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Perception of functional food consumption by adults: Is there any difference between generations?

Percepção do consumo de alimentos funcionais por adultos: Há diferenças entre as gerações?

Giovana Flores Safraid[1,2], Cristine Zanquetta Portes[2], Roseana Machado Dantas[2], Ângela Giovana Batista[2,3*]

[1]Universidade Federal de Santa Maria (UFSM), Centro de Ciências da Saúde, Departamento de Fisiologia e Farmacologia. Santa Maria/RS - Brasil
[2]Universidade Federal de Santa Maria (UFSM), Departamento de Alimentos e Nutrição, Palmeira das Missões/RS - Brasil
[3]Universidade Federal de Juiz de Fora (UFJF), Departamento de Nutrição, Governador Valadares/MG - Brasil

Corresponding author: Ângela Giovana Batista, Universidade Federal de Juiz de Fora (UFJF), Departamento de Nutrição, Campus Governador Valadares, R. São Paulo, 745, Centro, CEP: 35010-180, Governador Valadares /MG - Brasil, e-mail: angela.batista@ufjf.br

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Abstract

This study aimed to understand the perception of young adults and middle-aged adults about functional foods and to relate it to socioeconomic, health, and consumption factors. The study participants, both male and female adults (n = 522), completed two questionnaires. The first questionnaire addressed socioeconomic and health aspects, which were designed by the researchers. The second questionnaire focused on attitudes related to the consumption of functional foods, evaluating consumers' perceived needs, benefits, confidence, and safety. The results demonstrated that adults hold a positive perception of functional foods, acknowledging their benefits and the need for consumption. However, there is some skepticism regarding the credibility of functional food claims. Income and education level appear to be factors that influence adults' perception of functional food consumption. Middle-aged adults (45 to 65 years) tend to perceive functional foods as medications, while young adults (18 to 44 years) who consider nutritional quality important when choosing food for consumption tend to have a better perception of functional foods. The recognition of the benefits and the need for functional foods indicates that this market remains promising. However, measures to instill greater consumer confidence should be adopted.

Keywords: Functional foods; Healthy habits; Consumer attitudes; Adults; Nutrition; Bioactive compounds.

Resumo

O objetivo deste estudo foi conhecer a percepção de adultos jovens e de adultos de meia-idade acerca dos alimentos funcionais (AF), e sua relação com determinantes socioeconômicos, de saúde e de consumo. Os participantes do estudo, adultos de ambos os sexos (n = 522), responderam a dois questionários: um continha perguntas relacionadas a aspectos socioeconômicos e de saúde, elaborado pelos pesquisadores, e outro, sobre atitudes relacionadas ao consumo de AF, que avaliava a necessidade, os benefícios, a confiança e a segurança percebidos pelos consumidores. Os resultados demonstraram que há uma percepção positiva acerca dos AF pelos adultos e estes reconhecem seus benefícios e a necessidade de consumi-los, porém há uma desconfiança em relação à credibilidade das alegações funcionais. A renda e a escolaridade parecem ser fatores que interferem na percepção do consumo dos AF por adultos.

Adultos de meia idade (45 a 65 anos) tendem a perceber os AF como medicamentos e os adultos jovens (18 a 44 anos), que consideram importante a qualidade nutricional no momento da escolha do alimento para consumo, tendem a ter uma percepção melhor dos AF. O reconhecimento dos benefícios e da necessidade dos AF demonstra que este mercado continua promissor, porém medidas que estimulem maior confiança dos consumidores devem ser adotadas.

Palavras-chave: Alimentos funcionais; Hábitos saudáveis; Atitudes do consumidor; Adultos; Alimentação; Compostos bioativos.

Highlights

- Middle-aged adults perceived functional foods as more beneficial when dealing with health issues
- Young adults regarded the need for functional foods in comparison to middle-aged adults
- Higher income was associated with a better perception of functional foods for middle-aged adults
- Higher level of education was associated with a better perception of functional foods for young and middle-aged adults

1 Introduction

The sedentary lifestyle, poor eating habits, and the profile of modern diseases are concerning factors for the current generation as they determine their quality of life and longevity (Plasek et al., 2020; Souto, 2020; Stover et al., 2020). The concern for maintaining health, coupled with advancements in health studies, has led this population to seek healthier foods (Lusk, 2019). In this context, functional foods have gained more attention, as they play an important role in promoting long-term health benefits (Topolska et al., 2021; Altun et al., 2021).

Functional foods are defined as foods that trigger beneficial metabolic actions in the body beyond their nutritional function. In Brazil, functional foods have been regulated by the National Health Surveillance Agency (Agência Nacional de Vigilância Sanitária - ANVISA) since the 1990s, making it a relatively new concept for this generation (Brasil, 1999). Although these foods are safe for consumption without medical supervision or recommendation, their consumption among the population above 18 years is still low, with a tendency to increase (Amancio & da Silva, 2012; Corso et al., 2018). For example, during the Coronavirus disease 2019 (COVID-19) pandemic in 2020, many young adults, who were knowledgeable about food and health, increased their consumption of functional foods and supplements (Altun et al., 2021).

Adulthood is a phase of life where there is a need for dietary autonomy and the formation of new eating habits. In the early stages of adulthood (young adults), vulnerability arises due to the prioritization of factors other than food, leading to habits such as inadequate meal splitting, constant stress, and the replacement of meals with snacks (Dare et al., 2017). However, the middle-aged population has shown interest in adopting better eating habits to ensure a better quality of life (Corso et al., 2018). Factors such as gender, education, lifestyle habits, and culture seem to influence how adults relate to functional foods and health (Safraid et al., 2022; Sandmann et al., 2015; Szakály et al., 2019, Altun et al., 2021), but there may be differences between generations.

Considering the age groups of adults and their preferences related to health and food, it is essential to understand the motivation or lack thereof for these individuals to consume foods that claim health benefits (functional foods - FF). Furthermore, it is important to identify which socioeconomic, lifestyle, and food quality factors would most influence their decision to incorporate these foods into their dietary habits. The objective of this study was to understand the perception of young adults and middle-aged adults about functional foods and to assess the interference of socioeconomic, health, and consumption factors on this perception.

2 Methods

2.1 Data collection

A total of 568 individuals of both sexes participated voluntarily in the research through a non-probabilistic sample. The participants were randomly selected from various public places in two cities in Rio Grande do Sul state, Brazil (Palmeira das Missões and Santa Maria). Data collection took place from September 2018 to October 2019. The inclusion criteria were adults with age between 18 and 65 years old. The exclusion criteria were incomplete or poorly filled questionnaires and not being responsible for food purchases in the family.

2.2 Ethical aspects

All participants signed an informed consent form and the research was approved by the Ethics Committee on Human Research of the federal university where the study was performed (CAAE 95096818.7.0000.5346).

2.3 Methods

The participants were asked to complete two questionnaires. One questionnaire addressed socioeconomic and health-related aspects, which was designed by the researchers and self-filled by the respondents. In this questionnaire, consumers provided personal data such as sex, date of birth, monthly income, education level, and profession. It also included questions about health conditions, the presence of chronic/degenerative diseases, physical activity practices, the adoption of special diets, and the use of functional foods. Additionally, factors related to food acquisition were assessed, such as factors influencing food purchase decisions and the importance of nutritional information on labels.

To evaluate consumers' perception of functional foods, the previously validated Questionnaire for the Evaluation of Perception about Functional Foods (QEPFF) was used. This questionnaire had been previously structured and validated in adults, with a predominance of females and an average age of 41 years (Oliveira et al., 2016). The QEPFF consisted of positive and negative statements related to functional foods, covering the following aspects: a) benefits of usage (whether they are part of a varied diet, can repair health damage, have a pleasant taste, can improve well-being, and are more expensive); b) need for usage (whether these foods are useless for a healthy person, are part of a healthy diet, are only for sick people, and are just a passing trend); c) confidence (whether the safety of these foods is well studied, belief in their effects if recommended by a health professional, and whether these foods deliver the effects advertised); and d) safety (whether these foods can have undesirable effects, are harmful in excess, and whether only foods with health benefits mentioned on the label are functional foods).

The Likert scale, with five points, was used to assess the statements in the QEPFF, with 1 representing "strongly disagree" and 5 representing "strongly agree." Participants marked an "X" on the scale level corresponding to their perception of each item. The final score was obtained by calculating the average of the scores for the items that constituted the scale, considering that items 3, 5, 6, 8, 9, 12, 13, and 15 were reverse-scored (Oliveira, et al., 2016).

2.4 Statistical analysis

For statistical analysis, the participants included in this research were divided into four groups: 1) Young adults (18 to 45 years); 2) Middle-aged adults (45 to 65 years); 3) Participants with a favorable perception of functional foods (QEPFF >3.5); and 4) Participants with an unfavorable perception of functional foods (QEPFF <3.5). Data were analyzed using the chi-square test and Fisher's exact test (when

appropriate) for categorical variables and the Student t-test for continuous variables. Values with $p < 0.05$ were considered significant. GraphPad Prism version 5.0 (GraphPad Software, Inc., La Jolla, CA, USA) was used for statistical analysis.

3 Results and discussion

The profile of food consumption and the factors influencing individuals' choices vary depending on their generation (Williams & Page, 2011). The generation that bases its choices on its relationship with innovations could be more favorable to the consumption of functional foods, considering that the concept emerged in Brazil in the 1980s and 1990s (Guiné et al., 2020). This study aimed to evaluate which factors affect the consumption of functional foods among adults of different age groups. For this purpose, socioeconomic, lifestyle, and health factors were analyzed and related to the perception of the benefits, needs, safety, and trust in functional foods, using the validated questionnaire QEPFF (Oliveira, et al., 2016).

In total, 568 questionnaires were completed, and 46 were excluded based on pre-established criteria, resulting in 522 completed questionnaires. Regarding age groups, 52% (n = 272) were young adults aged 18 to 45 years, and 48% (n = 250) were middle-aged adults aged 45 to 65 years. The majority of participants were female (64%; n = 334) with more than 12 years of education (66%; n = 344) and a monthly income above 4 minimum wages (38%, n = 200). Concerning lifestyle and health data, 56% (n = 292) did not engage in physical activity, 87% (n = 456) did not follow a special diet, and 62% (n = 322) did not have any diseases. Regarding consumption and knowledge of functional foods, 61% (n = 317) of participants were familiar with the term "functional food," 37% (n = 194) claimed to have moderate knowledge about their benefits, and 75% (n = 394) mainly consumed functional foods containing dietary fibers. As for factors related to food purchase, 75% (n = 394) of participants considered health claims on labels important, 66% (n = 343) were concerned about the product's price, 58% (n = 304) cared about the taste of the food, and 51% (n = 268) focused on nutritional quality.

Table 1 shows the mean scores for both age groups according to the QEPFF questions. Statements assessing the perception of functional food benefits showed no statistically significant difference between age groups. Participants generally believed that functional foods promote well-being, agreed that they can repair health damage, disagreed that they have an unpleasant taste, and perceived functional foods as more expensive.

Associating an unpleasant taste with functional foods is a strong reason for consumers to avoid them (Grochowska-Niedworok et al., 2017; Topolska et al., 2021). In this study, this finding was not confirmed, as statement 3 of the QEPFF, which stated that "functional foods do not have a pleasant taste," obtained a low score (<3.5), indicating that respondents disagreed with the statement (Table 1). However, there may be an association of food neophobia with the rejection of functional foods, as shown in some studies (Siegrist & Hartmann, 2020), where adults are more likely to incorporate functional foods into their diets when they are already familiar with the food, whether to functional claims or sensory aspects of the product. Thus, knowing that the adults in this study do not consider functional foods to have an unpleasant taste, their inclusion in the diet may be more related to other factors. However, the groups most likely to consume functional foods (middle-aged adults, elderly, and women) may even sacrifice pleasant taste for health claims (Baker et al., 2022; Guiné et al., 2020).

Regarding the perception of the need for functional food usage, 3 out of 4 statements showed statistically significant differences between age groups. Overall, young adults had more favorable scores regarding the positive perception of the need for functional foods compared to the middle-aged group. However, both groups recognized the need for using these foods (score > 3.5). Middle-aged adults scored higher when perceiving functional foods as more beneficial when dealing with health issues (QEPFF Affirmative 8, Table 1).

The association of functional foods with medications has been observed in other studies (Baker et al., 2022; Topolska et al., 2021), showing that disease acts as a trigger for functional food consumption in adults.

A study (Landström et al., 2009) demonstrated that functional food consumers tend to be sedentary and ill individuals trying to compensate for poor choices by consuming foods that benefit them. Indeed, there is a scientific movement that seeks to study the effects of reversing pathologies and unhealthy eating habits with functional foods, which contributes to this consumer view. Some authors support this idea by referring to key functional foods as "nutraceuticals", indicating that these nutrients can act in reverse signs and symptoms of diseases, resembling pharmaceutical products (Yeung et al., 2018).

Table 1. Mean scores about the perception of adults (N = 522) on the consumption of foods with functional properties.

QEPFF	Young adults (<45 years old) n = 272	Middle-aged adults (>45 years old) n = 250	*p*-value
1. Functional foods do not replace a healthy diet, but they should be consumed as part of a varied diet.	3.97 ± 1.02	3.95 ± 0.92	0.563
2. Functional foods can repair damage caused by an unhealthy diet.	3.76 ± 1.02	3.88 ± 0.94	0.196
3. Functional foods do not have a pleasant taste.*	2.27 ± 1.16	2.30 ± 0.99	0.499
4. Functional foods are capable of improving my well-being.	4.35 ± 0.76	4.32 ± 0.76	0.571
5. Functional foods are more expensive. *	3.50 ± 1.01	3.40 ± 1.08	0.492
6. Functional foods are useless for a healthy person.*	1.78 ± 1.23	1.88 ± 1.06	0.003
7. Functional foods are part of a healthy diet.	4.51 ± 0.75	4.44 ± 0.59	0.009
8. Functional foods are only for ill people.*	1.29 ± 0.70	1.62 ± 0.76	<0.001
9. Functional foods are a passing fad.*	1.76 ± 0.91	1.80 ± 0.83	0.270
10. The safety of functional foods is well-studied.	3.27 ± 0.84	3.42 ± 0.89	0.018
11. I believe in the effect of functional foods if recommended by a health professional (doctor, nutritionist, etc.).	3.06 ± 1.32	2.90 ± 1.29	0.106
12. Functional foods truly exhibit the effects stated in the advertisements.	3.06 ± 1.12	3.14 ± 0.92	0.467
13. Functional foods may have undesirable effects.*	2.15 ± 1.12	2.04 ± 0.99	0.337
14. Excessive consumption of functional foods is harmful.	3.07 ± 1.17	3.32 ± 1.18	0.004
15. The only functional foods are those whose labels declare health benefits.*	2.13 ± 1.11	2.27 ± 1.03	0.055

*Opposes the consumption of foods with functional properties.

Statements related to trust received lower scores among all aspects. This category indicated that middle-aged adults have more confidence in studies confirming the functionality of functional foods than young adults. Young adults, however, expressed belief in functional foods if recommended by a healthcare professional.

Regarding safety, middle-aged adults showed more concern about excessive consumption of functional foods compared to young adults ($p < 0.05$). However, the scores for both groups indicated uncertainty or lack of opinion related to this aspect, as the scores were below 3.5. This question may be related to the perception that functional foods are similar to medications and should be taken in proper dosage. Both groups disagreed that functional foods have undesirable effects, and their consumption does not solely rely on the claims on the label.

Table 2 segregates the age groups based on their QEPFF scores, both favorable and unfavorable, and assesses the association of these factors with the perception of functional foods. In general, the majority of respondents showed a favorable perception of functional foods, with approximately 77% of the sample scoring above 3.5. The difference in mean scores between age groups was small.

Educational attainment demonstrated a trend to interfere with participants' perception of functional foods ($p = 0.07$). Individuals with more than 12 years of education represented 53% of the sample with a favorable perception.

Table 2. Associations of the consumption of foods with functional properties (FF) with socioeconomic, lifestyle, and food consumption characteristics among young and middle-aged adults (N = 522).

Characteristic		Young adults (n = 272)			Middle-aged adults (n = 250)			Total (n = 522)		
		QEPFF < 3.5 n (%)	QEPFF > 3.5 n (%)	*p*-value	QEPFF < 3.5 n (%)	QEPFF > 3.5 n (%)	*p*-value	QEPFF < 3.5 n (%)	QEPFF > 3.5 n (%)	*p*-value
Sex	Female	31 (11)	140 (51)	0.136	40 (16)	123 (49)	0.944	71 (14)	263 (50)	0.326
	Male	26 (10)	75 (28)		21 (8)	66 (26)		47 (9)	141 (27)	
Schooling (years)	<9	3 (1)	5 (2)	0.453	28 (15)	64 (39)	0.238	31 (6)	69 (13)	0.078
	9-12	8 (3)	26 (10)		9 (4)	34 (14)		17 (3)	60 (12)	
	>12	46 (17)	184 (68)		24 (10)	91 (36)		70 (13)	275 (53)	
Income (wage)	< 2	31 (11)	95 (35)	0.389	19 (8)	23 (9)	0.002	50 (10)	118 (23)	0.025
	2 to 4	12 (4)	56 (21)		19 (8)	67 (27)		31 (6)	123 (24)	
	> 4	14 (5)	64 (24)		23 (9)	99 (40)		37 (7)	163 (31)	
Physical activity	Active	27 (10)	99 (36)	0.859	22 (9)	82 (33)	0.313	49 (9)	181 (35)	0.528
	Sedentary	30 (11)	116 (43)		39 (16)	107 (43)		69 (13)	223 (43)	
Diet	On a diet	2 (1)	28 (10)	0.054	13 (5)	23 (9)	0.077	15 (2)	51 (10)	0.979
	Not on a diet	55 (20)	187 (69)		48 (19)	166 (66)		103 (20)	353 (68)	
Illness	Ill	8 (3)	54 (20)	0.076	37 (15)	101 (40)	0.324	45 (9)	155 (30)	0.964
	Not ill	49 (18)	161 (59)		24 (10)	88 (35)		73 (14)	249 (48)	
Use of FF	Consumer	29 (11)	185 (68)	< 0.001	9 (4)	178 (71)	< 0.001	81 (16)	363 (70)	< 0.001
	Not a consumer	28 (10)	30 (11)		52 (21)	11 (4)		37 (7)	41 (8)	
Profession/ Occupation	Healthcare	12 (4)	64 (24)	0.192	5 (2)	24 (10)	0.339	17 (3)	88 (17)	0.079
	Others	45 (17)	151 (56)		56 (22)	165 (66)		101 (19)	316 (61)	
Claim in the label	Important	46 (17)	183 (67)	0.417	42 (17)	123 (49)	0.589	88 (17)	306 (59)	0.796
	Not important	11 (4)	32 (12)		19 (8)	66 (26)		30 (6)	198 (38)	
Knowledge about FF	Unsatisfactory	17 (6)	91 (33)	0.086	23 (9)	80 (32)	0.524	40 (8)	171 (33)	0.101
	Satisfactory	40 (15)	124 (46)		38 (15)	10 (44)		78 (15)	233 (45)	
Nutritional quality of food	Important	15 (6)	116 (43)	>0.001	29 (12)	106 (42)	0.244	44 (8)	222 (43)	0.008
	Not important	42 (15)	99 (36)		32 (13)	83 (33)		74 (14)	182 (35)	
Cost of food	Important	40 (15)	151 (56)	0.993	35 (14)	117 (47)	0.529	75 (14)	268 (51)	0.576
	Not important	17 (6)	64 (24)		26 (10)	72 (29)		43 (8	136 (26)	
Taste of food	Important	28 (10)	124 (46)	0.248	39 (16)	113 (45)	0.564	67 (13)	237 (45)	0.526
	Not important	29 (11)	91 (33)		22 (9)	72 (29)		41 (8)	167 (32)	

Income, among the socioeconomic factors, showed the strongest association with the perception of functional foods (p = 0.025). The number of minimum wages was directly proportional to a favorable perception of functional foods, especially in the middle-aged group (p = 0.002). Around 40% of the sample belonged to the group with scores above 3.5, composed of middle-aged adults with a monthly family income above 4 minimum wages.

Other studies demonstrated a similar profile for functional food consumers: individuals seeking health knowledge, with higher education levels, and better financial situations (Altun et al., 2021; Chammas et al., 2019; Corso et al., 2018; Guiné et al., 2020; Safraid et al., 2022; Szakály et al., 2019; Vrgović et al., 2022). Our data, combined with the fact that moderate to advanced knowledge about functional foods favored a positive perception in the QEPFF, may indicate the importance of interventions on the consumption of functional foods among low-income and low-education groups.

No statistically significant differences were observed in perception between groups concerning gender, lifestyle, or health characteristics (physical activity, adherence to a special diet, and the presence of diseases). It is worth noting that 68% of individuals who did not follow a special diet obtained scores higher than 3.5 in the QEPFF. Regarding the disease profile, the youngest adults without diseases had a favorable perception of functional foods, showing a significant trend of association (p = 0.076).

The occupation of participants showed a trend of association with a favorable perception of functional foods, despite the majority not being from the healthcare professions (61%), they still expressed favorable scores ($p = 0.079$). Among young adults, a higher level of knowledge about functional foods may have influenced a positive scoring trend (46% scored QEPFF >3.5) ($p = 0.086$). This data is in accordance with previous study (Altun et al., 2021).

Regarding adults' buying behavior, the fact of considering nutritional quality important when making food purchases was identified as an important factor in food choice, resulting in a favorable perception of functional foods ($p < 0.01$), especially among young adults ($p < 0.001$). The higher QEPFF scores can support studies where functional food consumption is associated with healthy habits and lifestyles (Chammas et al., 2019; Corso et al., 2018; Puhakka et al., 2018). The main consumers of these foods are individuals seeking to improve overall health, especially young adults, who are more exposed to information about the benefits of a healthy lifestyle and are already applying it, including functional foods in their diets.

Table 3 shows the mean scores obtained for each aspect evaluated in the QEPFF (benefits, safety, trust, and need) according to sociodemographic, health, and food consumption characteristics. Statements in the QEPFF with a negative sense toward functional food consumption were reverse-scored.

Table 3. Score* of adult judgments regarding benefits, needs, confidence, and safety** in foods with functional properties (N = 522) according to socioeconomic and lifestyle aspects***.

Category	Benefits	Needs	Trust	Safety
Young adults (272)	3.66 ± 0.45 ^{Ab}	4.42 ± 0.59 ^{Aa}	3.09 ± 0.58 ^{Ac}	3.60 ± 0.63 ^{Ab}
Middle-aged adults (250)	3.69 ± 0.54 ^{Ab}	4.27 ± 0.57 ^{Ba}	3.04 ± 0.51 ^{Ac}	3.67 ± 0.66 ^{Ab}
< 2 wages (168)	3.58 ± 0.45 ^{Bb}	4.29 ± 0.60 ^{Ba}	3.06 ± 0.57 ^{Bc}	3.57 ± 0.67 ^{Ab}
2 to 4 wages (154)	3.71 ± 0.53 ^{Ab}	4.25 ± 0.55 ^{Ba}	2.98 ± 0.49 ^{Bc}	3.61 ± 0.64 ^{Ab}
More than 4 wages (200)	3.73 ± 0.47 ^{Ab}	4.49 ± 0.61 ^{Aa}	3.16 ± 0.57 ^{Ac}	3.71 ± 0.64 ^{Ab}
<9 years of schooling (100)	3.67 ± 0.55 ^{Ab}	4.00 ± 0.52 ^{Ba}	2.88 ± 0.44 ^{Bc}	3.62 ± 0.64 ^{Ab}
9 to 12 years of schooling (76)	3.65 ± 0.54 ^{Ab}	4.36 ± 0.56 ^{Aa}	3.18 ± 0.58 ^{Ac}	3.57 ± 0.68 ^{Ab}
> 12 years of schooling (346)	3.64 ± 0.42 ^{Ab}	4.41 ± 0.59 ^{Aa}	3.06 ± 0.58 ^{Ac}	3.62 ± 0.62 ^{Ab}
Active (291)	3.66 ± 0.53 ^{Ab}	4.27 ± 0.60 ^{Ba}	3.03 ± 0.52 ^{Ac}	3.61 ± 0.67 ^{Ab}
Sedentary (230)	3.70 ± 0.45 ^{Ab}	4.47 ± 0.58 ^{Aa}	3.14 ± 0.59 ^{Ac}	3.67 ± 0.62 ^{Ab}
Ill (322)	3.70 ± 0.50 ^{Ab}	4.37 ± 0.60 ^{Aa}	3.05 ± 0.55 ^{Ac}	3.60 ± 0.64 ^{Ab}
Not ill (200)	3.64 ± 0.50 ^{Ab}	4.35 ± 0.60 ^{Aa}	3.10 ± 0.53 ^{Ac}	3.66 ± 0.67 ^{Ab}
On a diet (456)	3.63 ± 0.50 ^{Ab}	4.25 ± 0.57 ^{Aa}	2.97 ± 0.52 ^{Ac}	3.58 ± 0.64 ^{Ab}
Not on a diet (66)	3.68 ± 0.42 ^{Ab}	4.38 ± 0.62 ^{Aa}	3.13 ± 0.53 ^{Ac}	3.54 ± 0.58 ^{Ab}
Nutritional quality of food is not important (254)	3.61 ± 0.54 ^{Ab}	4.21 ± 0.59 ^{Ba}	2.99 ± 0.53 ^{Bc}	3.56 ± 0.67 ^{Bb}
Nutritional quality of food is important (268)	3.73 ± 0.54 ^{Ab}	4.46 ± 0.58 ^{Aa}	3.13 ± 0.56 ^{Ac}	3.69 ± 0.62 ^{Ab}

*The affirmatives 2, 4, 6, 7, 9, 12, 13, and 15 from QEPFF were reverse-scored. **Lowercase letters indicate statistical difference between the judgments on the line according to the two-way ANOVA followed by Bonferroni tests. ***Different capital letters in the columns indicate statistical differences between the categories (column) according to the two-way ANOVA followed by Bonferroni tests.

In this evaluation, the aspect of need received the highest score among all QEPFF aspects and was the only one that showed a statistically significant difference between age groups. Young adults obtained a higher score in comparison to middle-aged adults regarding the need for functional foods ($p > 0.05$).

The aspects of benefits, needs, and trust showed statistical differences between income brackets, confirming what was found in Table 2. The group with a monthly income above 4 minimum wages obtained higher scores in all aspects, indicating that higher income was associated with a better perception of functional foods. Additionally, the income range from 2 to 4 minimum wages also showed a higher score for the benefit aspect compared to those with lower income. Educational attainment influenced respondents' perception of need and trust. These aspects had higher scores among both groups with more years of education ($p < 0.05$).

Individuals who engaged in physical activity scored higher in QEPFF ($p < 0.05$) compared to those who did not. However, the presence or absence of diseases and adherence to a special diet did not show statistically significant differences for the different QEPFF categories.

Both age groups in this study scored low in trust in functional foods (QEPFF <3.5). Young adults indicated in the QEPFF statements that they trust health professionals' recommendations more than middle-aged adults and also show more skepticism toward studies related to functional foods. A study (Verbeke, 2005) confirmed this finding, concluding that younger consumers tend to be more critical of functional food claims, leading to a reverse effect on the acceptance of functional foods. On the other hand, another study (Jáuregui-Lobera & López, 2018) with young adults showed significant interest in consuming functional foods, based on their nutritional quality, meaning that their choices are not solely influenced by claims but by rational arguments. Thus, a change in thinking regarding functional food consumption between the generations of the 2000s and 2010s is observed, considering these studies (Jáuregui-Lobera & López, 2018; Verbeke, 2005) as well as the results of the present study. As generations progress, young adults tend to consume foods based more on experience, nutritional quality, brand recognition, and a liking for innovations, besides the fact that the majority is pursuing higher education (Williams & Page, 2011). The generations that lived through the COVID-19 pandemic may be even more inclined to consume functional foods, given the widespread dissemination of knowledge on how a healthy diet could prevent certain health complications (Han, & Hoang, 2020; Altun et al., 2021).

The differences found between young adults and middle-aged adults lead to the inference that the profile of functional food consumers has changed over the generations. The improvement in the ability to distinguish between real and false information among young consumers, along with the encouragement to adopt healthy lifestyles and a connection with nature, may influence this behavior (Grochowska-Niedworok, et al., 2017). Another study also demonstrated that older individuals care about the amount of information about functional foods and the trustworthiness of this health information and are generally suspicious of its credibility, regardless of its source (Chammas et al., 2019; Puhakka et al., 2018).

New studies should be conducted to compare changes in the perception of functional foods before and after the COVID-19 pandemic, as their immune-boosting benefits were widely recognized at that time (Han & Hoang, 2020). However, we believe that the results shown in the present study confirm much of what was observed during the pandemic: People who seek functional foods are typically young adult women who prioritize their health (Altun et al., 2021; Safraid et al., 2022).

4 Conclusions

In conclusion, there is a generally positive perception of functional foods among young and middle-aged adults, with some differences between the generations. For middle-aged adults, socioeconomic factors and a monthly income above 2 to 4 minimum wages seem to be important factors influencing the perception of functional food consumption. Education levels above 9 years of study appear to influence both generations' perceptions.

Middle-aged adults may perceive functional foods as remedies or agents used to reverse unhealthy habits and their associated health damages. On the other hand, young adults showed a positive perception of functional foods when considering the nutritional quality of the food at the time of purchase, as well as a greater awareness of the need to consume functional foods compared to middle-aged adults.

The recognition of the benefits and necessity of functional foods as part of a healthy diet, along with the respondents' knowledge and familiarity with functional foods in this study, demonstrates that this market continues to be promising, provided that measures to stimulate greater consumer confidence are adopted.

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