	
<i>parenthood**</i>					
no children	48	47	55	51	0.455
children	52	53	45	49	
<i>relationship**</i>					
single	33	36	35	35	0.938
couple	67	64	65	65	
<i>household situation**</i>					
single living with parents	8	7	7	7	0.911
single living alone	17	21	24	21	
couples without children	23	19	25	24	
couples with children	44	46	40	43	
single parent	8	7	4	5	
<i>age groups**</i>					
18-29	52	55	66	58	0.306
30-39	24	21	16	20	
40+	24	24	18	22	

\* mean values tested based on analysis of variance (ANOVA) tests; a, b, c denote significant (p<0.05) differences between means based on LSD post-hoc tests; \*\* % per cluster and chi-square tests

*Product concepts*

Testing the concept and information on the product evaluations showed significant differences (table 3). These results showed that providing information on the package of the product has a positive effect on how attractive and trustworthy a product is perceived to be. Eventually, this result was also supported by an effect of information on consumers’ willingness to buy the products.

Table 3.  
Matrix of the p-values from the General Linear Model repeated measures analysis for the effect of information, product concepts, target groups and clusters.

measurements	within-subjects		between subjects	
	information	product concepts	target groups	clusters
attractive	<0.001	<0.001	ns	0.029
natural	ns	<0.001	ns	ns
trustworthy	0.001	<0.001	ns	ns
convenient	ns	<0.001	ns	ns
sure to prepare	ns	<0.001	ns	ns
willing to buy	0.015	<0.001	ns	0.007

ns indicates non-significant effects based on p-values>0.05

Additionally, it is shown that the differences between the product concepts influenced the way consumers evaluated the products (figure 2). “Cod fillets” were evaluated the highest, in all evaluative parameters. The product concept “cod portions” followed in second place in all evaluative parameters. In third place, was the product concept “cod and salmon portions”, equally in all evaluative parameters. The product concept “cod bites” was in fourth place. However, “cod bites” was not perceived as less natural than “cod and salmon portions”. In fifth place, the product concept “cod and salmon bites” was evaluated lower than “cod bites” only on attractiveness, convenience and sureness about its preparation. Finally, the last two product concepts were “minced cod” and “minced salmon”. They were both evaluated low on all parameters with the salmon product being lower than the cod one.

The two target groups differed in their evaluations of the product type. The participants who were in the groups of parents with young children evaluated most product concepts higher than the young adults. These differences were significant for “cod filets”, “cod portions “, “cod and salmon portions”, “cod bites” and “cod and salmon bites” with or without information. These differences were significant for the parameters; sure to prepare and willingness to buy, leading to an applicable distinction between the products.

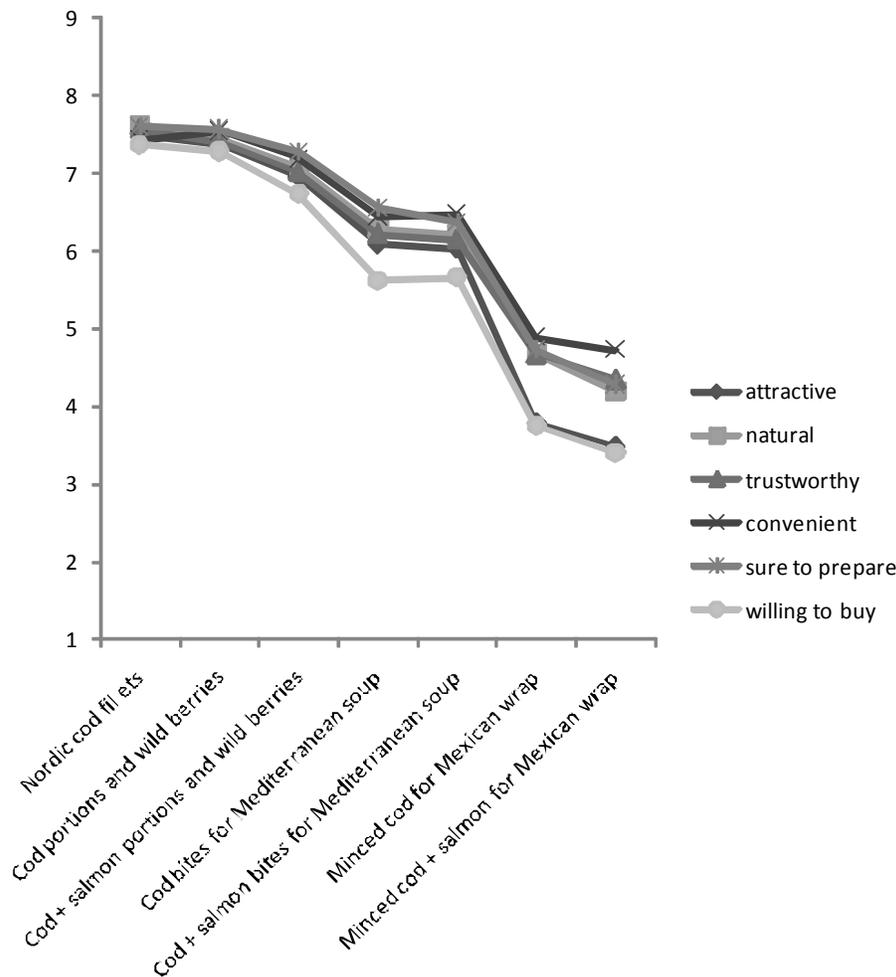


Figure 2. Product concepts evaluated by the consumers on six variables on nine-point Likert scales with one (1) denoting a low evaluation of the specific product characteristic and nine (9) a high one.

Finally, product concepts evaluations were compared between clusters. The differences between clusters were significant in the case of “cod fillets” (table 4), “cod portions”, “cod

and salmon portions” (table 5), “cod bites” and “cod and salmon bites” with or without information (table 6). The overall tendency in these differences was that “total positive health oriented consumers” evaluated most product concepts higher than “non health-action fish consumers”. The cluster “fast-convenient non-fish consumers” evaluated most of the product concepts the lowest. However, almost all evaluations of the three highest rated products (“cod filets”, “cod portions” and “cod and salmon portions”) were above seven, on an nine-point scale.

Table 4.  
Comparisons of the “Cod fillet” product concept evaluations\* between clusters

variable	clusters			total	p-value
	total positive health oriented consumers	non health-action fish consumers	fast-convenient non-fish consumers		
n	87	95	114	296	
<i>fillets cod</i>					
attractive	7.44	7.23	6.88	7.16	0.107
natural	7.77	7.55	7.54	7.61	0.560
trustworthy	7.44	7.37	7.44	7.42	0.942
convenient	7.70a	7.45ab	7.13b	7.40	0.037
sure to prepare	7.78a	7.80a	7.26b	7.59	0.040
willing to buy	7.86a	7.20b	7.08b	7.35	0.012
<i>Nordic cod fillets</i>					
attractive	7.77	7.52	7.28	7.50	0.162
natural	7.87	7.54	7.50	7.62	0.219
trustworthy	7.79	7.51	7.44	7.56	0.267
convenient	7.67	7.54	7.16	7.43	0.068
sure to prepare	7.92a	7.82a	7.18b	7.60	0.003
willing to buy	7.80a	7.51a	6.93b	7.37	0.007

\* mean values based on seven point Likert scales with one (1) denoting disagreement to a statement and seven (7) denoting agreement, tested based on analysis of variance (ANOVA) tests; a, b, c denote significant (p<0.05) differences between means based on LSD post-hoc tests

Table 5.  
Comparisons of “fish portions” product concept evaluations\* between clusters

variable	clusters			total	p-value
	total positive health oriented consumers	non health-action fish consumers	fast-convenient non-fish consumers		

n	87	95	114	296	
<i>portions cod</i>					
attractive	7.54	7.02	6.97	7.16	0.091
natural	7.68	7.24	7.51	7.47	0.220
trustworthy	7.53	7.35	7.42	7.43	0.746
convenient	7.76	7.56	7.44	7.57	0.362
sure to prepare	7.80	7.80	7.32	7.61	0.056
willing to buy	7.75	7.36	7.09	7.37	0.054
<i>portions cod + salmon</i>					
attractive	7.49a	6.87b	6.81b	7.03	0.047
natural	7.71a	6.76b	6.96b	7.11	0.002
trustworthy	7.43a	6.68b	6.86b	6.97	0.022
convenient	7.67a	7.18ab	6.93b	7.23	0.020
sure to prepare	7.56a	7.66a	6.89b	7.34	0.007
willing to buy	7.47a	6.79ab	6.48b	6.87	0.012
<i>portions cod and wild berries</i>					
attractive	7.78	7.29	7.16	7.39	0.053
natural	7.71	7.35	7.35	7.46	0.264
trustworthy	7.69	7.29	7.25	7.40	0.162
convenient	7.84	7.52	7.32	7.54	0.099
sure to prepare	7.97a	7.76a	7.10b	7.56	0.001
willing to buy	7.78a	7.32a	6.87b	7.28	0.006
<i>portions cod + salmon and wild berries</i>					
attractive	7.45a	6.81b	6.68b	6.95	0.025
natural	7.49	6.91	6.91	7.08	0.053
trustworthy	7.45a	6.84b	6.82b	7.01	0.044
convenient	7.48	7.15	6.98	7.18	0.161
sure to prepare	7.64a	7.39ab	6.89b	7.27	0.019
willing to buy	7.31a	6.66ab	6.35b	6.73	0.013

\* mean values based on seven point Likert scales with one (1) denoting disagreement to a statement and seven (7) denoting agreement, tested based on analysis of variance (ANOVA) tests; a, b, c denote significant ( $p < 0.05$ ) differences between means based on LSD post-hoc tests

Table 6.  
Comparisons of “fish bites” product concepts evaluations\* between clusters

variable	clusters			total	p-value
	total positive health oriented consumers	non health-action consumers	fast-convenient non-fish consumers		
n	87	95	114	296	
<i>bites cod</i>					
attractive	6.06a	5.27b	5.15b	5.46	0.014
natural	6.54	5.97	6.25	6.25	0.210

trustworthy	6.31	5.65	6.17	6.04	0.091
convenient	6.99a	6.07b	6.29b	6.43	0.011
sure to prepare	6.87	6.53	6.11	6.47	0.075
willing to buy	6.42a	5.13b	5.03b	5.47	<0.001
<i>bites cod + salmon</i>					
attractive	6.11	5.55	5.53	5.71	0.156
natural	6.49	5.80	6.08	6.11	0.094
trustworthy	6.28	5.74	6.07	6.02	0.228
convenient	6.56	6.47	6.44	6.49	0.922
sure to prepare	6.53	6.47	5.89	6.27	0.110
willing to buy	5.98	5.49	5.10	5.48	0.055
<i>bites cod for Mediterranean soup</i>					
attractive	6.56	5.95	5.83	6.08	0.058
natural	6.70	6.05	6.18	6.29	0.103
trustworthy	6.61	6.14	5.99	6.22	0.126
convenient	6.82	6.34	6.25	6.45	0.153
sure to prepare	6.93	6.64	6.18	6.55	0.061
willing to buy	6.24a	5.48b	5.26b	5.62	0.017
<i>bites cod + salmon for Mediterranean soup</i>					
attractive	6.63a	5.83b	5.74b	6.03	0.018
natural	6.52	5.92	6.21	6.21	0.204
trustworthy	6.53	5.83	6.11	6.14	0.109
convenient	6.86	6.23	6.38	6.47	0.134
sure to prepare	6.69	6.41	6.08	6.36	0.202
willing to buy	6.10	5.51	5.44	5.66	0.149

\* mean values based on seven point Likert scales with one (1) denoting disagreement to a statement and seven (7) denoting agreement, tested based on analysis of variance (ANOVA) tests; a, b, c denote significant ( $p < 0.05$ ) differences between means based on LSD post-hoc tests

## Discussion

This study shows that there are differences in the evaluations of the product concepts on all variables evaluated by young adults and families with young children. Significant and corresponding differences were found between the various product concepts with and without information. These differences showed that the Nordic cod fillet concept was the most preferred, followed by the fish portion concept. Lower on the evaluations were the fish bites and finally the minced fish. The consumers involved found product concepts less attractive, natural, trustworthy or convenient when they were offered in small pieces or minced. Small

portions of fish, not deviating too much from fillet size were evaluated as almost as good as the fillet concept.

According to the reported product concept evaluations, the participants in this study showed a higher preference for the product concepts with additional textual information about the product including a recipe as well as a photo illustration emphasising the naturalness and attractiveness of the final prepared dish. This effect was significant for the variables: perceived attractiveness, trustworthiness and willingness to buy the product concept. However, the positive effect on the preference for products with information was not as high as expected. The limited information effect in case of naturalness was probably due to the fact that the fresh product was so visible in the packaging that the participants perceived both versions of the product concept to be very natural. Convenience and sureness about the successful preparation of a meal using this product may not have been significantly affected by the packaging label because the information about the preparation of the meal was only described on the back of the package, without actually being presented to the consumers in the test.

Looking at the differences between fish species (cod and salmon), we can conclude that the combination of cod and salmon was well accepted. It was shown that the evaluations between the cod and cod & salmon product concepts were either equal or sometimes in favour of either one. The cod product concepts were slightly more appreciated in the case of fish portions. However, when the evaluations for the product concept “Fish bites for Mediterranean soup” were analysed, it was shown that cod & salmon bites were preferred. Finally, the use of cod or salmon for the minced fish product did not lead to any significantly positive change in consumers’ preference for this product. Minced fish was not appreciated regardless of the species or the accompanying information and the expected added value as a healthy replacement for popular minced meat in convenient dishes.

Young adult consumers evaluated the product concepts differently than parents of young children. Parents of young children rated most products higher than young adults did. The differences between the groups were significant for the product concepts that were rated the highest, showing that both groups agreed on the low scores of fish bites and minced fish. However, when they rated the more appreciated fish fillets and portions, parents of young children were more willing to buy them. This higher willingness to buy was mainly due to

their sureness about being able to prepare the product in a convenient way. This finding verified the results of the focus groups study reported previously in which consumers discussed the changes in meal preparation and food choices that come along with the presence of a child in the household (Altintzoglou et al., 2010).

An interesting outcome of this study was the definition of three consumer clusters, based on attitudinal variables. This analysis revealed the existence of the groups “totally positive health oriented consumers”, “non health-action fish consumers” and “fast-convenient non-fish consumers” who were equally spread across young adults and parents of young children. There was a non significant tendency for young adults to belong to the “fast-convenient non-fish consumers” cluster. The results suggested that there was an overall trend that “totally positive health oriented consumers” rated the product concepts higher than “non health-action fish consumers”. The lowest product concept evaluations were reported by the “fast-convenient non-fish consumers”. These differences were comparable to the differences between the two target groups in this study. Again, the low evaluations were not significantly different but the highly rated products were different between groups on willingness to buy and sureness about preparation.

Combining the differences found between target groups and between clusters, it is suggested that parents and individuals with an interest in health who already hold a positive opinion about fish are, in general, the consumers who evaluated the product concepts of this study the highest. This result is not surprising, taking into account that health involvement and attitudes towards fish are factors that influence fish consumption (Pieniak et al., 2006; Pieniak et al., 2008a; Pieniak et al., 2007, 2008b). However, this study suggested that the opinions of consumers in cluster three with low interest in health and a high convenience orientation gave some of the product concepts a highly positive evaluation. The high acceptance of the cod portions and wild berries concept and the cod & salmon portions with wild berries concept by all consumer segments at a comparable level of the traditional cod fillet product concept indicated an interesting opportunity for development and testing in that direction. This study is based on the results of a web-based product concept test. This test did not expose the participants to the actual products. Nevertheless, the value of this approach is in its convenience with testing various products in order to clarify which is the most successful one to be used in further testing (Dahan and Srinivasan, 2000). A follow-up test with real products can be performed with more security/confidence about the appropriateness of a product

selected by the consumers and not by the product developers. The pre selection of product concepts reported in this paper enables us to perform an in-home consumer test. We aim to develop and test products based on the cod and salmon portions with wild berries concept.

This product seems to fit perfectly to the consumer values by means of variation of species, freedom of choice between species and its attractive, innovative image which is created by pure, fresh and traditional ingredients. This product will be expected to be rated trustworthy and convenient and will include a recipe to assist the consumers towards its successful preparation.

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### **References**

- Advice on fish consumption: Benefits and Risks, 2004. In: Office, T.S. (Ed.). Scientific Advisory Committee on Nutrition. Committee on Toxicity of Chemicals in Food, London, pp. 222.
- Altintzoglou, T., Birch-Hansen, K., Valsdóttir, T., Odland, J.Ø., Martinsdóttir, E., Brunsø, K., Luten, J., 2010. Translating barriers into potential improvements: the case of healthy seafood product development. *Journal of Consumer Marketing* 27(3): 224-235.
- Altintzoglou, T., Einarsdóttir, G., Valsdóttir, T., Schelvis, R., Skåra, T., Luten, J., in press. A voice-of-consumer approach in development of new seafood product concepts. *Journal of Aquatic Food Product Technology*, *in press*.
- Brunso, K., 2003. Consumer research on fish in Europe, in: Luten, J.B., Oehlenschlaeger, J., Olafsdottir, G. (Eds.), *Quality of fish from catch to consumer: Labelling, monitoring and traceability*. Wageningen Academic Publishers, Wageningen, pp. 335-344.
- Cooper, R.G., 1999. From experience - The invisible success factors in product innovation. *Journal of Product Innovation Management* 16: 115-133.

- Dahan, E., Srinivasan, V., 2000. The predictive power of Internet-based product concept testing using visual depiction and animation. *Journal of Product Innovation Management* 17: 99-109.
- Einarsdottir, G., Sveinsdottir, K., Martinsdottir, E., F.H., J., Thorsdottir, I., Thorsdottir, F., 2007. Attitudes and fish consumption of 18-25 year olds-descriptive statistics, Skýrsla MATIS 05-07. MATIS, Reykjavik, Iceland.
- FAO, 2009. The state of the world fisheries and aquaculture 2008. FAO fisheries and Aquaculture Department. Food and Agriculture Organization of the United Nations, Rome.
- Grunert, K.G., Brunsø, K., Bisp, S., 1993. Food-Related Life-Style: Development of a cross-culturally valid instrument for market surveillance. Report number 12, MAPP Århus.
- Honkanen, P., Olsen, S.O., Verplanken, B., 2005. Intention to consume seafood--the importance of habit. *Appetite* 45: 161-168.
- Jaffry, S., Pickering, H., Ghulam, Y., Whitmarsh, D., Wattage, P., 2004. Consumer choices for quality and sustainability labelled seafood products in the UK. *Food Policy* 29: 215-228.
- Morrissey, M., 2006. Culinary based product development for seafood and the stage gate principle, The Third SEAFOOD Conference, Tromsø, Norway. [http://www.seafoodplus.org/fileadmin/files/events/2006-Third\\_SFplus/s1\\_02%20Mike%20Morrissey%20SEAFOODplus%20Conference%202006%20Oral\\_reduced.pdf](http://www.seafoodplus.org/fileadmin/files/events/2006-Third_SFplus/s1_02%20Mike%20Morrissey%20SEAFOODplus%20Conference%202006%20Oral_reduced.pdf)
- Myrland, Ø., Trondsen, T., Johnston, R.S., Lund, E., 2000. Determinants of seafood consumption in Norway: lifestyle, revealed preferences, and barriers to consumption. *Food Quality and Preference* 11: 169-188.
- Olsen, S.O., 2001. Consumer involvement in seafood as family meals in Norway: an application of the expectancy-value approach. *Appetite* 36: 173-186.
- Olsen, S.O., 2003. Understanding the relationship between age and seafood consumption: the mediating role of attitude, health involvement and convenience. *Food Quality and Preference* 14: 199-209.
- Olsen, S.O., Scholderer, J., Brunsø, K., Verbeke, W., 2007. Exploring the relationship between convenience and fish consumption: A cross-cultural study. *Appetite* 49: 84-91.
- Ophuis, P.A.M.O., 1989. Measuring health orientation and health consciousness as determinants of food choice behaviour: development and implementation of various attitudinal scales in: Avilonits, G.J., Papavasiliou, N.K., Kouremenus, A.G. (Eds.),

- Marketing Thought and Practice in the 1990's. EMAC XVIII, Athens School of Economics and Business, Athens, Greece, pp. 1723–1725.
- Pieniak, Z., Verbeke, W., Brunso, K., Olsen, S.O., 2006. Consumer knowledge and interest in information about fish., in: Luten, J., Jacobsen, C., Bekaert, K., Sæøbo, A., Oehlenschlager, J. (Eds.), *Seafood research from fish to dish: Quality, safety and processing of wild and farmed fish*. Wageningen Academic Publisher, Wageningen pp. 229-241.
- Pieniak, Z., Verbeke, W., Perez-Cueto, F., Brunso, K., De Henauw, S., 2008a. Fish consumption and its motives in households with versus without self-reported medical history of CVD: A consumer survey from five European countries. *Bmc Public Health* 8: -.
- Pieniak, Z., Verbeke, W., Scholderer, J., Brunsø, K., Olsen, S.O., 2007. European consumers' use of and trust in information sources about fish. *Food Quality and Preference* 18: 1050-1063.
- Pieniak, Z., Verbeke, W., Scholderer, J., Brunsø, K., Olsen, S.O., 2008b. Impact of consumers' health beliefs, involvement and risk perception on fish consumption: A study in five European countries. *British Food Journal* 110: 898 - 915.
- Pliner, P., Hobden, K., 1992. Development of a scale to measure the trait of food neophobia in humans. *Appetite* 19: 105-120.
- Rortveit, A.W., Olsen, S.O., 2007. The role of consideration set size in explaining fish consumption. *Appetite* 49: 214-222.
- Schifferstein, H.N.J., Ophuis, P.A.M.O., 1998. Health-related determinants of organic food consumption in the Netherlands. *Food Quality and Preference* 9: 119-133.
- Shepherd, J., Harden, A., Rees, R., Brunton, G., Garcia, J., Oliver, S., Oakley, A., 2006. Young people and healthy eating: a systematic review of research on barriers and facilitators. *Health Education Research* 21: 239-257.
- Similä, M., Fagt, S., Vaask, S., Thorgeirsdottir, H., Pudule, I., Petkeviciene, J., Johansson, L., Becker, W., Ovesen, L., Steingrimsdottir, L., Moltchanova, E., Valsta, L., 2003. The NORBAGREEN 2002 study; Consumption of vegetables, potatoes, fruit, bread and fish in the Nordic and Baltic countries, TemaNord Copenhagen, pp. 172.
- Steingrimsdóttir, L., Þorgeirsdóttir, H., Ólafsdóttir, A.S., 2002. Könnun á mataræði Íslendinga 2002: Helstu niðurstöður, Rannsóknir Manneldisráðs Íslands V.

- Stephoe, A., Pollard, T.M., Wardle, J., 1995. Development of a Measure of the Motives Underlying the Selection of Food - the Food Choice Questionnaire. *Appetite* 25: 267-284.
- Undeland, I., Lindqvist, H., Chen-Yun, Y., Falch, E., Luten, J.B., 2009. Seafood and health: what is the full story? in: Luten, J.B. (Ed.), *Marine Functional food*. Wageningen Academic Press.
- Verbeke, W., Sioen, I., Pieniak, Z., Van Camp, J., De Henauw, S., 2005. Consumer perception versus scientific evidence about health benefits and safety risks from fish consumption. *Public Health Nutrition* 8: 422-429.
- Verbeke, W., Vermeir, I., Brunsø, K., 2007. Consumer evaluation of fish quality as basis for fish market segmentation. *Food Quality and Preference* 18: 651-661.





