PREFERENCES ABOUT SEAFOOD SAFETY AND SUSTAINABILITY AMONG VERY YOUNG CHILDREN

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ABSTRACT

A group of 75 children from 3 to 5 years old from the earliest stages of a Spanish school were the target of an experimental test focused on the consequences of providing information about safety and fisheries sustainability on their preferences when choosing between different seafood presentations and labels. Both concepts were associated with two different logos, a crab for safety and an octopus for sustainability, which were introduced into a set of four different presentations of hake (steak with bone, boneless fillet, fish fingers and fishburger). These were the factors of an 8-sets fractional factorial design to perform a Discrete Choice analysis. Two measures were taken using the same design in a three months term. The first one reflects children's choice on a set of visual stimuli representing nothing other than a dish of hake. Between the measures, the children participated in several weekly activities in which the concepts of food safety and fisheries sustainability were explained to them by their teachers and seafood professionals in technical outdoor visits. At the same time, the two cartoons were linked with the concepts and presented as assurances for safety and sustainability of fishery products, like in the case of a brand or certification logo. A test was performed one week before the second experiment, confirming that the kids, with less success in the youngest group, properly identify the logos, the ideas related with them, and the consequences and benefits of consuming seafood labeled with the logos. Results indicate that as the children better understood the association between the logos and the concepts of safety and sustainability, they exhibited higher preferences towards the crab and lower towards the octopus. This suggests that children are more concerned about their personal safety and the avoidance of diseases than about the environment and its preservation, and that the consequences of the first are more evident to them than those of the former. This conclusion is less stable in the youngest group (3 years old) where, in contrast with the other two, even the concept of seafood safety was diffusely understood.

Keywords: Children, safety, sustainability, discrete choice.

INTRODUCTION

Results from the Food Consumption Panel of the Spanish Ministry of Fisheries (MAPA, 2007) indicating lower seafood consumption rates in families with young children (about a half of the average), made the authorities focus on this market segment with actions intended to increase seafood consumption among children. The national agency responsible of the organization and regulation of seafood markets (FROM) is carrying out yearly promotional campaigns focused in schools all over the country. These mainly consist of conferences, recipes, and tastings at school dining halls, where different child oriented seafood preparations are presented and promoted. The campaigns are reinforced with two national awards for the best seafood school menu for the schools, and best child driven seafood product for processors. These campaigns aim to increase consumption among children and their scope was limited to avoid phobias and rejection of seafood, looking for better taste and better-looking products. This is a good orientation as children base their preferences for food on sensory factors (Drewnowski, 2000; Nicklaus et al., 2004).

Educational actions taken at schools have shown positive effects in reducing children's aversion to new foods (Reverdy et al., 2008; Mustonen & Tuorila, 2009). Lessons provided at these activities are intended

to help the children to obtain and understand information related to food products. Further, they can be used to promote responsible consumer behaviors among children, creating criteria of selection that may be determining their preferences and habits with food in the adulthood stage (Mikkilä et al, 2004). Some of these responsible concerns and behaviors may be potential sources for the development of profitable differentiated strategies in the fisheries industry, as the time they contribute with other social goals. In terms of consumer behavior, children represent three market opportunities, as consumers themselves, as future consumers, and by their influence on parent's consumption (McNeal, 1998).

Research has shown evidence of the influence of information about seafood safety (Wessells & Anderson, 1995) and the use of sustainable fishing practices (Wessells et al., 1999; Jaffry et al, 2004) on purchaser's decisions for seafood. Perceptions of safety and sustainability of aquaculture methods also moderates consumer's assessments of farmed species (Young et al, 1999; Fernandez-Polanco & Luna, 2010). These concepts are present at the marketplace in the form of nutritional labels, safety assurances and ecolabels. These kinds of strategies depend on their ability to obtain premium prices from concerned consumers, in order to cover the costs of differentiation. As more consumers are aware and concerned about the particular issue that makes the product different, the greater will be the potential for success of the product. In this framework, the role of the social agents in creating the necessary level of awareness and implication among consumers, making the size of the concerned segments big enough to make the investment in controls and new methods viable for producers (Roheim, 2008).

Creating the optimal size segments for safe and sustainable seafood products is in part a matter of consumer education. Food habits in childhood exert an important influence in personal future food choices. It is expected that attitudes and behaviors related to food choices will also be affected along children's socialization process. Consumer socialization is the process by which children acquire knowledge and experience in the marketplace (Ward, 1974). Family; peers and media are three major factors of influence on children's consumer socialization reported in the literature (Dotson & Hyatt, 2005). Their influence varies across ages, following an evolution in cognitive skills first described by Piaget (Piaget, 1928; Ault, 1977; Roedder, 1981).

This paper illustrates a case study in which the pupils from a local school, in the first stages of their school life, are introduced to the concepts of food safety and harvest sustainability related with seafood consumption. Further, when the concepts appear to be understood, the influence of these concepts on children's choices for hake preparations is tested using a discrete choice experimental design (McFadden, 1974; 1986). The results presented here show the effects obtained after a three months educational activity where the concepts of seafood safety and fisheries sustainability were part of a wider school activity. Animal cartoons were used as logos indicating conditions of safety and sustainability. Information about both concepts was provided weekly through examples adapted to children's language and understanding. A choice experiment was performed before and after the educational program, and their results were assessed.

Attention here will be focused on the stage where perceptual skills start developing, which is known as the pre-operational stage (ages 2 to 7) in Piaget's theory of cognitive development. These are children of a low cognitive level, finding abstract concepts difficult to understand, and with an egocentric view of the world. Such young children's preferences change faster than any other consumer group, images of brands and products are formed at the very early stages of their lives. Children between 3 and 5 years old start making specific requests of branded products (Dotson & Hyatt, 2005). Indeed, it is said that children become consumers with two months, and active co-shoppers at the age of four years (McNeal, 1999). Although we may expect that children in this stage are less able to understand useful criteria for food selection than older, younger children have been shown to be more receptive to educational programs about food consumption than the former (Mustonen & Tuorila 2009).

At this pre-operational stage, parents' influence is stronger than peers and media, which increase their influence as the kid grows into adolescence (Dotson & Hyatt, 2005). Interaction between parents and children in the marketplace contributes to set purchase patterns as well as acquisition of more responsibility in purchase decisions (Gaumer & Arnone, 2010). Parents' influential effects in children's education are complemented with the role of school, which is the main source of out-of-home knowledge for children at these ages. Educational programs at school have revealed positive effects in changing and expanding dietary habits and reducing rejection of new foods (Reverdy et al., 2008; Mustonen & Tuorila, 2009).

RESEARCH QUESTIONS

From October to December 2009, the children from the preschooler levels of the School "Colegio Kotska" from Santander, Spain, participated in an experiment for testing the effects of providing information about seafood safety and sustainability on the decisions made by such young children on a set of different dishes of hake. The concepts were associated with two logos, one crab for seafood safety, and one octopus for sustainability. Further, basic ideas of both concepts were linked with the logos, as if they were typical commercial brands, and presented to the children weekly by their teachers in the classroom. Two visits and a two hours conference on risks and consequences of seafood hazards and irresponsible fishery practices reinforced both concepts. The same choice experiment was undertaken with the children before and after the educational activity took place.

The main goal of the research is to test whether the information provided by educators to children of these ages has any effect on their choices from sets of four different hake presentations. In extension, whether consumer education campaign focused on these pre-operational children may have relevant effects on children's behavior. If effective, the results could be valuable in choosing the ages to target actions of direct promotion or information about issues of seafood consumption.

If the first question is answered affirmatively, indicating significant effects on children's choices, a second question arises: to clarify how the two concepts exert their influence on children's choice behavior. Also whether they act in the same way and magnitude or if any of them has shown a stronger effect. Some concepts may be easier to understand by young children than others, and thus their effects may be more evident.

The rationale of the Spanish promotional effort on seafood consumption is that convenient presentations are more attractive for children than unprocessed products. Levels of processing were included also in the choice design, adding attributes and levels to children's choices. Four different dishes of hake were presented in each of the 8 choice sets exposed to the children; these were steak with skin and bone, boneless and skinless fillet, fish fingers and fishburger. As an extension of the study on the effects of information about seafood safety and sustainability on very young children seafood choices, their preferences about product processing can also be tested.

METHODS AND MATERIALS

Children's preferences can be measured in many different ways (Baxter, 2009). One common method consists of collecting information from parents regarding their children's attitudes and consumer behaviors (Valkenburg & Buijzen, 2005). But parents may not be aware of the child's behavior when they are not under their control (Briggs-Gowan & Carter, 1998). When looking to obtain direct information from children several problems arise. Survey methods are not always feasible depending on children's age and stage of cognitive development (Roedder, 1981). Questionnaires have to be carefully designed, adapted to children's comprehension and they have to be performed person to person to avoid

environmental biases (Götze, 2002). Qualitative methods are widely used in children's behavior research (Baxter, 2009). Store observation has also yield useful results in studying the process of parent-child interaction in the marketplace (Gaumer & Arnone, 2010).

Sensory studies are the most effective way to study children's food preferences when taste is involved in decision making (Mutsonen & Tuorila, 2009). But choices done from sets of pictures can be also a feasible way to produce quantitative data for other variables than taste or other physical attributes of the meal (Olsen et al., 2009). Data produced with choice sets of pictures can be analyzed using different methods of conjoint analysis and discrete choice. A discrete choice experiment design was chosen as a feasible way to obtain reliable information on the children's preferences at this cognitive stage.

Discrete choice experiments

Discrete choice experiments are based on random utility theory (McFadden, 1974; 1986). Consumers are assumed to implicitly evaluate the latent utility they derive from different choice alternatives and choose the one that maximizes their utility (Louviere et al, 2000). The latent utility can be composed into a systematic and a random component in the form:

$$U_{in} = V_{in} + \varepsilon_{in}, \quad (1)$$

Where U_{in} is the latent or unobservable utility that person n associates with choice option i, V_{in} is the systematic or explainable component for that individual for option i and ε_{in} is the random component for that person and that option. Different choice models arise from different assumptions about distributions and properties of error components and about variance-co-variance matrices of preferences parameters. The conditional logit model is the workhorse of choice modeling that is widely applied to estimate the parameters of the implicit utility function (McFadden, 1974).

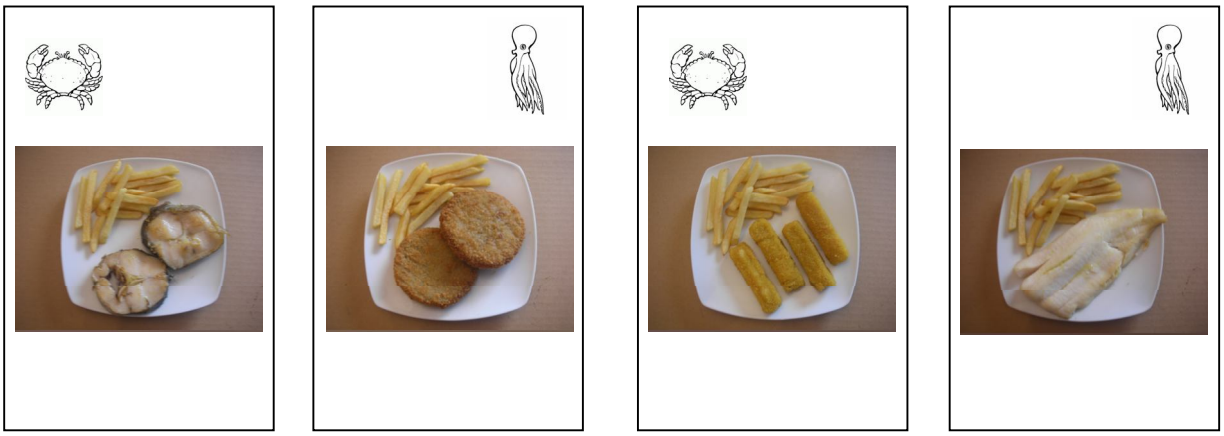
DCEs simulate real choices and have proven to be highly predictive for consumers' market behavior (Louviere et al., 2000). Respondents are asked to choose from several stimuli, each a combination of several attributes. When making repeated choices, respondents are forced to trade off between different attributes with desirable and less desirable attribute levels, thereby revealing their preferences. Choice based experiments were previously applied in analyzing consumer behavior towards seafood products and studies tested the influence of different product attributes, for different species in various markets (Quagrainie & Engle, 2006; Jaffry et al, 2004; Wessells et al, 1996, 1999).

Experimental design, attributes and concepts

A choice experiment requires the selection of attributes and their levels that are combined to create choice stimuli, controlled by an experimental design. To answer the research questions a total of three attributes were selected. The attributes were processing level (4 levels), and two logos for safety and sustainability (all 2 levels). Attributes and levels were assigned according an orthogonal main effect plan (OMEP) in eight choice sets with four stimuli each and statistical efficiency of 100%. Every respondent completed a complete choice design of eight repeated choices in a face to face interview. Over respondents, choice sets were randomized in their order.

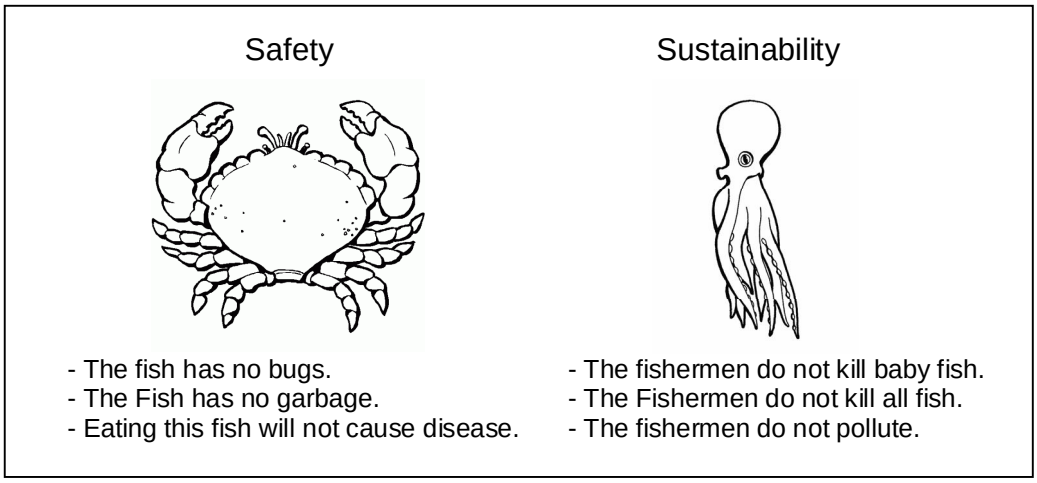
The species selected was hake, which is the fish most consumed in the Spanish market. Four different presentations were used to assign the levels of processing. On each of the eight sets the children had to indicate the "fish they would like to eat" between steak with skin and bones, boneless and skinless fillet, fish fingers and fishburger. All these preparations, excepting fishburger, can be found for hake at the local markets. Combined with the logos used to indicate safety and sustainability during the experiment, a choice like those presented to the children is illustrated in Figure 1.

Figure 1 – Example of a choice set.



The levels of the attributes for seafood safety and fisheries sustainability were represented by the presence or absence of two logos. Each of these logos communicated a series of statements as shown. The children were told that the animals represented in the logos were the ones who were making these statements. Several ideas were transmitted to the children at the educational workshop, and the teachers and researchers emphasized those that were best understood and easy to remember at the sessions.

Figure 2 – Most popular concepts associated by subjects with the logos.



In contrast with the concept of food safety, the meaning of the term fisheries sustainability still remains unclear for many adult consumers. In order to make the children build a comprehensive concept of the issue, a workable definition should be set. The definition provided by Jaffry et al (2004), based on the requirements of conservation of the stock, optimal populations and the avoidance of long term pollution, was used as the key definition of the concept. Children were familiarised with the idea of stock conservation to be associated with the preservation of baby fish, which constitutes one of the most popular official consumer education campaigns in the national seafood market. Safety claims were associated with the absence of chemical or biological hazards (garbage and bugs), and the assurance of

risk avoidance when consuming the fish marked with the logo. The most popular ideas associated by children with the animal logos are presented in Figure 2.

Subjects and measures

Subjects of the experiment were 75 children from the preschool levels of a school included in the national official educational program in Santander (Colegio Kostka), Spain. They are divided by ages of 3, 4 and 5 into three classes of 25 students each. A three months educational workshop called "Man and the sea" was programmed from October until Christmas holidays in the school, and the concepts of seafood safety and fisheries sustainability were introduced to the children along with other issues related with seafood consumption. Prior to the beginning of the course, the teachers were provided the two logos and a set of ideas that would be identified with each of the animals. The logos were part of this workshop in the form of pets of the three classrooms, the same for all three. Each class gave the pets a name.

One week before the workshop started, a first experiment was carried out with the children. The experiment was made during class time, face to face and person to person in a separate space inside the classrooms. The children were not aware of the meaning of the two logos. Choices were driven by visual attractiveness of the items presented, which finally depends on children's previous preferences. Processing level was expected to be the key determinant of children's choices, and these could be interpreted as their actual preferences to eat hake.

After this first experiment the children were given a half-an-hour weekly session with their teachers talking about the logos, and what they meant. On the first session the concepts and ideas were adapted to children's understanding and those more popular were reinforced. During the three months program, the children made a couple of visits where they were illustrated on different issues related with safety and sustainability. At the local fish market, they were informed about hygienic measures to prevent microbiological hazards, the storage and preservation conditions, and the allowable market sizes of species. Also they were aware of the existence of inspecting bodies controlling all these issues. All this information was provided by retailers and officials of the market's retailers association in small groups of 5 to 8 children. On another outdoor visit, a guide of the local maritime museum gave the children (in groups of 10 – 15) a short presentation in a section dedicated to marine preservation, with examples of pollutants found at the sea. She explained to the children what all that garbage was and the consequences on the marine species and humans due to consumption of polluted fish. In the first days of December one member of the research team gave the children a final presentation, some two hours long, supported by pictures and national advertising campaigns, in which the two concepts of interest were discussed with the children in age groups.

In December a test was performed with the children in order to assess their knowledge about the logos. Another face to face interview was conducted with three groups of questions about the logos and one on the children's preferences between them. Children were asked to give the name and any ideas related with them in a spontaneous question in the form "What does it do?" Another question enumerated a set of six ideas associated with the logos, and the children had to identify which each referred to. Finally, the children were asked about their preferences between the two logos with the simple question "Which is the one you like most?"

The information collected in the previous test gave knowledge to consider whether the concepts were properly understood, if they were easily identifiable and if the children can differentiate among them and their consequences. A second experiment was performed later the same month. The experiment design was the same as the one done in October, but this time the logos' meanings were explained.

RESULTS

Although there is a strong random component, the overall test of hypothesis allows rejection of a full random behavior in the two experiments (Table 1). This indicates that choices made by children follow a sort of probabilistic distribution determined by the proposed attributes and levels.

Table 1 – Hypothesis tests and goodness of fit indexes.

	LL	BIC(LL)	Npar	L^2	df	p-value	Class.Err.	$R^2(0)$	R^2
First experiment	-738,74	1498,59	5	916,84	63	0,000	0	0,013	0,009
Second experiment	-754,83	1530,85	5	925,37	64	0,000	0	0,012	0,012

Results from the first experiment (Table 2), without awareness of the meaning of the logos, show significance for all attributes. Processing level shows the bigger parameter value, suggesting that this attribute is more important than the logos when making children's decisions. Both logos are significant in predicting children's choices, with the octopus as a more influential attribute than the crab. In general, parameter values seem to indicate that the children prefer processed seafood, and among them, one with a logo will be preferable to one without. Information about the meaning of the logos started to arrive the next week from the end of this experiment.

Table 2 – Parameter results for the first experiment

Attributes	Class1	z-value	Wald	p-value
Processing level				
0 Slice w bones skin	-0,26	-3,13	9,83	0,02
1 Boneless fillet	0,09	1,21		
2 Fish finger	0,08	1,10		
3 Fishburger	0,09	1,20		
Safety				
0 none	-0,10	-2,27	5,16	0,02
1 Crab	0,10	2,27		
Sustainability				
none	-0,14	-3,12	9,72	0,00
1 Octopus	0,14	3,12		

Five days before the educational activity finished, and before the performance of the second experiments, the children participated in a short person to person survey where some questions about the logos were asked. Children were asked to tell the name and some ideas related with each logos (cleans bugs from seafood, protects baby fish, ...) in a spontaneous way. Results from this test varied according to children's age (Table 3). Rates of success increase as we move from the younger group to the older. More than half of the children over 4 years old succeeded when asked about the pet's duties, while only 13% of the youngest were able to recall any of them. A similar result, with bigger rates of success, was obtained when the children were asked to assign duties to logos from a list of six, three per logo. Finally, the children were asked to tell which one of the pets was preferred, revealing a strong preference for the crab in the older groups and a 50% split preference among the children from the 3 years old class.

Table 3 – Success rates and preferences in spontaneous tests for recognition and meaning of logos.

	Crab		**Octopus**		**Preference**	
Age	Name	Duties	Name	Duties	Crab	Octopus
3	39,1%	13,0%	4,3%	13,0%	47,8%	52,2%
4	61,5%	57,7%	26,9%	61,5%	73,1%	26,9%
5	88,5%	65,4%	73,1%	69,2%	80,8%	19,2%

The second experiment yielded results consistent with the survey test (Table 4). Processing level continues to be the most relevant attribute in children's decisions. The parameter for the fishburger has increased and the one for the fillet decreased with respect to the first experiment. The main change took place in the importance of the logos, with decreasing importance for the octopus resulting in non-significance. The logo for safety, the crab, slightly increases its parameter value and continues to have a significant effect on children's choices.

Table 4 – Parameter results for the second experiment

Attributes	Class1	z-value	Wald	p-value
Processing level				
0 Slice w bones skin	-0,26	-3,23	10,71	0,01
1 Boneless fillet	0,06	0,80		
2 Fish finger	0,09	1,23		
3 Fishburger	0,12	1,61		
Safety				
0 none	-0,12	-2,73	7,46	0,01
1 Crab	0,12	2,73		
Sustainability				
None	-0,06	-1,38	1,89	0,17
1 Octopus	0,06	1,38		

Attributes related with seafood safety and fisheries sustainability changed their importance over children's decisions after the educational program where these concepts were introduced to the children. Safety, represented by a crab logo, grew from 20% of relative importance to 36% while the octopus, symbolizing fisheries sustainability, reduced from 38% to 9% (Table 5).

Table 5 – Relative importance of attributes

	First experiment	Second experiment
Presentation	41%	55%
Safety	20%	36%
Sustainability	38%	9%

Although the sample is too small for estimating the models for each of the age groups, results from the survey test allow making expectations of differences in these changes according to children's age. Children from the younger class may be less focused on the crab than the other two groups. Their choices, taken alone, may be more similar to those obtained in the first experiment, with similar significance in both logos.

CONCLUSIONS

The main conclusion that can be derived from the results is that educational programs at schools, focused on promoting responsible seafood consumption, are effective even in the pre-operational stage (ages from 2 to 7). Well conducted, these programs can influence children's choices with respect to what seafood

should be eaten and which should be rejected. Effectiveness of these kinds of programs varies across ages, and it seems to work better with older age groups. Campaigns at schools may succeed in promoting seafood consumption among children, and they could also be used for promoting safe and sustainable consumption patterns. Further, inclusion of workshops on these concepts into the official educational programs may result in a higher level of concern and responsibility in the future generations.

In the pre-operational stage of cognitive development, children are egocentric in their decisions, including those referring to purchase and consumption. They know what is good for them, but they don't realize on the consequences of their actions on their environment (Piaget, 1928; Ault, 1977; Roedder, 1981). This feature in the behavior of children into the ages studied could made them more receptive to the ideas related with safety, indicating direct and personal avoidance of risk, than those about sustainability, from which consequences for the individual are indirect and less well understood. This may explain the changes in children's preferences in the second experiment, and the reduced importance of the octopus logo. The concept can be better understood in older ages, and then more effectively. The idea of sustainability should not be presented just as a formal concept, and the educators should emphasize the links between the individual and the environment, and how unsustainable practices cause adverse consequences on the individual's life. These linkages do not arise *per se* in the children, like those of self-protection, and may also be difficult to assimilate by adults. The sooner the individual starts understanding them, the faster they will become a sustainable consumer.

Finally, as expected, children prefer processed seafood to unprocessed. This relation may be even stronger in countries and cultures with low levels of seafood consumption. Processed products tend to be preferred by children as they remove some of the perceived barriers, as supported by both experiments. This suggests that the information learnt about safety and sustainability haven't surmounted the pupils' innate preferences for processed seafood. Results from the second experiment showed a slightly stronger preference for the more processed product, with a decrease in the preferences for fillets favouring the fishburger. This may well be due to a reduced novelty of the former, which was known by the children from the first experiment (Mustonen & Tuorila, 2009).

The case study provides an interesting platform for further research with scope for replication in different cultures and consumer environments to explore their wider application. Results could vary as individual and social experience with food risks and environmental issues may differ. Concerns about both issues are unlikely to be the same across different countries and societies, and thus, this in turn may be reflected in children's choices which, of course, are the basis of future consumption patterns.

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