DETERMINANT FACTORS IN FISH CONSUMPTION: AN APPLICATION OF THE THEORY OF PLANNED BEHAVIOR

Janaína dos Santos Benvindo¹ Lucas Silva de Amorim² João Felipe Nogueira Matias³ Isabella Carneiro Catrib⁴ Áurio Lúcio Leocádio⁵

ABSTRACT

Objective: The objective of this research is to investigate the factors that influence fish consumption in the diet. Theoretical Framework: The theoretical framework addresses fish consumption, as well as the application of the Theory of Planned Behavior (TPB) in the context of fish consumption, providing a solid foundation for understanding the research context.

Method: The methodology adopted for this research comprises an exploratory study with a quantitative approach. The analysis was conducted using Structural Equation Modeling (SEM). Data collection was carried out through an online questionnaire administered from 01/12/2022 to 20/01/2023. The sample consists of 250 valid questionnaires.

Results and Discussion: The obtained results revealed that attitude, competences, and perceived behavioral control influence the intention and consumption behavior. This study outlines practical contributions by analyzing consumer behavior regarding fish consumption, linking it to environmental, social, and sustainability issues.

Research Implications: The implications provide insights into the field of sustainable consumer behavior. These implications encompass relevant estimates for traders and governmental entities to delineate strategies aimed at fish consumption.

Originality/Value: The novelty lies in using the competency dimension as an antecedent of consumption behavior. The relevance and value of this research are evidenced through robust statistical analysis (SEM) to examine the antecedents of fish consumption behavior.

Keywords: Theory of Planned Behavior, Fish Consumption, Consumer Behavior, Sustainable Consumption.

FATORES DETERMINANTES NO CONSUMO DE PEIXE: UMA APLICAÇÃO DA TEORIA DO COMPORTAMENTO PLANEJADO

RESUMO

Objetivo: O objetivo desta pesquisa é investigar os fatores que influenciam o consumo de peixe na alimentação.

¹ Universidade Federal do Ceará (UFC), Fortaleza, Ceará, Brasil. E-mail: janainabenvindo@gmail.com
Orcid: https://orcid.org/0000-0002-8548-0079

² Universidade Federal do Ceará (UFC), Fortaleza, Ceará, Brasil. E-mail: lucas.rnamorim@gmail.com
Orcid: https://orcid.org/0000-0001-6401-0601

³ Universidade Federal do Ceará (UFC), Fortaleza, Ceará, Brasil. E-mail: jfn.matias@gmail.com
Orcid: https://orcid.org/0000-0001-6491-9073

⁴ Universidade Federal do Ceará (UFC), Fortaleza, Ceará, Brasil. E-mail: isabellac.catrib@gmail.com
Orcid: https://orcid.org/0000-0001-7207-1375

⁵ Universidade Federal do Ceará (UFC), Fortaleza, Ceará, Brasil. E-mail: aurioleocadio42@gmail.com
Orcid: https://orcid.org/0000-0003-3175-3382
Determinant Factors in Fish Consumption: An Application of The Theory of Planned Behavior

Referencial Teórico: O referencial teórico aborda o consumo de pescados, bem como a aplicação da teoria do comportamento planejado (TCP) no contexto do consumo de peixe, fornecendo uma base sólida para a compreensão do contexto da investigação.

Método: A metodologia adotada para esta pesquisa compreende um estudo exploratório, com abordagem quantitativa. A análise foi realizada através da modelagem por equações estruturais (MEE). A coleta de dados foi realizada por meio de de um questionário aplicado de forma online entre 01/12/2022 a 20/01/2023. A amostra consiste de 250 questionários válidos.

Resultados e Discussão: Os resultados obtidos revelaram que a atitude, as competências e o controle comportamental percebido influenciam a intenção e o comportamento de consumo. Este estudo delineia contribuições práticas ao analisar o comportamento do consumidor em relação ao consumo de peixe, vinculando-o a questões ambientais, sociais e de sustentabilidade.

Implicações da Pesquisa: As implicações fornecem insights no campo do comportamento sustentável do consumidor. Essas implicações abrangem estimativas relevantes para que comerciantes e entidades governamentais possam delinear estratégias direcionadas ao consumo de peixe.

Originalidade/Valor: Destaca-se o inédismo de utilizar a dimensão de competências como um antecedente do comportamento de consumo. A relevância e o valor desta pesquisa são evidenciados através de uma análise estatística robusta (MEE) para analisar os antecedentes do comportamento de consumo de peixe.

Palavras-chave: Teoria do Comportamento Planejado, Consumo de Peixe, Comportamento do Consumidor, Consumo Sustentável.

FACTORES DETERMINANTES EN EL CONSUMO DE PESCADO: UNA APLICACIÓN DE LA TEORÍA DEL COMPORTAMIENTO PLANIFICADO

RESUMEN

Objetivo: El objetivo de esta investigación es investigar los factores que influyen en el consumo de pescado en la dieta.

Marco Teórico: El marco teórico aborda el consumo de pescados, así como la aplicación de la Teoría del Comportamiento Planeado (TCP) en el contexto del consumo de pescado, proporcionando una base sólida para comprender el contexto de la investigación.

Método: La metodología adoptada para esta investigación comprende un estudio exploratorio con enfoque cuantitativo. El análisis se realizó utilizando Modelado de Ecuaciones Estructurales (SEM). La recolección de datos se realizó a través de un cuestionario en línea administrado del 01/12/2022 al 20/01/2023. La muestra consta de 250 cuestionarios válidos.

Resultados y Discusión: Los resultados obtenidos revelaron que la actitud, las competencias y el control conductual percibido influyen en la intención y el comportamento de consumo. Este estudio delinea contribuciones prácticas al analizar el comportamiento del consumidor en relación con el consumo de pescado, vinculándolo a cuestiones ambientales, sociales y de sostenibilidad.

Implicaciones de la Investigación: Las implicaciones proporcionan ideas en el campo del comportamiento sostenible del consumidor. Estas implicaciones abarcan estimaciones relevantes para que los comerciantes y entidades gubernamentales puedan delinear estrategias dirigidas al consumo de pescado.

Originalidad/Valor: La novedad radica en utilizar la dimensión de competencias como antecedente del comportamiento de consumo. La relevancia y el valor de esta investigación se evidencian a través de un análisis estadístico robusto (SEM) para examinar los antecedentes del comportamiento de consumo de pescado.

Palavras-chave: Teoría del Comportamiento Planificado, Consumo de Pescado, Comportamiento del Consumidor, Consumo Sustentable.
1 INTRODUCTION

In recent decades, the analysis of the consumer's acquiring behavior of aquatic products has received considerable attention from researchers, motivated by political and economic reasons related to nutrition, dietetics, food safety, sustainability and dynamics of the fishing industry (Carlucci et al., 2014). In this context, fish and seafood are generally perceived as essential components of a balanced and healthy diet, given their low fat content and high quality protein supply (Bombardelli et al., 2005; De Oliveira Sartori & Amâncio, 2012; Yaktine, 2007). In addition, social transformations influence consumer choices, and with the advent of healthy eating as a trend in the food landscape, demand for aquatic food has experienced a noticeable increase in recent years (Fao, 2022).

Global per capita consumption of aquatic food on average grew from 9.9 kg in the 1960s to 20.5 kg per inhabitant in 2018 (Fao, 2022). By comparison, the annual per capita consumption of beef is around 46 kg per person. In Brazil, the average intake of fish is approximately 9 kg per person per year. However, the recommended amount is 12 kg per person per year (Lopes et al., 2016).

Currently, the additional fish production comes from aquaculture, the food sector that experiences the highest global growth, reaching almost 70 million tons of annual production, which corresponds to about 50% of the fish consumed worldwide (Fao, 2022). The global importance of fisheries and aquaculture, combined with related activities such as fish processing, packaging and distribution, provides livelihoods and income for approximately 10 to 12% of the world's population (Carlucci et al., 2014).

Several factors, as indicated by international studies (Dey et al., 2011; Chidmi et al., 2012; Vassilopoulos et al., 2012; Singh et al., 2014; Bronmann, 2016; Del valle et al., 2017; Higuchi, 2017; Vassilopoulos et al., 2019) and Brazilian research (Minozzo et al., 2008; Melo et al., 2011; Tavares et al., 2013; Figueiro et al., 2014; Barbosa & Sampaio, 2016; Lopes et al., 2016; Fornari et al., 2017; Magalhães Araújo et al., 2018; Ribeiro et al., 2018), may impact fish consumption. Aspects such as price, difficulties in preparation and food taboos associated with the consumption of this type of food may contribute to the reduction of demand.
The identification of the predominant factors influencing fish consumption allows to understand the interconnections between the frequency of this behavior and the underlying attitudes. This provides insights into the intent and consumption of fish meat. Several theories have been applied to interpret behavior related to the consumption of fish protein (Ajzen, 1991; Scholderer & Grunert, 2001; Verbeke & vackier, 2005; Mitterer-daltoé et al., 2013) with TCP being one of the most recognized (Hoppe et al., 2012; Ajzen, 2015; Kothe & Mullan, 2015; Menozzi et al., 2015; Carfora, et al., 2016; Wilson Highlighting its effectiveness in explaining behaviors associated with a healthy diet (Mcdermott, 2015).

Brazilian literature on fish consumption is specific, predominantly centered on analysis of impact factors in particular localities, without due consideration of the characteristics of the home environment, for example (Wagner et al., 2022). In this sense, there is a gap for the exploration and deepening of issues related to the determinants of the consumption of fish in the country. It is therefore imperative to conduct a study that addresses these determinants more comprehensively, making use of a more representative sampling (Wagner et al., 2022). In the light of the above, the research question that arises is: what behavioral factors exert an influence on the consumption of fish in the food of individuals? Thus, the objective of the research is to verify the determinants that influence the inclusion behavior of fish consumption in the diet.

As for the contributions of this study, there is a deepening in the understanding of the determinants of fish consumption behavior by individuals. In addition, an empirical rationale for the impacts of attitudes, skills and intentions is provided as a behavioral background to the inclusion of fish consumption.

2 THEORETICAL FRAME

2.1 THE PRODUCTION AND CONSUMPTION OF FISH

Meat from fish has been recognized as a substantial component in the basis of human nutrition and plays an essential role in complementing animal protein sources (Silveira et al., 2012). This product, obtained through fishing (catching) and aquaculture (cultivation), is of considerable importance. Overall production of fish for human consumption reached 157.4 million tons in 2020, showing a continuous increase in overall fish production and consumption during the period 1990 to 2020, although there has been a slight decline in the last two years (FAO, 2022). However, this upward trend does not manifest itself in an equivalent way in the...
Brazilian context, as it is possible to see a decrease in fish consumption in all regions between the years 2002 and 2018 in Table 1:

Table 1

<table>
<thead>
<tr>
<th>Large Regions</th>
<th>2002</th>
<th>2008</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>49.334</td>
<td>35.088</td>
<td>19.709</td>
</tr>
<tr>
<td>Northeast</td>
<td>9.945</td>
<td>9.93</td>
<td>8.166</td>
</tr>
<tr>
<td>Southeast</td>
<td>4.342</td>
<td>4.129</td>
<td>2.733</td>
</tr>
<tr>
<td>South</td>
<td>3.567</td>
<td>3.193</td>
<td>2.086</td>
</tr>
<tr>
<td>Midwest</td>
<td>2.72</td>
<td>3.239</td>
<td>2.899</td>
</tr>
<tr>
<td>Brazil</td>
<td>9.175</td>
<td>8.064</td>
<td>5.591</td>
</tr>
</tbody>
</table>

Source: IBGE (2019).

Table 1 shows that the northern region has the highest per capita consumption of fish in the country, corroborating with Lopes et al., (2016), in which the authors state that this preference in the northern region for fish intake stems from the abundance of fish in the area, also pointed out by Tavares et al., (2013). The regularity of consumption, according to the same authors, varies according to the proximity of the region to water bodies, a fact that favors, therefore, the northern region. On the other hand, the Midwest region has the lowest consumption rate.

Faced with the challenges of sustainable development, it is essential to encourage the consumption of fish, considering population growth and food security (FAO, 2020). Despite the global trend of higher fish intake, Brazil needs campaigns to promote this habit, as indicated by Mitterer-Daltoé et al. (2013). With Brazilians showing willingness to include fish in food, there is an opportunity to increase their consumption in the country.

2.2 THE IMPLEMENTATION OF TCP IN THE CONTEXT OF FISH CONSUMPTION

The TCP conceived by Ajzen in 1991, represents an extension of the Rational Action Theory (TAR) proposed by Feishbein and Ajzen (1975). ART is based on the premise that human behavior has a rational logic that makes the intention to perform a certain action predictable. However, the ART presumes that the individual exercises absolute control over his ability to act, neglecting alternative behaviors that the subject evaluates before performing a certain action (Almeida; Sobral, 2007). In light of this, Ajzen (1991) reformulated ART to incorporate behavioral provisions such as social attitude and personality trait, playing a crucial role in predicting and explaining behavior.
TCP uses the concepts of attitudes, subjective norms and behavior control to understand and anticipate behavior in specific contexts (Ajzen, 1991, 2015, 2020; Fayolle & Gailly, 2006; Lassas-Clerc, 2006). The attitude towards behavior reflects the individual's personal view of behavior and its possible consequences, while subjective norms involve the perception of social pressures and judgments that can influence the decision whether or not to perform a particular behavior (Ajzen, 2012). These beliefs have an indirect impact on behavior, influencing the intentions of the individual, which are mediated by attitudes, subjective norms and behavior control (Ajzen, 1991, 2015, 2020).

Behavioral beliefs are linked to attitude, reflecting perception about the execution of a behavior and its consequences, while normative beliefs influence social and individual expectations regarding behavior. These beliefs intertwine with individual motivations, shaping the context for the realization of behavior. Finally, control beliefs are related to the perception of factors that affect the individual's ability to perform behavior (Ajzen, 1991, 2015, 2020; Liñán & Chen, 2009; Fishbein & Ajzen, 2010). Against this background, the following hypotheses have been formulated:

H1: attitude positively influences intention
H2: subjective norm positively influences intention
H3: Perceived behavioral control positively influences intention

Perceived value refers to the feelings of an individual regarding the level of satisfaction provided by an artifact or any entity that demonstrates value based on previously established desires and decisions (Chen, 2016). In conjunction with perceived power, these elements act as facilitators or obstacles to behavioral performance, and readily accessible control beliefs result in a certain degree of perceived behavioral control (or self-efficacy) (Ajzen, 1991, 2015; Liñán & Chen, 2009).

In this scenario, one assumes that intentions guide behavior when people actually have the ability to do so, that is, when they have real control over their actions. This real control moderates the impact of intentions on behavior. However, in many cases of TCP, identifying all the factors that influence this actual control can be challenging or even impossible (Ajzen, 2015), as illustrated in Figure 1.
The conception that the execution of a behavior is a result of the interaction between motivation (intention) and ability (behavioral control) has been the subject of study for decades (Thompson, 2009; Tomic et al., 2016; Ajzen, 2020). In this context, the expectation is that intentions motivate behavior, since motivation drives the person's willingness to try (Ajzen, 2020).

The study by Verbke & Vackier (2005) was carried out with the population of Belgium and among other results, it was found that the intention of eating fish is due to factors related to social pressure, moral responsibility and the certainty of the individual as to have abilities to choose and prepare the food. Accordingly, the study by Carrilho et al., (2011) incorporates a latent variable as the antecedent of the intention, investigating whether the possession of culinary skills for the preparation of fish positively influences the intention to consume them. In view of this, the following hypothesis is formulated:

H4: Competences have a positive influence on intention.

The study by Tomic et al., (2016), which used TCP to explain the intentions of fish consumption in Croatia, revealed that all the constructs of TCP (attitude, subjective norms and perceived behavioral control) significantly explain the intentions of fish consumption, thus generating the hypothesis:

H5: Intent has a positive influence on behavior.

Another research that integrates the consumption of fish with TCP is that of Nunes et al., (2020), whose main results indicate that all the constructs of TCP (attitude, subjective norms and perceived behavioral control) are significant in the intention to consume fish, and the variable "healthy values" plays an important role in the ingestion of fish. Based on this, the hypothesis is formulated:

H6: Healthy values have a positive influence on behavior.
Research by Fiandari et al., (2019) showed that attitude precedes perceived value in fish consumption, influencing it significantly, addressing considerations about price and health. However, a positive attitude does not always result in consumption. On the other hand, research by Higuchi et al., (2017) analyzed fish consumption in Lima, Peru, with 159 participants. It has been found that the intention to consume fish is influenced by personal attitudes, social norms and past experiences. In spite of the expectation that a healthy lifestyle will positively influence the intention to consume fish, the results indicated a mismatch between theory and practice, since this concern was not reflected in the eating habits studied.

3 METHOD

In order to investigate the factors that influence the intention of including fish consumption in the diet of individuals using the theoretical lens of TCP, an exploratory study was carried out, with a quantitative approach, which intends to observe and understand the most varied aspects related to the phenomenon examined (Gil, 2017).

The sample was calculated from the A-priori sample size calculator for structural equation models, which requires some inputs for sample calculation, being (1) effect size, (2) desired statistical power level, (3) number of latent variables, (4) number of observed variables, (5) and probability level (Soper, 2023). For items 2 and 5, the input values were those suggested by Cohen (1988), being 80% and 0.05 respectively. As to the size of the effect, item 1, we used the value of 0.5, considered high by Hair et al., (2009), since TCP already has a vast field of study in Brazilian territory. Finally, the number of observed variables is 20, while the number of latent variables is 7. The result of the calculation recommended a minimum sample of 223 respondents to be able to capture statistical effects through ESM.

The readiness of respondents to participate in the questionnaire was the criterion for inclusion in the sample, characterizing it as a "non-probabilistic" and "accidental (Esmo)" sample. Thus, non-probabilistic methods can be defined as sampling in which the researcher chooses the components that make up the sample. Accidental sampling (Esmo) can be understood as the one in which the elements arise until the number of elements required to complete the sample is completed (Loesch, 2012).

As regards the elaboration of the research instrument, this was constructed using the scale of attitudes, subjective norms, perceived behavioral control and behavioral intent, as proposed in the study by Nunes et al., (2020). In addition, the scale of behavior was adapted from studies by Verbeke & Vackier (2005). Finally, the skill scale was adapted based on the
Determinant Factors in Fish Consumption: An Application of The Theory of Planned Behavior

In their research, Nunes et al., (2020), investigated whether TCP could predict the intent for the consumption of fish protein in a sample of South-Mato Grosso consumers. In this sense, the results provided a clearer understanding of the fish's consumption intentions.

The questionnaire was drawn up on the Google Forms platform and its dissemination took place on social media such as Instagram and Facebook. Collection of responses took place from 01/12/2022 to 20/01/2023. The variables of the research were measured by a 5-point Likert-type scale, which contained descriptions covering the extremes "I totally agree" and "I totally disagree". Table 2 below shows the scales that were used in the survey.

**Table 2**

*Survey Questionnaire*

<table>
<thead>
<tr>
<th>Attitude</th>
<th>ATI1</th>
<th>It is very good for me to include fish meat in my food</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ATI2</td>
<td>It is advantageous for me to include fish meat in my food</td>
</tr>
<tr>
<td></td>
<td>ATI3</td>
<td>It is necessary for me to include fish meat in my food</td>
</tr>
<tr>
<td></td>
<td>ATI4</td>
<td>It is important for me to include fish meat in my food</td>
</tr>
<tr>
<td>Subjective rule</td>
<td>NSJ1</td>
<td>Most people who are important to me think I should include fish meat in my food</td>
</tr>
<tr>
<td></td>
<td>NSJ2</td>
<td>Most of the people I hear opinions about, would approve of me including fish meat in my food.</td>
</tr>
<tr>
<td>Perceived behavioral control</td>
<td>CCP1</td>
<td>I feel confident to overcome the obstacles that would make it difficult for me to feed fish meat</td>
</tr>
<tr>
<td></td>
<td>SPC2</td>
<td>Consuming fish meat in my diet depends only on me</td>
</tr>
<tr>
<td></td>
<td>CCP3</td>
<td>Inserting fish meat into my food is under my control</td>
</tr>
<tr>
<td>Competencies</td>
<td>CPT1</td>
<td>I can prepare dishes with fish meat</td>
</tr>
<tr>
<td></td>
<td>CPT2</td>
<td>I know the places where you buy fish meat</td>
</tr>
<tr>
<td></td>
<td>CPT3</td>
<td>I know the types of fish when I go shopping</td>
</tr>
<tr>
<td>Intent</td>
<td>INT1</td>
<td>I intend to include fish meat in my food</td>
</tr>
<tr>
<td></td>
<td>INT2</td>
<td>It is my strong intention to include fish meat in my food</td>
</tr>
<tr>
<td></td>
<td>INT3</td>
<td>I'm likely to include fish meat in my food</td>
</tr>
<tr>
<td>Healthy Values</td>
<td>VAS1</td>
<td>I feel that I must insert fish meat into my food</td>
</tr>
<tr>
<td></td>
<td>VAS2</td>
<td>I feel that I have an obligation to feed fish meat</td>
</tr>
<tr>
<td></td>
<td>VAS3</td>
<td>I feel like if I put fish meat in my food, I'm going to feel a better person</td>
</tr>
<tr>
<td></td>
<td>VAS4</td>
<td>I feel like if I put fish meat in my food, I'm going to be a healthier person</td>
</tr>
<tr>
<td>Behavior</td>
<td>COM1</td>
<td>How many times do you eat fish meat a month?</td>
</tr>
</tbody>
</table>

The questionnaire also included questions that sought to identify the profile of the participants, such as gender, age group, profession and level of schooling.

The conceptual model of this article takes as its starting point the model proposed by Nunes et al., (2020), in which they complement conventional TCP with a new latent variable, known as healthy values, composed of four variables that seek to measure how much the healthy values of potential consumers of fish protein in the diet. In order to complement the model of...
Nunes et al., (2020), it is suggested to insert a latent variable as an antecedent of the variable "Intent", based on Carrilho et al., (2011) in order to assess whether the fact that the individual has skills to cook fish positively influences his intention to consume them. Thus, Figure 2 exposes the model to be tested:

**Figure 2**

*Theoretical Model*

For analysis of the results, statistical techniques of multivariate data analysis were applied, being the ESM and exploratory factor analysis (EFA), besides estimation of the reliability of the constructs from the greatest lower bound (GLB). To this end, the MEE was carried out using the R programming language, with the support of the R Studio software and the haven and lavaan packages, while the AFE and GLB were calculated from the R Studio software JASP. Prior to the application of multivariate techniques, the A-priori sample size calculator for structural equation models, an online calculator specific for the sample calculation of works performed applying the ESM, was used.

The questionnaire was answered by 276 people. After the data was compiled, the database went through a scavenging process in order to verify the existence of missing values and other values that might not match what was asked. Due to the presence of missing values, 9 responses from individuals were excluded, leaving 267 responses. Then, 17 forms were excluded due to answers inconsistent with what was asked in the item about the amount of times you consume fish per month, since instead of answering a positive whole number, individuals
responded in word form, as rarely, hardly and I don't know how to specify. Finally, 250 forms were considered valid.

4 RESULTS AND DISCUSSIONS

Of the 250 valid forms, 30 respondents are between 18 and 24 years old, 62 between 25 and 35 years old, 101 between 36 and 50 years old, and 66 are from 51 years old. As for the gender, the sample was well divided, being composed of 125 persons of the feminine gender and 134 persons of the masculine gender. Finally, as to the level of schooling, 8 categories emerged, being a person with an incomplete fundamental level, 3 with a complete fundamental level, 1 with an incomplete middle level and 22 with a complete medium level, 45 with an incomplete higher level and 67 with a complete higher level, 14 with an incomplete postgraduate level and 123 with a complete postgraduate level.

Due to the variable "amount of times you consume fish per month", a boxplot was used to divide the numbers into 5 categories of monthly fish consumption frequency, as shown in Figure 3.

Figure 3

variable boxplot number of times you consume fish per month.

Note: In red are indicated the outliers
Source: Prepared by the authors with research data (2023).

The boxplot showed the presence of 8 outliers, which are individuals that consume fish more than 15 times a month, and it was chosen to consider them in the analyzes, since it is important to consider the history of people who consume fish in far greater quantities than most individuals (Aguinis is et al., 2013). In addition, the total amount of outliers represents less than
5% of the total sample size. Thus, it is not necessary to make adjustments to the sample (Hair, *et al.*, 2009). Figure 3 shows only 5 points, but in three of them the individuals reported that they consume exactly the same amount of fish. To assist in the process of understanding the distribution of the sample in the boxplot, Table 3 exposes the quantities of individuals in each of the five categories.

### Table 3

*Quantity categories of fish consumed per month and their values.*

<table>
<thead>
<tr>
<th>Category</th>
<th>Range</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>0 and less than 3</td>
<td>58</td>
</tr>
<tr>
<td>2.</td>
<td>3 and less than 4.5 (median)</td>
<td>67</td>
</tr>
<tr>
<td>3.</td>
<td>Median and less than 8</td>
<td>55</td>
</tr>
<tr>
<td>4.</td>
<td>Equal to 8 and less than 15</td>
<td>62</td>
</tr>
<tr>
<td>5.</td>
<td>Values greater than 15 (outliers)</td>
<td>8</td>
</tr>
</tbody>
</table>

Source: research data (2023).

The data were categorized into five groups: those below the first quartile, in category 1; between the first quartile and the median, in category 2; between the median and the third quartile, in category 3; between the third quartile and the upper limit, in category 4; and the values above the upper limit to the maximum, in category 5. After analysis of the sample, inferential statistics and application of the proposed model were performed. Before applying the model, the data were tested for distribution using the Shapiro-Wilk test for normality. All normal test values were less than 0.05, indicating a non-normal distribution. Details of the values are available in the supplemental material in this article.

Thus, in order to test the validity of the proposed hypotheses, an ESM was continued. It is worth noting that the estimator chosen for the ESM was the *diagonal weighted least squares* (DWLS), which is considered one of the most suitable for non-normal data in latent variable work (Li, 2016), therefore being suitable for work measured on the Likert scale (Distefano & Morgan, 2014). When testing the proposed model with the lavaan package in R Studio, the software reported a warning message, warning that the proposed model may be unidentified because the variance-covariance matrix is negative. Two of the ways of dealing with this situation are by respecifying the model and excluding problematic variables (Hair *et al.*, 2005).

To re-specify the model, the exclusion of possible problematic variables was first pursued by performing an exploratory factor analysis (EFA) in the JASP software, used to identify which variables are really important in the model according to the sample and to verify the data disposition in factors (Hair *et al.*, 2009). The number of factors was based on eigenvalues, the type of rotation chosen was oblique *PROMAX* and the estimator was the...
weighted least squares (WLS). In all, 5 EFAs were carried out, which can be found in Supplementary Material Number 2, along with Greatest lower bound values (GLB) for the final arrangement. The layout of the items was done according to Table 4.

Table 4

<table>
<thead>
<tr>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
<th>Factor 4</th>
<th>MSA</th>
<th>Greatest lower bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATI_1</td>
<td>0.967</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.806</td>
</tr>
<tr>
<td>ATI_2</td>
<td>0.894</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.848</td>
</tr>
<tr>
<td>ATI_4</td>
<td>0.783</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.859</td>
</tr>
<tr>
<td>NSJ_1</td>
<td>-</td>
<td>0.901</td>
<td>-</td>
<td>-</td>
<td>0.884</td>
</tr>
<tr>
<td>NSJ_2</td>
<td>-</td>
<td>0.761</td>
<td>-</td>
<td>-</td>
<td>0.738</td>
</tr>
<tr>
<td>VAS_3</td>
<td>-</td>
<td>0.631</td>
<td>-</td>
<td>-</td>
<td>0.751</td>
</tr>
<tr>
<td>VAS_2</td>
<td>-</td>
<td>0.613</td>
<td>-</td>
<td>-</td>
<td>0.627</td>
</tr>
<tr>
<td>CCP_3</td>
<td>-</td>
<td>-</td>
<td>0.920</td>
<td>-</td>
<td>0.605</td>
</tr>
<tr>
<td>CCP_2</td>
<td>-</td>
<td>-</td>
<td>0.884</td>
<td>-</td>
<td>0.870</td>
</tr>
<tr>
<td>CPT_1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.780</td>
<td>0.881</td>
</tr>
<tr>
<td>CPT_3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.739</td>
<td>0.847</td>
</tr>
<tr>
<td>CPT_2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.578</td>
<td>0.910</td>
</tr>
</tbody>
</table>

Source: research data (2023).

Finally, a final ERA was performed on the items related to the latent variable intention. The Kaiser-Meyer-Olkin (KMO) tests and factorial loads were acceptable, as well as the GLB values. Table 5 exposes the values found.

Table 5

<table>
<thead>
<tr>
<th>Factor 5</th>
<th>MSA</th>
<th>GLB</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT_2</td>
<td>0.966</td>
<td>0.763</td>
</tr>
<tr>
<td>INT_1</td>
<td>0.896</td>
<td>0.687</td>
</tr>
<tr>
<td>INT_3</td>
<td>0.870</td>
<td>0.806</td>
</tr>
</tbody>
</table>

Source: research data (2023).

According to the results of Higuchi et al. (2017) the perception on health aspects precedes the intention, as observed in factor 2. This proposition aligns with the sample's understanding that healthy values are antecedents of intent in this study. The new fact is that the items of healthy values fit well with the subjective items of norm, according to the sample, a fact that may be due to a social pressure felt by the respondents. Thus, starting with the new layout of the data, it was possible to propose a new model, set out in Figure 4.
Determinant Factors in Fish Consumption: An Application of The Theory of Planned Behavior

Figure 4

Model re-specified from ERA

With this, the H6 hypothesis is no longer considered, while the H2 hypothesis contemplates the union of the items relating to healthy values and the subjective norm. The new hypotheses are set out below:

a) H1: attitude positively influences the intention to consume fish (Nunes et al., 2020);
b) H2: Subjective norms and healthy values positively influence the intention to consume fish (Higuchi et al., 2017; Nunes et al., 2020);
c) H3: Skills positively influence the intention to consume fish (Nunes et al., 2020);
d) H4: Perceived behavioral control positively influences the intention to consume fish (Carrilho et al., 2011);
e) H5: Intent has a positive influence on fish consumption behavior (Nunes et al., 2020).

Thus, the new model was shown to be identified, presenting 94 degrees of freedom (gl) and a statistically significant p-value (Chi-square) (p-value < 0.05). The final model fit measurements were satisfactory ($\chi^2 = 219.367$; gl = 94; $\frac{\chi^2}{gl} = 2.33$; CFI = 0.989; TLI = 0.986; SRMR. = 0.05), suggesting that the model has acceptable structure. Thus, the path coefficients and status of the proposed new assumptions are set out in Table 6.

Table 6

<table>
<thead>
<tr>
<th>Assumptions</th>
<th>Written hypothesis</th>
<th>Status</th>
<th>Path coefficient</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>The attitude positively influences the intention.</td>
<td>Not rejected</td>
<td>0.82</td>
<td>0.00</td>
</tr>
<tr>
<td>H2</td>
<td>Subjective norms and healthy values positively influence intent.</td>
<td>Rejected</td>
<td>-0.104</td>
<td>0.172</td>
</tr>
<tr>
<td>H3</td>
<td>Skills positively influence intention.</td>
<td>Not rejected</td>
<td>0.318</td>
<td>0.00</td>
</tr>
<tr>
<td>H4</td>
<td>Perceived behavioral control positively influences intent.</td>
<td>Rejected</td>
<td>-0.091</td>
<td>0.101</td>
</tr>
<tr>
<td>H5</td>
<td>Intent positively influences behavior.</td>
<td>Not rejected</td>
<td>0.609</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Source: research data (2023).
From the P-value, as shown in the table above, the hypotheses H2 and H4 are rejected, as they were not statistically significant. With regard to H1, the hypothesis was confirmed. In addition, based on the results of Table 6, it can be inferred that attitude is the strongest predictor of intent to consume fish meat. In this sense, consumers who have a favorable attitude towards the consumption of fish protein tend to have a stronger intention to consume them (Nunes et al., 2020).

From the results obtained in Table 6, it can be stated that the competencies influence the intention positively, that is, H3 was statistically supported. This result corroborates the findings of the research of Scholderer & Grunert (2001) and Carrilho et al. (2011). In this sense, the results achieved highlight that the availability of fish, the skills to prepare and the knowledge about different types of fish have a positive influence on the intention to consume them (Scholderer & Grunert, 2001; Nölle et al., 2020).

For H4, the hypothesis was statistically confirmed. In this way, the intention has a positive influence on the behavior for eating fish. In this sense, as expected, the intention to eat fish is a significant explanation for consumption behavior (Ajzen, 2020; Nunes et al., 2020). The results found in this research reinforce that the immediate antecedent of fish consumption behavior is behavioral intent (Higuchi et al., 2017). In addition, new trends in sustainable consumption show that consumers can develop a greater intention to consume fish provided they have an eco-label or certificate (Dos Santos et al., 2021).

Figure 5 shows the final model with the path coefficients and the values of $R^2$, which corresponds to the percentage of variance explained in each of the factors.

**Figure 5**

*Path coefficient and value of $R^2* 

Note: *** = significant at 1%; $x$ = statistically non-significant.

Source: Research data (2023).
The values of $R^2$ indicate that intention is explained in 0.88 (88%) by its relation with factors 1 and 3. It should be noted that this result presented more robust statistical significance (INT $R^2 = 88%$), compared to studies by Nunes et al., (2020) and Aboelmaged (2021). However, it was found that intention is not the only direct estimator regarding the variance of monthly fish consumption, indicating that other external factors should be considered in future studies. It should be noted that consumer awareness of sustainability, safety and quality issues can boost fish consumption behavior (FAO, 2020).

In addition, based on the analysis in Figure 5, it can be inferred that the intention explains 37% of the fish consumption behavior. This finding was obtained by means of the ELM used, where the coefficient of determination ($R^2$) of the behavior reached the value of 0.37. These results suggest that intent plays a significant role in predicting and understanding fish consumption behavior, highlighting its importance as a key determinant in that specific context (Ajzen, 2020; Nunes et al., 2020, Aboelmaged, 2021). Finally, it is emphasized that public and private agents must create strategies to raise awareness of the nutritional and protein benefits that the consumption of fish can bring to society. In this sense, it is important to highlight the consumption of small fish species as a source of calcium, iron and zinc (Nölle et al., 2020).

5 FINAL CONSIDERATIONS

The main scope of this study was to investigate the elements that influence the inclination to adopt the consumption of fish in food. To this end, a theoretical review of fish consumption was carried out, complemented by the planned behavior theory, followed by a data analysis using structural equation modeling. Classified as an exploratory study of quantitative approach, this research sought to clarify existing gaps and deepen issues related to the determinants of fish consumption in the national context.

The ESM of the reworked model indicated that the attitude emerged as the most robust predictor of intent to consume fish. Competencies and perceived behavioral control also showed positive influence on intention, statistically corroborating themselves. The intention, in turn, positively influenced the behavior of fish consumption. In this way, hypotheses H1, H3 and H5 were statistically corroborated, signaling that, in addition to intention, other external factors can modulate the monthly consumption of fish.

The results achieved so far have made a number of academic contributions. Initially, the understanding about the determinants of fish consumption behavior was increased, contributing...
to the closing of gaps in the research of the elements influencing fish consumption in the national context. In the background, empirical support was given to the impacts of attitudes, skills and intention as behavioral precursors of the insertion of fish consumption in food.

At the same time, this study outlines practical contributions by analyzing consumer behavior in relation to fish consumption, linking it to environmental, social and sustainability issues. The data obtained emerge as relevant estimates for producer agents, traders and government entities to be able to draw up strategies directed towards the production and consumption of fishery products, subsidizing the increase in supply in needy regions. In addition, promotional strategies that stimulate the consumption and sustainable production of fish are measures that can encourage the preference for this category of protein, recognized for its benefits to human health.

With regard to limitations, it should be noted that external factors also influence the behavioral propensity to include fish consumption in food. For future research, it is suggested to incorporate variables such as accessibility and beliefs. Furthermore, it is crucial that the research be extended to other regions of the country to confer a greater generalization to the results obtained.

REFERENCES


Determinant Factors in Fish Consumption: An Application of The Theory of Planned Behavior


Mitterer-Daltoé, ML, Carrillo, E., Queiroz, MI, Fiszman, S., & Varela, P. (2013). Modelagem de equações estruturais e associação de palavras como ferramentas para melhor


---


