

Cross-sectional study for assessment of fish consumption in terms of the level of physical activity and perception of quality of life in volunteers in Brazil and Portugal

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Abstract

Background: A healthier lifestyle, with the promotion of physical activity and healthy diets, has supported studies on the possible relationship of daily choices for food consumption and practices of physical activities, this research aimed to evaluate the relationship between the frequency of fish consumption, the level of physical activity and domains of quality of life in the voluntaries from the Brazil and Portugal.

Methods: This is a cross-sectional delineation study through a survey conducted via the Internet, the volunteers responded to a structured survey about fish consumption, the perception of quality of life was evaluated with WHOQOL-bref and the level physical activity with International Physical Activity Questionnaire all instruments available through the online system SurveyMonkey. For data analysis, the criterion adopted was the situation of the subjects who reported consuming fish at least once a week (Group 1) or less than once a week or who did not consume fish (Group 2). As a non-parametric test, the Mann-Whitney test was used For the comparison of average values of variables.

Results: The criterion adopted was the situation of the subjects who reported consuming fish at least once a week (Group 1, n = 417) or less than once a week or who did not consume fish (Group 2, n = 527). The results showed significant statistical differences between the consumption groups in all variables considered The values for the mean and sum of ranks show that Group1, formed by volunteers with higher fish consumption, presents higher values in all variables, indicating that more frequent fish consumers have a more active lifestyle and better perception of quality of life in both countries.

Conclusions: The results suggest the fish consumption appears to be associated to more active and better perception of quality of life, regardless of geographical location, so is so important actions encouraging the consumption of healthier foods, like a fish, and regular physical activities in worldwide.

Introduction

The interest in a healthier lifestyle, with the promotion of physical activity and healthy diets, has supported studies on the possible relationship of daily choices for food consumption [1,2].

Everyday choices include intrinsic and extrinsic elements. Regarding foods, intrinsic choices concern their nutritional value, the presence of functional component, palatability and the relationship with health. Extrinsic elements, on the other hand, refer to eco-friendly, sustainable and organic production, and the use of techniques that ensure animal welfare [3]. It has been observed that intrinsic motivation is critical for the general maintenance of the practice of physical activity and a balanced diet [1].

In this sense, attitudes regarding fish consumption have been linked to health issues, the main drive for consumers' interest [4]. The traditional diet pattern of Mediterranean populations, for example, rich in fish consumption, has been evidenced as a health promoter, and

consistent investigations have been conducted on this type of diet [5-7].

In the Mediterranean countries, the frequency of fish consumption is very high, regardless of barriers and motivational aspects that affect its consumption [8]. The interest in fish consumption is connected with information about its nutritional value and its association with health improvement. This aspect is observed in populations that have a fish-based diet [9-11] and consume fish at least twice a week, according to nutritional recommendations [12,13].

Despite the cultural differences, a study conducted on fish

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consumers in Belgium, Denmark, the Netherlands, Poland and Spain showed that, in general, there is a concern among consumers with the relationship between food and health, in addition to a positive association of fish consumption with health benefits and a subjective perception of life satisfaction [14].

There seems to be a collective consciousness to food healthiness, where fish has gained prominence due to studies that reinforced the association of fish consumption with lower prevalence of non-transmittable chronic diseases such as diabetes [7-15], heart conditions [6-16], breast cancer [6], reduction of cholesterol levels and stroke incidence, and Alzheimer's disease. Fish consumption is also attributed to increased cognitive function in adults and prevention of birth of underweight babies [10].

A study conducted in Norway, showed that women who consume from 75-100 g of lean fish, between 2-3 times a week, presented a reduction of approximately 30% of the risk for type II diabetes (Rylander *et al.* 2014). An increase in fish consumption to about 14.4 g/day was associated with a decreased prevalence of metabolic syndrome [17].

Despite several well-known benefits, fish consumption is still low in many countries and it may be linked to cultural differences [18], influences in social group [19], preparation convenience [20], high prices and problems in the production chain [21]. In Brazil, the low *per capita* fish consumption result from the fact that few people have the habit of consuming fish in their usual diet [22].

The regular practice of physical activity has been recommended as one of the factors capable of decreasing mortality rates and controlling diseases such as hypertension, diabetes and obesity worldwide [23,24]. Physical activity provides the population benefits for the improvement or maintenance of health conditions, which bring benefits to public health systems in terms of hospitalizations and complementary services [25]. Adequate diets, along with healthy lifestyles, can be even more beneficial, demonstrating the importance of expanding knowledge about the effects of this association on the quality of life (QOL) of the population [1].

In light of these considerations, this research aimed to evaluate the relationship between the frequency of fish consumption, the level of physical activity and domains of QOL recommended by the World Health Organization (WHO), in the context of two countries, Brazil and Portugal.

Methods

This is a cross-sectional delineation study through a survey conducted via the internet.

Subjects

This research counted on the participation of 944 Brazilians and 132 Portuguese volunteers who responded to a structured survey available through the online system *Survey Monkey*.

For data analysis, the criterion adopted was the situation of the subjects who reported consuming fish at least once a week (Group 1, n = 417) or less than once a week or who did not consume fish (Group 2, n = 527).

The instruments were available in two versions, one for disclosure in Brazil and another in Portugal with semantic language adaptations carried out by language specialists in Portugal. In Brazil, the survey

was made available on the homepage of the University of São Paulo (USP), the Brazilian Enterprise for Agricultural Research (EMBRAPA) and federal universities, and the access was allowed to any Brazilian resident in the country. In Portugal, the invitation was forwarded to researchers and students of the University of Porto, and access was granted to any Portuguese citizen.

All participants were asked to read and agree to the Free Informed Term of Consent (FITC) made available on the homepage of the survey. This study was approved by the Committee of Ethics for research with human beings of the Escola Superior de Agricultura "Luiz de Queiroz" of the University of São Paulo, under the protocol number 087.

Fish consumption

The study on consumption of fish was carried out using the Perception Survey of Fish Consumption developed and validated by Maciel [26] with adaptations. The questionnaire consisted of evaluating the frequency and consumption habits, desirable characteristics or attributes and purchase-related habits of fish.

Quality of life (QOL)

The perception of QOL was evaluated with *WHOQOL-bref* [27], which covers four domains - physical, psychological, social relations and environment - and the general QOL.

Physical activity level

The level of physical activity was verified by the *International Physical Activity Questionnaire* (IPAQ) short version and normal week validated in Brazil [28].

The results were calculated on the basis of the MET (Metabolic Equivalent) that refer to the quantity of oxygen required, per minute, under conditions of normal rest, equal to 3.5 ml of oxygen consumed per kilogram of body weight per minute (ml/kg min). The higher the MET, the greater oxygen consumption, thus, the greater calorie burning [29].

Data analyses

We compared variables of domains of QOL and MET values recommended for a normal week between the two groups composed of subjects of both countries, but also allowing differentiated analyses of responses given by respondents in each country. The data were subjected to the analysis of normality (*Kolmogorov* and *Smirnov* tests) and homoscedasticity. The descriptive analysis of the sample was performed.

For the comparison of average values of variables to categorize fish consumption, the validity of the application of nonparametric tests was defined due to the ordinal nature of the data and the inadequate application of the analysis of variance, supported by the non-adherence of data original to normal distribution. As a non-parametric test, the Mann-Whitney test was used.

Results

The study showed a distinct sociodemographic profile between Brazilian and Portuguese volunteers who responded to the questionnaire (Table 1), the Portuguese showed a higher average age than the Brazilians.

Group 1, with higher weekly fish consumption, presented 124 individuals (13.1%) with consumption twice or more a week and 293 (31%) with consumption once a week, totaling 417 (44.1%) individuals.

Table 1. Socio-demographic distribution of research participants.

	n	%
Gender		
Women	507	53.7
Men	387	41
Missing	50	5.3
Schooling		
Primary school complete	1	1
Middle school dropout	1	1
Middle school complete	16	1.7
College dropout	202	21.4
College complete	172	18.2
Post-graduation	502	53.2
Missing	50	5.3
Marital status		
Single	485	51.4
Married	347	36.8
Widowed	5	5
Divorced	28	3
Other	29	3.1
Missing	50	5.3
Income		
Less than one minimum wage (MW)	15	1.6
1-2 MW	59	6.3
2-3 MW	71	7.5
3-4 MW	79	8.4
4-6 MW	160	16.9
6-8 MW	108	11.4
8-10 MW	133	14.1
Higher than 10 MW	269	28.5
Missing	50	5.3

Missing= lost or left out data

Group 2, with lower weekly fish consumption, had 258 (27.3%) of individuals with consumption two to three times a month; 130 (13.8%) with consumption once a month; 120 (12.7%) with rare consumption and 19 (2%) that never consumed fish, totaling 527 (55.8 percent) individuals.

The results showed significant statistical differences between the consumption groups in all variables considered (Table 2).

The values for the mean and sum of ranks show that Group1, formed by volunteers with higher fish consumption, presents higher values in all variables, indicating that more frequent fish consumers in both countries have a more active lifestyle, shown by MET. These consumers also have a better perception of QOL reflected in the domains that compose it.

Discussion

This study found positive relationships between fish consumption, physical activity and QOL, indicating the possibility of associations between these three variables.

In the investigation of reasons and barriers to fish consumption, some studies have taken into consideration the individual lifestyle choices, health conditions and socio-demographic aspects [11,30,31], which allow concluding that there is a strong component related to fish consumption and life styles, for example, the practice of physical activity [32]. The relationship between fish consumption and the age, in turn, demonstrates that elderly people consume fish more often

than younger populations do [11]. Socio-demographic aspects studied in specific regions show that fish consumption is also associated with the presence of children in families, higher age, females and the people living in coastal regions, highlighting the effect of the product availability on the consumption habit [31].

Strengthening the habit seems to be one of the most obvious factors to stimulate consumption, because a habit practiced in the past seems to influence the choices for fish consumption. Thus, effective changes of behavior require affirmative actions that stimulate everyday habits strengthening behavioral choices [33].

Similarly, the habit of fish consumption has been associated with a choice for healthy animal protein in geographically distinct studies [34]. Reduction of cholesterol levels, incidence of stroke, heart disease and possibly Alzheimer's are among the benefits. Fish consumption can boost the cognitive function in adults and help prevent the birth of underweight babies and pre-term labor [10].

Although consumption of other foods was not evaluated in this study, there is a premise that fish consumption is associated with healthier lifestyles, corroborating [15], who identified strong correlation between the consumption of fish and other healthy foods such as vegetables and fruits, based on results observed in the study with Finnish fishermen.

The importance of adopting adequate living habits for health promotion is supported in several studies and shows that healthy eating patterns are associated with significant risk reduction of cardiovascular diseases [35-38].

Table 2. Groups of higher and lower weekly fish consumption in the variables MET and domains of QOL.

		n	Mean rank	Sum of ranks	Mean	SD (±)	p
MET	Group 1	367	454.01	166622.50	2823.61	165.18	0.012
	Group 2	491	411.18	201888.50	2733.64	173.33	
	Total	858					
Domains							
Physical	Group 1	417	508.98	212245.50	16.80	0.11	< 0.001
	Group 2	527	443.63	233794.50	16.23	0.10	
	Total	944					
Psychological	Group 1	417	526.55	219572.50	16.07	0.09	< 0.001
	Group 2	527	429.73	226467.50	15.22	0.10	
	Total	944					
Social relations	Group 1	417	513.47	214119.00	16.15	0.13	< 0.001
	Group 2	527	440.08	231921.00	15.23	0.13	
	Total	944					
Environment	Group 1	417	523.91	218472.50	14.90	0.10	< 0.001
	Group 2	527	431.82	227567.50	14.12	0.09	
	Total	944					
General QOL	Group 1	417	531.75	221740.50	16.33	0.13	< 0.001
	Group 2	527	425.62	224299.50	15.19	0.13	
	Total	944					

MET (Metabolic Equivalent) Group 1: higher fish consumption. Group 2: lower fish consumption
 Mean Rank= Mean of points; Sum of Rank= Sum of points; QOL= Quality of Life

Based on data obtained through scientific approaches, the American Heart Association (AHA, 2006) recommends that to promote health of the cardiovascular system, it is important to adopt a balanced diet and it highlights that fish should be consumed at least twice a week, also recommended by [39].

A study on fish consumption and n3 fatty acids and its relation with the risk of coronary heart disease among the Japanese showed that people who consumed less fish, those who ate more fish were less likely to be overweight, but were more likely to be hypertensive and have high alcohol consumption. Compared to the modest fish consumption once a week, a higher consumption was associated with a substantial reduction in the risk of coronary heart disease, mainly non-fatal cardiac events among middle-aged people [39].

Thus, we can affirm that fish consumption may be associated with better health, since it is basic food for diets to control body weight, given that this habit is associated with the consumption of low-caloric foods such as vegetables and fruits. This profile of eating habit also seems to be associated with greater practice of physical activity and therefore greater energy expenditure, as observed in this study and, somehow, it influenced a better perception of QOL.

The relationship of fish consumption with QOL in terms of welfare was investigated by Averina *et al.* [40], who aimed to prove the relationship between the low consumption of fish, fruit and vegetables with depression, anxiety, sleep disorders and poor QOL in 1,968 men and 1,737 women, in Russia, between 18-90 years of age. The authors showed that the chances of sleep disturbances were 60% higher for those who consumed fish, fruits or vegetables less frequently and at lower quantity when compared to those who consumed these foods more than once a week. Participants with their nutrition evaluated as "poor" also had significantly higher chances of depression, anxiety, sleep disorders and poor QOL, which shows a beneficial effect of the adherence of these practices and their impact on QOL.

Similarly, a study conducted on a population in New Zealand showed a significant relationship between fish consumption, QOL and mental state of health, indicating that fish consumption was significantly associated with better self-reported mental health state. The results support other studies, where fish consumption is inversely correlated with depression, attributed to the amount of polyunsaturated fatty acids in fish [41].

The positive aspects of fish consumption can also be associated to biological parameters, including low levels of blood cholesterol, triglycerides and glycemia, good cardiovascular response and stress control [42].

This relationship between the adherence to the Mediterranean diet, rich in fish, and the mental and physical self-perception, smoking, BMI, alcohol consumption, schooling, leisure, physical activity and presence of chronic diseases was tested on a sample composed of 3,910 men and 4,285 women, between 35-74 years old, residing in Spain [5].

Although the discussion about this diet model started long ago, only at the end of the last decade the results of epidemiological research were confirmed, indicating its potential beneficial for the prevention of non-transmittable cardiovascular diseases, if it is associated with an active lifestyle [43]. Another interesting evidence lies in the fact that dietary intervention indicates an improvement in the QOL by adopting diets composed of fish, fruits and vegetables [44].

Eating habits are also determined by the age of consumers. This

seems to be one of the most discriminatory personal factors to the perception of food quality, that is, changes in the age group of the population, recorded in the last decade, namely reduction of birth rates and increase life expectancy, have caused changes in consumption patterns and eating habits with impacts on the entire food industry [45]. In a study composed of 60 subjects aged between 20-40 years old, to validate a survey to measure fish consumption in Spain, Iceland and Ireland, it was observed that the frequency of fish consumption was higher in Spain, where 70% of participants consumed fish twice or more per week, while in Iceland, 47% and Ireland 10% showed the same frequency of consumption. This shows the power of cultural habits practiced in these countries [4].

It is clear that social and cultural aspects can also provide health benefits. A favorable environment of social support can contribute to better self-perception of health-related QOL [46]. A study conducted on university students in the United Kingdom, for example, showed a strong relationship between the subjective perception of well-being and QOL, related to the behaviors of healthier lifestyles [47].

In a cross-sectional study to evaluate diet and lifestyle in 210 university students in Italy and Spain, 27 years old on average, differences were observed in relation to the consumption of some foods. Italian students consumed cereals more frequently, while Spanish students consumed more fish and vegetables and had higher levels of physical activity [7]. Similarly, the family history of obesity and dietary habits has been linked to lifestyle patterns and risk factors for obesity [48].

Similar results are provided by a study on 19,647 students between 17-30 years old in 21 countries, including Europe, the United States and Asia, about lifestyle with information about smoking, physical activity, alcohol consumption, solar protection, and fruit, fats and fibers intake. Greater satisfaction with life was positively associated with nonsmoking, regular practice of physical exercises, regular consumption of fruits and limitation in fat intake. The results were consistent in all regions for the variables smoking and physical exercises and the relationship between life satisfaction and lifestyle was independent of beliefs in the benefits of behavior to health, that is, active lifestyle and with healthier behaviors influence directly on customer satisfaction and QOL, regardless of knowledge on the subject [42].

Fish effects on health are the main reason for dietary recommendations for fish consumption. However, data show a decrease in consumption among younger people, characteristic of the nutritional transition through which various countries have passed [4].

The evaluation of fish consumption is complex, even in countries with substantial consumption established, which can be attributed to difficulties of the production chain that raises concern about quality and safety of the product. There are collective efforts to overcome this consumption barrier; however, the nutritional quality and perishable characteristics of fish are the main factors that hinder control in the production chain.

On the other hand, as fish and its products are a significant part of a healthy diet, it is important to have a valid and easy-to-apply method to assess its consumption. Questionnaires on eating habits are commonly used in diet studies. Their validation plays an important role in quality assurance of study, because information provided by non-validated questionnaires can lead to inaccurate results and associations.

As limitation of the study, we highlight that it was not performed evaluation of all foods of the diet, which could justify, in part, if the

fish has been consumed with other foods for health promotion. There is also the possibility of sampling bias, mainly among Brazilians, since access to the Internet and use of its tools are still limiting factors to these types of studies in the country.

Conclusion

This study shows that individuals that consume fish with higher frequency have better perception of QOL and greater energy expenditure. These characteristics are part of healthy lifestyle habits that contribute to health promotion and the results suggest that, regardless of geographical location, fish consumption appears to be associated to other factors for a more active lifestyle.

Competing interest

The authors declare that they have no competing interests.

Authors' information

ESM conceived of the study, and participated in its design and coordination and drafted the manuscript. JGS participated in the design of the study and drafted the manuscript. DMM participated in the design of the study, performed the statistical analysis and drafted the manuscript. FRPQ participated in the design of the study, performed the statistical analysis and drafted the manuscript and drafted the manuscript. MO drafted the manuscript conceived of the study, and participated coordination and helped to draft the manuscript. RV conceived of the study, and participated in its design and coordination and helped to draft the manuscript. All authors read and approved the final manuscript.

Ethical approval

All procedures performed in this studied involving human participants were in accordance with the ethical standards of the institutional and / or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Informed consent was obtained from individual participants all included in this studied and was approval for the Comitee of ethics in research with human beings of the Escola Superior de Agricultura "Luiz de Queiroz" by University of São Paulo (protocol 087).

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