


## Healthiness, appearance, or fashion? The drivers behind the sushi popularity in Italy

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### ABSTRACT

Italy is witnessing an unprecedented success for sushi even if Italian consumers have a historical reluctance towards eating raw fish. It is important to understand what is behind this major shift in preferences, since it may set an example for the process of adoption of global products and/or diets. To this aim, we investigated which food motives drive sushi consumption (i.e., health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity, and ethical concern), including also individual factors (i.e., social norms, food neophobia, traceability) on a national representative sample of 798 consumers. Data analysis yielded that social norms were the main drivers behind sushi consumption, while sensory appeal, price and neophobia reduced sushi frequency consumption. Traceability was associated with naturalness, and ethical concern, and hindered sushi consumption frequency. These results may pave the way for forthcoming marketing strategies and policies aimed at promoting the consumption of novel, healthy and sustainable food.

### 1. Introduction

Over the past few decades, Italian lifestyles and dietary patterns have changed considerably, causing a rising demand for food diversity (Sassatelli, 2019). Sushi is an example that has gradually been integrated into Italy's gastronomic culture, despite originating far from Mediterranean customs (Hsin-I Feng, 2012). The presence of raw, undercooked or lightly processed fish or shellfish, as common in sushi, can be associated with a risk of parasitic zoonoses such as anisakiasis (Baptista-Fernandes et al., 2017). This fear is reinforced by a common Anisakis-hypersensitivity in coastal areas, where marinated anchovies are popular (Fumarola et al., 2009; Maggi et al., 2000; Mattiucci et al., 2013; Pampiglione et al., 2002; Pozio et al., 2013; Ugenti et al., 2007).

It is a well-documented phenomenon that South European countries, such as Italy, exhibit a strong attachment to food traditions and ancient tastes (Altamore et al., 2020; Malavolta et al., 2022). This attachment is such that traditions are even invented when there is a lack of historical evidence, in order to foster a sense of community identity (Faria & Kang, 2022; Parasecoli, 2019). Therefore, research that deepens the understanding of sushi consumption may benefit from an external validity in

terms of explaining, more in general, how ethnic and global foods are integrated in a national food culture. Then, we may have further insights into trends that shape fish consumption that may foster the adoption of healthier diets.

Sushi arrival in Italy dates to the 70s. Recent data point out about 1000 Japanese restaurants in Italy have been listed on TripAdvisor.it website (Fanelli & Di Nocera, 2018; Novielli et al., 2021). This kind of consumption is not limited to out-of-home consumption, since sales of ready-to-eat sushi in Italy increased by 43% from April to June 2019. Sushi has been so successful that it broke a significant food-related taboo in Italian cuisine regarding the consumption of raw fish, which, prior to sushi, was limited to small seaside regions (Pappalardo et al., 2021). The success of sushi in Italy is partly due to the freshness and reduced number of ingredients (Fanelli & Di Nocera, 2018). In addition, Japanese cuisine benefits from a naturalness halo (Cwierka, 2005; Jang et al., 2009; Wahlqvist & Lee, 2007). The appeal of Japanese culture, with its blend of mystery, tradition, and modernity, stimulated interest in Japanese food among EU consumers (Altintzoglou et al., 2016).

To our knowledge, no studies have explored the introduction of sushi in Italy. Thus, understanding the main drivers of sushi's success helps to

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shed light on how deeply rooted culinary traditions, such as those in Italy can evolve (SERT, 2017; Losasso et al., 2012).

The objectives of this study are to investigate the primary drivers and barriers of sushi consumption in Italy and the role of traceability. We used as a base for investigation the food choice questionnaire (Step toe et al., 1995), then we took into account, food neophobia (Pliner & Hobden, 1992a,b), social norms (Giampietri et al., 2018; Wolstenholme et al., 2021) and traceability.

The remainder of the paper is organized as follows. Section 2 provides an overview of the conceptual framework. Section 3 presents the adopted methodology and the data analysis. Section 4 reports results. Then, Section 5 provides a discussion of the obtained results and lastly, in Section 6 the main conclusions are drawn.

## 2. Theoretical background and conceptual framework

The role of consumers' food motivations in their choices has been extensively studied, with broad consensus on using the Food Choice Questionnaire (FCQ; Step toe et al., 1995), as the primary tool for assessment. This approach has been widely applied in research on specific diets and lifestyles (Forestell et al., 2012; Hasselbach & Roosen, 2015; Konttinen et al., 2013). It is made up of 36 items aggregated into nine factors: health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity, and ethical concern (Januszewska et al., 2011; Step toe et al., 1995). However, to the best of our knowledge, there is no evidence of how these food motives can influence the Italians' sushi perception, and in turn its consumption.

Seafood is generally perceived as *healthy* food and recommended for regular intake, and higher fish consumption is related to consumer beliefs and practices regarding the importance of food for health (Olsen, 2003; Trondsen et al., 2004; Supartini et al., 2018). However, there is significant concern in Italy over raw fish consumption due to the risk of Anisakis, a parasite that can cause serious gastrointestinal issues (Pampiglione et al., 2002; Ugenti et al., 2007). *Price* is crucial in fish consumption, particularly for sushi, as it is widely perceived by sushi consumers to be a high-quality, glamorous, prestigious, and therefore, expensive food (Sakamoto & Allen, 2011). *Sensory cues* are also important for seafood, besides taste, smell and appearance are particularly valuable as they are important cues from which determine a freshness judgement (Antão-Geraldes et al., 2020; Hinkes & Schulze-Ehlers, 2018; Murray et al., 2017; Pihlajamäki et al., 2019). The *mood motive* may be important as it can be perceived as a reward-consumption (Gardner et al., 2014; Naughton et al., 2015). *Naturalness* may also be an important factor, as sushi is processed and its appearance differs from the raw ingredients, which could lead to perceptions of it being unnatural. However, some types of sushi, such as sashimi, are minimally processed, uncooked, and unseasoned, and may therefore be seen as highly natural (Muscolino et al., 2014; Rozin et al., 2012). Moreover, *familiarity* is an element to take into account, as sushi is supposed to not be familiar to most of Italian consumers, due to its recent popularity in Italian context (Borgogno et al., 2015; Delizia & Macfie, 1996). *Convenience* may be an important feature as many consumers avoid fish consumption due to its time and effort-taking preparation, but sushi comes into a ready-to-eat form and may be a solution in this sense (Pulcini et al., 2020). Therefore, our first Research Question (RQ) is:

RQ1: To what extent do food choice motives explain sushi consumption?

Additionally, it is important to consider that sushi is an ethnic food, unfamiliar to Italian culinary traditions, and the fear of unfamiliar foods can discourage its consumption, potentially leading to a decline in diet quality (Jaeger et al., 2017). Individuals with lower neophobia levels tend to engage in more adventurous behaviour, actively seeking novel experiences (Babicz-zielinska, 2006; Rabadán & Bernabéu, 2021), conversely, neophobic consumers are expected to lower raw fish

consumption (Losada-Lopez et al., 2021). Considering that the perception of risky events is influenced by their frequency (Johnson & Tversky, 1983), we can expect further reluctance from this groups of consumers and more concern towards safety (Wang & Huang, 2018). Previous studies demonstrated the role of neophobia in food choice (Jaeger et al., 2021; Kral, 2018; Puleo et al., 2021), especially for ethnic foods as Chinese and Thai Cuisines, Seaweed, non-traditional foods for Koreans (Asperin et al., 2011; Choe & Cho, 2011; Losada-Lopez et al., 2021; Ting et al., 2016). Jaeger et al. (2021) demonstrated positive correlations between neophobia and familiarity, convenience and price, and negative correlations with health, natural content, ethical concerns, and sensory cues. However, no studies have yet explored these connections in the context of sushi consumption. Therefore, we propose the following research question.

RQ2: How does food neophobia influence sushi consumption, and what is its correlation with food choice motives?

We believe that also *social norms* strongly influence consumers' food decisions, especially for out-of-home consumption (Dannenberg et al., 2024). Social norms are thought to provide information about the correctness of an action - "If a lot of people are doing and approving it, it must be right" (Jacobson et al., 2011). They can also provide heuristic cues in decision-making process, and we know that food decisions occur very quickly within seconds and with low cognitive effort (Jacobson et al., 2011). Then, people, in the case of public consumption, may modify their food choices as impression management with cultural expectations, peer influence, and situational context acting as mediators in food choice (Catellani & Carfora, 2023; Vartanian, 2015; Wang & Lalwani, 2019). Literature showed that social norms influence a very broad spectrum of food consumption, such as fruit and vegetable, meat reduction and meat alternatives, healthy snacks (Carfora et al., 2022; Collins et al., 2019; Gonçalves et al., 2021; Huitink et al., 2020; Thomas et al., 2017). Therefore, we investigate the following research question.

RQ3: What role do social norms play in sushi consumption?

Lastly, we investigated the role of traceability in explaining sushi frequency of consumption. As all fish-based food, traceability is fundamental in reassuring consumers about the safety and the quality against the risk of consuming contaminated or stale products (Fung et al., 2018; Rodriguez-Salvador & Dopico, 2020), but it may also be a cue for traditional quality and link with the territory (Foley & Havice, 2016). Seafood is believed to have the highest level of mislabelling (Khaksar et al., 2015; Pappalardo et al., 2021; Pramod et al., 2014) and misdescription that ranges from 31.8% in Northern Italy to 40% in Southern and Central Italy (Pappalardo et al., 2021). This caused an important decline in consumer trust and confidence towards the entire category of marine products (Saidi et al., 2023; Saidi et al., 2022). Previous studies have already demonstrated that traceability may raise consumers' perceptions on sushi (Rodriguez-Salvador & Dopico, 2020; van Rijswijk et al., 2008), and this is more important in the light of the many food scandals that continuously harm sushi reputation, both in restaurants and grocery stores (Khaksar et al., 2015; Lowenstein et al., 2010; Miller et al., 2012, pp. 345-358; Pappalardo et al., 2021; Pramod et al., 2014). The prevention of health risks and reinforcing fish traceability is on the agenda of EU which normed the provision of information regarding the supply chain and the punishment for illegal fishing (AITal, 2012; EUMOFA, 2020). Still, the ongoing series of food scandals caused some aversion towards raw fish, as for sushi (Pennings et al., 2002; Rosenfeld & Tomiyama, 2019; Tilman & Clark, 2014). Seafood products mislabelling poses also various risks, extending beyond health determinants (Triantafyllidis et al., 2010) to impact the industry, environment, and consumer behaviour (Garcia-Vazquez et al., 2011). In addition, mislabelling can lead to economic losses and misshape consumer perceptions, potentially steering them towards less sustainable protein choices

like red meat and chicken (Visciano & Schirone, 2021a). Thus, the environmental consequences of mislabelling, coupled with false claims, present a significant obstacle to the establishment of sustainable fisheries value chains (Fox et al., 2018, pp. 939–963), consumer trust and confidence in the authenticity and traceability of marine products (Saidi et al., 2023). There is a gap in the existing literature concerning the impact of fish traceability on consumer behaviour, particularly with respect to raw fish consumption, as well as the specific information required to make well-informed decisions. Thus, we propose the following research question:

RQ4: How does traceability impact sushi consumption?

### 3. Methodology

#### 3.1. Questionnaire and data collection

The current study is cross-sectional and includes a representative sample of 798 consumers from Italy, selected using a quota sampling method. The survey was designed by the University of Naples Federico II and was pretested and administered online by Demetra, a market research company. Data collection was conducted through an online survey, chosen for its scalability, and ability to reach a geographically diverse sample and providing flexibility for respondents to participate at their convenience. To minimize biases in sampling and responses, a representative sample was selected based on demographic factors, such as age, gender, education, income and location. To ensure diversity and reduce selection bias, we collected 1000 representative responses with no screening out of participants, then a selection has been made when analyzing data. The online survey was anonymous, encouraging honest answers and minimizing social desirability bias. Clear instructions were provided to avoid confusion and response bias. Furthermore, the questions were framed neutrally, randomized where possible, to prevent leading answers. Additionally, the survey was pretested to identify and correct any ambiguities. Ethical requirements were fulfilled and all participants signed an informed consent before beginning the activity.

To measure sushi knowledge among Italian consumers, a single-choice question was constructed with the following options: “I do not know it”; “I know it, but I do not consume it”; “I have tasted it but do not consume it”; “I consume it occasionally”; and “I consume it regularly”. Sushi consumption frequency was assessed using a single choice question with the following options: “Never”; “Once a year”; “Less than once a month”; “Once a month”; “2–3 times a month”; “Once a week”; “2 times a week”; and “More than 2 times a week”. Then, data regarding food choice motives was collected using the Food Choice Questionnaire (Steptoe et al., 1995) (Table A1). Respondents had to indicate their agreement on a 7-point Likert scale, ranging from “Strongly disagree” to “Strongly agree”. Furthermore, consumers’ food neophobia was evaluated using Pliner & Hobden, 1992 scale, each variable was rated with a 7-point Likert scale ranging from “Strongly disagree” to “Strongly agree” (Annex 1).

Regarding traceability, the following definition was provided: “Traceability is the ability to trace and follow a food, feed or animal intended for human consumption through all stages of production, processing, and distribution (Reg. 178/2002); then, respondents were asked to express “How important is it for you to consume traceable fish?” on a 7-point Likert scale (Not important at all–Extremely important) (Nicolae et al., 2016). Lastly, the survey included a variety of sociodemographic variables such as age, income, area of residence, education, work status, presence of children within the household and type of diet.

#### 3.2. Data analysis

To ensure the accuracy of our study, participants were screened to include only those familiar with sushi and who had previously tried it, as our focus is on understanding consumer preferences regarding sushi consumption. Additionally, consumers who identified as vegetarian or

vegan were excluded, as their dietary choices generally exclude sushi containing fish or seafood (Unit et al., 2016). From an initial pool of 1000 participants, 798 were retained after applying these criteria, ensuring that the final sample accurately represents consumers who are both familiar with and likely to consume sushi (Hsin-I Feng, 2012).

Analysis was performed using the STATA software. The collected data was analysed using various statistical methods, including descriptive statistics to provide a comprehensive overview of sushi consumers and their purchasing habits. The Cronbach’s alpha value for each construct was also calculated to assess the reliability of the items included in the questionnaire. Furthermore, we performed one-way ANOVA tests to check for any differences in sushi consumption among different groups. The CFA (Confirmatory Factor Analysis) was then conducted to estimate the factor loading (Brown, 2015), Composite Reliability (CR), and Average Variance Extracted (AVE) for all constructs (Sujati & Akhyar, 2020). The composite reliability of the constructs of the questionnaire was used to examine the reliability of scale items, the factor loadings, and average variance extracted were used to assess the convergent validity of the constructs of the measurement model. We verified our research questions (RQ1–RQ4) by testing the goodness-of-fit of four nested SEM models.

Model 1 examined the extent to which food choice motives explain sushi consumption (RQ1) and included the paths from food choice motives to sushi consumption frequency. While the regression weights of the paths among the other variables were fixed at 0. Model 2 extended Model 1 by adding food neophobia to assess how it influences sushi consumption and its correlation with food choice motives (RQ2). The regression weights of the other paths were fixed to 0. Model 3 built on Model 2 by incorporating social norms to explore their role in sushi consumption, especially by including the paths from social norms to sushi consumption frequency (RQ3). The path from social norms to sushi consumption frequency was added. The regression weights of the paths related to traceability were fixed to 0. Lastly, Model 4 further extends Model 3 by including traceability to identify the impact of fish traceability on consumers’ decision-making regarding sushi consumption and the significant food choice motives to consider when talking about traceability (RQ4).

We assessed the fit of the models using various indicators, including the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Standard Root Mean Squared Residual (SRMR), and Root Mean Square Error of Approximation (RMSEA) (Shi et al., 2019). Then, we compared the nested models with the  $\chi^2$  difference test ( $\Delta\chi^2$ ). We also examined the direct and indirect effects for each of the stipulated models using the p-value for testing the null hypothesis that RMSEA is not greater than 0.05.

The rigorous methodology and the representative sample used for the analysis ensure the validity and reliability of our study, which contributes to shed light on consumer preferences, cultural adaptation, and market trends with regards to sushi consumption.

## 4. Results

### 4.1. Descriptive statistics

Table 1 shows that the sample demonstrates demographic diversity, with a balanced representation across gender, age, area of living, profession, education level, income level, and food orientation.

Summary statistics in Table A1 show that Italians prioritized sensory appeal (5.98), natural content (5.73) and convenience (5.31), followed by mood motives (5.25), price (5.23) and ethical concern (5.12). Familiarity (3.8) and health (4.45) were the least important factors when making food choice. Traceability (5.89) stands out as the second most important factor influencing fish choices, highlighting its significant role in decision-making. Food neophobia (3.27) scored the lowest, thus suggesting its role as a potential barrier to sushi consumption within Italian dietary habits.

**Table 1**  
Sample description, Italy.

Category	Variable	Number of Individuals	Percentage
<b>Gender</b>	Female	399	50.00%
	Male	399	50.00%
<b>Age</b>	18–29	130	16.29%
	30–44	219	27.44%
	45–54	200	25.06%
	55–70	249	31.20%
<b>Education Level</b>	Secondary school diploma	85	10.65%
	High school diploma	427	53.51%
	Bachelor's degree	239	29.95%
<b>Job</b>	Master and Ph.D.	47	5.89%
	Freelancer	86	10.78%
	Employee	320	40.10%
	Worker	85	10.65%
	None	159	19.92%
	Student	63	7.89%
	Others	99	10.65%
<b>Income</b>	<20,000€	217	27.19%
	20,000–39,999€	319	39.97%
	40,000–59,999€	100	12.53%
	60,000–100,000€	33	4.14%
	>100,000€	10	1.25%
	Prefer to not respond	119	14.91%
<b>Area of Living</b>	Seaside city	179	21.35%
	Near the seaside	178	21.15%
	Internal area	399	51.56%
	Mountain area	42	5.94%
	No	173	21.68%
<b>Type of Diet</b>	Yes	625	78.32%
	Omnivore	682	85.46%
	Flexitarian	40	5.01%
	Pescatarian	52	6.52%
	Others (specific food allergies)	24	3.01%
<b>Total</b>		798	100.00%

## 4.2. Structural equation models

### 4.2.1. Measurement model

Bartlett's test for sphericity and the Kaiser-Meyer-Olkin (KMO) were initially performed to measure the sampling adequacy. The results show that a rejection of the null hypothesis for Bartlett's test of sphericity ( $p = 0.000$ ,  $p \leq 0.001$ ) and overall high KMO (0.83) indicates that the factor analysis of the variables is suitable. Significant factor loadings ( $p \leq 0.01$ ) were observed for all constructs including ethical concern, familiarity, price, natural content, convenience, sensory appeal, health, weight, mood motive, food neophobia, and social norms items (Contini et al., 2018; M. C. Johnson & Guilford, 1956; Konuk, 2019).

The factor loadings ranged from 0.52 to 0.81, surpassing the threshold value of 0.50. All items were included for result interpretation.

Cronbach's alpha values for ethical concern, familiarity, price, natural content, convenience, sensory appeal, health, weight, mood motive, neophobia, and social norms ranged from 0.64 to 0.88, indicating strong internal consistency and reliability of the questionnaire items (Agbo, 2010; Fornell & Larcker, 1981). Composite reliability for health, mood motive, sensory appeal, natural content, price, weight, convenience, neophobia, and social norms ranged from 0.75 to 0.96, exceeding the recommended minimum cut-off value of 0.70 (Bacon et al., 1995). However, ethical concern and familiarity scored lower than the recommended minimum cut-off. Cronbach's alpha and composite reliability values obtained for different constructs revealed good internal consistency and reliability of scale items of the questionnaire. The average variance extracted (AVE) for mood motive, sensory appeal, natural content, social norms, weight, and convenience ranged from 0.50 to 0.62, exceeding the minimum acceptable cut-off value of 0.50. However, the AVE for health, ethical concern, familiarity, and neophobia was lower than 0.50. Nonetheless, the composite reliability was higher than 0.60, validating the internal consistency and reliability of

the scale items (Fornell, 1979).

In summary, the factor loadings and AVE values for different constructs and items demonstrated the convergent validity of the model's constructs.

### 4.2.2. Comparison of nested models

The first structural model developed to demonstrate the extent of the relationship between the general food choice motives and sushi consumption frequency in Italy had a bad fit with an RMSEA value of 0.19 ( $p \geq 0.05$ ), an SRMR value of 0.099, and CFI and TLI values of 0.02 and  $-0.60$ , respectively, falling within the unacceptable range. Food choice motives, on their own, can not explain sushi consumption in Italy. Model 2 added to Model 1 neophobia to general food choice motives. The comparison between Model 1 and Model 2 supported the addition of food neophobia,  $\Delta\chi^2(1) = 61.51$ ,  $p = 0.001$ . We noticed improvements in the model fit with an RMSEA value of 0.18 ( $p \geq 0.05$ ), an SRMR value of 0.09, and CFI and TLI values of 0.17 and  $-0.46$ . Model 3 added social norms to Model 2. The comparison between Model 2 and Model 3 supported the addition of social norms,  $\Delta\chi^2(1) = 79.59$ ,  $p = 0.001$ . We noticed improvements in the model fit with an RMSEA value of 0.16 ( $p \geq 0.05$ ), an SRMR value of 0.09, and CFI and TLI values of 0.36 and  $-0.22$ . Model 4 added to Model 3 traceability. The comparison between Model 3 and Model 4 supported the addition of social norms,  $\Delta\chi^2(10) = 268.92$ ,  $p = 0.001$ . When adding traceability, all model fit indices did fall within the acceptable range with an RMSEA value of 0.18 ( $p = 0.000$ ,  $p \geq 0.05$ ), an SRMR value of 0.003, and CFI and TLI values of 0.98 and 0.95. Table 2 summarizes the findings of the 4 nested models.

### 4.2.3. Model 4: Sushi consumption drivers and role of traceability

Model 4 explained the extent of the relationship between the general food choice motives, neophobia, social norms, traceability and sushi consumption frequency.

All insignificant impacts, in Fig. 1, were eliminated to have a clear representation of the model.

Health ( $\beta = -0.03$ , S.E. = 0.09,  $p \geq 0.05$ ), familiarity ( $\beta = 0.01$ , S.E. = 0.08,  $p \geq 0.05$ ), convenience ( $\beta = -0.03$ , S.E. = 0.06,  $p \geq 0.05$ ), mood ( $\beta = 0.06$ , S.E. = 0.06,  $p \geq 0.05$ ), natural content ( $\beta = -0.04$ , S.E. = 0.06,  $p \geq 0.05$ ), ethical concern ( $\beta = 0.03$ , S.E. = 0.06,  $p \geq 0.05$ ), weight ( $\beta = 0.05$ , S.E. = 0.05,  $p \geq 0.05$ ) had no significant impact on sushi consumption frequency. While sensory appeal ( $\beta = -0.15$ , S.E. = 0.07,  $p \leq 0.05$ ) and price ( $\beta = -0.10$ , S.E. = 0.03,  $p \leq 0.05$ ) had a significant negative impact on sushi consumption frequency. In addition, social norms ( $\beta = 0.35$ , S.E. = 0.03,  $p \leq 0.001$ ) positively influenced sushi consumption frequency. Conversely, neophobia ( $\beta = -0.36$ , S.E. = 0.05,  $p \leq 0.001$ ) negatively impacted sushi consumption frequency.

The correlations analysis between food neophobia and FCQ factors showed no significance between neophobia and convenience ( $\beta = 0.02$ , S.E. = 0.04,  $p \geq 0.05$ ), price ( $\beta = 0.06$ , S.E. = 0.04,  $p \geq 0.05$ ), weight control ( $\beta = 0.04$ , S.E. = 0.04,  $p \geq 0.05$ ) and ethical concern ( $\beta = 0.01$ , S.E. = 0.04,  $p \geq 0.05$ ). While significant negative correlations were identified between neophobia and health ( $\beta = -0.08$ , S.E. = 0.03,  $p \leq 0.01$ ), mood ( $\beta = -0.09$ , S.E. = 0.04,  $p \leq 0.001$ ), sensory appeal ( $\beta = -0.16$ , S.E. = 0.03,  $p \leq 0.001$ ), and natural content ( $\beta = -0.13$ , S.E. = 0.04,  $p \leq 0.001$ ), indicating the inverse relationship between neophobia and these variables. Conversely, a positive correlation was identified between neophobia and familiarity ( $\beta = 0.14$ , S.E. = 0.02,  $p \leq 0.001$ ).

Ethical concern ( $\beta = 0.31$ , S.E. = 0.04,  $p \leq 0.001$ ), natural content ( $\beta = 0.16$ , S.E. = 0.04,  $p \leq 0.001$ ), price ( $\beta = -0.14$ , S.E. = 0.03,  $p \leq 0.001$ ), and sensory appeal ( $\beta = 0.11$ , S.E. = 0.04,  $p \leq 0.05$ ) were found to have a significant effect on traceability. While health ( $\beta = 0.10$ , S.E. = 0.06,  $p \geq 0.05$ ), convenience ( $\beta = -0.005$ , S.E. = 0.04,  $p \geq 0.05$ ), mood ( $\beta = 0.07$ , S.E. = 0.04,  $p \geq 0.05$ ), familiarity ( $\beta = -0.01$ , S.E. = 0.05,  $p \geq 0.05$ ), and weight ( $\beta = -0.05$ , S.E. = 0.03,  $p \geq 0.05$ ) had no significant effect on traceability.

Most importantly, traceability ( $\beta = -0.19$ , S.E. = 0.05,  $p \leq 0.001$ ) was found to have a significant impact on sushi consumption frequency,

**Table 2**

The goodness of fit and standardised coefficients for each nested model. code: \*\*\* =  $p < 0.001$ , \*\* =  $p < 0.01$ , \* =  $p < 0.05$ , † =  $p < 0.1$ .

Statistic/Path	Model 1 (Only food choice motives)	Model 2 (Model 1 plus food neophobia)	Model 3 (Model 2 plus social norms)	Model 4 (Model 3 plus traceability)
<b>Model Fit Statistics</b>				
$\chi^2$ (df)	410.808 (429.088)	349.294 (429.088)	269.702 (429.088)	157.782 (429.088)
RMSEA	0.188	0.18	0.164	0.035
CFI	0.02	0.172	0.365	0.98
TLI	-0.605	-0.465	-0.216	0.95
SRMR	0.099	0.094	0.09	0.035
<b>Path Coefficients</b>				
Convenience → Traceability	Fixed to 0	Fixed to 0	Fixed to 0	-0.05
Convenience → Sushi consumption frequency	-0.04	-0.03	-0.03	-0.03
Mood → Traceability	Fixed to 0	Fixed to 0	Fixed to 0	0.07
Mood → Sushi consumption frequency	0.15*	0.06	0.05	0.06
Ethical concern → Traceability	Fixed to 0	Fixed to 0	Fixed to 0	0.3
Ethical concern → Sushi consumption frequency	-0.04	0.01	-0.02	0.03
Health → Traceability	Fixed to 0	Fixed to 0	Fixed to 0	0.1
Health → Sushi consumption frequency	0.03	-0.01	-0.05	-0.03
Natural content → Traceability	Fixed to 0	Fixed to 0	Fixed to 0	0.16***
Natural content → Sushi consumption frequency	-0.11	-0.15*	-0.07	-0.04
Familiarity → Traceability	Fixed to 0	Fixed to 0	Fixed to 0	-0.01
Familiarity → Sushi consumption frequency	-0.10	0.09	0.01	0.01
Price → Traceability	Fixed to 0	Fixed to 0	Fixed to 0	-0.14***
Price → Sushi consumption frequency	-0.10*	-0.08	-0.07	-0.10**
Sensory appeal → Traceability	Fixed to 0	Fixed to 0	Fixed to 0	0.11**
Sensory appeal → Sushi consumption frequency	-0.04	-0.13	-0.17**	-0.15**
Weight control → Traceability	Fixed to 0	Fixed to 0	Fixed to 0	-0.05
Weight control → Sushi consumption frequency	0.07	0.11*	0.06	0.05
Neophobia → Sushi consumption frequency	Fixed to 0	-0.44***	-0.36***	-0.36
Social norms → Sushi	Fixed to 0	Fixed to 0	0.35***	0.35

**Table 2 (continued)**

Statistic/Path	Model 1 (Only food choice motives)	Model 2 (Model 1 plus food neophobia)	Model 3 (Model 2 plus social norms)	Model 4 (Model 3 plus traceability)
consumption frequency				
Traceability → Sushi consumption frequency	Fixed to 0	Fixed to 0	Fixed to 0	-0.19***
<b>Correlations with Neophobia</b>				
Convenience	Fixed to 0	0.02	0.03	0.02
Mood	Fixed to 0	-0.09**	-0.09**	-0.09**
Health	Fixed to 0	-0.02**	-0.02**	-0.08**
Sensory appeal	Fixed to 0	-0.16***	-0.16***	-0.16***
Ethical concern	Fixed to 0	0.01	0.02	0.01
Natural content	Fixed to 0	-0.13***	-0.13***	-0.13***
Familiarity	Fixed to 0	0.15***	0.15***	0.15***
Price	Fixed to 0	0.06	0.06	0.06
Weight control	Fixed to 0	0.04	0.04	0.04

suggesting that as awareness of seafood traceability measures increases, Italians tend to consume sushi less frequently.

**5. Discussion**

The current study attempts to unveil the main drivers behind sushi consumption and the role of traceability in defining consumers dietary habits among Italian consumers. The main findings reveal that sensory appeal, price, social norms, and neophobia define sushi consumption patterns among Italians. Additionally, traceability is a key factor, influenced by health claims, natural content, price, and ethical concerns.

Despite sushi being perceived as a "healthy food", our findings indicate that health-related motives are not the primary drivers of its consumption frequency among Italian consumers. Certainly, the heterogeneous nature of sushi can introduce nutritional values that may, in fact, conflict with weight control objectives (Hsin-I Feng, 2012). Furthermore, the spread of "all-you-can-eat" restaurants (Mela, 2001), may drive excessive consumption. Hence, sushi cannot be generalised as a diet-friendly food. Besides, respondents who favour good-looking, nice-smelling, good-textured, and tasty food, eat less sushi compared to others. Previous scholars demonstrated how the sensory experience of eating is multifaceted and has a functional role to play in energy intake regulation, beyond simply guiding food choice and hedonic value (Januszewska et al., 2011; Jáuregui-Lobera & Bolaños Ríos, 2011). Specifically, each component of consumers' sensory experience drives the behavioural responses to food in a number of distinct but certainly overlapping ways (Mccrickerd & Forde, 2016). As a result, consumers who look for meals that provide them with a positive sensory experience do not expect it in sushi, and other elements, mostly extrinsic, seem to play a major role.

Despite fish being commonly perceived as a natural food, sushi, in contrast, is not perceived as such. This divergence may be attributed to its ethnic characteristics, rendering consumers less familiar with its processing and preparation methods (Nygård & Storstad, 1998). Similarly, the motivations driving Italians to consume sushi are notably tethered to perceptions of either luxury or affordability. Even though previous studies demonstrated the impact of price on fish choices and fish-based products (Carlucci et al., 2015; Saidi et al., 2022, 2023), consumers, in this context, did not demonstrate price sensitivity.

The allure of sushi as a trendy food choice appears to wield more significant influence. This preference could stem from lingering concerns about health risks of raw fish. Thus, the cultural perception of sushi as a fashionable and sophisticated culinary option seems to overshadow its health-related attributes in shaping consumption patterns. These findings align with recent studies investigating the influence of trends and the introduction of new food products as potential strategies

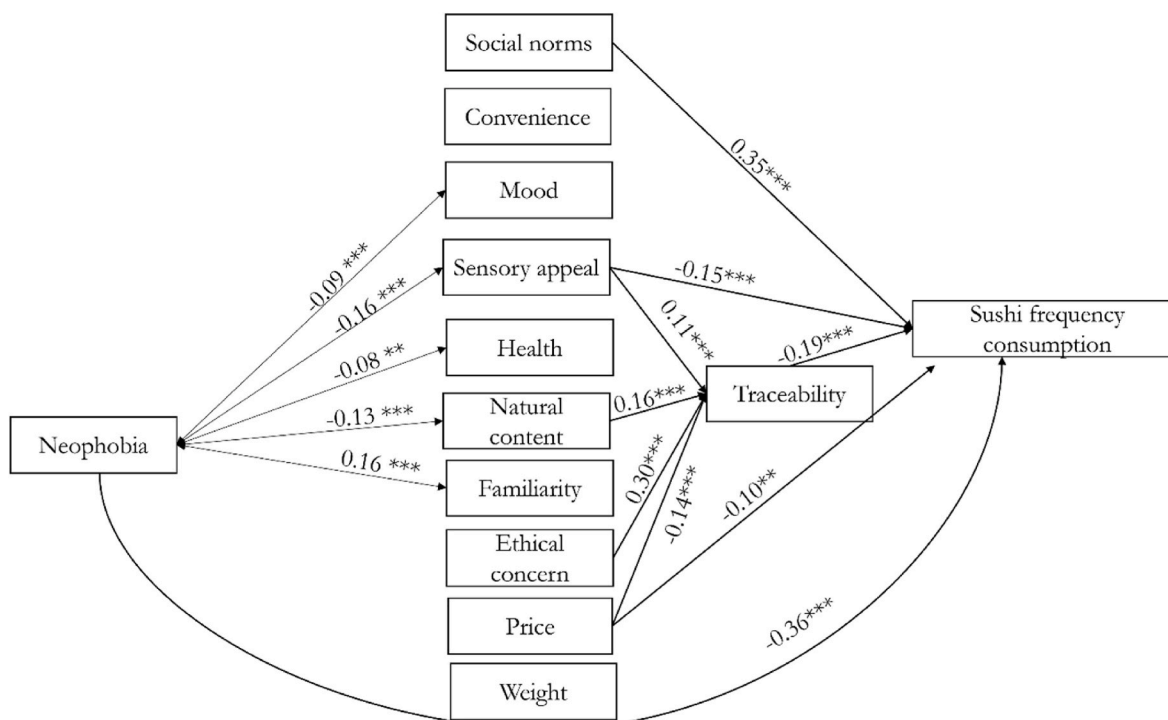


Fig. 1. Model 4 results. code: \*\*\* =  $p < 0.001$ , \*\* =  $p < 0.01$ , \* =  $p < 0.05$ , † =  $p < 0.1$ .

to address future food security concerns (Santeramo et al., 2018; Visciano & Schirone, 2021b). Like plant-based alternatives (Alcorta et al., 2021; Schiano et al., 2020), that have gained traction in response to environmental and ethical considerations, the popularity of sushi often derives from trendy appeal rather than its health benefits, thus reflecting a societal shift favouring culinary exploration, and gastronomic diversity (Marra-Alvarez & Way, 2023; Alcorta et al., 2021; Schiano et al., 2020). Consequently, the food landscape is witnessing a paradigm where the appeal of a particular dish, driven by cultural and lifestyle trends, can outweigh traditional health considerations in shaping dietary preferences (Gavrieli et al., 2022).

Results also reveal a correlation between neophobia and food choice motives. Significant correlations exist with neophobia, sensory appeal, health, natural content, and familiarity, in line with a previous study by Jaeger et al. (2021). Instead, neophobia was negatively correlated with mood motives and was not correlated to convenience. This supports the idea that sushi consumption in Italy is driven more by social pressure than other motives. Neophobia also indicates a negative correlation with sensory appeal, potentially influenced by: i) physiological motive, where sensitivity to familiar foods tends to be lower compared to less familiar options like sushi (Dovey et al., 2012), ii) sensory education role in reducing neophobia levels (Rabadán & Bernabéu, 2021). The significant positive correlation between neophobia and familiarity validates the proposed model, supported by the conceptual proximity of these variables as demonstrated by Aldridge et al. (2009) and Raudenbush and Frank (1999). Unlike novel foods as insects, micro-algae, edible jellyfish, and cultured meat (Siddiqui et al., 2022), the fear of consuming raw fish in sushi potentially has some positive outcomes: i) reduced over-exploitation of commonly used fish species and supporting faster regeneration of fish stocks through more sustainable fishing practices (Smith et al., 2017), ii) informed consumer choices: those who choose to eat sushi despite neophobic tendencies may do so more consciously, less influenced by trends, and more informed about their food choices, making them less susceptible to marketing hype (Siegrist et al., 2013), iii) safety consciousness: neophobia might encourage consumers to prioritize trustworthy and traceable sushi options, promoting safety and reliability in sushi consumption practices (Huang et al., 2019), and iv)

health considerations: neophobic consumers may prioritize health when selecting sushi, opting for familiar varieties they perceive as healthier, which can contribute to more health-conscious eating habits (Gutiérrez et al., 2016, pp. 583–588).

Results highlight the significant role of social influence in shaping individuals' food patterns and underscores the need for further research on the contextual factors that impact consumption behaviour (Cruwys et al., 2015). Dietary behaviours have been reported to be related to perceptions of normative behaviour within peer groups (Ball et al., 2010; Lally et al., 2011; Louis et al., 2007) and food intake can be predicted by the eating behaviour of socially connected peers (de la Haye et al., 2010; Pachucki et al., 2011). Thus, promoting sushi consumption as a socially desirable and environmentally conscious choice could encourage adoption through peer influence.

Results also show that Italians prefer naturally and ethically sourced food in line with previous studies (Saidi et al., 2023), making traceability a marker of food safety and authenticity (Delpiani et al., 2020; Pappalardo et al., 2021; Menozzi et al., 2015). Still, Italians' willingness to pay for traceable fish is hindered by the price (Geri, 2021). This can have serious implications: i) lower quality standards where producers may prioritize cost cutting measures over quality and ethical sourcing, leading to less transparency in supply chains and compromising food safety and environmental standards (Risius et al., 2017; Visciano & Schirone, 2021), and ii) lack of traceability can cause health risks, as it becomes harder to trace back the origin of foodborne illnesses or contaminants (Kris-Etherton et al., 2002; Paiva et al., 2012). Despite sushi trendiness, Italians still have reservations about consuming raw fish, reflecting their historical apprehensions. For Italians, fish traceability means ensuring ethical sourcing, naturalness, and reduced health risks, though these concerns are often outweighed by price considerations.

Marketers can use these findings to better target their strategies, as shown by a recent study where the combination of messages on environmental awareness and skills, including those related to identifying traceability, led to the most significant and lasting improvements in attitudes, perceived control, and sustainable seafood purchasing behaviour (Carfora & Catellani, 2024). Emphasizing traceability, ethical sourcing, and naturalness in marketing could shift sushi's perception

from an all-you-can-eat option to a luxurious, sustainable dining experience, appealing to conscious consumers.

Other practical results of this study may be reflected in enhancing the possibilities for valorizing Italian high-quality fish products in the market, in the specificity of sushi form. These products may benefit from communication and storytelling based on their freshness, superior taste and appealing visual presentation. Furthermore, their health benefits ethical certifications and traceability may strengthen consumers' trust and preference. An emphasis on familiar ingredients may also help to include neophobic consumers in the target market. The value proposition of these products lies in their intrinsic quality and premium attributes, so low prices are not needed, and this may help producers' revenues. The effect of social norms, highlighted by this study, suggests that communication strategies should incorporate shared values, community and celebrity endorsements, and aspirational behaviours.

Our findings are not free of limitations. SEM can be sensitive to model misspecification, where the underlying assumptions of the model do not match the data. In addition, identifying the parameters of the SEM may be challenging when there is a lack of variation in the observed variables or when the model is too complex. SEM can only infer causality but cannot prove it. It is important to keep in mind that correlation does not always imply causation. Furthermore, SEMs require careful consideration of model selection, and often involve a trade-off between model fit and parsimony. Thus, it can be difficult to determine which model is the best fit for the data. Most importantly, SEMs can be difficult to interpret, particularly when the results are not consistent with prior theory or research. Our results only concern Italian consumers and may not be transferable to other geographical contexts, as cultural differences and dietary habits may play a role in shaping consumer decision choices for sushi. Future research needs to be undertaken in several directions.

To address one of the core limitations of the current study, it would be worth analysing the main drives for sushi and the role traceability plays in consumer's decision-making choices in other countries. In addition, alternative modelling techniques such as multiple group SEM or latent curve analysis can be used to address identification issues (Bayard & Jolly, 2007; Meredith & Tisak, 1990), longitudinal studies, to track preference and behaviour over time (Oud, 2001), or also improve the validity of SEM through multiple data sources or methods to test the same hypothesis (Schuberth & Cantaluppi, 2017). The influence of social norms also suggests that more objective knowledge may be achieved in an experimental field study, allowing for the assessment of external validity and the potential for uncovering social desirability factors that may influence the outcomes observed in hypothetical studies (Caracciolo et al., 2020).

## 6. Conclusions

Japanese cuisine, as an ethnic cuisine, is distinct and typically recognized as originating outside the local culture. Its successful establishment results from the interplay between supply-side and demand-side factors, with social norms and food neophobia identified as key drivers of sushi consumption in Italy. For Italian consumers, sushi is viewed as fashionable and trendy, unlike seafood, where health benefits play a key role in decision-making. Many choose sushi to fit in socially, though a significant portion still finds it unfamiliar or 'strange.' There's also growing demand for high-quality, safe, and environmentally friendly products with transparent traceability. The absence of traceability reduces consumption frequency, emphasizing the need for better consumer education on the origins of fish and the value chain to address concerns about raw fish in sushi.

Producers, marketers, and policymakers must prioritize naturalness, ethical sourcing of raw materials, health, and pricing, as these factors have emerged as central to consumer decision-making, outweighing concerns about fish origin and production methods. A strategic focus on these areas may be essential to avoid consumer confusion and align with their primary considerations. This can be supported by adopting new technologies, such as blockchain, which can bring together stakeholders to ensure food safety by providing a transparent and immutable history of transactions.

## CRedit authorship contribution statement

**Carla Cavallo:** Writing – review & editing, Writing – original draft, Validation, Methodology, Formal analysis, Conceptualization. **Ahmed Saidi:** Writing – original draft, Software, Methodology, Investigation, Formal analysis, validation. **Gianni Cicia:** Writing – review & editing, Validation, Supervision, Project administration, Formal analysis. **Rossella Di Monaco:** Writing – review & editing, Validation, Funding acquisition. **Teresa Del Giudice:** Writing – review & editing, Validation, Supervision, Formal analysis. **Valentina Carfora:** Writing – review & editing, Validation, Supervision, Methodology, Formal analysis, Conceptualization.

## Ethical statement

The study planned and executed by Carla Cavallo, Ahmed Saidi, Gianni Cicia, Rossella Di Monaco, Teresa Del Giudice and Valentina Carfora on the *Healthiness, appearance, or fashion? The drivers behind the sushi popularity in Italy: evidence from a national sample survey*, conducted under the scientific responsibility of Dr. Ahmed Saidi of the University of Naples Federico II, received a formal ethical approval by the Independent Ethical Committee of Demetra [Opinioni.net](https://www.opinioni.net) srl on the June 16, 2021.

The ethical review and approval were granted for this research due to the full compliance of the study with the principles stated in the Declaration of Helsinki and the avoidance of any form of risk or actual and potential harm (physical or psychological) to participants.

In particular, the collected data will be completely anonymous with no personal information being collected, the data will not be sensitive or confidential in nature, the issues being researched are not likely to upset or disturb participants, and there is no risk of possible disclosures or reporting obligations. Participants will provide an informed consent to take part in the research at the beginning of the survey and will be free to leave the survey at any time. Data protection guidelines will be followed by both Opinioni and the University of Naples Federico II; including the anonymization, storage and back-up of research data.

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## Declaration of competing interest

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

## Annexes.

## Annex 1

Table A1

Items description, Mean score, factor loading, Cronbach's alpha( $\alpha$ ), composite reliability (CR), and average variance extracted (AVE) of the food choice questionnaire, social norms, traceability, and sushi consumption frequency.

Construct/Code/Item Description	Mean Score $\pm$ SD	Factor Loading	p Value	Bibliographic Reference(s)
<b>Food Choice Questionnaire</b>				
<b>Dimension 1: Health</b>	Mean Score: 4.45 $\pm$ 0.96, Cronbach's alpha: 0.84, CR: 0.84, AVE: 0.46			Step toe et al. (1995)
Health_1, Contains a lot of vitamins and minerals	5.58 $\pm$ 1.23	0.76	***	
Health_2, Keeps me healthy	4.94 $\pm$ 1.16	0.68	***	
Health_3, Is nutritious	5.82 $\pm$ 0.99	0.69	***	
Health_4, Is high in protein	5.06 $\pm$ 1.29	0.62	***	
Health_5, Is good for my skin/teeth/hair/nails	5.22 $\pm$ 1.45	0.64	***	
Health_6, Is high in fibre and roughage	5.04 $\pm$ 1.40	0.67	***	
<b>Dimension 2: Mood</b>	Mean Score: 5.25 $\pm$ 1.1, Cronbach's alpha: 0.87, CR: 0.87, AVE: 0.53			
Mood_1, Helps me cope with stress	5.04 $\pm$ 1.47	0.78	***	
Mood_2, Helps me to cope with life	5.11 $\pm$ 1.44	0.78	***	
Mood_3, Helps me relax	5.04 $\pm$ 1.47	0.76	***	
Mood_4, Keeps me awake/alert	5.14 $\pm$ 1.43	0.69	***	
Mood_5, Cheers me up	5.22 $\pm$ 1.40	0.77	***	
Mood_6, Makes me feel good	5.93 $\pm$ 1.19	0.56	***	
<b>Dimension 3: Sensory Appeal (Senso)</b>	Mean Score: 5.98 $\pm$ 0.93, Cronbach's alpha: 0.83, CR: 0.82, AVE: 0.53			
Sens_1, Smells nice	6.08 $\pm$ 1.09	0.75	***	
Sens_2, Looks nice	5.69 $\pm$ 1.25	0.68	***	
Sens_3, Has a pleasant texture	5.90 $\pm$ 1.14	0.73	***	
Sens_4, Tastes good	6.25 $\pm$ 1.08	0.74	***	
<b>Dimension 4: Natural Content (Natur)</b>	Mean Score: 5.73 $\pm$ 1.16, Cronbach's alpha: 0.82, CR: 0.79, AVE: 0.56			
Natur_1, Contains no additives	5.72 $\pm$ 1.39	0.75	***	
Natur_2, Contains natural ingredients	5.81 $\pm$ 1.24	0.69	***	
Natur_3, Contains no artificial ingredients	5.65 $\pm$ 1.4	0.81	***	
<b>Dimension 5: Price (Pric)</b>	Mean Score: 5.23 $\pm$ 1.18, Cronbach's alpha: 0.77, CR: 0.75, AVE: 0.5			
Price_1, Is not expensive	5.05 $\pm$ 1.47	0.8	***	
Price_2, Is cheap	4.78 $\pm$ 1.53	0.73	***	
Price_3, Is good value for money	5.84 $\pm$ 1.24	0.56	***	
<b>Dimension 6: Ethical Concern (Ethic)</b>	Mean Score: 5.12 $\pm$ 1.15, Cronbach's alpha: 0.64, CR: 0.6, AVE: 0.33			
Ethic_1, Comes from countries I approve of politically	4.44 $\pm$ 1.75	0.523	***	
Ethic_2, Has the country of origin clearly marked	5.6 $\pm$ 1.35	0.593	***	
Ethic_3, Is packaged in an environmentally friendly way	5.29 $\pm$ 1.38	0.609	***	
<b>Dimension 7: Convenience (Convi)</b>	Mean Score: 5.31 $\pm$ 1.10, Cronbach's alpha: 0.83, CR: 0.91, AVE: 0.62			
Conv_1, Is easy to prepare	5.28 $\pm$ 1.48	0.82	***	
Conv_2, Can be cooked simply	5.41 $\pm$ 1.39	0.8	***	
Conv_3, Takes no time	4.99 $\pm$ 1.54	0.74	***	
Conv_4, Can be bought in shops that are close	5.33 $\pm$ 1.43	0.55	***	
Conv_5, Is easily available	5.56 $\pm$ 1.32	0.58	***	
<b>Dimension 8: Weight</b>	Mean Score: 5.31 $\pm$ 1.10, Cronbach's alpha: 0.85, CR: 0.82, AVE: 0.61			
Weight_1, Is low in calories	4.87 $\pm$ 1.52	0.78	***	
Weight_2, Controls my weight	5.21 $\pm$ 1.52	0.78	***	
Weight_3, Is low in fat	5.26 $\pm$ 1.44	0.78	***	
<b>Dimension 9: Familiarity (Familia)</b>	Mean Score: 3.80 $\pm$ 0.76, Cronbach's alpha: 0.69, CR: 0.65, AVE: 0.38			
Familia_1, Is what I usually eat	5.11 $\pm$ 1.43	0.63	***	
Familia_2, Is familiar	4.91 $\pm$ 1.45	0.67	***	
Familia_3, Is like the food I ate when I was a child	4.45 $\pm$ 1.61	0.55	***	
<b>Social Norms (Norms)</b>	Mean Score: 4.51 $\pm$ 1.34, Cronbach's alpha: 0.85, CR: 0.84, AVE: 0.57			(Giampietri et al., 2018; Wolstenholme et al., 2021)
Norms_1, Most of the people I know (family, friends ...) would approve if I eat sushi	4.92 $\pm$ 1.55	0.73	***	
Norms_2, Most of the people I know (family, friends ...) would like me to eat sushi	4.09 $\pm$ 1.67	0.76	***	
Norms_3, Most of the people I know (family, friends ...) eat sushi	4.61 $\pm$ 1.69	0.73	***	
Norms_4, Most of the people I know (family, friends ...) think it's OK to eat sushi	4.42 $\pm$ 1.50	0.8	***	

(continued on next page)

Table A1 (continued)

Construct/Code/Item Description	Mean Score ± SD	Factor Loading	p Value	Bibliographic Reference(s)
<b>Neophobia (Neo)</b>	Mean Score: 3.27 ± 1.02, Cronbach's alpha: 0.88, CR: 0.96, AVE: 0.43			(Pliner & Hobden, 1992)
Neo_1, I am constantly trying new and different foods	3.41 ± 1.65	0.65	***	
Neo_2, When choosing food, I don't trust novelties	3.22 ± 1.77	0.63	***	
Neo_3, If I don't know a food, I don't try it	3.15 ± 1.89	0.69	***	
Neo_4, I like food from different countries	2.89 ± 1.64	0.77	***	
Neo_5, Ethnic food seems too strange for me to eat	3.16 ± 1.85	0.71	***	
Neo_6, At dinners with friends, I like to try new foods	2.75 ± 1.61	0.73	***	
Neo_7, I am afraid to eat food that I have never tasted before	3.26 ± 1.86	0.72	***	
Neo_8, I am picky about the food I eat	3.53 ± 2.00	0.57	***	
Neo_9, I generally eat almost everything	2.66 ± 1.66	0.55	***	
Neo_10, I like to try new ethnic restaurants	4.70 ± 1.77	0.39	***	
<b>Traceability:</b> How important is it for you to consume traceable fish?	5.89 ± 1.20			(Loureiro & Umberger, 2007; Menozzi et al., 2015; Nicolae et al., 2016)

## Data availability

Data will be made available on request.

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