

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

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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 ($p = 0.006$).

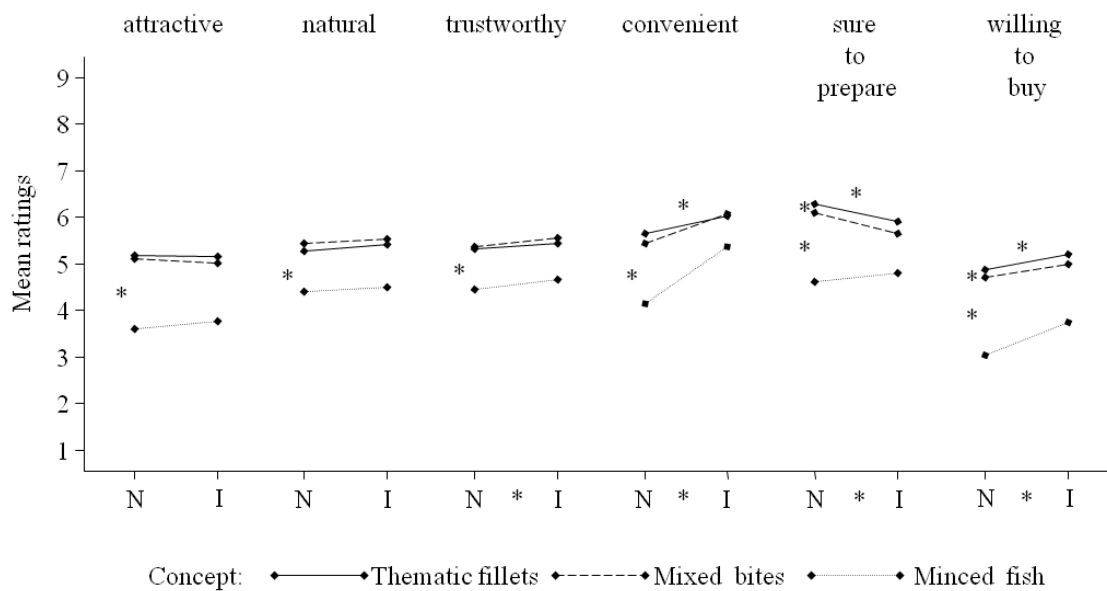


Figure 2. Evaluation of product concept conditions in Norway (N) and Iceland (I) on self reported nine point scales with one (1) denoting the lowest evaluation for each variable (e.g. totally not attractive) and nine (9) the opposite extreme (e.g. totally attractive). * Indicates significant differences (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 ($p = 0.004$).

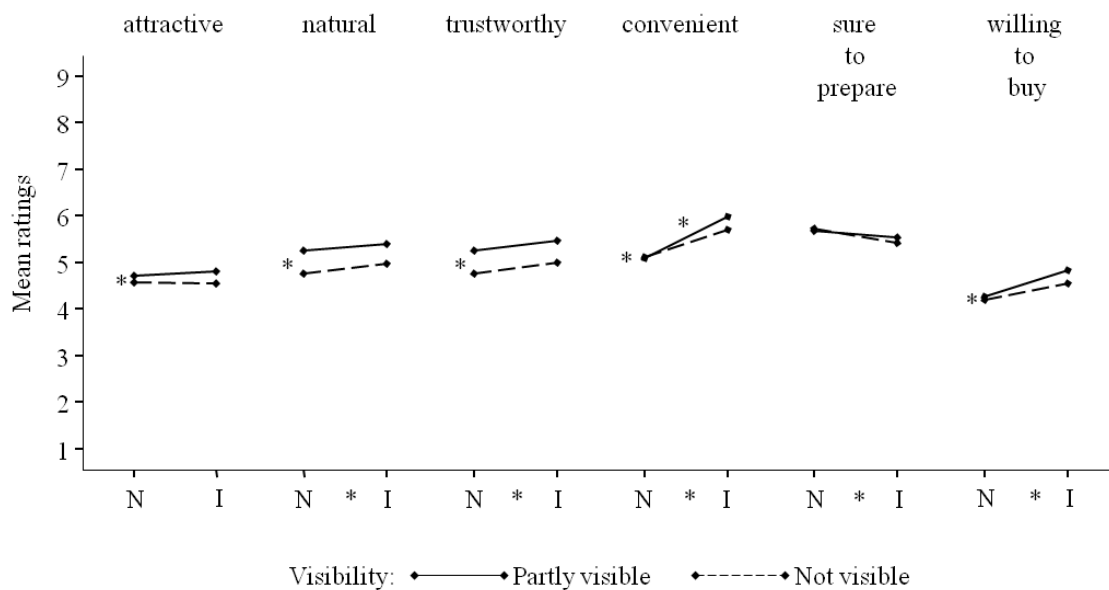


Figure 3. Evaluation of visibility conditions in Norway (N) and Iceland (I) on self reported nine point scales with one (1) denoting the lowest evaluation for each variable (e.g. totally not attractive) and nine (9) the opposite extreme (e.g. totally attractive). * Indicates significant differences ($p < 0.05$) 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.

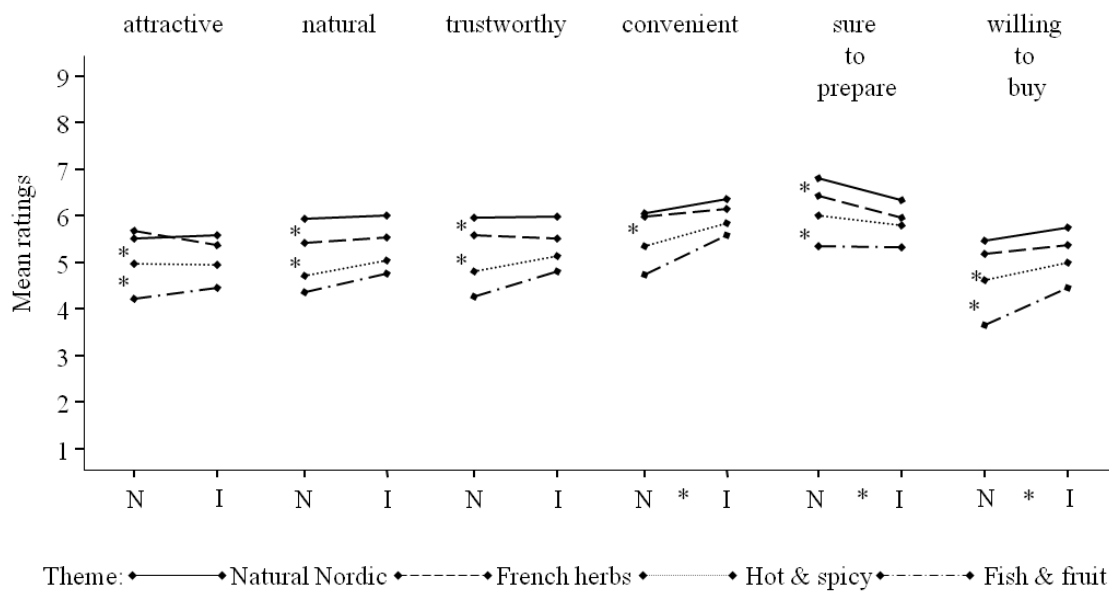


Figure 4. Evaluation of theme conditions only on the fillets concept in Norway (N) and Iceland (I) on self reported nine point scales with one (1) denoting the lowest evaluation for each variable (e.g. totally not attractive) and nine (9) the opposite extreme (e.g. totally attractive). * Indicates significant 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.

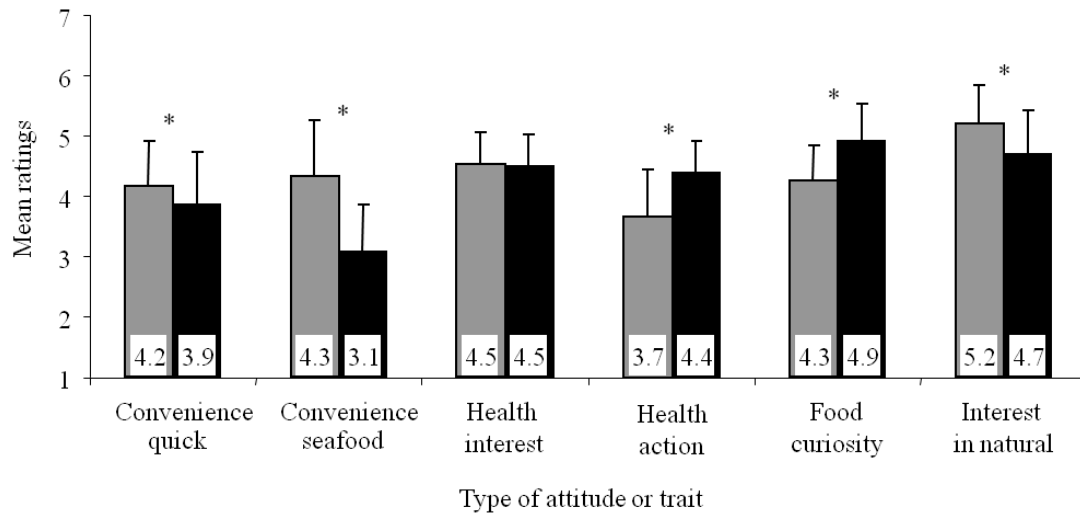


Figure 5. Attitudes and personality traits (mean & SD) in Norway (grey) and Iceland (black) on seven point likert scales with one (1) denoting “totally disagree” and seven (7) totally agree. * Indicates significant differences ($p < 0.001$)

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
- 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.