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Open-Ended Emotive Projection Test: A Nondeterministic Method for Understanding Consumers' Emotional Reactions to Innovative Food Processing Technologies

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ABSTRACT

The objective of this study was to reveal the efficiency of Open-Ended Emotive Projection Tests (OEEPTs) and Open-Ended Questions (OEQs) in understanding consumers' reactions to products processed with innovative food processing technologies (IPTs) and the influence of such communication on consumer attitudes, perception of appropriateness and willingness to perform different behaviors. A representative sample of 1206 Norwegian participants were organized in six experimental groups and responded to OEEPTs, an Emotive Projection Test (EPT), OEQs and survey questions. OEEPTs and EPTs showed no significant differences in consumers' responses between experimental conditions. OEQs indicated that the information on food processed as usual was preferred, while responses to food processed using IPT were not influenced by information about its benefits. This result was confirmed by willingness to try, buy and eat the same products. The main managerial implication is that communicating about benefits should be prioritized over information about IPTs.

KEYWORDS

Acceptance; consumer; emotions; methods; new food technology

1. Introduction

Consumer food choice is a topic that is evolving in terms of research methods, theories and innovative perspectives. That is due to the challenges around methodologies for measuring consumer perceptions, thoughts and emotions as responses to food-related stimuli (Köster, 2009; Köster & Mojet, 2018). A possible approach that has been suggested to remedy some of these issues is the use of methodologies that promote the ability of the participants to provide information without being asked predetermined questions (Altintzoglou, Sone, Voldnes, Nøstvold, & Sogn-Grundvåg, 2018; Mojet et al., 2016; Spinelli et al., 2017). Examples of such methodologies

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are the Emotive Projection Test (EPT) and Open-Ended Questions (OEQs). However, these methodologies have been tested individually and either in studies including real food stimuli or not, introducing the question of compatibility. Up to this point, there is no literature evidence of previous research on this combination of methods. The present study introduces a new approach to this challenge by combining OEQs with EPTs in an Open-Ended Emotive Projection Test (OEEPT). This will allow consumers to indicate the emotions they feel themselves, representing a top-of-mind approach, instead of a more deterministic evaluation of items in scales. The use of such a method to acquire consumer reactions to food-related research could be very useful. One important issue to explore is if such an approach is powerful enough when collecting data on reactions to information about innovative processing technologies. Several new processing technologies are being introduced to modern food systems, potentially leading consumers to skepticism (Nielsen et al., 2009; Olsen, Grunert, & Sonne, 2010). This skepticism is apparent, despite perceived proactive consumer protection and aims to ensure food safety (Van Kleef et al., 2007). A way to approach this challenge could be by focusing on the communication of benefits by the use of such innovative food processing technologies. Furthermore, this study will explore the effectiveness of an OEQ in eliciting consumer responses to novel stimuli, thus adding to existing literature about the potential uses of OEQs. Finally, the study will use a questionnaire to test consumer responses to the different experimental conditions in a more conventional way.

The main objective of this study is to reveal the efficiency of an OEEPT and OEQs in understanding consumers' reactions to innovative food processing technologies. Additionally, the goal was to establish the influence of communication about products processed with innovative processing technology (IPT) on consumers.

The main contribution of this article is twofold. First, a new methodological approach is presented using a hands-on application in research on consumer acceptance of food products that were processed using innovative processing technologies. Second, this study provides useful insight into how to communicate the use of innovative processing technologies and the resulting benefits on doing so on food products and associated promotion campaigns.

2. Literature background

When consumers receive information about something new, they cannot use previous experience and make informed and analytical evaluations. Thus, good methodologies for measuring such consumer reactions to new

products or information are valuable for the development of new product concepts and communication campaigns. One potential way of evaluating new stimuli is through emotional reactions that influence mood (Köster & Mojet, 2015, 2018). EPTs can measure emotional reactions that can be an indication of consumer expectations and how these expectations could influence liking of a new food product after it is consumed (Mojet et al., 2015). The EPT approach is based on the principle of consumers' projections of their own emotions onto the description of emotions they perceive on the faces of others. Such an approach is often based on pictures of faces with neutral expressions, to which consumers rate a list of relevant emotions, which in turn, represent the projection of consumers' own emotional reactions to the stimuli. These emotional responses about products can also be used in identifying the effect of new packaging information (Spinelli & Niedziela, 2016), such as information about innovative food processing technologies. Could these top-of-mind emotional reactions also lead to consumers' associations with information stimuli, captured as responses to OEQs (Altintzoglou et al., 2018)? This study focuses on these free associations that consumers make, also with an emotional frame of mind, that together could provide new insights that enrich previous research and theory. The question is to what extent these free associations agree with the results of the predetermined questions on the consumers' emotional responses to the stimuli in this study?

Another way of evaluating new stimuli could be using OEQs as a thematically open reaction to the given stimuli. Previous studies of OEQs have revealed the effectiveness of this methodology in eliciting consumer responses and increasing the validity and usability of the results in a quantitative questionnaire (Altintzoglou et al., 2018; Altintzoglou, Honkanen, & Whitaker, 2021). This approach is not limited to emotion-related reactions and is defined by priming with a shopping situation where consumers find themselves with the dilemma of choice between products. In this study, the effectiveness of an OEQ in eliciting consumer responses to a novel stimulus (information about IPT) will be explored. The associated research question would be to examine if OEQs provide new insights that could have been missed by using predetermined questions alone.

Innovative food processing technology is one example of a new stimulus which consumers will be exposed to more and more in the future. The development of innovative food technologies is important because it will enable the empowerment of consumers to make informed decisions based on benefits and potential improvements to which the processing can lead, while securing food security in the future (Frewer, 2017; Siegrist & Hartmann, 2020). Gaining knowledge of how to promote these technologies to consumers is important to ensure that they are quickly adopted. However,

consumers often respond to new food with emotions like skepticism and fear, also called food neophobia (Tuorila, Lähteenmäki, Pohjalainen, & Lotti, 2001). These emotions that influence human behavior are considered to be the fundamental driver behind uncertainty, anxieties and other factors that influence human behavior (Carleton, 2016). Neophobia can be an even bigger issue when consumers are exposed to information about new food processing technologies (Frewer, 1999); it is linked to general technophobia and can lead to differences in acceptance and adoption of consumer technology, depending on factors like risk aversion, optimism and increased cognitive processing when considering high-tech purchases (Kotze, Anderson, & Summerfield, 2016). Innovative food processing technologies are no exception to this. Several studies have shown differences between the acceptance of various technologies, due to factors such as the food product that is processed, perceived potential risks after its consumption and the way the processing technology is communicated (Cardello, 2003; Cardello, Schutz, & Leshner, 2007; Galati, Moavero, & Crescimanno, 2019). Media coverage of new processing technologies can be biased both negatively and positively, such as in the case of nanotechnology (Metag & Marcinkowski, 2014). However, the best way to communicate new technologies is by using transparent and balanced communication, including a description of the benefits and risks to consumers. This kind of communication can increase the acceptance of products that are processed using innovative technologies (Jacobs et al., 2015; Verbeke, 2011). This information can either be part of a communication campaign, or in the form of labeling that empowers consumers to make informed choices and increases consumer trust in food products and the food sector (Messer, Costanigro, & Kaiser, 2017). The topic of food processing from the perspective of consumer preferences for minimally processed food has also been explored in the literature, leading to results that are in agreement with the neophobia literature (Sillani & Nassivera, 2015).

How consumers respond to food products produced using novel technologies can also be measured by using different self-reported measures. Foods produced using novel technologies can have particular advantages, for example health or environmental benefits. However, none of these benefits will be realized unless the products are adopted by consumers. Consequently, it is essential to investigate consumer attitudes toward new food technologies before any new product utilizing novel technologies is fully developed (da Costa, Deliza, Rosenthal, Hedderley, & Frewer, 2000; van Kleef, Van Trijp, & Luning, 2005). In this way, perceived negative evaluations of new products or novel technologies have the potential to be overcome during development, rather than after products are released into the marketplace. Positive attitudes together with all other relevant factors

that influence consumer acceptance of food processed with IPTs can in this way be the seed to future consumer market success, despite initial neophobic reactions (Cattaneo, Lavelli, Proserpio, Laureati, & Pagliarini, 2019; Priyadarshini et al., 2019). The way that each of the experimental conditions influences consumer attitudes will be tested in this study.

The anticipated usage situation of a product can help define consumers' ends or goals and thus orient their choices toward situationally appropriate solutions (Giacalone & Jaeger, 2019). In much the same way, the appropriateness of a novel technology or a benefit associated with a product can help to explain consumers' behavior with respect to that food. This study will answer the research question on which terms are considered the most appropriate for communicating each of the experimental benefits. Additionally, this study tested the appropriateness of the latter communication for different product categories.

Whether or not a person will buy food products processed with innovative technologies may depend on their intention to do so. An intention is an indication of how hard a person is willing to try to perform a specific behavior and is used as a direct predictor of behavior. A common way of measuring consumers' behavioral intentions regarding novel or unfamiliar food products is using their willingness to try, eat or pay for it (Damsbo-Svendsen, Frøst, & Olsen, 2017). This study will answer the research question on whether benefit communication can increase consumer acceptance of product processed with IPTs, in terms of increased willingness to try, eat and pay.

3. Methods

This study followed a combination of methods incorporated in a consumer survey. An experimental design was used where participants were randomly assigned to different groups. The participants were exposed to different experimental conditions and responded to open-ended emotive projections, emotive projections, OEQs and classic survey questions. This combination of approaches was followed to test the effectiveness of recent and new methods and as an effort to secure implementation of the results by companies in the real market.

3.1. Recruitment

Recruitment followed the General Data Protection Regulation (GDPR) procedures and the project received the approval of the ethical and privacy committee of Norway. The recruitment resulted in a representative sample of 1206 participants from Norway, a market that is relevant when it comes

Table 1. Information given to participants in each of the experimental conditions.

Experimental condition	Information given to the participants
Control	Food product processed as usual
Innovative Processing Technology (IPT)	Food product processed using innovative processing technologies
IPT + benefit	
Convenience	Food product processed using innovative processing technologies for increasing convenience in your daily life
Health	Food product processed using innovative processing technologies for improving the effect food has on your health
Sustainability	Food product processed using innovative processing technologies for improving environmental sustainability
Quality	Food product processed using innovative processing technologies for improving the quality

to food naturalness. Participants that were included in the study had no food allergies and were responsible for at least 50% of the purchase or preparation of food in their household during the last month.

3.2. Experimental design

The experimental design followed in this survey was based on six experimental conditions with 200 participants randomly assigned to each group. The participants in each group were thus similar in terms of social and demographic characteristics. The participants received information about participating in a study related to one of the experimental conditions (Table 1), followed by basic guidelines on how to use the various parts of the survey and on anonymity in data management. All participants responded correctly to the manipulation check, indicating that they were aware of the condition they were assigned to.

3.3. Experiment

At the start of the experiment, all participants were given the information that matched the experimental condition they belonged in. This was followed by an open-ended emotive projection task, where participants were asked to judge the mood of people that were shown to them in four pictures (Figure 1; Adams, Garrido, Albohn, Hess, & Kleck, 2016). The pictures were shown to participants in random order and they were first asked to reply in three open fields for each of the pictures (Altintzoglou et al., 2018). After that, they were asked to evaluate four moods of the pictured people in an emotive projection task: (a) open, (b) suspicious, (c) cheerful and (d) stressed, on a seven-point scale from 1 = very little to 7 = very much (Mojet et al., 2016; Vermeer, Mojet, van Veggel, & Köster, 2009).

The next part of the survey was dedicated to an OEQ that requested the participants to imagine that they were at a shop/supermarket to buy



Figure 1. The four pictures shown to participants based on Adams et al. (2016).

food for dinner. They were shown a product that was accompanied by the information that matched the experimental condition they belonged in. The participants were asked to write the first three thoughts that came into their mind, using one or two words (Altintzoglou et al., 2018).

The next part focused on the participants' impression of the appropriateness of various food categories to each of the experimental conditions. The food categories were: Ready-to-eat salads, Ready-to-eat dressings/soups/vegetables/potatoes, Salads, Vegetables, Frozen vegetables, Milk, Milk-based products, Juice/Smoothies and Potatoes, rated on a seven-point scale from 1 = not at all appropriate to 7 = very appropriate (Schutz, 1994).

After that, participants rated the products of their experimental condition on willingness to try, willingness to eat and willingness to pay (Wilks & Phillips, 2017). Both willingness to try and willingness to eat were rated on a five-point scale with the points: Definitely yes, Probably yes, Unsure, Probably no and Definitely no. Willingness to pay was rated on a five-point scale with the points: Much more, Somewhat more, Neither more nor less, Somewhat less and Much less.

Consumer attitudes toward products belonging to each of the experimental conditions were measured using a seven-point scale from 1 = negative attitude to 7 = positive attitude (Oliver, 1980). The attitudes measured were

Foolish–Wise, Risky–Safe, Bad for me–Good for me and Harmful–Beneficial. After that, participants were asked to rate the appropriateness of various benefits for the products in their experimental condition. These benefits were: Stays fresh longer, Easy planning, No wasted product, Better taste, Healthier, More vitamins, Less sugar and Sustainable, rated on a seven-point scale from 1 = never appropriate to 7 = always appropriate (Schutz, 1994).

3.4. Statistical analysis

Correspondence analysis, using Past 3, was used to analyze the content of the OEEPT and OEQs. Analysis of variance (ANOVA) was used to analyze the effect of the different experimental conditions on the consumer responses to survey items. SPSS 26.0 software was used for conducting the ANOVA.

4. Results

The results section starts with a description of the sample and a test of if respondents were randomly distributed to the different experimental groups. This is followed by the OEEPT results and the EPT results. The rest of the results show consumer responses to information about IPT in terms of an OEQ, followed by more traditional survey items, including personality, social and demographic characteristics.

4.1. Sample

The descriptive representation of the social and demographic characteristics of the study population indicated a balanced sample (Table 2).

4.2. Emotive Projection Tests

The results show that the new OEEPT approach was of limited usefulness in terms of discriminating between reactions to the information provided in the experimental conditions. The participants showed the ability to come up with emotions to report, but the distribution of the words in the analysis did not indicate a particularly clear separation between the six experimental conditions (Figure 2).

The EPT results showed no significant differences between the experimental conditions (Table 3).

Table 2. Social and demographic characteristics of the representative Norwegian sample population ($n = 1206$).

Characteristic	Option	%	Characteristic	Option	%		
Region	Oslo/Akershus	23.9	Mean age		48.66		
	Rest Østland	19.2		Gender	Female	49.2	
	Sørlandet	13.6			Male	50.8	
	Vestlandet	26			Personal yearly income (NOK)	< 100,000	5.6
	Trøndelag/Nord-Norge	17.2				100,000–99,999	5.6
Lifecycle situation	Pre-family	25.7	200,000–299,999			11.4	
	Young family	10.9	300,000–399,999	13.6			
	Adult family	18.5	400,000–499,999	18			
	Active Empty Nesters	25.8	500,000–599,999	11.5			
	Senior Citizens	19.2	600,000–699,999	6.6			
Family situation	Living with parent(s)	4.1	700,000–799,999	4.5			
	Single parent	4.6	800,000–899,999	2.2			
	Single	31.3	900,000–999,999	1.2			
	Couple with child(ren)	24	> 1,000,000	2			
	Couple without child(ren)	32	Prefer not to report	13.8			
Marital status	Other with child(ren)	0.8	Household yearly income	Don't know	3.9		
	Other without child(ren)	3.2		< 100,000	3		
	Divorced	7.3		100,000–199,999	2.9		
		Registered couple		0.7	200,000–299,999	6.8	
		In relationship, living alone		7.5	300,000–399,999	8	
Cohabiting		19.5	400,000–499,999	9.3			
		Married	37.6	500,000–599,999	8.3		
	Separated	1.9	600,000–699,999	6.6			
	Single	23.5	700,000–799,999	9			
	Widow(er)	2.2	800,000–899,999	7			
Number of children in household	0	74.5	900,000–999,999	6.6			
	1	11.4	> 1,000,000	12.9			
	2	10	Prefer not to report	14.5			
	3	3.2	Don't know	5.1			
	4	0.6	Household size	1	29.9		
5 or more	0.3	2		38.8			
Education	Primary	7.5		3	12.9		
	High school	36.8		4	12.7		
	University etc. (1–3 years)	29.9		5	3.5		
	University etc. (\geq 4 years)	25.2	6	1.3			
	Prefer not to report	0.7	7	0.6			
Occupation	Retired	20.7	Residential area size (number of residents)	8 or more	0.2		
	Unemployed	11.9		Capital area	16.2		
	Homemaker	3.2		> 50,000	30.1		
	Student	9.3		5000–49,999	29.9		
	Employed (Office)	23.2		< 5000	23.1		
Employed (Skilled)	23.8	Don't know	0.7				
Self-employed	4.6						
Other	3.3						

4.3. Consumer reactions to Open-Ended Questions

Consumer responses to OEQs regarding information about innovative food processing technologies led to the results shown in Figure 3. It is apparent that the control condition, communicating that the food products were processed as usual, was significantly different to the other conditions,

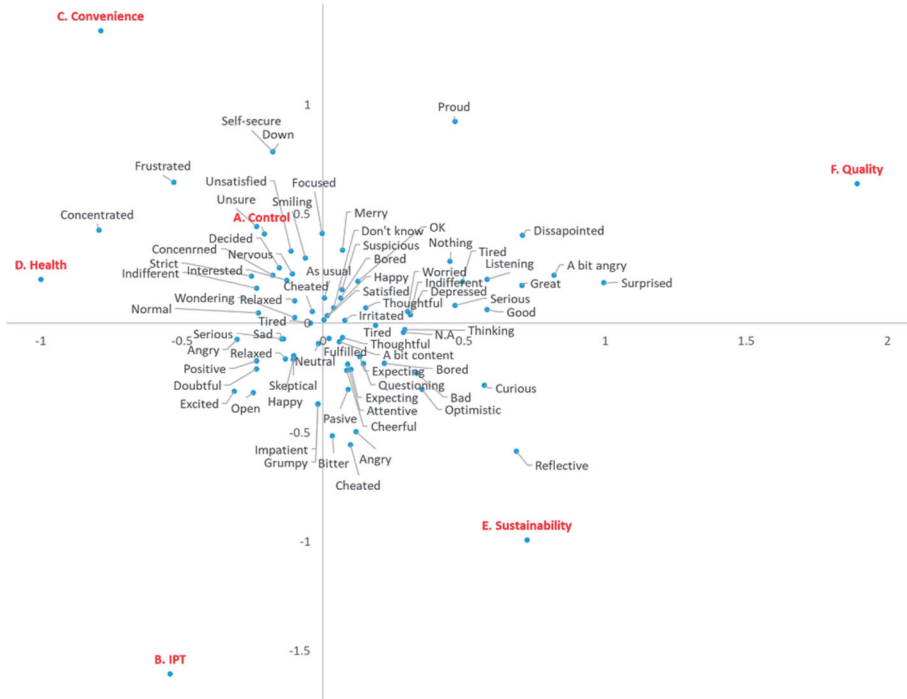


Figure 2. Open-Ended Emotive Projection Test results; dimension 1 (30.0%), dimension 2 (21.4%).

Table 3. Mean Emotive Projection Test responses per experimental condition.

	Experimental condition						Total	F	p
	Control	IPT	Convenience	Health	Sustainability	Quality			
Open	3.7	3.6	3.5	3.7	3.7	3.8	3.7	1.6	0.17
Suspicious	3.8	3.8	3.8	3.9	3.88	3.8	3.8	0.2	0.95
Happy	3.6	3.6	3.5	3.6	3.6	3.6	3.6	0.5	0.76
Stressed	3.0	3.1	3.1	3.0	3.0	3.1	3.1	0.2	0.96

leading to its placement on the very left of the figure, together with words like natural, safe, good and quality. At the other end and furthest away was the condition about IPT, together with words such as suspicious, skeptic, genetically modified etc. The benefits are on the same side of the figure as the IPT, but they are more spread along the other axis (up and down). The benefits are generally associated with positive words reflecting the benefit. As an example, the benefit sustainability is associated with environmentally friendly and the benefit convenience is associated with convenient. However, as the benefits are on the right side of the figure, they are still associated with the negative associations of IPT (skeptical, GMO etc.). For the benefits there is a clear divide between the communication of convenience which is on the opposite side to health and sustainability. Convenience is surrounded by words like easy, smart and new. Health and

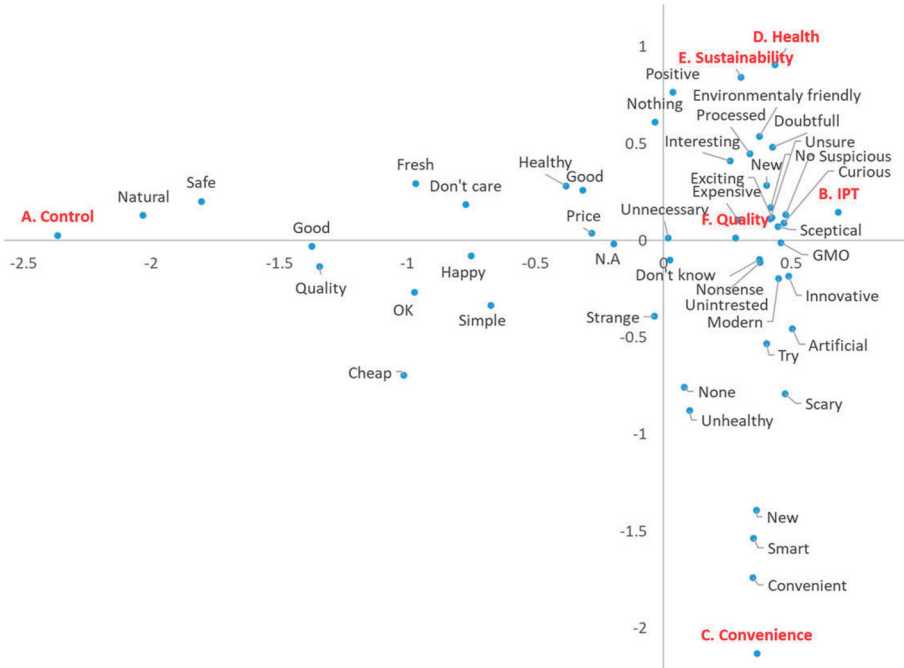


Figure 3. Consumers’ impressions of information regarding food processed using IPT; dimension 1 (51.8%), dimension 2 (22.1%).

sustainability are near words such as positive, environmentally friendly, processed and doubtful. These results indicated how consumers react to such information without the limitations introduced by suggestive questionnaire items that define the relevant items on which consumers report their opinions, enabling the respondents to freely elicit responses to a stimulus. This provides a larger number of reactions to a stimulus that can help uncover all the different dimensions of the phenomenon that is studied.

4.4. Suitability of information

Table 4 shows how consumers evaluated the appropriateness of the information in each experimental condition to different product categories. The control group received the highest consumer rating for all product categories except Ready-to-eat dressings, Soup, Vegetables and Potatoes. The IPT group received the lowest rating for the five product categories Salads, Vegetables, Frozen vegetables, Milk and Potatoes. The group of IPT with the benefit of improving environmental sustainability was given the lowest rating for the four product categories: both Ready-to-eat product categories, Milk-based products and Juice/Smoothies. The results show that IPT with benefit information receives a significantly lower evaluation than food

Table 4. Appropriateness of IPT, IPT with benefits and control for different product categories.

	Experimental condition							<i>p</i>
	Control	IPT	IPT + health	IPT + convenience	IPT + quality	IPT + sustainability	<i>F</i>	
Ready-to-eat salad mix	4.68a	4.10b	4.33ab	4.79a	4.37ab	3.92b	7.57	0.000
Ready-to-eat dressings, soup, vegetables and potatoes	4.25bc	4.74ab	4.28bc	4.90a	4.59ab	3.93c	9.56	0.000
Salads	4.88a	3.61c	4.14bc	4.34ab	4.07bc	4.02bc	12.46	0.000
Vegetables	5.14a	3.53c	4.00bc	4.03bc	4.05bc	4.21b	19.06	0.000
Frozen vegetables	4.79a	4.11b	4.44ab	4.69a	4.49ab	4.36ab	4.09	0.001
Milk	5.21a	3.60c	3.87bc	3.77bc	4.20b	3.89bc	22.06	0.000
Milk-based products	4.79a	4.26ab	4.21b	4.20b	4.52ab	3.99b	6.05	0.000
Juice or Smoothies	4.64a	4.50ab	4.39ab	4.52ab	4.48ab	3.98b	3.65	0.003
Potatoes	4.91a	3.03c	3.41bc	3.49bc	3.62bc	3.85b	24.63	0.000

Different letters within the same row indicate significant differences ($p < 0.05$).

Table 5. Differences in consumer willingness to try, eat and pay between experimental condition groups.

	Experimental condition						F	p
	Control	IPT	IPT + health	IPT + convenience	IPT + quality	IPT + sustainability		
Willingness to try	4.16a	3.47b	3.39b	3.43b	3.38b	3.52b	21.28	0.000
Willingness to eat	4.00a	3.53b	3.51b	3.48b	3.51b	3.62b	9.55	0.000
Willingness to pay	3.08a	2.71b	2.92ab	2.83ab	2.86ab	2.98a	5.41	0.000

Different letters within the same row indicate significant differences ($p < 0.05$).

Table 6. Differences in consumer attitudes between experimental condition groups.

	Experimental condition						F	p
	Control	IPT	IPT + health	IPT + convenience	IPT + quality	IPT + sustainability		
Attitude	5.32a	4.35b	4.47b	4.29b	4.56b	4.80b	12.98	0.000

Different letters within the same row indicate significant differences ($p < 0.05$).

produced in the usual way in the product categories Ready-to-eat salad mix with information on IPT and sustainability benefit, Salads with information on IPT and sustainability as well as quality and health benefits, Vegetables with information on all IPT with benefits, Milk with information on all IPT with benefits, Milk-based products with information on IPT and sustainability as well as convenience and health benefits, Juice/Smoothies with information on IPT and sustainability benefit and, finally, Potatoes with information on all IPT with benefits.

4.5. Willingness to try, eat and pay

Consumers' willingness to try, eat and pay for IPT, IPT with benefits and the control group are shown in Table 5. The consumers were significantly less interested in trying and eating food products with IPT and IPT with benefits. There was no difference in willingness to pay between the control group and food products with IPT and benefits. Yet, a significantly lower willingness to pay was found for IPT compared with the control group.

4.6. Attitude

Consumers reported a significantly less positive attitude to food produced using IPT with or without information about associated benefits related to health, convenience, quality and sustainability (Table 6).

4.7. Appropriateness of communication

The appropriateness of different types of information for IPT, IPT with benefits and the control group showed some significant differences in the two convenience types related to keeping the food fresh for longer and ease

Table 7. Differences in consumer-reported appropriateness of communication between experimental condition groups.

	Experimental condition						<i>F</i>	<i>p</i>
	Control	IPT	IPT + health	IPT + convenience	IPT + quality	IPT + sustainability		
Keeps fresh for longer time	4.79b	5.27ab	5.21ab	5.27ab	5.37a	4.98ab	4.33	0.001
Easy to plan	5.00ab	4.96ab	4.79ab	5.15a	4.85ab	4.64b	2.94	0.012
Avoids food waste	5.00	4.96	4.96	5.09	5.24	5.24	1.37	0.231
Better taste	4.93	4.58	4.87	4.47	4.96	4.67	3.22	0.007
Healthier	5.01	4.81	5.12	4.77	4.87	4.99	1.29	0.268
More vitamins	4.86	4.84	4.92	4.78	4.78	4.88	0.22	0.955
Less sugar	4.92	5.14	5.34	4.92	5.10	5.09	1.92	0.089
Sustainable	4.97	4.84	4.97	4.84	4.95	5.25	1.74	0.123

Different letters within the same row indicate significant differences ($p < 0.05$).

of planning (Table 7). The results show small or no differences for the appropriateness of different types of information for IPT, IPT with benefits and the control group for most of the other categories. There is a clear tendency that the corresponding benefit of the communication receives the highest score. For example, when the information is about ease of planning, IPT and convenience benefit has the highest score and when the information is about health, more vitamins and less sugar, IPT and health benefit scores highest.

5. Discussion

A representative Norwegian consumer sample successfully completed an OEEPT, reporting a long list of words describing their emotions. Yet, these emotions did not indicate a particular or significant differentiation of the experimental conditions. This result was confirmed by an EPT with predetermined questions (Mojet et al., 2015), where no significant differences were found between the experimental and control conditions. These results may show a lack of difference between conditions, on an emotional level, or a weakness of the method for this particular type of stimulus. The EPT method has been previously used to evaluate food products, while in this study it was employed to reveal emotional differences in the consumer reactions to information about innovative food processing technologies (Mojet et al., 2016). Even though OEQs have proven to be a good approach for collecting consumer data regarding reactions to new information (Altintzoglou et al., 2021), the high level of abstraction in this study may have made it difficult for consumers to emotionally relate to one or other approach and benefit. A potential improvement in future tests would be to expose consumers to more detailed information, such as using actual innovative technologies, rather than just the general description ‘innovative processing technology’. A further improvement could be using real food products that carry information related to the various experimental

conditions. We consider the use of OEEPTs useful and feasible, with the additional recommendation of using stimuli that are more tangible and detailed, to generate greater contrast in consumer responses.

The main contextual finding is that consumers are able to freely elicit different responses to a novel stimulus by responding to OEQs. The OEQ methodology provides a large number of reactions to the information given to the consumers. In this study, the reactions help to uncover what the consumers associate with the usual and innovative food processing technologies and potential benefits these technologies can provide. It is clear that food products processed as usual are associated with positive attributes like natural, safe, good and quality, whereas innovative food process technologies are associated with more negative words like suspicious, skeptic and genetically modified. Adding information on benefits evokes associations that are generally positive, however they are still related to the negative associations of IPT.

The latter is also confirmed by the responses to the predetermined questions in the questionnaire. When Norwegian consumers are informed about food products being processed using innovative technologies, they become less positive than when informed about food processing being done as usual. This could be due to fear of unknown technologies leading to associations to feared past events linked to e.g., irradiation (Parlato, Giacomarra, Galati, & Crescimanno, 2014). An additional explanation could be a general technology neophobia consumers report as a barrier to accept, for example, olive oil by-products (Giordano, Clodoveo, De Gennaro, & Corbo, 2018; Perito, Di Fonzo, Sansone, & Russo, 2019). Adding information about the potential benefits from using IPT, such as improved health, increased convenience, improved quality and increased sustainability, seems to have a positive effect on consumer responses, yet this effect is more limited than expected (Oliver, 1980; Schutz, 1994; Wilks & Phillips, 2017). The benefit that seems to result in the most positive effect is increased convenience, which consumers potentially associated with increased shelf-life (Olsen, Scholderer, Brunsø, & Verbeke, 2007; Pieniak, Verbeke, Scholderer, Brunsø, & Olsen, 2008). Sustainability, quality and health were also considered relevant benefits, leading to increased willingness to pay. However, this positive effect was only observed when reporting on food on a general level, and not when the focus was on food categories and example products. In the latter situation, convenience was the main driving force for increased acceptance of innovative food processing technologies. These results were also confirmed by the additional method of OEQs. On a product-specific level, the results showed variation in the appropriateness of communicating benefits, but with the traditional processing methods always having the highest scores.

6. Conclusion

This study clearly demonstrates the advantages of using an OEQ methodology to explore consumer responses to novel stimuli. By using OEQs, the consumers can react to information without the limitations of predetermined questionnaire items. The methodology enables the respondents to freely elicit responses to a stimulus. This provides a larger number of reactions to the stimulus that can help uncover different dimensions of the phenomenon that is studied. The study demonstrates the potential use of an OEEPT. However, future studies should expose consumers to more tangible stimuli in order to obtain greater variation in the emotional reactions the consumers express. More charged language or the addition of visual stimuli could be a way to achieve the latter.

The study demonstrates that communicating information about products processed with IPT to consumers could be challenging and require communication that is informative in a clear and transparent way, describing which method is used and why instead of vaguely referring to new technologies (Frewer, 2017). Generally, products processed as usual evoke positive consumer associations and IPT evoke negative associations using an OEQ methodology. By adding information about the benefits of the IPT, some positive reactions are evoked, however some of the negative associations remain. This is confirmed by using a traditional questionnaire methodology. Predetermined questions rated on a scale showed that IPT are generally rated lower for appropriateness of various food categories, willingness to try, eat and pay, and attitude. Some of the foods processed with IPT carrying information about its benefits are rated similarly to products processed as usual for appropriateness and willingness to pay.

Innovative food processing technologies are not in the top of the mind of Norwegian consumers, indicating that the country choice was relevant. Their low knowledge about the technologies generates some skepticism when they hear about them, contrary to more acceptable conventional processing technologies. However, communicating the benefits of using these new technologies has potential for future differentiation strategies, depending on the technology and food category. Information about convenience related to specific food categories, potentially due to increased shelf-life, could be used to increase acceptance of a shift toward these innovative technologies. Additionally, communicating about specific environmental benefits from the use of innovative food processing technologies could increase acceptance and willingness to pay for food as a whole. Balanced information about the justification for changes in food production and processing is a valuable tool for increasing consumer acceptance and the avoidance of emotional reactions at a later stage, when technologies are

broadly available and potentially communicated in an overdramatized manner by the media.

The theoretical implications for future research derived from this study deal with the new approach in collecting data about consumers' emotional reactions to information. It was demonstrated that using OEQs to collect data that would otherwise be collected by EPTs led to a comparable conclusion, with the addition of a broader variety of consumer reactions. This broader range of reactions would have been missed if the list of emotions rated on scales would be identified by the researchers, instead of the subjects. It is in fact the subjects' impressions we want to get insight in, which makes the use of OEEPTs promising for future research and theory development.

The managerial implications are mostly linked to the design of marketing communication strategy. From the results of this study, one could conclude that despite the addition of generic benefits, consumers are skeptical to the use of innovative processing technologies. Yet, simple terms, focusing on the concrete daily benefits consumers may experience in their life by using products that have been processed in new ways, can be used to improve the reputation of processed food.

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