



Determination of Factors Affecting Fish Consumption Behaviors in Edirne Central and Districts

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Abstract

The study aims to obtain a more profound knowledge about fish consumption preferences and patterns in Edirne center and districts, as well as determine the underlying dynamics. Factor analysis was used to determine the factors affecting consumers' fish consumption, and the relationships between these factors and socio-economic and demographic variables were examined. According to the study results, 99.7% of the participants consume fish, and their annual average fish consumption is 7.9 kg. This rate is high compared to the Turkish average and very low compared to the world average. Fish consumption occurs a few times a month (29.9%). Factor analysis revealed four factors affecting fish consumption: consumption tendency, negative perception, nutritional value perception, and conscious choice effect. These factors significantly influence consumers' fish consumption habits. The study revealed that women's perception of fish consumption is more negative than men's, and low-income groups attach more importance to the nutritional value of fish. It was also determined that consumers make more conscious choices about fish consumption as their age and education level increase. The results show that regional differences and socio-economic factors affect fish consumption. Cultural awareness, education, and conscious consumption incentives were suggested to increase consumers' fish consumption. It was also stated that local fish species should be promoted, and healthier and more sustainable practices should be established in fish consumption.

Keywords Edirne · Exploratory factor analysis · Confirmatory factor analysis · Fish consumption behaviors · Turkey

Introduction

Regarding nutrients, seafood, especially fish, is a rich source of nutrients (Nunes et al. 2006). Generally, one or two portions of fish per week are recommended (Balık et al. 2013; Leek et al. 2000). Fish meat is a good source of nutrients rich in high-quality protein, low-saturated fatty acids, and many micronutrients (such as selenium and some vitamins). They are also a good source of long-chain polyunsaturated omega-3, especially eicosapentaenoic (EPA) and docosahexaenoic (DHA) fatty acids. When looked at globally, it

was determined that 17% of animal protein needs were met by fish in 2022, and this figure corresponds to 7% of all proteins consumed (FAO 2024). Although there are differences in the amount of fish consumption between regions and countries, it has been determined that certain factors, such as consumer behavior and nutritional culture, are effective. While fish consumption per capita in developed countries was 24.5 kg according to 2022 data, it was determined as 19.8 kg per capita in developing countries and 9.4 kg in low-income, food-deficit countries (FAO 2024).

Although the consumption of aquatic products in Turkey varies by region, the annual per capita consumption of marine products was 7.3 kg in 2022 (TUIK 2023). The amount of consumption is related to factors such as consumption habits, production amount, price of aquatic products, and consumer purchasing power (Gürel et al. 2017; Kızılaslan and Nalinci, 2013; Çiçek et al. 2014). Studies have determined that fish consumption habits in various regions of Turkey vary according to the cities, whether the cities are coastal or not, whether there are aquaculture activities in

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wetlands such as dams, lakes, ponds, etc. within the city boundaries, whether there are fish farming farms, and the types and amounts of seafood consumed vary according to socio-economic conditions, seasons, traditional tastes, cultural differences, and nutritional habits (Çolakoğlu et al. 2006; Genç et al. 2020; Aydın and Karadurmuş 2013; Çadır and Duman 2013; İbiş 2014; Temel and Uzundumlu 2014; Erümit 2016; Bayraktar et al. 2019; Tozakçı 2022). However, one of the most critical problems identified in these studies is that seafood is not consumed sufficiently in our country. To eliminate this massive gap in our country compared to other countries, necessary studies should be carried out to determine the current situation and increase the amount of seafood consumption.

To provide a product or service well according to the business's continuity and the consumers' satisfaction, it is necessary to know the factors affecting the consumer well and to analyze the consumer's preference decision well. For this reason, this study, which will determine the current consumption behaviors in order to increase and spread the consumption of seafood, will contribute to the development of appropriate strategies. The study aims to obtain a more profound knowledge about fish consumption preferences and patterns in Edirne center and its districts, as well as to create a survey developed to measure fish consumption behaviors by determining the dynamics behind these preferences. It also statistically examines the economic and sociological factors affecting consumer behavior towards fish consumption in Edirne center and its districts. In this direction, the following research questions were discussed.

What are the main socio-demographic factors affecting fish consumption in Edirne center and its districts? How do consumers' fish consumption frequency and quantity relate to their perceptions of fish's nutritional value and health? How do demographic variables such as gender, age, education, and income shape perceptions and attitudes towards fish consumption? How do positive and negative fish consumption perceptions affect consumers' fish consumption habits? How does the proximity of the region to the sea and its coastline affect fish consumption behavior?

Materials and Methods

A "Consumer Survey Study" measured fish consumption behaviors, preferences, awareness, attitudes, and opinions. The basic material of this study consists of data collected from consumers living in the center of Edirne and its districts through a survey method. The proportional approach was used to determine the number of samples that would best represent the primary audience in the consumer dimension (Miran 2003). In order to determine the sample size for

the research to be conducted on consumers, the total number of surveys to be conducted was calculated using data obtained from the Edirne province population directorate records. The sampling formula to be used to find the sample size of consumers is as follows;

$$n = \frac{Np(1-p)}{(N-1)\sigma_p^2 + |p(1-p)} \quad (1)$$

n=Sample size (Number of samples to be selected), N=Population size (Total number of individuals or units in the universe), p=Estimation rate (Usually 0.5 is taken because it provides the maximum sample size), Z=Z value in the confidence interval (For example, Z=1.645 for a 90% confidence interval), Margin of error (e or d)=Accepted error rate depending on the sample (0.05 is taken for 5%), Since the characteristics of the consumers constituting the main population were not known at the beginning, p=0.5 was taken to maximize the sample size. This calculation was carried out for each district, and the minimum number of people to whom the survey should be applied was determined (Table 1).

This study applied exploratory factor analysis (EFA) to determine whether the scale developed to measure consumer behavior toward fish consumption was suitable for the purpose. EFA was conducted using principal components analysis and Varimax rotation. Before factor analysis, the data were tested for suitability using the Kaiser-Meyer-Olkin (KMO) test and the Bartlett Test of Sphericity. The KMO test is calculated by comparing simple correlation coefficients with partial correlation coefficients. The test value ranges from 0 to 1. KMO values greater than 0.90 indicate that the sampling is sufficient. KMO values between 0.89 and 0.80 indicate that the sampling is valuable, while KMO values between 0.79 and 0.60 indicate that the sampling is moderate. KMO values less than 0.6 indicate that the sampling is insufficient (Field 2009). The Bartlett test

Table 1 Number of surveys to be conducted according to the population of the Edirne center and districts

	Male	Female	Total Population	Minimum Number of Surveys to be Conducted
Centre	96.958	98.033	194.991	130
Keşan	42.387	42.459	84.846	66
Uzunköprü	29.731	29.988	59.719	44
İpsala	13.543	12.612	26.155	25
Havsa	9.117	8.960	18.077	19
Meriç	6.602	6.295	12.897	15
Enez	5.448	5.177	10.625	12
Süloğlu	3.539	2.866	6.405	11
Lalapaşa	3.328	2.870	6.198	10
Total	210.653	209.260	419.913	332

also tests whether a matrix (correlations) is significantly different from an identity matrix (filled with 0). It shows that the data is suitable for factor analysis when there is no identity matrix, where all diagonal terms are 1 and non-diagonal terms are 0 (Bryman and Cramer 2011). The factor loading threshold was set at 0.40 and above, and items below this value were eliminated. Internal consistency of the scale was assessed using Cronbach's Alpha coefficient, with values of 0.70 and above being interpreted as acceptable reliability levels (Nunnally 1978). Confirmatory factor analysis (CFA) was conducted to validate the scale created through exploratory factor analysis. CFA is a technique that aims to verify whether the number of factors and the loadings of the observed variables on them are consistent with what is expected based on theory (Sarmento and Costa 2019). After the final scale was determined, the distribution properties of the scale data obtained from consumers were examined with the Kolmogorov-Smirnov and Shapiro-Wilk tests, and parametric tests were applied for data that met the standard distribution assumption.

The Student t-test was used in the study to determine whether total scale scores differed by employment status. One-way analysis of variance and Tukey's multiple comparison test were used to decide whether or not they differed by age, income, education level, place of employment, and amount of fish consumed. All statistical calculations were made using the SPSS 21.0 V statistical package program. Research findings are presented as frequency (%), mean, and standard deviation values, and findings were considered significant at the $p < 0.05$ level.

Results and Discussion

Demographic Findings of Consumers

When the demographic data of the study is examined, 55.4% of the consumers are male and 44.6% are female. The majority of these consumers are in the 30–49 age group (59%), and the 19–29 age group is represented by 21%, the 50–59 age group by 12.9%, the 60 and above age group by 4.8%, and the 18 age group by 2.4%. Nearly half of the consumers (48.2%) are university graduates, high school graduates come second with 24.3%, and postgraduate graduates come third with 13.5%. Regarding their professions, 32% are civil servants, 17.7% are workers, 10.5% are freelancers, and the rest are in low percentages. When the income levels of the consumers were examined, it was determined that 28.7% were 45,001 TL and above, 21.6% were 35,001–45,000 TL, 15.9% were 25,001–35,000 TL, 14.4% were 17,001 TL–25,000 TL, 14.4% were 10,000 TL and below, and 8.4% were 10,001–17,000 TL (Table 2).

Table 2 Demographic information of consumers

Gender	<i>n</i>	%	Income	<i>n</i>	%
Male	185	55.4	10 000 TL down	37	11.1
Female	149	44.6	10001–17000 TL	28	8.4
Total	334	100	17001–25000 TL	48	14.4
Age	n	%	25001–35000 TL	53	15.9
18 age	8	2.4	35001–45000 TL	72	21.6
19–29	70	21	45001 and above TL	96	28.7
30–49	197	59	Total	334	100
50–59	43	12.9			
60 years and above	16	4.8	Job	n	%
Total	334	100	Officer	107	32
Educational Status	n	%	Worker	59	17.7
No education	3	0.9	Student	21	6.3
Primary school	15	4.5	Retired	27	8.1
Middle school	29	8.7	Housewife	29	8.7
High school	81	24.3	Freelance	35	10.5
University	161	48.2	Farmer	24	7.2
Degree	45	13.5	Tradesman	32	9.6
Total	334	100	Total	334	100

It was determined that the majority of consumers (99.7%) consume fish. The prevalence of fish consumption may be related to the region's cultural habits and consumers' perception that fish meat is a healthy source of protein. Similar studies conducted throughout Turkey show that fish is perceived as a nutritious food and its consumption is encouraged (Beyazbayrak 2014; Söğüt 2017; Yücel et al. 2020). It is stated that fish is especially rich in omega-3 fatty acids, and its positive effects on cardiovascular health increase the consumption frequency of consumers (Jayedi and Shab-Bidar 2020). In addition, the highest rate of fish consumption is several times a month with 29.9%, followed by consumption once a week by 27.2%, once a month by 20.9%, and less than a month by 20.1%, respectively (Table 3). The emergence of regular consumption habits shows that consumption is shaped by lifestyle, economic status, and the ease of supply of fish. This situation is parallel to the findings of the study conducted by Can et al. (2015), which shows that consumers with higher income levels consume fish more frequently.

Consumers' preferences for purchasing fish were 56.3% fishmongers, 22.2% fish market, 16.2% market, 3.6% table vendors, and 1.8% fish facilities (Table 3). The most preferred reasons for fishermen are related to the freshness and reliability of the fish. Consumers see fish markets and markets as alternative supply points. These results are similar to the literature (Abdikoglu et al. 2015; Carlucci et al. 2015; Erümit 2016; Gultom et al. 2021; Güney et al. 2022; Lestari et al. 2023).

When annual fish consumption amounts were examined, it was seen that 14.4% of the consumers consumed less than 5 kg, 47.5% consumed between 5 and 8 kg, 28.7%

Table 3 Fish consumption status of consumers

Frequency of fish consumption	<i>n</i>	%
Daily	4	1.2
Once a week	91	27.2
Several times a month	100	29.9
Monthly	70	20.9
Less than a month	67	20.1
Never	2	0.6
Annual fish consumption amounts	<i>n</i>	%
Less than 5 kg	48	14.4
Between 5–8 kg	157	47.5
Between 8–13 kg	96	28.7
More than 13 kg	33	9.9
Where to buy fish	<i>n</i>	%
Fish Market	74	22.2
Fisherman	188	56.3
Market	54	16.2
Street vendor	12	3.6
Fish Plant	6	1.8

consumed between 8 and 13 kg, and 9.9% consumed more than 13 kg of fish (Table 3). These results are consistent with the literature, which shows that fish consumption shows regional differences throughout Turkey, generally higher in coastal regions and lower in landlocked areas.

For example, annual per capita fish consumption in coastal regions was found to be 20.07 kg in Rize (Temel and Uzundumlu 2014), 15 kg in İzmir (Çaylak 2013), 7.8 kg in Manisa (Çelik 2014), 8 kg in Mersin and Adana (Cengiz 2019), 10.5 kg in Çanakkale (Saka 2020), 30 kg in Trabzon and Giresun (Aydın and Karadurmuş 2013), 18.40 kg in Ordu-Fatsa (Gözener et al. 2016) and 14.69 kg in Tekirdağ (Abdikoğlu et al. 2015). On the other hand, it is observed that it is in very low amounts in landlocked regions such as Erzurum 6.3 kg; Van 6.8 kg (Güngör 2014), Tunceli 3 kg (Menteşe 2016), Batman 4.8 kg (Akkuş 2018), Kastamonu 11 kg (Dilek et al. 2019), Niğde 3.8 kg (Bashimov 2017), Şanlıurfa 3.5 kg (Karadağ 2017), Konya 4 kg (Bolat and Cevher 2018), Kayseri 5.6 kg (Deniz 2019). This situation can be associated with the easy access to fresh and more diverse fish products in coastal areas and the widespread cultural consumption of fish (Can et al. 2015; De Bruyn et al. 2021).

The region's economic structure and cultural characteristics also directly affect fish consumption. For example, while consumption is higher in coastal areas due to the economic contribution of fishing and the fishing sector, the preference for meat and other animal protein sources in inland areas may reduce consumption (Rahman and Islam 2020). While the world's aquaculture consumption amount was 20.05 kg in 2021, it was very low in Turkey, with 7.2 kg in 2023. In the study, the annual fish consumption amount of Edirne province was determined as 7.9 kg.

This result is below the world average, but slightly higher than the Turkish average.

Anchovy, which is the most consumed (70.4%), has been emphasized in many studies due to its features such as being cheap, consumed a lot in the winter season, and being quickly accessible (Temel and Uzundumlu 2014; Polat 2017; Terin et al. 2019). Civelek 2022 stated that the most consumed fish species in Sakarya are anchovy and bonito, while the least consumed is horse mackerel. In Rize province, the most consumed fish species were determined to be anchovy, bonito, and red mullet (Temel and Uzundumlu 2014). The most preferred fish in İzmir are sea bream, sea bass, horse mackerel, anchovy, and sardine (Çaylak 2013). Anchovy consumption is increasing in the Black Sea region, and sea bream and sea bass consumption is increasing through aquaculture in the Aegean and Marmara regions (Aydın and Karadurmuş 2013; Çelik 2014; Saka 2020). In addition, it has been determined that the consumption of sardine, horse mackerel, and grey mullet, which have higher arsenic and mercury accumulation compared to other species, has decreased due to health risks (Vieira et al. 2011). The least preferred fish in the study were silverfish (2.1%), mackerel (4.2%), coral (5.1%), eel (5.1%), sole (6.9%), and pike perch (7.5%) (Fig. 1). The low prevalence of these species is explained by their regional rarity, high prices, and consumption habits not being directed towards these species (Deniz 2019; Akkuş 2018). Some studies have reported that the reasons for under-consumed fish species are due to factors such as low nutritional value, strategic sustainability concerns, and biodiversity loss (Seves et al. 2016; Lopes et al. 2021).

Behavior Scale for Fish Consumption

Exploratory Factor Analysis was applied to determine whether the scale developed to measure consumers' behavior towards fish consumption was suitable for the purpose. As a result of the analysis, the Kaiser-Meyer-Olkin (KMO) value was determined as 0.89, and the sample size was determined to be very good (Field 2009). In addition, as a result of the Bartlett Sphericity test, it was determined that it was appropriate to apply factor analysis to the data examined in the study ($p < 0.001$) (Bryman and Cramer 2011) (Table 4).

The factors resulting from the exploratory factor analysis conducted for the fish consumption behavior scale are presented in Table 5. Four sub-dimensions were formed as a result of the analysis, and these sub-dimensions were named as consumption tendency, negative perception, nutritional value perception, and conscious choice effect. Within the scale, items belonging to the negative perception and nutritional value perception sub-dimensions were evaluated negatively, and their scores were reversed. The internal

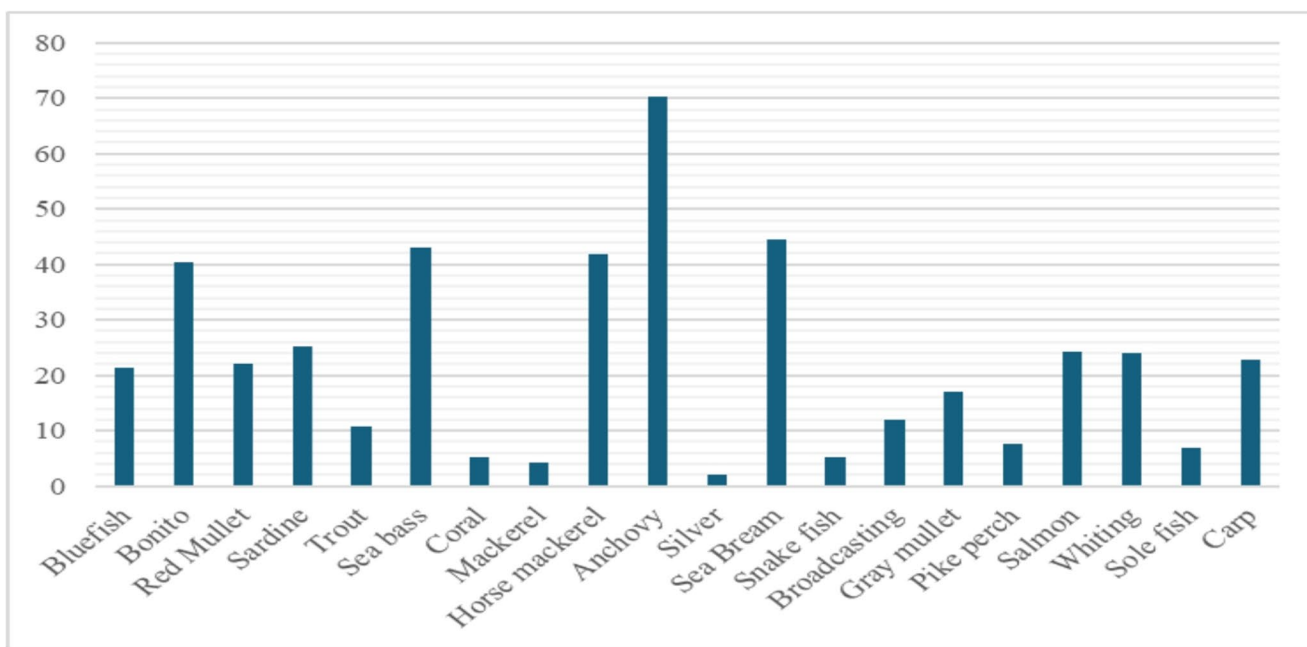


Fig. 1 Percentage distribution of fish species consumed by consumers

Table 4 Suitability of the behavior scale for fish consumption to factor analysis

Kaiser-Meyer-Olkin Criterion of Sampling Adequacy	0,890
Bartlett’s Test of Sphericity	Approximate Chi-Square 4257,67
	Sd 171
	Significance <0,001

Table 5 Factors emerging in the behavior scale for fish consumption

Factors	Eigenvalue	Variance Explained	Cronbach’s Alpha	Reliability
Consumption Trend	7,819	41,154	0,936	High Reliability
Negative Perception	2,622	13,799	0,738	Moderate Reliability
Nutritional Value Perception	1,376	7,244	0,844	High Reliability
Conscious Choice Effect	1,098	5,779	0,737	Moderate Reliability
General		67,976	0,805	Moderate Reliability

consistency of participants’ responses to all items and sub-dimensions of the scale was determined to be moderate to highly reliable (Table 5).

When the explanation rates of the factors obtained by factor analysis within the total variance were examined, it was seen that the consumption tendency sub-dimension explained 41.15% of the total variance, the negative perception sub-dimension 13.80%, the nutritional value sub-dimension 7.24% and the conscious choice effect sub-dimension 5.78%. In total, these four sub-dimensions explained 67.98% of the variance (Table 6).

It is understood that the factors that affect consumers’ fish consumption preferences are shaped by health, taste, practicality, and socio-cultural structures. It is stated in the literature that fish is a healthy food due to its rich omega-3 and omega-6 content, vitamins, and mineral supplements (Olsen 2003; Trondsen et al. 2004; Birch and Lawley 2014; Temel and Uzundumlu 2014). In addition, one of the reasons for consumption preference is the perception that fish is easy to digest and delicious (Birch and Lawley 2014; Polat 2017). In the study, it is seen that doctor, family recommendations, and cultural habits, which are included in the consumption tendency sub-dimension, are also sources of motivation in fish consumption. For this reason, it is thought that this situation, which is parallel to the literature, should be addressed in socio-cultural phenomena in fish consumption preferences (Olsen 2003; Temel and Uzundumlu 2014). Birinci and Yavuz (2020) stated that factors such as advertising, promotion, and fish variety are essential variables affecting fish consumption amounts, especially among consumers with high fish consumption. This also coincides with the view put forward by Verbeke and Vackier (2005) that variables such as health awareness, marketing, and habits direct consumption behaviors. However, Olsen (2004) emphasized that marketing influence is limited to consumers’ consumption behaviors and habits, which are more effective.

Negative perceptions such as the smell of fish, the disturbing bones, and the dislike of its appearance and taste are generally stated as consumption negativities in research (Leek et al. 2000; Verbeke and Vackier 2005; Orhan and Yüksel 2010; Beyazbayrak 2014; Çiçek et al. 2014; Kılıç et

Table 6 Exploratory factor analysis results of the fish consumption behavior scale

	Average	SD	Loads	Eigenvalue	Variance	Alpha
Consumption Trend (CT)				7.819	41.154	0.936
CT Total score	40.14	11.11				
CT Average item score	3.65	0.33				
Eating fish is healthy	4.08	1.23	0.787			
Fish is easy to digest	3.87	1.21	0.778			
I find fish meat delicious	3.98	1.20	0.856			
I catch the fish myself	3.67	1.27	0.757			
I prefer processed and canned products	3.31	1.38	0.643			
I always have the urge to eat fish	3.54	1.34	0.745			
My family thinks I should buy and eat fish	3.64	1.34	0.847			
Doctors and nutritionists think I should eat fish	3.64	1.33	0.843			
Advertisements encourage me to buy more fish food	3.69	1.32	0.820			
I have been consuming fish since my childhood	3.85	1.25	0.777			
I usually prefer fish at invitations	2.89	1.36	0.538			
Negative Perception (NP)				2.622	13.799	0.738
NP Total score	13.81	3.33				
NP Average item score	3.45	0.55				
Fish has an unpleasant odor	3.14	1.24	0.787			
Bones in fish are irritating	2.86	1.31	0.800			
The appearance of the fish is bad	3.74	0.97	0.688			
Fish is not to my taste	4.07	0.87	0.526			
Nutritional Value Perception (NVP)				1.376	7.244	0.844
NVP Total score	5.72	2.29				
NVP Average item score	2.86	0.11				
Fish is low in fat	2.78	1.25	0.815			
Fish is low in calories	2.94	1.22	0.877			
Conscious Choice Effect (CCE)				1.098	5.779	0.737
CCE Total score	4.81	1.99				
CCE Average item score	2.40	0.01				
I prefer farm-raised fish to marine fish.	2.40	1.13	0.828			
If I am informed correctly about fish, I will consume it	2.41	1.10	0.838			
Overall Total Score	64.49	10.45			67.976	0.776
Overall Average Item Score	3.394	0.541				

al. 2019). It has been determined that consumers who are on a diet and eat healthy prefer fish more due to its fat content and the fact that it is a low-calorie food. In the literature, it has been stated that these features of fish are the main factors defined as diet-friendly food (Hatırlı et al. 2004; Pieniak et al. 2008). Leek et al. (2000) stated that advertisements play a decisive role in consumption preferences. In some studies, it has been stated that one of the reasons for low fish consumption rates is due to inadequate advertising and marketing activities (Gürel et al. 2017; Polat 2017).

In the study, the nutritional value perception dimension, which is diet and low-calorie beliefs, shows that consumers can increase their fish consumption. Similar results in the literature suggest that fish consumption rises because it is a healthy food with high protein and low-calorie content. Verbeke and Vackier (2005) stated that consumers' health motivations are an essential driving force in fish consumption. Lien et al. (2001) showed that fish consumption is more common among individuals who care about a healthy

diet. Altintzoglou et al. (2010) revealed that consumers having sufficient knowledge about the health benefits of fish increase the frequency of consumption. In addition, Olsen (2003) stated in his study that with the development of healthy nutrition awareness, consumers turned to alternative protein sources such as fish with lower fat content instead of red meat. Pieniak et al. (2010) emphasized the strong connection between fish consumption and health awareness, stating that consumers with a high nutritional value perception make fish consumption regular. Birch and Lawley's (2014) studies show that fish consumption increases as awareness of low-calorie and omega-3-rich foods increases. In this context, the fact that fish is a high-protein and low-calorie food is an important factor that increases consumption rates, especially in individuals who care about healthy nutrition.

The interest in processed and farm-raised fish is related to the type of fish, price advantage, and more regular supply. While the reasons for choosing processed and farm-raised

fish are similar in the literature, time saving and practicality are also emphasized (Tveteras et al. 2012; Yılmaz et al. 2014). However, it has been stated that consumption of processed seafood is less preferred in Turkey compared to other countries (Çolakoğlu et al. 2006; Polat 2017; Deniz 2019; Tozakçı 2022). On the other hand, it has been stated that consumers' health concerns due to the accumulation of heavy metals in some fish have an adverse effect on consumption behavior (Temel and Uzundumlu 2014; Uzundumlu and Dinçel 2015).

According to the confirmatory factor analysis results, when the obtained statistical values were examined, it was observed that the *p*-values for all items were <0.01 , which revealed that all variables showed a significant relationship with the factors they were dependent on (Table 7). In addition, it was determined that the structural reliability of the sub-dimensions that emerged was moderately and highly reliable, internal consistency ($CR > 0.70$) was provided, and convergent validity of the factors was obtained (Table 8) (Hair et al. 2006). It was determined that this scale, which was developed according to the fit criteria whose validity was accepted by the researchers, was within the acceptable and good fit criteria, and it was concluded that the scale can be used to measure the behavior of consumers towards fish consumption.

Relationship Between Behavioral Factors and Demographic Variables Affecting Fish Consumption

In the study, it was analyzed whether the total scale scores differed according to age, income, education level, profession, residence, fish supply place, and fish consumption amount. According to the results, those with a statistically significant difference between the total scale and sub-dimension total scores are given in Table 9 ($P < 0.05$). Female consumers had higher negative perception scores towards fish consumption than males ($P = 0.003$; Table 9). The fact that there was no significant difference between genders in the dimensions of consumption habits, consumption tendency, nutritional value perception, and conscious choice effect shows that male and female consumers generally have similar views and behaviors on these issues. However, the difference in the negative perception dimension includes their negative views on sensory and physical properties. The appearance and bones of fish are important features that affect the perception of fish consumption. Studies have shown that many people find whole fish visually unappealing and prefer processed fish served as fillets (Honkanen et al. 2005). It is reported in the literature that women, in particular, attach more importance to the hygienic and aesthetic aspects of food than men (Verbeke et al. 2005). It has been shown that women are more sensitive to odors than men

Table 7 Confirmatory factor analysis results of the fish consumption behavior scale

Factors/Items	Standard Loads	t-value	Structure reliability	CR	R ²
Consumption Trend (CT)					
Eating fish is healthy	0.85	18.81**	%93.6	0.890	0.71
Fish is easy to digest	0.85	18.91**			0.72
I find fish meat delicious	0.92	21.61**			0.84
I catch the fish myself	0.76	16.08**			0.58
I prefer processed and canned products	0.58	11.31**			0.34
I always have the urge to eat fish	0.72	14.90**			0.52
My family thinks I should buy and eat fish	0.76	15.97**			0.57
Doctors and nutritionists think I should eat fish	0.74	15.44**			0.55
Advertisements encourage me to buy more fish food	0.76	16.17**			0.58
I have been consuming fish since my childhood	0.78	16.80**			0.62
I usually prefer fish at invitations	0.43	8.08**			0.19
Negative Perception (NP)					
Fish has an unpleasant odor	0.72	12.98**	%73.8	0.727	0.51
Bones in fish are irritating	0.80	14.55**			0.64
The appearance of the fish is bad	0.59	10.37**			0.35
Fish is not to my taste	0.39	6.42**			0.15
Nutritional Value Perception (NVP)					
Fish is low in fat	0.92	17.85**	%84.4	0.810	0.84
Fish is low in calories	0.80	15.29**			0.64
Conscious Choice Effect (CCE)					
I prefer farm-raised fish to marine fish	0.79	10.17**	%73.7	0.624	0.62
If I am informed correctly about fish, I will consume it	0.74	9.88**			0.55

** $p < 0.01$

Table 8 Confirmatory factor analysis fit indices of the fish consumption behavior scale

Measure of Compliance	The value of	Rapport
$\chi^2 = 320,61/sd = 135$	2.37	Acceptable Compliance
RMSEA	0.064	Acceptable Compliance
NFI	0.96	Good Fit
NNFI	0.97	Good Fit
CFI	0.98	Good Fit
GFI	0.91	Acceptable Compliance
AGFI	0.87	Acceptable Compliance

Table 9 Level of fish consumption habits of individuals according to the status of variable groups

Scale and Sub-Dimensions	Variables	N	Average	SS	t-value	P-value		
Negative Perception	Male	185	9,7	3,09	-3,043	0,003		
	Female	149	10,8	3,52				
	Less than 5 kg	48	10,56ab	3,47			3,021	0,03
	Between 5-8 kg	157	10,36ab	3,39				
	Between 8-13 kg	96	9,41b	3				
	More than 13 kg	33	11,12a	3,46				
Conscious Choice Effect	18 age	8	6,13b	3,23	4,809	0,001		
	19-29	70	6,56b	2,12				
	30-49	197	7,25ab	1,91				
	50-59	43	7,72ab	1,64				
	60 years and above	16	8,38a	1,41				
	No education	3	4,00b	3,46			2,613	0,025
	Primary school	15	7,67a	2,19				
	Middle school	29	7,90a	1,35				
	High school	81	7,22a	2				
	University	161	7,10a	2,02				
	Degree	45	7,09a	1,84				
Nutritional Value Perception	Fish Market	74	7,18ab	2,13	2,989	0,019		
	Fisherman	54	6,65bc	2,01				
	Market	6	6,83abc	2,4				
	Street vendor	188	7,45a	1,86				
	Fish Plant	12	6,00c	2				
	10 000 TL down	37	7,16a	2,42			2,523	0,029
	10001-17000 TL	28	6,00ab	2,23				
	17001-25000 TL	48	5,58b	2,43				
	25001-35000 TL	53	5,94ab	2,32				
	35001-45000 TL	72	6,51ab	2,3				
45001 and above TL	96	6,36ab	2,08					

and therefore perceive the smell of fish more clearly (Boesveldt and Graaf 2017). It is known that fish presented with eyes, scales, or skin are perceived as “visually unpleasant” by some consumers. This could explain the strong negative perceptions of women regarding fish consumption. However, it has been stated that these negative perceptions of women can be reduced by processing, deboned and improving the presentation of the product (Pieniak et al. 2008). Some studies have found no statistically significant difference between men and women in terms of fish consumption frequency, suggesting that fish consumption may be more related to other lifestyle factors (education, health awareness, economy, etc.) than gender (Wennberg et al. 2012; Frackiewicz et al. 2023).

The higher negative perception scores of female consumers regarding fish consumption identified in this study contradict the literature, which suggests that women have more positive attitudes toward healthy foods like fish (Verbeke and Vackier 2005; Pieniak et al. 2010; Dölekoğlu et al. 2015). This suggests that women are more sensitive to sensory attributes than men, as well as a perception that they place greater importance on food hygiene and aesthetics. Furthermore, it has been observed that product presentation

and consumption habits, stemming from regional differences, may differentiate these perceptions. This result suggests that the general literature on gender-based consumer profiles should be supplemented with more detailed studies.

In the study, a statistically significant difference was found between the negative perception sub-dimension of the fish consumption habit scale of individuals according to the amount of fish consumption ($P < 0.05$; Table 9). The negative perception scale items in the study were fishy smell, irritating bones, negative appearance perception, and unpleasant taste. The negative perception scores of individuals who declared that they consumed 13 kg and above fish were found to be higher than those who consumed 9–13 kg of fish ($P = 0.030$). This situation causes some people to accept the natural smell of fish as an indicator of its freshness, while for others, this smell is unpleasant and may reduce consumption. Studies show that the smell differences, especially between freshwater and marine fish, have significant effects on consumer preferences (Verbeke and Vackier 2005).

Consumers aged 60 and over had higher total scores on the Conscious Choice Effect sub-dimension for fish consumption than those aged 29 and under ($P = 0.001$; Table 9).

These results show that consumers make more conscious choices in fish consumption as age increases and that they tend to consume more as their level of knowledge about fish consumption increases. Similar results were obtained by Pieniak et al. (2012), who found that health-related beliefs positively affected the frequency of fish consumption in older adults, but subjective knowledge was a stronger indicator of fish consumption. It has been emphasized in the literature that older consumers tend to consume fish regularly, taking its health benefits into consideration more (Norrish 2000; Olsen 2004; Honkanen et al. 2005; Yücel et al. 2020; Tozakçı 2022). It has been emphasized that fish consumption supports cognitive well-being in the elderly, reduces the risk of dementia, improves quality of life, and reduces neurodegenerative disorders and all-cause mortality (Bakre et al. 2018). Another study indicated a positive relationship between seafood consumption in older adults and that it is influenced by factors such as health, nutritional beliefs, psychological characteristics, and the environment. It has also been emphasized that physical disabilities, such as dental problems, can limit consumption in older adults (Govzman et al. 2021). It is thought that both economic and health-related behavioral consequences may underlie the more conscious consumption of fish by older individuals. It can be said that elderly individuals tend to consume fish more consciously in the Edirne region due to the ease of access to fish stalls, the continuation of cultural habits, and the importance given to price-quality balance by retirees with fixed incomes.

Consumers who declared that they had not received any education had lower Conscious Choice Effect scores for fish consumption compared to others ($P=0.025$; Table 9). The fact that consumers with no education level ($n=3$) had much lower conscious choice effect scores suggests that these individuals may have insufficient knowledge and awareness in the conscious decision-making process regarding fish consumption. The results of the analysis show that consumers make more conscious choices about fish consumption as their level of education increases. This indicates that the knowledge and awareness gained through education enables consumers to make more careful choices about issues such as nutritional value, production processes, and environmental impact. In the literature on fish consumption behavior, the education factor has an important role, especially in the conscious choice process (Myrland et al. 2000; Verbeke et al. 2005; Terin et al. 2019; Demirel and Hatırlı, 2020). The findings from Edirne are consistent with this literature, showing that as education levels increase, the preference for farmed fish and the tendency to turn to reliable sources of supply (e.g., fishermen) for fish consumption strengthen. Furthermore, a lack of knowledge and awareness about fish consumption in

low-educated groups limits the development of conscious consumption behaviors.

The total score of the conscious choice effect sub-dimension of consumers who declared that they bought their fish from fishermen was found to be higher than those who bought their fish from markets and stallholders ($P=0.019$; Table 9). It is frequently emphasized in the literature that products procured from “fishermen” are perceived by consumers as fresh, reliable, and based on local production. Direct communication with the seller can increase the sense of trust in the quality of the product (Verbeke and Vackier 2005). This situation can be considered to be reflected in the highest conscious choice effect score of the “Fisherman” group. Correct, complete, and reliable information positively affects consumption decisions by eliminating the consumer’s uncertainties about the product. In the literature, it has been reported that informing the consumer about the product source, production conditions, nutritional value and health benefits increases the frequency of consumption (Pieniak et al. 2010). The results of our study support this notion, suggesting that consumers in Edirne can learn more about the origin, catch, and freshness of their products when shopping from fishermen, encouraging conscious consumption behaviors. This is likely due to the fact that fishermen in the region generally offer fresh, local products, communicate directly with consumers, and foster trust in their products. Furthermore, access to fresh fish is easier in Edirne’s city center and some districts, particularly due to proximity to coastal areas (e.g., access to the Gulf of Saros), which further supports fishermen’s preferences.

Consumers reporting a monthly income of 10,000 TL or less had higher nutritional value perception scores for fish consumption than those reporting a monthly income of 17,001–25,000 TL ($P=0.029$; Table 9). It has been suggested that health concerns may have a greater influence on food choices among low-income individuals (Darmon and Drewnowski 2008). This study suggests that low-income consumers view fish as valuable for their health and that their consumption is high due to factors such as Edirne’s geographic structure, ease of fish supply, and the widespread and affordable availability of farmed fish. Similar results are found in the literature; Terin and Keskin (2021) found a positive correlation between the frequency of fish consumption among households earning below the minimum wage, and that this is due to low-income households’ preference for consuming local fish, which is less expensive than other protein sources. Erdal and Esengül (2008) found that average annual per capita fish consumption was higher in middle- and low-income families than in high-income families. Mentese (2016) reported a negative relationship between fish consumption frequency and income. Low-income groups view fish as an important source of

protein. However, it has also been noted that increasing fish prices negatively impact consumption for these groups (Deniz 2019). Most studies have shown that an increase in income increases the amount of fish consumption, while low income restricts consumption due to price increases (Çadır and Duman 2013; Wan and Hu 2012; Güngör 2014; Deniz and Sarıözkan, 2020; Issifu et al. 2022).

These results suggest that the relationship between income level and health-conscious dietary choices is inconsistent across contexts. Local socio-economic conditions can significantly influence consumer perceptions and preferences. Therefore, these findings challenge common perceptions about food consumption and health awareness (especially the global trend toward more conscious behavior among higher-income groups) and highlight the importance of local context.

Consumers who declared that they were housewives had higher nutritional value perception scores for fish consumption than workers ($P=0.002$), consumers who declared that they were workers and retired had higher conscious choice effect scores than students ($P=0.049$), and consumers who declared that they were self-employed and retired had higher negative perception scores than housewives and students ($P=0.037$) (Table 10). In the literature, it is frequently reported that housewives take an active role in family nutrition and are more conscious in their food choices; in contrast, it is suggested that the awareness of the working class

about nutritional value may remain lower due to economic constraints and the level of access to information (Pieniak et al. 2010). The lower scores of the student group in the perception of the conscious choice effect can be explained by the fact that they are still at the stage of fully forming their consumption habits, or that they give more importance to practicality and instant preferences in food choices. Honkanen et al. (2005) stated that age and professional experience strengthen conscious decision-making processes in consumption preferences and tend to make more mindful choices. It is known that the living conditions, experiences, and knowledge level of the occupational group create different effects on perceptions and preferences towards fish consumption (Baydede 2018; Gürel et al. 2017).

Conclusions

Factor analysis was used to determine the factors affecting consumers' fish preference, and one-way analysis of variance and Tukey's multiple comparison test were used to determine the relationships between the determined factor groups and the socio-economic characteristics of consumers. Four factors were determined with explanatory factor analysis. The explanation rates of the factors obtained with factor analysis within the total variance explain 41.15% of the total variance of the consumption tendency sub-dimension,

Table 10 Level of fish consumption habits of consumers according to education status

Scale and Sub-Dimensions	Variables	N	Average	SS	t-value	P-value
Negative Perception	Officer	107	10,07	3,43	2,167	0,037
	Worker	59	8,9	3,75		
	Student	21	10,57	3,84		
	Retired	27	10,89	2,53		
	Housewife	29	10,66	3,52		
	Freelance	35	11	2,78		
	Farmer	24	10,04	3,01		
	Tradesman	32	10,94	2,42		
Nutritional Value Perception	Officer	107	6,36ab	2,16	3,256	0,002
	Worker	59	5,20b	2,61		
	Student	21	5,67ab	2,31		
	Retired	27	6,74ab	1,93		
	Housewife	29	7,07a	2,51		
	Freelance	35	6,40ab	1,61		
	Farmer	24	6,79ab	2,41		
	Tradesman	32	6,75ab	2,17		
Conscious Choice Effect	Officer	107	7,06ab	1,86	2,05	0,049
	Worker	59	7,63a	2,25		
	Student	21	6,10b	2,28		
	Retired	27	7,70a	1,3		
	Housewife	29	7,21ab	2,11		
	Freelance	35	6,77ab	1,68		
	Farmer	24	7,54ab	2,47		
	Tradesman	32	7,34ab	1,68		

13.80% of the negative perception sub-dimension, 7.24% of the nutritional value sub-dimension, and 5.78% of the conscious choice effect sub-dimension. In total, four factors explain 67.98% of the variance. The first of these factors is the consumption tendency, health and taste perception, which significantly positively affects fish consumption, the second is negative perception, which is an important obstacle that reduces fish consumption, the third is the perception of nutritional value, which is the preference of consumers with healthy eating habits such as diet and low calorie belief, and the fourth is the conscious choice effect, which positively affects consumption by those who prefer farm-raised fish and being informed correctly about fish.

The study found significant relationships between factor sub-dimensions and some demographic variables. Female consumers were found to have higher negative perception scores towards fish consumption than male individuals. Consumers who declared that their monthly income was 10,000 TL and below had higher nutritional value perception scores towards fish consumption than individuals who declared that their monthly income was between 17,001 and 25,000 TL. It was determined that consumers made more conscious choices in fish consumption as age and education level increased. In addition, workers and retirees tend to make conscious choices. While housewives emphasize nutritional value in fish consumption behaviors, according to consumers' occupational status, self-employed and retirees have higher negative perceptions.

As a result, it has been understood that while developing strategies to increase fish consumption, it is necessary to benefit from processed and farmed fish, healthy life perceptions, and marketing effects. In addition, it is essential to promote appropriate fish products for each income group and ensure access to these products, considering different consumption patterns depending on income levels. Such measures can make fish consumption in the region more sustainable. In order to promote the diversity of local fisheries, campaigns can be launched to promote the benefits and tastes of less-consumed varieties. In order to improve seafood consumption habits, affordable and accessible solutions can be developed that will allow the consumption of local fish species, as well as species such as anchovies. To increase fish consumption, cultural awareness programs can be organized, and promotional events can be held by offering interesting and practical recipes. Accurate information about the nutritional value of fish can be provided through education and awareness campaigns. In order to eliminate negative perceptions, fish cooking methods can be facilitated and delicious recipes can be shared, making people more willing to consume fish.

Some limitations of this study are acknowledged. These include the fact that the research was conducted only in Edirne city center and its districts, and the findings cannot be

generalized to other regions of Turkey with different cultural, economic, or environmental characteristics. The study presents a cross-section of fish consumption behavior at a specific point in time; it does not reflect changes or causal relationships over time. Data were collected using self-report surveys, introducing the possibility of response bias. Future research should consider a longitudinal approach to capture long-term outcomes and include a more diverse population. Furthermore, investigating the impact of perception differences between farmed and wild fish on consumer decisions could have significant implications for fish marketing and consumption behavior.

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Data Availability No datasets were generated or analysed during the current study.

Declarations

Ethical This study was prepared under the permission numbered 01–36, dated 26.03.2024, from the Ethics Committee of Tokat Gaziosmanpaşa university the decisions of the ethics council for the research in social and human sciences.

Consent to Participate Consent to Participate declaration: not applicable.

Competing interests The authors declare no competing interests.

Conflict of interest We declare that there is no conflict of interest between us as the article authors.

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