



# Structural equation modelling and word association as tools for a better understanding of low fish consumption



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## ABSTRACT

To develop a model and explain the whole set of relations involved in fish consumption behaviour in a population with low fish consumption (Brazil), an extended Food Choice Questionnaire (FCQ) and the Theory of Planned Behaviour (TPB) questionnaire were applied and structural equation modelling (SEM) was used to test the relationships between constructs. The questionnaires were run on a sample of 200 fish consumers in the city of Rio Grande (RS, Brazil). The results indicated a good fit for the proposed model. Attitude, subjective norms and past experience had direct effects on the intention to consume fish and this was directly associated with fish consumption behaviour. Attitude was inversely correlated to fish consumption. The extended constructs of “health” and “weight control” appeared to be good predictors of intention. A further aim was to analyse the cognitive perception of new fish products by applying word association methodology. Word association proved a useful method for gathering perceptions of new fish products and also helped to explain the results obtained with the structural equation model. The relationship between SEM and word association highlighted that this sample population was very concerned about health and weight control.

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## 1. Introduction

The Theory of Planned Behaviour (TPB) (Ajzen, 1991) appraises behaviour as a composite of three constructs: attitudes, subjective norms and perceived behavioural control. This theory assumes that the link between these three constructs and behaviour is not direct but mediated by behavioural intention. This theory has been used to explain consumption intention and the actual consumption of various kinds of food (Arvola et al., 2008) and the variance in fish consumption behaviour in countries with a high consumption of fish (Honkanen, Olsen, & Verplanken, 2005; Olsen & Ruiz, 2008; Scholderer & Grunert, 2001; Verbeke & Vackier, 2005).

A previous study (Mitterer-Daltoé, Latorres, Queiroz, Fiszman & Varela, unpublished) was conducted to investigate consumer behaviour towards fish in a population with low fish consumption, in this case Brazil, using TPB. The TPB results fitted the Brazilian data well and a greater understanding of the constructs of low fish consumption behaviour was gained. One result that stood out was that attitude based on evaluative and affective judgments was inversely correlated to fish consumption. However, when the relationships hypothesized by TPB were tested through regression analysis, which examines one relationship between dependent and independent variables at a

time, the relationship between attitudes, perceived behavioural control and underlying beliefs was not sustained.

The structural equation modelling (SEM) technique makes it possible to use different variables and test their interrelation simultaneously (Carrillo, Prado-Gascó, Fiszman, & Varela, 2012; Pieniak, Verbeke, Scholderer, Brunso, & Olsen, 2008). This technique examines the structural interrelationships expressed in a series of multiple regression equations. Such equations describe all the relationships between constructs (dependent and independent variables) involved in the analysis. The unobservable or latent factors involved in the constructs are measured through multiple observed variables. SEM is based on two multivariate methods: factor analysis and multiple regressions (Hair, Black, Babin, Anderson, & Tatham, 2009).

In SEM terminology, a model consists of two models, the measurement model (how measured variables come together to represent the constructs) and the structural model (which shows how the constructs are related to each other). SEM should be tested from a strong theoretical basis for specifying these two models, since this technique is considered a confirmatory analysis, that is to say, it is useful for testing and confirming a potential theory (Hair et al., 2009).

The theoretical background of the present study is based on previous studies (Mitterer-Daltoé et al., unpublished results; Verbeke & Vackier, 2005) that applied TPB to studying consumer behaviour towards fish. Although TPB is a useful model for predicting behaviour intention and fish consumption behaviour, the variance could best

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be predicted by including other constructs such as the factors that comprise the Food Choice Questionnaire. Food choice has been described as a complex function of preferences for sensory characteristics combined with the influence of non-sensory factors (Ares & Gámbaro, 2008; Carrillo, Varela, Salvador, & Fiszman, 2011; Steptoe, Pollard, & Wardle, 1995).

Low fish consumption could be due to different barriers. People may be averse to consuming fish because of a perceived difficulty in buying or preparing it, or the unpleasant properties of some varieties of fish, such as bones or smell, or even a lack of habit. To introduce the habit of consuming fish, a strategic solution is to make good quality fish products available that are convenient and better suited to modern consumer demands. Currently, the Brazilian government aims to increase the exploration of Brazilian fish species that are not yet being exploited, such as pelagic *Engraulis anchoita*, and to develop new fish products to increase fish consumption (Pastous-Madureira et al., 2009). Business and marketing managers are interested in knowing how well or poorly a given product is rated among different consumer segments and cultures and why consumers do or do not consume their products. As well as gaining an understanding of the parameters linked to choice and behaviour that underlie fish consumption in a low fish consumption population, it would be interesting to link fish consumption to these customers' subjective perception of fish products. Word association is a quick and easy method for gathering useful information about consumers' perceptions of a new food product (Antmann, Ares, Salvador, Varela, & Fiszman, 2011; Ares, Giménez, & Gámbaro, 2008). The associations that first come to the respondents' mind are the most relevant for consumer decisions related to product consumption (Roininen, Arvola, & Lähteenmäki, 2006).

The objective of this research was to develop a model and explain the whole set of relations between constructs of fish consumption behaviour in a population with low fish consumption (Brazil) by applying the Theory of Planned Behaviour, extended by the Food Choice Questionnaire. In addition, the cognitive perception of fish (*Engraulis anchoita*) products was evaluated with the same sample population by means of a word association task.

## 2. Material and methods

### 2.1. Participants

The questionnaires were completed by 200 participants from the city of Rio Grande in the state of Rio Grande do Sul, Brazil. This city is bathed by the Atlantic Ocean and its economy is based mainly on its port. The consumers interviewed were recruited randomly at the Federal University of Rio Grande, 60% were female and 40% male, 50% were married and 37% had children living at home. Their average number of years of education was  $16 \pm 4$  years. The participants' ages varied from 18 to 60 years and averaged  $33 \pm 12$  years.

In terms of consumption patterns, the recruitment was not structured to look for consumers with low consumption but rather to get a random sample, subsequently verifying if the frequency of consumption of the obtained sample was in line with the general population's consumption patterns. The obtained frequencies of consumption were as follows: 2% of the participants never consumed fish, 33% consumed fish less than monthly; 11.5% consumed fish monthly; 15.5% consumed fish several times a month; 28% consumed weekly; 10% several times a week and no consumer (0%) said consumed fish daily. Taking into account that dietary guidelines generally recommend 3 portions of fish a week in a balanced healthy diet (Pinto Fontanillo, 2005), the interviewed population definitely had a low fish consumption pattern.

### 2.2. Questionnaires

The questionnaires were self-administered.

The questions related to the Theory of Planned Behaviour (TPB) and referring to fish consumption behaviour were based on the proposal by Verbeke and Vackier (2005). This questionnaire included measures of the following constructs: attitude towards eating fish (including statements of evaluative judgements and affective judgements), subjective norm (including statements of social norm and personal norm), perceived behavioural control (including statements of facilitating conditions and past experience) and behavioural intention to eat fish. All questions were measured on five-point scales, from "totally disagree" to "totally agree" except for the behaviour variable "How frequently do you eat fish?", which was measured on the following seven-point scale: daily; several times a week; weekly; several times a month; monthly; less than monthly; never. In order to check how each variable represented each factor, rejecting or confirming a preconceived theory of the measurement model, a confirmatory factor analysis (CFA) for TPB data was applied (see Statistical analysis below).

The Food Choice Questionnaire (FCQ) was based on a modification by Carrillo et al. (2011) of one previously developed for English consumers by Steptoe et al. (1995). Three of the nine motivational factors in the original work (health, price and weight control) were included in the structural model. These factors were chosen because they were not well covered by the TPB questionnaire. The results previously reported by Mitterer-Daltoé et al. (unpublished) showed that Brazilian government policies should begin with campaigns that raise health awareness, so an exploration of the perception of healthiness could contribute to an understanding of the main factors underlying fish consumption. In Uruguay, Ares and Gámbaro (2008) studied the motives underlying consumers' food choices; the health-related factors of "feeling good and safe", "health" and "nutrient content", together with "sensory appeal", were rated as the most important.

Price is another factor that influences food choice and plays a significant role in determining eating patterns and health behaviour (Darmon, Briand, & Drewnowski, 2004; Popkin, Duffley, & Gordon-Larsen, 2005). According to Steptoe et al. (1995) the cost of food is a much more important element of selection for people on low incomes and for females. Another interesting observation is that women showing dietary restraint were less influenced by price (Carrillo et al., 2011), so exploring this variable could help in understanding the frequency of fish consumption and whether there is any correlation with the weight control factor.

The food choice factor items were evaluated by rating the words that complete the statement "It is important to me that the food I eat on a typical day...". In order to discover the consumers' opinion of omega 3 content and its influence on food choice, the item "contains omega 3" was included in the questionnaire. All the statements were answered on a seven-box scale, labelled from "not at all important" to "very important". The change from the original four-box scale was made to increase the ability to discriminate between food choice motives (Fotopoulos, Krystallis, Vasallo, & Pagiaslis, 2009). According to the original authors, the questionnaire presents adequate psychometric properties.

### 2.3. Word association

Word association is supported by the hypothesis that giving the respondent a stimulus concept or object and asking him or her to associate it freely with whatever ideas come to mind gives relatively unrestricted access to mental representations of the stimulus term (Ares et al., 2008).

The stimuli used were two pairs of identical pictures of fish products: one of nuggets and one of a burger (Fig. 1). In order to avoid response bias caused by previous contact with the technique, 100 of the 200 participants were presented with the images of the nuggets and the other 100 with the images of the hamburger.

For the first image in the pair (called the conventional product) the instruction was: "Please write down the first four words, descriptions, associations, thoughts or feelings that came to your mind when

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