Positive versus negative information: What is really shifting consumers' intention to eat Norwegian salmon? Evidence from three European countries

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Food Quality and Preference 108 (2023) 104871

Contents lists available at ScienceDirect

Food Quality and Preference

journal homepage: www.elsevier.com/locate/foodqual

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ARTICLE INFO

Keywords:
Salmon
Consumption
Information
Intention
Behaviour

ABSTRACT

This study provides empirical evidence on the drivers affecting Norwegian salmon consumption in three European countries – Italy, Poland, and France – using the Theory of Planned Behaviour (TPB). We also highlight the effects of positive and negative information about the sustainability of salmon farming on consumers' perceptions and behaviour. The empirical study was conducted using an online survey with representative samples of French (n = 748), Italian (n = 771) and Polish (n = 756) consumers. A treatment including neutral, positive, and negative information was applied using a between-subjects design in the three countries. This study confirms the role of attitudes in affecting consumers' intentions, and consequently, behaviour. We show that negative information more strongly affects consumers' attitudes and intentions than positive one, as the negative information frame modifies the structural paths in the studied countries. Newly available negative information also affects the way that attitude and intention correlate with the individuals' prior health and environmental beliefs.

1. Introduction

Norwegian aquaculture faces challenges and demands from domestic policy makers, citizens, and international consumers. Moreover, the European Union (EU) is the most important market for Norwegian fish products, consuming approximately 70 % of the total volume of Norwegian salmon exported in recent years. For example, nine of the ten most important markets are from Europe, including Poland, France, and Italy (VALUMICS EU Hproject2020, 2021). However, per capita fish consumption dropped by more than 390 g in 2019 in the EU market, and reached the lowest amount in the past decade at less than 24 kg per capita/year (EUMOFA, 2021). Furthermore, only one-third of EU citizens consume fish weekly and these habits did not change after the COVID-19 pandemic (Eurobarometer, 2021).

The fish industry is also economically important for the EU. Hence, policy-makers are interested in understanding the impact of policies, including providing quality information to consumers so that they can influence consumption behaviour towards fishery and aquaculture products (Cantillo et al., 2021). Researchers have already examined the role of information in affecting consumers' purchase and eating behaviour. For example, besides mandatory information such as the name and species of the product, other voluntary information should be provided to European consumers, including the fishing gear used to catch the fish, the date of catch, and the port of landing (Eurobarometer, 2021). Consumers also have a more positive image of wild fish than farmed fish (Claret et al., 2014; Reig et al., 2019; Vanhonacker et al., 2013). A survey from 2021 indicated that a relative majority of European fish consumers prefer wild-caught fish to farmed fish (32 %), while 30 % have no preference regarding wild or farmed fish, 15 % of them don't know if the products they buy or eat are wild or farmed, and for 16 % of the respondents it depends on the type of product. Finally, only 7 % of European consumers prefer farmed species (Eurobarometer, 2021). Consumers consider wild fish to be of higher quality than farmed species (Claret et al., 2014; Verbeke et al., 2005), especially on taste and health aspects (Cardoso et al., 2013; Claret et al., 2014, 2016; Rickertsen et al., 2017). European consumers mostly evaluate the appearance, price, and

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https://doi.org/10.1016/j.foodqual.2023.104871
Received 27 October 2022; Received in revised form 30 March 2023; Accepted 31 March 2023
Available online 10 April 2023

origin when purchasing fish products, including both capture fisheries and aquaculture; meanwhile, bad taste, smell, appearance, and high prices are the most important reasons for seldom or never eating fish products (Eurobarometer, 2021). This negative perception may result in low consumption rates and preferences for farmed fish (Claret et al., 2016; Wongprawmas et al., 2022), and consequently, the risk of production stagnation.

One of the causes of this negative perception of the EU fish industry is also due to scarce and often misleading information about the fishing industry in the media in several European countries (Amberg & Hall, 2008, 2010; Govaerts, 2021; Olsen & Osmundsen, 2017; Phuc, 2016; Pulcini et al., 2020). For instance, in France, the most frequent topics covered in the media on salmon farming are related to economic, health, and environmental issues. Compared to other countries, French media pays more attention to health (Govaerts, 2021) and most articles about farmed salmon are negative. Negative media coverage may negatively affect consumers' attitudes and behaviour towards Norwegian salmon. Moreover, the complexity of messages related to the health effects of fish consumption may induce confusion among consumers and reduce the usefulness of the information (Roosen et al., 2009).

Notably, more than a third of EU consumers (37 %), particularly young generations, believe that the environmental impact should be mentioned on the label of these products (Eurobarometer, 2021). Therefore, providing consumers with positive information on the industry's efforts to improve environmental performance as well as sustainability certifications and labels (Menozzi et al., 2020; Olsen et al., 2021) may positively affect their attitude and purchase behaviour. Consequently, we must understand how information about aquaculture products affects consumer preferences and behaviour (Feucht & Zander, 2017; Polymeros et al., 2015).

Therefore, the aim of this study is twofold: 1) to explain European consumers' intention to purchase Norwegian seafood using a well-established theoretical framework, the Theory of Planned Behaviour (TPB), and 2) to measure the impact of positive and negative information related to farmed salmon on consumer evaluations. To the best of our knowledge, we still do not clearly know how information about the environmental and health consequences of Norwegian salmon farming may influence European consumers' beliefs, attitudes, and behavioural intentions (Govaerts, 2021; Olsen & Osmundsen, 2017; Olsen et al., 2021); hence, we included neutral, negative, and positive information treatments to address this gap. Moreover, we can conduct a cross-cultural comparison as we focus on three countries (Italy, Poland, and France).

The remainder of this study is organised as follows. We first describe the theoretical framework of TPB and our hypotheses, followed by the methods and results. We then outline discussion of our results. The final section presents the industry and policy implications.

2. Theoretical framework and research hypothesis

2.1. The theory of planned behaviour

TPB (Ajzen, 1991) is used to explore the relevant predictors of a particular human behaviour. According to the TPB, behavioural intention, the immediate precursor of behaviour, is affected by three determinants: attitude towards the behaviour, subjective norms, and perceived control over the behaviour (perceived behavioural control, PBC). TPB has been used in explaining and predicting several dietary contexts, including sustainable dietary behaviours (Biasini et al., 2021), healthy (McDermott et al., 2016), and fish and seafood eating behaviour (Budhathoki et al., 2022; Tomić et al., 2016; Verbeke & Vackier, 2005). In general, as noted by Biasini et al. (2021), studies which assess the intention to eat healthy have an explained intention variance ranging from 32 % to 77 % and explained behaviour variance ranging from 3 % to 65 % depending on the measurement tool. The literature indicates that TPB variables have medium to large associations with both intention and dietary patterns, and therefore, may provide useful guidance for designing effective interventions (McDermott et al., 2016). Here, we examined the consumption of Norwegian salmon in the future, as postulated by the TPB, using behavioural intention and PBC as relevant predictors. Our hypotheses were as follows:

H1: Attitude is a significant predictor of individuals' intention to consume Norwegian salmon.

H2: Subjective norms are significant predictors of individuals' intention to consume Norwegian salmon.

H3: PBC is a significant predictor of individuals' intention to consume Norwegian salmon.

H4: Individuals' intention affects the consumption of Norwegian salmon.

H5: PBC affects the consumption of Norwegian salmon.

2.2. The role of exposure to information

Each TPB construct has prior determinants: attitudes are driven by beliefs about the likely consequences of performing the behaviour (behavioural beliefs); subjective norm is a function of beliefs about the normative expectations of important others (normative beliefs); and PBC is based on beliefs about the presence of factors that may facilitate or impede the performance of the behaviour (control beliefs) (Fishbein & Ajzen, 2011). Importantly, TPB has no underlying assumption that these beliefs are formed in a rational and unbiased way. Instead, beliefs may reflect the information and knowledge people have about the performance of a given behaviour. In principle, previous knowledge allows people to make more informed decisions in line with their personal preferences. However, this information is often inaccurate and incomplete (Ajzen, 2011). Nevertheless, regardless of how beliefs are formed and how accurate they are, the TPB postulates that perceived knowledge is not directly related to behaviour; instead, it is related to motivational factors (e.g., intention, attitudes, social norms and perceived control) and behavioural skills which, in turn, predict actual behaviour (Fishbein & Ajzen, 2011). From this perspective, newly available information may alter a person's beliefs and consequently other constructs. Other studies have supported the idea that exposure to information should be treated as an antecedent to TPB variables. The empirical evidence, moreover, indicates that the effect on behaviour and behavioural intention tends to be small and mediated by more proximal antecedents, such as attitudes (Fishbein & Ajzen, 2011). Lindell and Perry (2012) describe how information predicts pre-decision processes, which in turn influence perceptions, and ultimately behaviour. In another study (Witzling et al., 2015) exposure to information from different channels was associated with TPB variables, though the direction and strength varied. Furthermore, the effects of exposure to information and short-term advertising campaigns on TPB variables was analysed in the case of energy conservation behaviours (Rizzi et al., 2020). Therefore, exposure to (positive or negative) information is considered an important background factor able to modify the major predictors of intentions and actions, understood in terms of behavioural, normative, and control beliefs.

Here, we measured consumers' behavioural, normative, and control beliefs before they were provided with positive and negative information; therefore, independent of how people arrived at their beliefs and their previous knowledge, we analyse how the information has modified the way beliefs formed their attitudes towards the behaviour, and their subjective norms and PBC. An information treatment on the Norwegian salmon industry was applied with a between-subjects design dividing the sample into three groups of the same size: control (provided with neutral information about salmon farming in Norway), positive information (e.g. improvement of nutrition and health, occupation and economic development of coastal areas, food security), and negative information groups (e.g. risks of release of organic and inorganic effluents, chemicals used in the treatment of salmon diseases). Essentially, we assessed whether and how positive and negative information affected TPB paths as well as the correlations between TPB variables and

Table 1
Socio-demographic sample characteristics, N (%).

	France N = 748	Italy N = 771	Poland N = 756
Gender			
Female	383 (51.2)	407 (52.8)	402 (53.2)
Male	365 (48.8)	364 (47.2)	353 (46.7)
Neutral	0 (0.0)	0 (0.0)	1 (0.1)
Age (years)			
18–24	81 (10.8)	63 (8.2)	70 (9.3)
25–34	116 (15.5)	105 (13.6)	140 (18.5)
35–44	113 (15.1)	134 (17.4)	153 (20.2)
45–54	128 (17.1)	150 (19.5)	114 (15.1)
55–65	132 (17.6)	134 (17.4)	139 (18.4)
>65	178 (23.8)	185 (24.0)	140 (18.5)
Education			
Primary school	9 (1.2)	1 (0.1)	14 (1.9)
Secondary school	315 (42.1)	475 (61.6)	338 (44.7)
Bachelor's Degree	283 (37.8)	93 (12.1)	129 (17.1)
Masters' Degree or higher	141 (18.9)	202 (26.2)	275 (36.4)
Household members (n)			
1–2	475 (63.5)	322 (41.8)	321 (42.5)
≥3	273 (36.5)	449 (58.2)	435 (57.5)

antecedent beliefs. In particular, exposure to information related to health, the environment, and socio-economic impacts of salmon farming is expected to alter attitude and intention, and the way that attitude and intention correlates with individuals' previous knowledge (i.e. the antecedent behavioural beliefs) (Lindell & Perry, 2012; Rizzi et al., 2020; Witzling et al., 2015). Since behavioural beliefs were assessed before the information was provided, we expect that the positive information would strengthen their relationship with attitudes and intentions, whereas negative information would weaken this correlation. Hence, hypotheses 6–9 below regard how exposure to positive and negative information altered, respectively, attitudes towards the behaviour and behavioural intentions, and their relation with antecedent beliefs.

H6: Positive information makes consumers' attitudes more favourable (H6a), and strengthens the linkage between attitudes and beliefs related to health and environmental impacts (H6b).

H7: Negative information makes consumers' attitudes less favourable (H7a), and weakens the correlation between attitudes and beliefs related to health and environmental impacts (H7b).

H8: Positive information increases consumers' intention to consume Norwegian salmon (H8a), and strengthens the linkage between intention and beliefs related to health and environmental impacts (H8b).

H9: Negative information reduces consumers' intention to consume Norwegian salmon (H9a), and weakens the correlation between intention and beliefs related to health and environmental impacts (H9b).

Finally, previous studies provide only limited insights into the relative effects of exposure to information on TPB paths, i.e. on the antecedents' impact on intention and behaviour. In principle, the reasoned action approach postulates that interventions (such as exposure to new information) must target the beliefs that underlie the component we wish to change. Thus, to change attitudes towards the behaviour, we must change the set of behavioural beliefs salient in the population of interest (Fishbein & Ajzen, 2011). For instance, Nolan et al. (2008) shown that the influence of subjective norms on a behavioural option regarding energy conservation prevails over the individual attitude towards the behaviour, particularly when reinforced with the referents' provision of energy saving information. In other words, since subjective norms had the strongest effect on energy conservation, normative information (i.e. neighbours' conservation efforts) spurred people to conserve more energy than any of the standard appeals that are often used to stimulate such eco-friendly behaviour (e.g. protecting the environment, being socially responsible, or even saving money) (Nolan et al., 2008). Zaho et al. (2020) indicated that higher level of exposure to information about alcohol consumption had a weak but significant effect on PBC (Zhao et al., 2020). In the present case, we provide information about personal (e.g. nutrition and health) and societal (e.g. environmental, occupation, food security, etc.) effects of salmon farming, mostly related with behavioural beliefs and attitude towards the behaviour (i.e. Norwegian salmon consumption), therefore expected to strengthening the motivational attitude-intention-behaviour relationships. Indeed, as postulated by H6-H9, the information provided (both positive and negative) is expected to modify attitude and, in turn, intention, but not subjective norms and PBC. Therefore, we expect information to strengthen the attitude-intention relationship more than subjective norms-intention and PBC-intention relationships. Hence, hypotheses 10–11 are as follows:

*H*10: Exposure to positive (H10a) and negative (H10b) information strengthen the relationship between attitude and intention, more than the relationship between subjective norms/PBC and intention.

*H*11: Exposure to positive (H11a) and negative (H11b) information strengthen the relationship between intention and behaviour, more than PBC and behaviour.

3. Material and methods

3.1. Data collection and sample

Qualitative data were collected in three EU countries (Poland, Italy, and France) through online personal interviews and focus groups with approximately 20 participants per country. The qualitative phase was used to *a)* elicit the salient behavioural, normative and control beliefs about the consumption of Norwegian salmon, and *b)* inform a consumer survey. The survey was web-based and piloted on a convenience sample of 300 Italian consumers to check for incongruences and mistakes. The master questionnaire was developed in English and then translated by native speakers in each national language of the sampled countries. Data were collected using computer-assisted web interviewing (CAWI) through a private platform owned by a private research agency (Lightspeed ltd, UK) in February 2021. Informed consent was obtained before starting the survey. The study was approved beforehand at the project level as part of the project owners' common request for ethical approval of all project surveys from the Ethical Scientific Committee in Norway (NSD). The final sample comprised 2,275 participants (France, N = 748; Italy, N = 771; Poland, N = 756). To ensure the representativeness of the sample at the national level, participants were stratified according to gender, age, and area of residence. Moreover, all the other sociodemographics (i.e. educational level, household size, number of children in the household, occupation, monthly income) were not significantly different across the three information groups. Table 1 presents the main sociodemographic characteristics of the three samples.

3.2. Measures and information

The survey questionnaire was based on the qualitative study (focus group and in-depth online interviews) and used a theory-driven approach (Fishbein & Ajzen, 2011). All items were adapted from previous studies on attitude, intention, and behaviour towards fishery and aquaculture products (e.g. Verbeke & Vackier, 2005), and are reported in Appendix Table A1.

The behaviour of interest was defined as the consumption of Norwegian salmon in the future. To measure behaviour, we asked respondents about their current frequency of fish and salmon consumption, and used it as a proxy for future behaviour. Specifically, *behaviour* (i.e. self-reported consumption of fish and salmon) was assessed with the following item: 'Please indicate how often you consume fish/salmon (fresh, frozen, canned, smoked, ready-to-eat, etc.) at home or in a restaurant: never or rarely; a few times a year; once a month; 2–3 times a month; 1–2 times a week; almost every day'. We assessed the direct measure of *Attitude toward the behaviour* with six semantic differentials using a 7-point unipolar scale: 'for me, consuming

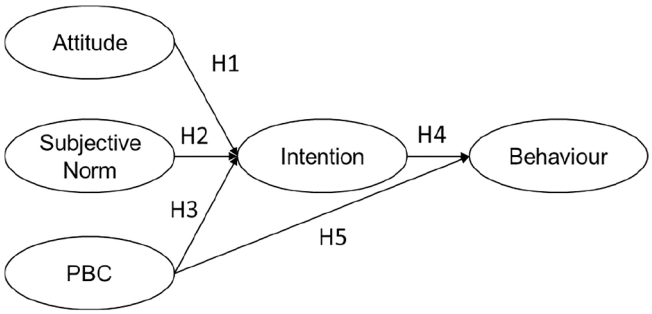


Fig. 1. Theoretical framework and tested hypotheses.

Norwegian salmon in the future would be: not at all useful/very useful; not at all satisfactory/very satisfactory; not at all healthy/very healthy; not at all pleasant/very pleasant; harmful/beneficial; foolish/wise'. To measure *behavioural beliefs strength*, we used three items: 'I would have a healthier life', 'I would have a more varied diet', and 'I would contribute to environmental sustainability'. Each item was anchored on a bipolar differential 7-point scale ranging from 'very unlikely' to 'very likely'. For each belief-strength variable, we included an equivalent *outcome evaluation* statement. Each statement was measured on a bipolar 7-point scale ('not at all important' to 'extremely important'). We used three items on a 7-point scale ('strongly disagree' to 'strongly agree') as direct measures of *Subjective Norms*: 'Most people who are important to me think that I should consume Norwegian salmon in the future', 'Most people I respect would approve my consumption of Norwegian salmon in the future', and 'Most people like me will consume Norwegian salmon in the future'. To obtain an indirect measure of subjective norms, two categories of normative beliefs were considered: injunctive (reflecting what important others think we should do) and descriptive (reflecting what we believe other might do) beliefs. We used three statements to assess *normative belief strength*, such as 'My family members think I should consume Norwegian salmon in the future', scored on a bipolar 7-point scale ('very unlikely to 'very likely').

We measured *Perceived Behavioural Control* with three items on a 7-point scale: 'The consumption of Norwegian salmon in the future is completely up to me', 'If I really wanted to, I could eat Norwegian salmon in the future', and 'I believe that consuming Norwegian salmon in the future is under my control' ('strongly disagree' to 'strongly agree'). We assessed *control beliefs* with six items that assessed participants' perceptions about their ability to consume Norwegian salmon in the future (e.g. 'Eating Norwegian salmon in the future would allow me to get good value for the money'), on a 7-point scale ('strongly disagree' to 'strongly agree').

We used three items to assess behavioural *Intention*: 'I intend to consume Norwegian salmon in the future' and 'I plan to consume Norwegian salmon in the future' were measured on a 7-point scale ('strongly disagree' to 'strongly agree'). The third item 'I will be consuming Norwegian salmon in the future' was measured on a slightly different 7-point scale ('very unlikely' to 'very likely').

A treatment with neutral, positive, and negative information was applied to numerically similar three groups of consumers in the three countries. The content of the information, discussed and approved by a group of researchers from different disciplines, was adapted from previous research (Chen, 2017; GESAMP, 2008; Jacobs et al., 2015; Taranger et al., 2015) and is reported in Appendix Table A2. The information was pre-tested on approx. 100 respondents (France N = 20, Italy N = 42, Poland N = 36) for assessing the clearness and credibility of the messages, as well as whether it was perceived as negative, neutral or positive by the respondents. This pre-test indicated that all information was easy, clear, credible, and convincing, and that the message was perceived by respondents as expected (i.e., neutral, positive, or negative). The results of the pre-test are reported as a Supplementary material S1.

3.3. Statistical analysis

Statistical analysis was performed using SPSS v.28.0 and AMOS v.27.0 statistical software (IBM Corporation, Armonk, NY, USA). Means and standard deviations were calculated for each questionnaire item and TPB construct. The Kruskal–Wallis test for independent samples was performed to determine the existence of significant differences between the control (neutral information) and treatment groups (positive and negative information) in consumers' attitudes and intentions to purchase Norwegian salmon in the future. A given belief's contribution to, for example, attitude and its ability to account for variation in the relative construct, may be discerned by examining its correlation (Fishbein & Ajzen, 2011). Thus, we calculated Spearman's rank-order correlations (ρ) between the TPB constructs to examine the behavioural, normative, and control beliefs' contribution to *a)* the overall constructs (i.e. attitude, subjective norm, and PBC, respectively), *b)* intention to perform the behaviour, and *c)* the behaviour itself. To test H6b-H9b we applied the procedure suggested by Sheskin (2003), specifically computing Fisher Z transformations of Spearman's correlations, then calculating the standard error of the difference of these Z scores, then the ratio of the difference to the standard error, and finally comparing this ratio to a standard normal distribution (Sheskin, 2003).

We modelled three structural equation models (SEM), one for each country, to test hypotheses H1–H5 and the theoretical frame in Fig. 1. SEM allows one to specify models with both latent (e.g. attitude towards consuming Norwegian salmon in the future) and observed variables (e.g. questionnaire items) (Kline, 2016). Convergent validity of the model variables was assessed using average variance extracted (AVE), Cronbach's α coefficient, and composite reliability (CR). Discriminant validity was tested by comparing the square root of the AVE of each construct with the inter-construct correlation (Bagozzi & Yi, 2012). The goodness-of-fit of the models was assessed using χ^2 and their degrees of freedom (df), Tucker-Lewis Index (TLI), comparative fix index (CFI), root mean square error of approximation (RMSEA) with a 90 % confidence interval, and the standardised root mean square residual (SRMR). A multi-group analysis was also conducted for each country to test for differences between the control and information treatment groups. We assessed the measurement invariance across groups through configural and metric invariance (equal factor loadings) based on changes in the model fit, i.e. $\Delta\chi^2$ and ΔCFI. We applied the Bayesian estimation routine (Byrne, 2010).

4. Results

4.1. Descriptive statistics

Table 2 shows the descriptive statistics of the latent and observable variables: the factor loadings of the variables items (λ) above 0.50, CR values and Cronbach's α above 0.70, and AVE values above 0.50, with the only exception of PBC in France (0.48), show strong reliability, and convergent and discriminant validity of all factors in the measurement model.

Notably, assessing the discriminant validity was also important because the squared root of the AVE of each construct, as shown in Table 3, was greater than the correlation between the constructs (Bagozzi & Yi, 2012).

Overall, the results in Table 2 demonstrate a moderately positive attitude towards consuming Norwegian salmon in France (mean score: 4.67), and positive attitudes in Italy (5.22) and Poland (5.15). Furthermore, important others had a moderately positive influence (France 4.29, Italy 4.81, and Poland 4.67) as well as relatively strong control over the behaviour (France 5.31, Italy 5.35, and Poland 5.46). Again, consumers exhibited a moderately positive intention to buy Norwegian salmon in France (4.75), and positive intentions in Italy (5.13) and

Table 2
Mean values (standard deviation, SD) of single items and TPB constructs, assessed on a 7-point *Likert* scale, factor loadings (λ), composite reliability (CR), average variance extracted (AVE) and Cronbach's α of the sample in France, Italy and Poland.

	France (n = 748)					Italy (n = 771)					Poland (n = 756)				
	Mean (SD)	λ	CR	AVE	α	Mean (SD)	λ	CR	AVE	α	Mean (SD)	λ	CR	AVE	α
Attitude	4.67 (1.41)		0.94	0.74	0.95	5.22 (1.29)		0.93	0.71	0.94	5.15 (1.49)		0.96	0.82	0.97
att1	4.60 (1.57)	0.89				5.26 (1.36)	0.90				5.14 (1.51)	0.93			
att2	4.65 (1.59)	0.93				5.26 (1.40)	0.91				5.08 (1.52)	0.92			
att3	4.87 (1.53)	0.88				5.40 (1.40)	0.89				5.27 (1.65)	0.93			
att4	4.96 (1.56)	0.86				5.30 (1.45)	0.88				5.21 (1.60)	0.89			
att5	4.50 (1.69)	0.77				5.14 (1.64)	0.71				5.05 (1.72)	0.88			
att6	4.46 (1.59)	0.81				4.93 (1.63)	0.74				5.12 (1.68)	0.87			
Subjective norm	4.29 (1.23)		0.89	0.73	0.89	4.81 (1.18)		0.92	0.78	0.91	4.67 (1.25)		0.93	0.82	0.93
sn1	4.12 (1.40)	0.85				4.70 (1.34)	0.87				4.85 (1.35)	0.92			
sn2	4.41 (1.33)	0.85				4.90 (1.27)	0.90				4.94 (1.32)	0.92			
sn3	4.35 (1.34)	0.87				4.83 (1.22)	0.89				4.93 (1.32)	0.88			
Perceived Behavioural Control	5.31 (0.99)		0.72	0.48	0.70	5.35 (0.97)		0.82	0.61	0.82	5.46 (0.98)		0.79	0.57	0.79
pbc1	5.55 (1.18)	0.74				5.34 (1.20)	0.79				5.63 (1.13)	0.63			
pbc2	5.13 (1.37)	0.46				5.43 (1.10)	0.69				5.45 (1.15)	0.75			
pbc3	5.27 (1.23)	0.82				5.28 (1.10)	0.86				5.31 (1.19)	0.86			
Behavioural Intention	4.75 (1.44)		0.95	0.87	0.95	5.13 (1.27)		0.94	0.83	0.94	5.09 (1.37)		0.96	0.88	0.96
int1	4.67 (1.48)	0.90				5.02 (1.37)	0.86				4.99 (1.44)	0.90			
int2	4.82 (1.50)	0.97				5.20 (1.33)	0.96				5.13 (1.43)	0.97			
int3	4.75 (1.52)	0.94				5.18 (1.33)	0.92				5.15 (1.43)	0.94			
Behaviour	3.92 (0.90)		0.85	0.74	0.65	4.17 (0.82)		0.83	0.71	0.57	3.64 (0.94)		0.85	0.75	0.65
b1 [a]	4.38 (0.95)	0.86				4.58 (0.79)	0.85				4.05 (1.01)	0.86			
b2 [a]	3.46 (1.13)	0.86				3.75 (1.13)	0.85				3.23 (1.17)	0.86			

Note: CR: composite reliability; AVE: average variance extracted; α: Cronbach's α; λ: factor loadings represented by unstandardized regression weights. [a]: 1. Never or rarely, 2. A few times a year, 3. Once a month, 4. 2–3 times a month, 5. 1–2 times a week, 6. Almost every day.

Table 3
Spearman's rank-order correlations (ρ) between constructs including the squared root of the AVE of each construct (reported in bold), in France (upper, n = 748), Italy (middle, n = 771) and Poland (bottom, n = 756).

		ATT	SN	PBC	INT	B
ATT	FR	**0.86**	0.77	0.35	0.76	0.19
	IT	**0.84**	0.68	0.44	0.72	0.22
	PL	**0.90**	0.78	0.51	0.78	0.22
SN	FR		**0.86**	0.33	0.73	0.18
	IT		**0.88**	0.51	0.68	0.28
	PL		**0.91**	0.56	0.71	0.29
PBC	FR			**0.69**	0.41	0.14
	IT			**0.78**	0.50	0.20
	PL			**0.75**	0.50	0.23
INT	FR				**0.93**	0.25
	IT				**0.91**	0.32
	PL				**0.94**	0.29
B	FR					**0.86**
	IT					**0.84**
	PL					**0.86**

Note: ATT: Attitude Towards the Behaviour; SN: Subjective Norms; PBC: Perceived Behavioural Control; INT: Behavioural Intention; B: Behaviour. Note: all correlations are significant at $p < 0.001$.

Poland (5.09). In general, participants reported consuming fish once or twice per week in France and Italy, and only two or three times per month in Poland, while also reporting lower eating frequencies (two or three times per month in France and Italy, and once a month in Poland).

4.2. Structural equation model results

The results of the SEM analysis with standardised path coefficients and R^2 are reported in Fig. 2, while the unstandardised coefficients and standard errors are reported in Appendix Table A3. Table 4 summarises the results of the structural model tests.

As shown in Fig. 2, there is a satisfactory fit between the hypothesised model and data. Measurement invariance analysis showed first that the configural model was found to be well fitting in its representation of the multi-groups in the three countries (unconstrained model France: χ^2 (df) = 578.99 (327); CFI = 0.976; TLI = 0.970; RMSEA (90 % CI) = 0.032 (0.028–0.036); SRMR = 0.046; Italy: χ^2 (df) = 717.74 (330); CFI = 0.962; TLI = 0.953; RMSEA (90 % CI) = 0.039 (0.035–0.043); SRMR = 0.036; Poland: χ^2 (df) = 678.50 (327); CFI = 0.972; TLI = 0.965; RMSEA (90 % CI) = 0.038 (0.034–0.042); SRMR = 0.041). The analysis also provided reasonable evidence in support of measurement invariance permitting a meaningful comparison between the groups in France (factor loadings invariance: $\Delta\chi^2$ (52) = 34.19, p = 0.081, ΔCFI = 0.001), Italy ($\Delta\chi^2$ (24) = 38.51, p = 0.031, ΔCFI = 0.001), and Poland ($\Delta\chi^2$ (24) = 68.86, p = 0.000, ΔCFI = 0.004). In the case of Italy and Poland, although the difference in χ^2 from the configural model was statically significant, the difference between the CFI values met the recommended cut-off criterion of 0.01 (Byrne, 2010). Using the CFI difference test as the criterion upon which to determine evidence of invariance, we concluded the factor loadings to be operating similarly across information groups in the three countries.

Overall, the TPB model explains 62 % to 76 % of the variance in the intention to consume Norwegian salmon in the future, and 6 % to 24 % of the behaviour across the control and treatment groups (Fig. 2). Attitude towards Norwegian salmon consumption is the main significant predictor of behavioural intention in control groups across all countries, with standardised coefficients ranging from $\beta = 0.37$ ($p < 0.001$) in the French control group to $\beta = 0.73$ ($p < 0.001$) in the Polish control group. This result, which is consistent across countries, strongly supports H1.

The role of subjective norms is more ambiguous: it has a significant effect in the control groups in Italy ($\beta = 0.23$, $p < 0.01$) and France ($\beta = 0.40$, $p < 0.001$), where it is the main predictor of intention, therefore supporting H2. However, subjective norms' effect is not significant in Poland, and thus H2 is rejected in that case (Table 4). We accept H3 since PBC has a weaker but significant effect on behavioural intentions to consume Norwegian salmon in the control groups (France: $\beta = 0.20$, $p < 0.001$; Italy: $\beta = 0.18$, $p < 0.01$; Poland: $\beta = 0.14$, $p < 0.05$). In general, intention to consume Norwegian salmon in the future is the main predictor of behaviour and its effect is significant in the three control groups (France: $\beta = 0.29$, $p < 0.05$; Italy: $\beta = 0.39$, $p < 0.01$; Poland: $\beta = 0.41$, $p < 0.001$). Thus, H4 is supported. The effect of perceived control on behaviour is not significant in the control groups; therefore, H5 is rejected in the three countries.

Attitude towards Norwegian salmon consumption is the main

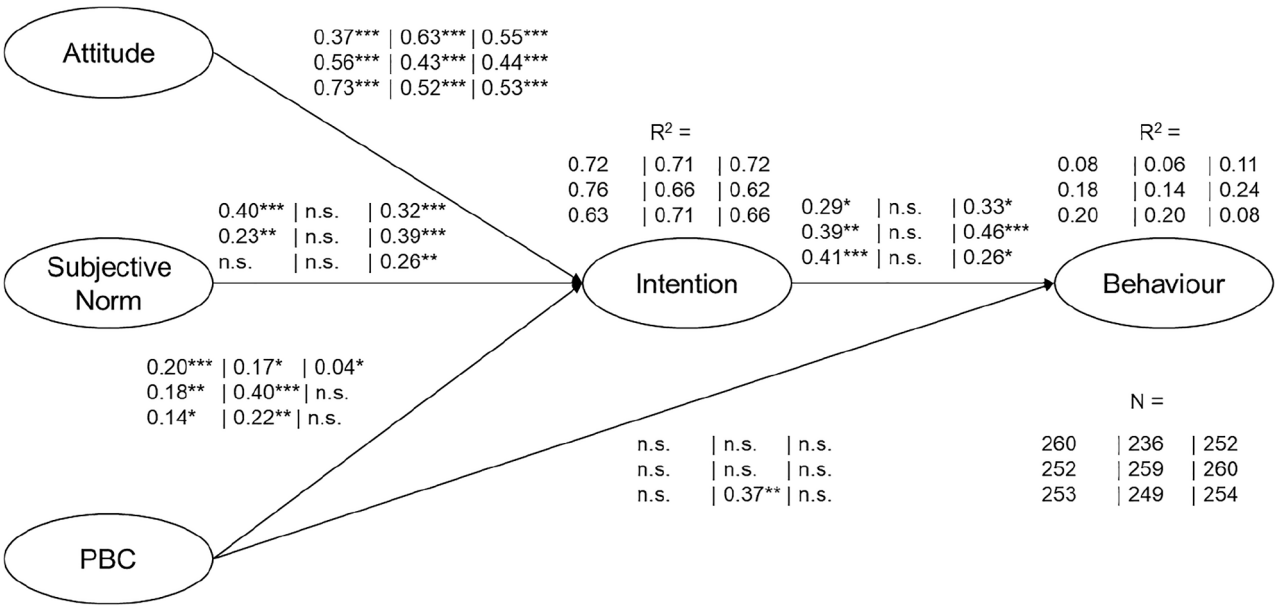


Fig. 2. Standardized regression coefficients, in France (upper), Italy (middle) and Poland (bottom), for control | positive | negative groups. Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, n.s.: not significant. Model fit indices: France: χ^2 (df) = 2287.795 (1395); CFI = 0.955; TLI = 0.949; RMSEA (90 %CI) = 0.029 (0.027–0.031); SRMR = 0.043. Italy: χ^2 (df) = 2484.863 (1398); CFI = 0.947; TLI = 0.939; RMSEA (90 %CI) = 0.032 (0.030–0.034); SRMR = 0.051. Poland: χ^2 (df) = 2705.976 (1395); CFI = 0.940; TLI = 0.932; RMSEA (90 %CI) = 0.035 (0.033–0.037); SRMR = 0.062.

Table 4
Structural model tests, in France (n = 748), Italy (n = 771) and Poland (n = 756).

		France	Italy	Poland
H1	ATT → INT	Accept	Accept	Accept
H2	SN → INT	Accept	Accept	Reject
H3	PBC → INT	Accept	Accept	Accept
H4	INT → B	Accept	Accept	Accept
H5	PBC → B	Reject	Reject	Reject
H10a	ATT_P → INT_P > SN_P/ PBC_P → INT_P	Accept/ Accept	Accept/ Reject	Accept/ Accept
H10b	ATT_N → INT_N > SN_N/ PBC_N → INT_N	Reject/ Accept	Reject/ Accept	Accept/ Accept
H11a	INT_P → B > PBC_P → B	Reject	Reject	Reject
H11b	INT_N → B > PBC_N → B	Accept	Accept	Accept

Note: ATT: Attitude Towards the Behaviour; SN: Subjective Norms; PBC: Perceived Behavioural Control; INT: Behavioural Intention; B: Behaviour; P: Positive information group; N: Negative information group.

significant predictor of behavioural intention also in almost all positive and negative informative conditions (Fig. 2). When positive information is communicated, subjective norms are not significant in any country; however, they have a significant effect in the groups which received negative information (France: $\beta = 0.32$, $p < 0.001$; Italy: $\beta = 0.39$, $p < 0.001$; Poland: $\beta = 0.26$, $p < 0.01$). PBC has a significant effect on behavioural intentions to consume Norwegian salmon in the positive information groups (France: $\beta = 0.17$, $p < 0.05$; Italy: $\beta = 0.40$, $p < 0.001$; Poland: $\beta = 0.22$, $p < 0.01$), whereas its effect is only marginally significant in the French group which received negative information ($\beta = 0.04$, $p < 0.05$). Thus, we can argue that exposure to positive information (H10a) strengthens the relationship between attitudes and intention, more than the relationship between subjective norms and intention in the three countries, and more than the relationship between PBC and intention in France and Poland. In Italy this hypothesis is not confirmed. Exposure to negative information (H10b) strengthen the relationship between attitude and intention, more than the relationship between PBC and intention in the three countries, whereas the effect of attitude on intention, compared to the effect of subjective norms on intention, is significantly higher in terms of p-values only in Poland (Table 4).

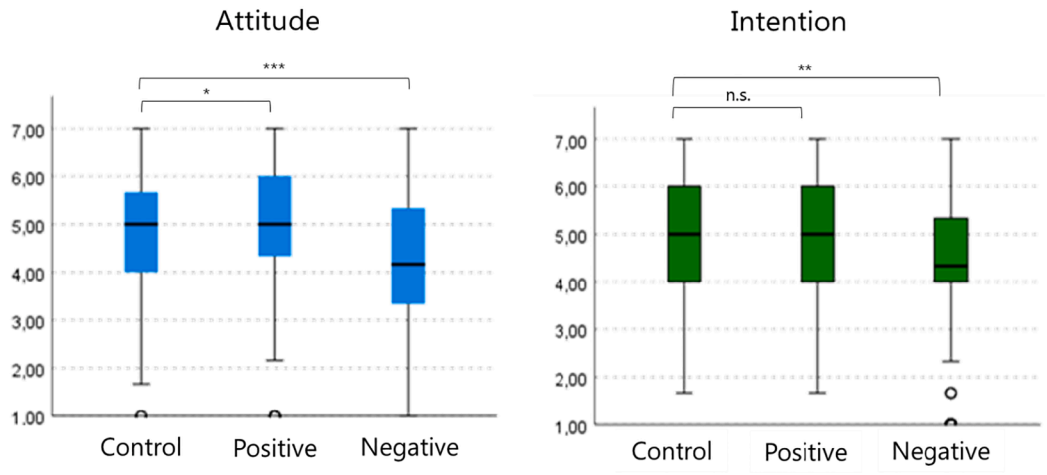
Intention to consume Norwegian salmon in the future is the main predictor of behaviour in the negative information groups (France: $\beta = 0.33$, $p < 0.05$; Italy: $\beta = 0.46$, $p < 0.001$; Poland: $\beta = 0.26$, $p < 0.05$), whereas the behavioural intention effect is only marginally significant in the positive information groups in Italy ($p = 0.063$) and France ($p = 0.103$) (Appendix Table A3). The effect of perceived control on behaviour is only significant in the Polish group that received positive information ($\beta = 0.37$, $p < 0.01$). Therefore, it is accepted that exposure to negative information (H11b) strengthens the relationship between intention and behaviour, more than PBC and behaviour, while this effect is not confirmed under exposure to positive information (H11a) (Table 4).

4.3. Effect of information on attitude and intention

Fig. 3 shows the box plot diagrams of the effect of information on attitude towards the behaviour and intention in the three countries. Table 5 summarizes the results of the tests on the effects of exposure to information.

Positive information on salmon farming (e.g. reducing pressure on wild fish stocks, and increasing salmon availability and employment opportunities) influences consumers' attitudes in Italy ($p = 0.003$) and, to a lesser extent, in Poland ($p = 0.011$) and France ($p = 0.034$). Meanwhile, providing consumers with negative information on intensive salmon farming, documenting the negative effects on the environment (e.g. release of organic and inorganic effluents, escape and interbreeding of farmed and wild salmon), and fish health (e.g. sea lice infestation) has a significant effect on making consumers' attitudes towards salmon consumption less favourable in the three countries ($p < 0.001$). These results confirm both H6a and H7a. Importantly, positive information does not shift consumers' intention to eat Norwegian salmon in the three countries, while negative information has a significant effect on reducing consumers' intentions in France ($p = 0.002$), Italy, and Poland ($p < 0.001$). Therefore, based on these results we reject H8a and accept H9a (Table 5).

a) France (control: n = 260, positive: n = 236, negative: n = 252).



b) Italy (control: n = 252, positive: n = 259, negative: n = 260).

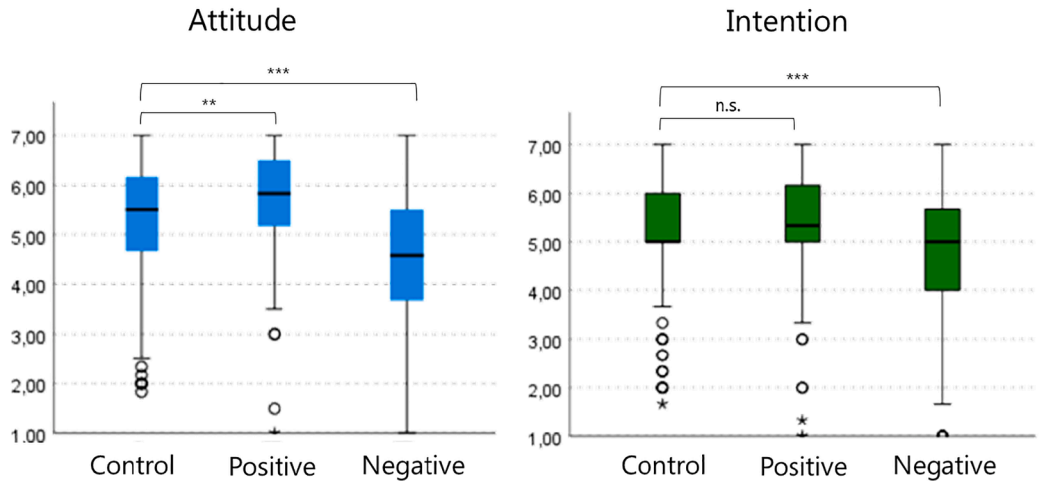


Fig. 3. Box plot diagram of the effect of positive and negative information vs control group, on attitude towards the behaviour and intention (non-parametric Kruskal-Wallis test). a) France (control: n = 260, positive: n = 236, negative: n = 252). b) Italy (control: n = 252, positive: n = 259, negative: n = 260). c) Poland (control: n = 253, positive: n = 249, negative: n = 254). Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, n.s.: not significant.

4.4. Effect of beliefs and information

The correlations (ρ) between behavioural, normative, and control beliefs with their relative constructs (attitudes, subjective norms, and PBC, respectively), intention to consume Norwegian salmon in the future, and behaviour are reported in the Appendix Tables A4-A6. This set of beliefs help us gain insight into the determinants of the TPB constructs across the three information conditions; in particular, we tested if positive and negative information affects the correlation between attitude/intention and beliefs related with health and environmental impacts (see H6b-H9b, Table 5, and Appendix Tables A4-A6).

In France, intermediate correlation levels (ρ 0.40–0.70) are reported for the association of normative beliefs with subjective norms and intention to consume Norwegian salmon in the control and positive information groups (Table A4). In particular, family members' opinions and behaviour (i.e. injunctive and descriptive norms, respectively) affect norms and intention. Behavioural beliefs associating Norwegian salmon consumption with an increased likelihood of healthier life and contribution to environmental sustainability are the most relevant in control and positive information groups ($0.60 > \rho > 0.50$), and less relevant in affecting the attitude of consumers who received negative information ($\rho < 0.40$). Control beliefs seem more associated with intention; in particular, believing that eating Norwegian salmon in the future allows one to save time (being ready to eat, and easy to consume and prepare) positively influences intention in the control and positive information groups. In all cases, the effect of all beliefs on behaviour is less relevant ($\rho \leq 0.30$), indicating the mediating effect of intentions and other TPB constructs on consumer behaviour.

In Italy, we found strong correlations ($\rho > 0.70$) between subjective norms and family members' opinions and behaviours for the control and positive information groups (Table A5). Intermediate correlation levels (ρ 0.40–0.70) are reported for doctors and nutritionists' opinions with subjective norms and intentions. Attitudes towards behaviour and intention are mostly affected by the likelihood of a healthier life,

c) Poland (control: n = 253, positive: n = 249, negative: n = 254).

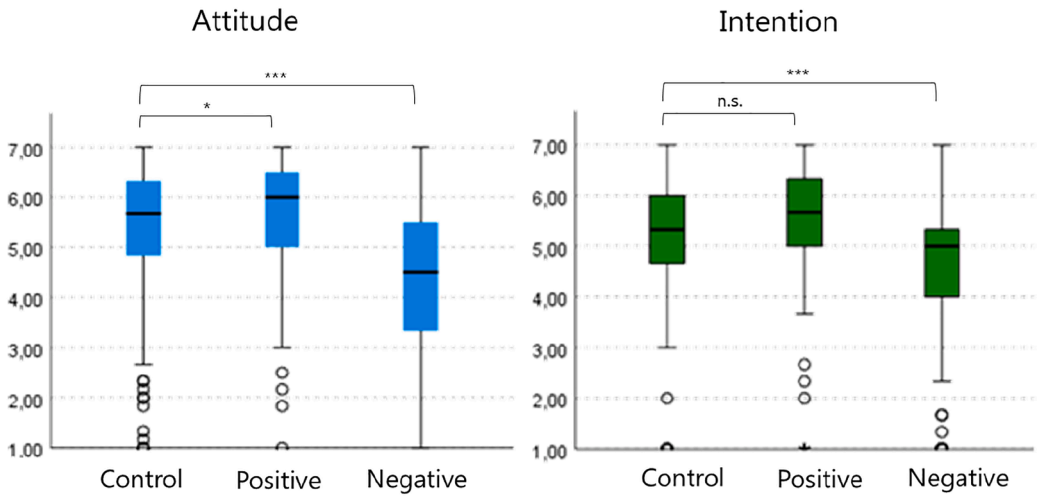


Fig. 3. (*continued*).

Table 5
Results of the tests on exposure to information on attitude, intention and beliefs, in France (n = 748), Italy (n = 771) and Poland (n = 756).

		France	Italy	Poland
H6a	ATT_C < ATT_P	Accept	Accept	Accept
H6b	ATT*BB1_C < ATT*BB1_P	Reject	Reject	Reject
H6b	ATT*BB2_C < ATT*BB2_P	Reject	Reject	Reject
H6b	ATT*BB3_C < ATT*BB3_P	Reject	Reject	Reject
H7a	ATT_C > ATT_N	Accept	Accept	Accept
H7b	ATT*BB1_C > ATT*BB1_N	Accept	Accept	Accept
H7b	ATT*BB2_C > ATT*BB2_N	Reject	Accept	Accept
H7b	ATT*BB3_C > ATT*BB3_N	Accept	Accept	Accept
H8a	INT_C < INT_P	Reject	Reject	Reject
H8b	INT*BB1_C < INT*BB1_P	Reject	Reject	Reject
H8b	INT*BB2_C < INT*BB2_P	Reject	Reject	Reject
H8b	INT*BB3_C < INT*BB3_P	Reject	Reject	Reject
H9a	INT_C > INT_N	Accept	Accept	Accept
H9b	INT*BB1_C > INT*BB1_N	Reject	Accept	Accept
H9b	INT*BB2_C > INT*BB2_N	Reject	Accept	Accept
H9b	INT*BB3_C > INT*BB3_N	Reject	Reject	Accept

Note: ATT: Attitude Towards the Behaviour; INT: Behavioural Intention; BB1: Behavioural belief 1 (Healthier life); BB2: Behavioural belief 2 (More varied diet); BB3: Behavioural belief 3 (Environmental sustainability); C: Control group; P: Positive information group; N: Negative information group; the asterisk * indicate the correlation between two variables (the results of the tests are provided in Appendix Tables A4-A6).

environmental sustainability, and more varied diet ($\rho > 0.50$). When negative information is provided, these associations become less important ($\rho < 0.30$). Providing good value for money, saving time, and product availability at the supermarket positively affected both PBC and intention in the control and positive information groups ($\rho > 0.45$). However, we found significant but weaker correlations between normative beliefs and behaviour ($\rho < 0.40$).

In Poland, subjective norms and intention to consume Norwegian salmon are correlated ($\rho > 0.65$) with family opinions and behaviour, as well as doctors' and nutritionists' opinions in the control and positive information groups (Table A6). Furthermore, respondents with more positive attitudes towards eating Norwegian salmon are more likely to believe that such products provide health benefits, allow a more varied diet, and contribute to environmental sustainability ($0.50 > \rho > 0.70$). When negative information was provided, these associations became less relevant ($\rho < 0.35$). In addition, control beliefs are associated with intention, particularly convenience aspects such as good value for money, saving time, product availability at the supermarket, and its convenience on special occasions ($\rho > 0.45$). We found weaker associations when negative information was provided ($\rho < 0.40$), apart from the correlation between behaviour and obtaining good value for money ($\rho = 0.47$).

Overall, providing positive information does not strengthen the correlation between attitude/intention and beliefs related to health (i.e. healthier life, and more varied diet) and environmental impacts (i.e. environmental sustainability). Thus, H6b and H8b are rejected in all

Table A1
Questionnaire items and codes.

Codes	Constructs and items
	Attitude towards the behaviour
	For me, consuming Norwegian salmon in the future would be… (7-point scale)
att1	Not useful at all – Very useful
att2	Not satisfactory at all – Very satisfactory
att3	Not healthy at all – Very healthy
att4	Not pleasant at all – Very pleasant
att5	Harmful – Beneficial
att6	Foolish – Wise
	Subjective norm
	(1 = strongly disagree; 7 = strongly agree)
sn1	Most people who are important to me think that I should consume Norwegian salmon in the future.
sn2	Most people I respect would approve my consumption of Norwegian salmon in the future.
sn3	Most people like me will consume Norwegian salmon in the future
	Perceived behavioural control
	(1 = strongly disagree; 7 = strongly agree)
pbc1	The consumption of Norwegian salmon in the future is completely up to me.
pbc2	If I really wanted to, I could eat Norwegian salmon in the future.
pbc3	I believe that consuming Norwegian salmon in the future is under my control.
	Behavioural Intention
	(1 = strongly disagree; 7 = strongly agree)
int1	I intend to consume Norwegian salmon in the future
int2	I will be consuming Norwegian salmon in the future
int3	I plan to consume Norwegian salmon in the future
	Behaviour
b1	How often do you normally eat fish (fresh or frozen) or seafood? (never or rarely; a few times a year; once a month; 2–3 times a month; 1–2 times a week; almost every day)
b2	How often do you eat salmon (raw, fresh, frozen, smoked, canned) at home or in a restaurant? (never or rarely; a few times a year; once a month; 2–3 times a month; 1–2 times a week; almost every day)

Table A2
Text shown to the participants in the information treatments (neutral, positive, and negative).

NEUTRAL:
According to the Food and Agriculture Organization of the United Nations (FAO), Norway is the largest salmon farming nation, producing around one third of the global salmon market. The salmon farming production cycle lasts about 3 years. The first year of production takes place in controlled freshwater environments. After 10–16 months in freshwater, the salmon is transferred to sea-cages. Then salmons are reared in aquafarms for 12–18 months. Once it reaches harvestable size (4–8 kg), they are slaughtered and transported to processing plants to be prepared for sale.
POSITIVE:
Salmon farms allow fresh salmon to be available on the market and help take fishing pressure off the wild salmon stocks. Many scientists believe that salmon farming produces healthy, affordable food that is high in beneficial omega-3 fatty acids, an important factor in reducing heart disease. Moreover, salmon farming provides employment opportunities for coastal communities and contributes to local economic development. Norwegian salmon farms are strictly regulated and monitored: the level of pollutants (PCB, dioxin and heavy metal level) is far below EU limits.
NEGATIVE:
Intensive farming in open sea cages results in release of organic and inorganic effluents (e.g. waste feed, faeces, copper to impregnate the nets) to the surrounding environment, this leads to a change in sediment chemistry and the faunal and floral communities. Moreover, therapeutic chemicals used in the treatment of salmon diseases contribute to local chemical pollution. The escape and interbreeding of farmed and wild salmon could cause permanent changes in the genetic characteristics of wild salmon populations, reducing survival of wild stocks. Finally, the presence of large number of farmed salmon in a fjord increases the risk of sea-lice infestation of wild salmon, increasing the probability of death for young wild salmonids.

Note: the two (positive and negative) treatments provided first the neutral information.

three countries (Table 5; tests available in Appendix Table A4-A6). Instead, when respondents are provided with negative information about salmon farming, the correlation between attitude and beliefs related to health and environmental impacts are significantly lower for the three behavioural beliefs in all countries. Only the correlation between attitudes and the belief related to more varied diet in France is not affected by negative information (Table 5, Appendix Table A4). This confirms H7b. Negative information weakens the correlation between intention and beliefs related to health and environmental impacts in Poland, thus confirming H9b (Table 5, Appendix Table A6). H9b is rejected in France (Table 5, Appendix Table A4), whereas in Italy negative information only weakens the correlation between intention and health-related behavioural beliefs (Table 5, Appendix Table A5).

5. Discussion

Our empirical evidence from three EU countries shows differences between treatments related to consumers' attitudes towards Norwegian salmon consumption and their intention to eat it in the future. We confirmed the hypothesis that exposure to positive information about the sustainability of salmon farming resulted in significantly more favourable consumer's attitudes compared to the control group, which received only neutral information about salmon production. This is especially true for Italy, followed by Poland and, to a lesser extent, France. Other empirical studies documented that Italian consumers are interested in fish products that carry sustainability and ecological labels (Brécard et al., 2009; Menozzi et al., 2020). However, we rejected the hypothesis that positive information strengthens the correlation between attitudes and beliefs related to health (i.e. healthier life, and more varied diet) and environmental impacts (i.e. environmental sustainability). One possible explanation is that the current positive attitude towards fish and salmon consumption (Masi et al., 2022) is not sufficiently affected by exposure to positive information in order to strengthen its relationship with previous perceived knowledge.

We also confirmed the hypothesis that negative information significantly changes attitudes in all countries, even more than positive information. This suggests a relatively higher influence of negative communication (e.g. related to pressure on the sustainability of natural resources or animal welfare) on unfavourable consumers' attitudes.

The greater influence of negative information is also observed for behavioural intentions. Specifically, on the one hand, the intention to eat Norwegian salmon does not significantly differ between the control and positive information groups; on the other hand, it is significantly lower for the negative information group than the control group in all countries. Moreover, we also confirmed the hypothesis that exposure to negative information significantly reduces the correlations between attitudes and intention with health- and environmental-related beliefs. This indicates that negative information has modified the way consumers' beliefs form their attitudes towards the behaviour and their intention, confirming other studies that indicate how exposure to information may alter the way that attitude correlates with the previous knowledge (Lindell & Perry, 2012; Rizzi et al., 2020; Witzling et al., 2015). Norwegian salmon farming is generally associated with negative

Table A3
TPB Models: unstandardised beta coefficients, standard errors (S.E.), p-values, in France, Italy and Poland across control, positive and negative information groups.

France	**Control (N = 260)**			**Positive (N = 236)**			**Negative (N = 252)**		
Predictors of INT	*Beta*	*S.E.*	*p*	*Beta*	*S.E.*	*p*	*Beta*	*S.E.*	*p*
ATT	0.39	0.08	<0.001	0.71	0.15	<0.001	0.54	0.09	<0.001
PBC	0.48	0.12	<0.001	0.64	0.28	0.019	0.44	0.17	0.011
SN	0.48	0.10	<0.001	0.15	0.17	0.384	0.38	0.11	<0.001
Predictors of B	*Beta*	*S.E.*	*p*	*Beta*	*S.E.*	*p*	*Beta*	*S.E.*	*p*
INT	0.10	0.05	0.039	0.09	0.05	0.103	0.10	0.04	0.013
PBC	−0.01	0.05	0.880	0.02	0.15	0.915	−0.04	0.07	0.525
Italy	**Control (N = 252)**			**Positive (N = 259)**			**Negative (N = 260)**		
Predictors of INT	*Beta*	*S.E.*	*p*	*Beta*	*S.E.*	*p*	*Beta*	*S.E.*	*p*
ATT	0.55	0.08	<0.001	0.52	0.10	<0.001	0.46	0.07	<0.001
PBC	0.23	0.07	0.002	0.47	0.11	<0.001	0.06	0.08	0.449
SN	0.21	0.07	0.004	0.04	0.09	0.632	0.48	0.09	<0.001
Predictors of B	*Beta*	*S.E.*	*p*	*Beta*	*S.E.*	*p*	*Beta*	*S.E.*	*p*
INT	0.14	0.05	0.006	0.10	0.05	0.063	0.14	0.04	<0.001
PBC	0.03	0.04	0.553	0.07	0.06	0.266	0.05	0.04	0.301
Poland	**Control (N = 253)**			**Positive (N = 249)**			**Negative (N = 254)**		
Predictors of INT	*Beta*	*S.E.*	*p*	*Beta*	*S.E.*	*p*	*Beta*	*S.E.*	*p*
ATT	0.84	0.10	<0.001	0.57	0.12	<0.001	0.48	0.07	<0.001
PBC	0.26	0.12	0.036	0.30	0.10	0.003	0.27	0.19	0.154
SN	−0.05	0.10	0.648	0.16	0.10	0.093	0.28	0.09	0.002
Predictors of B	*Beta*	*S.E.*	*p*	*Beta*	*S.E.*	*p*	*Beta*	*S.E.*	*p*
INT	0.16	0.05	<0.001	0.07	0.07	0.353	0.09	0.05	0.059
PBC	0.04	0.07	0.522	0.32	0.11	0.005	0.01	0.08	0.946

Note: ATT: attitude towards the behaviour; SN: subjective norms; PBC: perceived behavioural control; INT: behavioural intention; B: behaviour,

Table A4
France: Spearman's rank order correlations (ρ) between beliefs and their respective direct measure (attitude, subjective norm, and perceived behavioural control – PBC), intention, and behaviour, in control (C, n = 260), positive (P, n = 236) and negative (N, n = 252) information groups.

Behavioural Beliefs	**Attitude**					**Intention**					**Behaviour**		
	C	**P**	**N**	**C—P**	**C—N**	**C**	**P**	**N**	**C—P**	**C—N**	**C**	**P**	**N**
Healthier life	0.557	0.537	0.375	n.s.	0.011	0.514	0.524	0.403	n.s.	n.s.	0.195**	n.s.	0.201**
More varied diet	0.465	0.487	0.379	n.s.	n.s.	0.398	0.448	0.393	n.s.	n.s.	0.123*	0.152*	0.152*
Environmental sustainability	0.513	0.521	0.297	n.s.	0.004	0.437	0.482	0.314	n.s.	n.s.	n.s.	n.s.	0.181**
Normative Beliefs	**Subjective Norms**					**Intention**					**Behaviour**		
	C		**P**	**N**		**C**	**P**		**N**		**C**	**P**	**N**
Doctors/nutritionists injunct.	0.533		0.452	0.394		0.547	0.496		0.458		0.230	0.158*	0.149*
Family members injunctive	0.583		0.602	0.468		0.461	0.575		0.473		0.214	0.158*	0.304
Family members descriptive	0.623		0.682	0.504		0.629	0.694		0.542		0.188**	0.219	0.277
Control Beliefs	**PBC**					**Intention**					**Behaviour**		
	C		**P**	**N**		**C**	**P**		**N**		**C**	**P**	**N**
Eating sushi	n.s.		n.s.	n.s.		0.360	0.274		0.300		n.s.	n.s.	n.s.
Good value for the money	0.361		0.319	0.208		0.482	0.540		0.454		0.187**	0.137*	0.195**
Save time (ready to eat, easy to consume and prepare)	0.463		0.339	0.358		0.508	0.523		0.433		0.212	n.s.	0.154*
Uncertainty about the origin [a]	0.193**		0.156*	n.s.		n.s.	n.s.		n.s.		n.s.	n.s.	n.s.
High availability supermarket	0.417		0.255	0.321		0.540	0.497		0.474		0.185**	n.s.	0.222
Easier on special occasions	0.275		0.161*	0.178**		0.383	0.291		0.215		n.s.	n.s.	n.s.

Note: C—P indicates the statistical test (p-value) of the difference in the Spearman's rank order correlation in control and positive information groups; C—N indicates the statistical test (p-value) of the difference in the Spearman's rank order correlation in control and negative information groups (Sheskin, 2003). Sig. ** $p < 0.01$, * $p < 0.05$, n.s.: not significant. All other coefficients are significant at $p < 0.001$.
[a] Reversed score.

Table A5
Italy: Spearman's rank order correlations (ρ) between beliefs and their respective direct measure (attitude, subjective norm, and perceived behavioural control – PBC), intention, and behaviour, in control (C, n = 252), positive (P, n = 259) and negative (N, n = 260) information groups.

Behavioural Beliefs	**Attitude**					**Intention**					**Behaviour**		
	C	**P**	**N**	**C—P**	**C—N**	**C**	**P**	**N**	**C—P**	**C—N**	**C**	**P**	**N**
Healthier life	0.630	0.620	0.246	n.s.	0.000	0.590	0.578	0.304	n.s.	0.000	0.234	0.269	0.371
More varied diet	0.500	0.548	0.232	n.s.	0.001	0.504	0.522	0.321	n.s.	0.016	0.184**	0.220	0.259
Environmental sustainability	0.495	0.529	0.220	n.s.	0.001	0.428	0.517	0.299	n.s.	n.s.	n.s.	0.181**	0.258
Normative Beliefs	**Subjective Norms**					**Intention**					**Behaviour**		
	C		**P**	**N**		**C**	**P**		**N**		**C**	**P**	**N**
Doctors/nutritionists injunct.	0.655		0.599	0.440		0.513	0.494		0.334		0.190**	0.246	0.208
Family members injunctive	0.697		0.673	0.501		0.560	0.519		0.359		0.204	0.317	0.235
Family members descriptive	0.744		0.733	0.502		0.665	0.651		0.491		0.288	0.334	0.330
Control Beliefs	**PBC**					**Intention**					**Behaviour**		
	C		**P**	**N**		**C**	**P**		**N**		**C**	**P**	**N**
Eating sushi	0.215		0.291	n.s.		0.272	0.309		0.254		0.262	n.s.	0.193**
Good value for the money	0.465		0.512	0.292		0.535	0.512		0.389		0.223	0.191**	0.258
Save time (ready to eat, easy to consume and prepare)	0.494		0.583	0.318		0.526	0.593		0.290		0.296	0.222	0.268
Uncertainty about the origin [a]	0.140*		0.264	n.s.		n.s.	0.231		n.s.		n.s.	0.161**	n.s.
High availability supermarket	0.520		0.568	0.254		0.551	0.482		0.325		0.250	0.211	0.222
Easier on special occasions	0.361		0.400	0.123*		0.386	0.321		0.146*		n.s.	n.s.	n.s.

Note: C—P indicates the statistical test (p-value) of the difference in the Spearman's rank order correlation in control and positive information groups; C—N indicates the statistical test (p-value) of the difference in the Spearman's rank order correlation in control and negative information groups (Sheskin, 2003). Sig. ** $p < 0.01$, * $p < 0.05$, n.s.: not significant. All other coefficients are significant at $p < 0.001$.
[a] Reversed score.

media coverage in several EU countries, such as France (Govaerts, 2021) and the US (Rickard & Feldpausch-Parker, 2016). Furthermore, newspapers did not act as passive media in the case of contaminated salmon and were prone to use the framing effect (Höijer et al., 2006). This may have negatively influenced the demand for Norwegian salmon, although the real impact of media coverage on this demand has also been questioned (Liu et al., 2016).

Importantly, our results are consistent with previous findings suggesting that the TPB model can effectively explain individuals' food choices and consumption (Ajzen, 2016; Biasini et al., 2021; McDermott et al., 2015). The explanatory power of the TPB model ranged from 62 % to 76 % of the variance in the intention to consume Norwegian salmon in the Italian negative information and control groups, respectively, and from 6 % to 24 % of behaviour in the French positive information and Italian negative information groups, respectively. These results are consistent with previous findings (Biasini et al., 2021; McDermott et al., 2015). In particular, the lower explained variance in behaviour is quite common when more objective measures of behaviour are applied, such as frequency of consumption, instead of self-reported behavioural measures (Armitage & Conner, 2001; Biasini et al., 2021; McEachan et al., 2011). The low explained variance in behaviour may be also related to the lack of compatibility between the TPB constructs (measured on a 1–7 point scale) and behaviour (measured on a frequency scale) (Armitage & Conner, 2001; Fishbein & Ajzen, 2011).

We show that intention is the main predictor of behaviour and, in turn, attitude is the main predictor of intention in almost all countries and information conditions. This result is consistent with theory and in line with a systematic literature review on the adoption of sustainable dietary behaviours (Biasini et al., 2021). Notably, the effect of subjective norms was more relevant in the control and negative information

Table A6
Poland: Spearman's rank order correlations (ρ) between beliefs and their respective direct measure (attitude, subjective norm, and perceived behavioural control – PBC), intention, and behaviour, in control (C, n = 253), positive (P, n = 249) and negative (N, n = 254) information groups.

Behavioural Beliefs	**Attitude**					**Intention**					**Behaviour**		
	C	**P**	**N**	**C—P**	**C—N**	**C**	**P**	**N**	**C—P**	**C—N**	**C**	**P**	**N**
Healthier life	0.654	0.681	0.323	n.s.	0.000	0.574	0.608	0.340	n.s.	0.001	0.215	0.298	0.326
More varied diet	0.533	0.595	0.272	n.s.	0.001	0.522	0.555	0.300	n.s.	0.003	0.236	0.346	0.318
Environmental sustainability	0.541	0.582	0.332	n.s.	0.005	0.493	0.493	0.341	n.s.	0.044	0.228	0.290	0.161*
Normative Beliefs	**Subjective Norms**					**Intention**					**Behaviour**		
	C	**P**	**N**			**C**	**P**	**N**			**C**	**P**	**N**
Doctors/nutritionists injunct.	0.661	0.683	0.488			0.611	0.615	0.393			0.290	0.318	0.287
Family members injunctive	0.738	0.680	0.619			0.605	0.565	0.461			0.306	0.387	0.324
Family members descriptive	0.748	0.695	0.580			0.698	0.686	0.524			0.318	0.354	0.366
Control Beliefs	**PBC**					**Intention**					**Behaviour**		
	C	**P**	**N**			**C**	**P**	**N**			**C**	**P**	**N**
Eating sushi	0.297	0.390	0.191**			0.328	0.347	0.257			0.177**	0.179**	0.206
Good value for the money	0.533	0.574	0.369			0.633	0.592	0.468			0.292	0.317	0.419
Save time (ready to eat, easy to consume and prepare)	0.493	0.580	0.343			0.466	0.599	0.289			0.216	0.218	0.288
Uncertainty about the origin [a]	n.s.	n.s.	n.s.			n.s.	n.s.	n.s.			n.s.	n.s.	n.s.
High availability supermarket	0.515	0.594	0.378			0.616	0.587	0.372			0.217	0.271	0.254
Easier on special occasions	0.398	0.447	0.309			0.375	0.467	0.290			n.s.	n.s.	0.210

Note: C—P indicates the statistical test (p-value) of the difference in the Spearman's rank order correlation in control and positive information groups; C—N indicates the statistical test (p-value) of the difference in the Spearman's rank order correlation in control and negative information groups (Sheskin, 2003). Sig. ** $p < 0.01$, * $p < 0.05$, n.s.: not significant. All other coefficients are significant at $p < 0.001$.
[a] Reversed score.

groups, whereas the PBC effect was more significant in the positive information groups across the three countries. As long as consumers are exposed to negative or neutral information, the role of social referents, such as family members, doctors, and nutritionists, in influencing their motivation becomes more important, as the perceived normative pressure increases (Fishbein & Ajzen, 2011). However, when positive information is provided, the role of factors that can impede or facilitate the performance of a behaviour becomes more relevant. This suggests that under positive informative conditions, efforts may focus on facilitating the availability and consumption of fish products, such as ready-to-eat products (Cantillo et al., 2021).

Interestingly, the intention to purchase Norwegian salmon significantly affected behaviour in the negative information groups, but was only marginally significant in the Italian and French positive information groups. Thus, the hypothesis that exposure to positive information strengthens the relationship between intention and behaviour was not supported by the data. The empirical evidence, however, has indicated that newly available information does not consistently influence behaviour, and when it does, the effect on behaviour and behavioural intention tends to be small and mediated by more proximal antecedents (Fishbein & Ajzen, 2011). For instance, exposure to information about alcohol consumption had a weak but significant influence on adolescents' stronger PBC, whereas it does not correlate with behavioural intention (Zhao et al., 2020). Similarly, environmental knowledge had no effect on energy conservation (Ajzen et al., 2011). Castellari et al. (2019) indicated that the provision of nutritional information by itself can have limited impact on healthier choices in a self-service restaurant unless it synergizes with others instruments such as nutritional education, social norm provision and nudges. More insight is needed on how attribute and information framing impacts on consumers' attitudes and intentions with regard to food products (Dolgopolova et al., 2022).

The ambivalent effects of exposure to positive and negative information should alarm the Norwegian industry and stakeholders, as it implies that consumers' behaviour may be more influenced by negative messages. Specifically, we show that when consumers receive negative information, they exhibit less favourable attitudes and lower intentions to consume the product. This in turn is more likely to affect their actual behaviour (i.e. fish and salmon eating frequency). By contrast, positive information is less relevant from a consumer's perspective. First, when positive information is provided, its effect is less relevant in favourably modifying attitudes and irrelevant for affecting intentions. Second, the effect of (unmodified) intention over the behaviour is only marginally significant in Italy and France. Other studies have suggested that when both positive and negative information are provided, the latter may outweigh the former (Nayga et al., 2005).

6. Policy implications and conclusions

This study presents several findings relevant to stakeholders and policymakers in the salmon industry. First, under neutral information conditions, behaviour is guided by people's motivation. Thus, *ceteris paribus*, providing more information related to the health effects of salmon consumption (e.g. health claims) (Menozzi et al., 2020), as well as potential contribution to environmental sustainability (e.g. sustainability labels) (Olsen et al., 2021) may positively affect the behaviour because of the mediating effect of attitude and intentions. Other studies have confirmed that sustainably farmed Atlantic salmon remains a product of high nutritional quality and delivers substantial health benefits to consumers (Henriques et al., 2014). Therefore, providing clearer information regarding the quality, origin, and environmental, social, and ethical impacts may positively affect consumers' motivations and behaviour (Cantillo et al., 2021; Wongprawmas et al., 2022). Moreover, the information should be easily accessible, say via point-of-purchase displays, food labels, or digital information, to increase the likelihood that the information is used as an input for judgment and choice (Nayga et al., 2005). Research is needed to understand how information can be framed in a more attractive, clearer, and easier manner (Dolgopolova et al., 2022).

Second, this study points out the potential negative effects of media coverage on consumers' perceptions of Norwegian farmed salmon. Farmed fish products are often misconceived by consumers, and perceived as less tastier and healthier than wild alternatives (Pulcini et al., 2020). When negative information on the sustainability of salmon farming is provided, the role of opinion and behaviour of important referents (e.g. family members, nutritionists) becomes crucial in influencing subjective norms and consumer behaviour. In this case, interventions on motivational processes should also focus on the role of consumers' social referents in supporting and encouraging the behaviour (Steinmetz et al., 2016). As long as positive information is provided, PBC becomes relatively more relevant in affecting intentions and, in Poland, behaviour. Policies supporting products that are easy and quick to prepare, such as ready-to-eat (e.g. smoked or tartare), easy-to-

consume (e.g. boneless), and easy-to-prepare (e.g. quick cooking) products, by retailers and the food industry can effectively promote the consumption of fish products (Cantillo et al., 2021; Menozzi et al., 2020).

This study has some limitations. First, although common in several cross-sectional studies, we were not able to provide a prospective prediction of the behaviour, thereby limiting the compatibility of behaviour with its antecedents (McEachan et al., 2011). Moreover, we used a self-reported measure of past behaviour as an endogenous variable in the TPB model. These shortcomings may be mitigated by relatively stable salmon consumption in all sampled countries (EUMOFA, 2021). Finally, the variability in the behaviour is not fully addressed by the self-reported behavioural scale applied. Although other studies have used a similar frequency scale, such as in the case of fish consumption in Belgium (Verbeke & Vackier, 2005) and organic fish purchase in Denmark (Budhathoki et al., 2022), a more detailed measure of frequency, e.g. recording the quantity consumed per month or per week, might have better reflected the actual behaviour. As an alternative, Likert-type scales of self-reported behaviour have also been applied (Witzling et al., 2015). Future studies might take these points into consideration.

In summary, our results show the potential of TPB in explaining the drivers affecting consumers' purchase of Norwegian salmon in three EU countries. Furthermore, we provide evidence on the effects of positive and negative information about salmon farming on consumers' perceptions and behaviour. Importantly, this study confirms the role of individuals' attitudes in affecting consumers' intentions, and consequently, their behaviour. We also provide evidence on the stronger effect of negative information than positive messages in affecting consumers' attitudes and intentions. We also show how such a negative information frame modifies the structural paths in the studied countries, and the way that attitudes and intention correlate with health and environmental behavioural beliefs.

CRediT authorship contribution statement

Davide Menozzi: Conceptualization, Data curation, Formal analysis, Methodology, Project administration, Resources, Software, Supervision, Validation, Writing – original draft, Writing – review & editing. **Giovanni Sogari:** Conceptualization, Formal analysis, Methodology, Resources, Software, Writing – original draft, Writing – review & editing. **Cristina Simeone:** Conceptualization, Data curation, Formal analysis, Methodology, Resources, Software, Validation, Writing – original draft, Writing – review & editing. **Mikołaj Czajkowski:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing. **Wojciech Zawadzki:** Methodology, Writing – original draft, Writing – review & editing. **Pascale Bazoche:** Methodology, Writing – original draft, Writing – review & editing. **Sterenn Lucas:** Conceptualization, Writing – original draft, Writing – review & editing. **Cristina Mora:** Methodology, Writing – original draft, Writing – review & editing. **Margrethe Aanesen:** Conceptualization, Funding acquisition, Methodology, Project administration, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The authors do not have permission to share data.

Appendix

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.foodqual.2023.104871.

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