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Motivation for health behaviour: A predictor of adherence to balanced and healthy food across different coastal Mediterranean countries

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ABSTRACT

This cross-sectional study aimed to assess perceptions of healthy food and motivation for health behaviour (MHB) in different Mediterranean countries. Multiple linear regression was used to identify the association between perception of healthy food and MHB in different countries. The highest MHB was observed in Portugal (median 38.0; IQR 7.0) and the lowest in Greece (median 34.0; IQR 8.0). Compared to Portuguese respondents, respondents from Croatia (ß=0.35; $p < 0.001$), Egypt (ß=0.24; $p < 0.001$), and Greece (ß=0.10; $p < 0.001$) had a higher probability of a better perception of healthy food. Slovenia respondents had reduced perception of healthy food (ß=-0.10; $p < 0.001$) and MHB (ß=-0.22; $p < 0.001$), despite higher adherence to a healthy diet (ß=0.22; $p < 0.001$). Lifestyle habits, such as physical exercise, showed a weak association with MHB (ß=0.14; $p < 0.001$) and adherence to healthy food (ß=0.18; $p < 0.001$). The presence of most chronic diseases was negatively associated with MHB. The association between the perception of healthy food, MHB, and adherence to a balanced and healthy diet across different countries could be useful for implementing strategies to promote healthy eating and prevent chronic diseases.

1. Introduction

Understanding the reasons for the consumption of certain foods by humans is important for improving people's lives around the world. Although nutrition today is mainly associated with global health and health information, the consequences of unhealthy food consumption are omnipresent in all strata of society. To be healthy and active, our diet (what we regularly eat and drink) must be adequate in quantity and variety to meet our energy and nutritional requirements. Unhealthy food choices could be a reason for concern in connection with potential adverse health consequences. Low adherence to dietary guidelines results in most people eating an unhealthy diet (Ridder, Kroese, Evers, Adriaanse, & Gillebaart, 2017). In addition, different determinants influence the motivation for food selection (Leng et al., 2017). For example, dietary components (e.g. highly palatable foods and liking some types of food), health attitude, perceived stress, familial preferences, cultural and social environment, and also the marketing of unhealthy commodities may influence food choices (Buchanan, Kelly, Yeatman, & Kariippanon, 2018; Leng et al., 2017). This may be a problem when food choices are not correlated with individual health, or

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when they are unhealthy.

People's food choices are very complex and dynamic, and are influenced by motivation related to health and security, as well as by diverse factors, such as emotional and socioeconomic status, demographic variables, health conditions, and lifestyles (Bartkiene et al., 2019; Ferrão, Correia, Ferreira, & Guiné, 2019; Ferrão et al., 2018; Liu et al., 2017; Sami, Ansari, Butt, & Hamid, 2017). Personal taste and the need for nutrients, food characteristics, prices, convenience, ethical issues, and religious, cultural, marketing, political, and environmental influences may affect motivation for food choice and consumption (Bartkiene et al., 2019; Ferrão, Correia, et al., 2019; Ferrão et al., 2018; Liu et al., 2017; Sami et al., 2017). One of the domains that greatly influence food habits is the culture and society surrounding the individuals, that is, the country where one lives (Barauskaite et al., 2018; Boustani & Guiné; Stasi et al., 2018).

Geographic position, rural and urban environment, racial and ethnic disparities, and other conditions may influence differences in nutrient intake (Downs et al., 2012; Vadiveloo, Perraud, Parker, Juul, & Parekh, 2019). Nevertheless, patterns and trends in food consumption differ among diverse geographic and cultural environments (Mengesha, 2021). In addition, tradition plays an important role in maintaining a healthy diet (Vadiveloo et al., 2019). Indeed, the traditional diets around the Mediterranean Sea have been recognised as contributing to the promotion of health status, and UNESCO has recognised this cultural background as an intangible cultural heritage in 2010 (Andrade et al., 2020). However, populations living around the Mediterranean today often adopt a Western diet, and are at risk of gradually abandoning their traditional Mediterranean diet (Quarta et al., 2021).

Furthermore, understanding healthy food choices depends on the general population's nutritional knowledge and may have crucial implications for food motivations and choices. Studies confirm a positive association among sociodemographic characteristics, higher nutrition knowledge, motivation, and the adherence to healthier dietary patterns (Andrade et al., 2020; Boustani & Guiné; Ferrão, Correia, et al., 2019; García-Conesa et al., 2020; Guiné et al., 2020; Hendrie, Coveney, & Cox, 2008; Ljubicic et al., 2017; Quarta et al., 2021). Increasing nutritional knowledge may affect dietary pattern changes to shift toward a healthier diet (Hartmann, Keller, & Siegrist, 2016).

Motivation for a positive lifestyle and healthy food consumption plays a crucial role in maintaining health (Ridder et al., 2017). Unhealthy lifestyle habits manifesting as poor physical activity, unhealthy diet, smoking, alcohol consumption, unhealthy daily behaviours, and individual functioning may have negative impacts on human health (Farhud, 2015). Additionally, stress, continuously escalating in today's world, can be associated with unhealthy lifestyle habits and may influence personal food motivations (Ashton, Hutchesson, Rollo, Morgan, & Collins, 2017). The association between stress and poor lifestyle habits has been reported in many studies (Finch, Cummings, & Tomiyama, 2019; McKenzie & Harris, 2013). Poor lifestyle habits are often associated with stress, daily fatigue, and loss of motivation for freshly prepared and selected foods. A busy daily life related to stress can provoke a loss of motivation for health behaviour (MHB) and often results in the choice of unhealthy fast foods (Finch et al., 2019; Morera, Marchiori, Medrano, & Defagó, 2019). This can lead to adverse health outcomes in the development of chronic diseases (such as cardiovascular disease, diabetes mellitus, atherosclerosis, gastrointestinal diseases, and others) (Cortes et al., 2021; McKay et al., 2021; Morera et al., 2019; Thomson et al., 2018; World Health Organization, 2013). Indeed, people often prefer to live with their illness rather than change bad lifestyle habits and unhealthy dietary patterns, or they have ambivalence concerning changing that behaviour (Hessler, Fisher, Polonsky, Bowyer, & Potter, 2018). However, a healthy diet with many fruits and vegetables, which includes low consumption of processed convenience foods (i.e., foods with too much salt, saturated fat, trans fat, and sugar), has beneficial effects on health and prevents many diseases (Bvenura & Sivakumar, 2017). Hence, the role of food as a valuable ally in disease prevention and treatment, even if well-known and documented, should be constantly emphasised and modified in accordance with the latest knowledge.

Health behaviours are reflected in combination with a set of experiences and circumstances that have unfolded over time in the life environment of social and cultural contexts (Spring, Moller, & Coons, 2012). Additionally, health behaviours are associated with a multitude of health outcomes, such as chronic diseases, disrupted quality of life, and well-being (Spring et al., 2012). Studies have shown that behavioural changes involving a healthy diet can dramatically reduce a significant number of diseases and their complications (Naughton, McCarthy, & McCarthy, 2015). However, these changes are a necessary motivation. Hence, MHB is strongly associated with knowledge about healthy foods, and its impact on human health may be a crucial factor in food choice (K. Carter & Kulbok, 2002; Ljubicic et al., 2017; Scalvedi, Gennaro, Saba, & Rossi, 2021).

Motivation is a force that drives a person to satisfy a specific personal need. In the context of MHB, it represents an individual's willingness to change their behaviour to improve their health. Additionally, MHB may play a crucial role in the consumption of balanced and healthy foods that contain abundant fruits and vegetables, olive oil, dietary fibre, antioxidants, fish and poultry, vegetable proteins, and vitamins. New studies confirm that a traditional diet should be approximated to modern environmental and living conditions to help people implement positive, healthy behaviour (de Lorgeril, Salen, & Rabaeus, 2018). In addition, it is debatable whether medications actually decrease morbidity or mortality compared with natural lifestyle changes, like the Mediterranean diet (Bonaccio et al., 2019; Estruch et al., 2018). In particular, studies have shown that a healthy lifestyle that incorporates a Mediterranean diet may prevent many chronic diseases (DuBroff & Lorgeril, 2015).

Despite the priority of choosing healthy foods and MHB, studies examining the importance of MHB for consumption of healthy foods have confirmed that MHB is not effectively measured. However, studies have also shown that motivation is a crucial determinant of health behaviour and should be imperative in future enquiry (K. F. Carter & Kulbok, 2002; Dunsmore & Goodson, 2006; Fisher & Kridli, 2014; Ntoumanis et al., 2020). Overall, there is a clear need for additional research to clarify the reasons for these incoherent circumstances. Accordingly, this study could influence the application or interpretation of the impact of MHB on preventing negative health outcomes.

This study aimed to assess the perception of healthy food, MHB, and adherence to a balanced and healthy diet among participants from different coastal countries (i.e., Croatia, Egypt, Greece, Italy, Portugal, and Slovenia). We hypothesised that MHB due to different country characteristics and the perceptions of healthy food among individuals belonging to these countries could have repercussions on adherence to a balanced and healthy diet.

2. Materials and methods

2.1. Participants

This descriptive study was based on a cross-sectional questionnaire, which was conducted on a non-probabilistic convenience sample of 5,773 respondents living in six coastal countries: Croatia (26.6%), Egypt (13.7%), Greece (8.6%), Italy (9.4%), Portugal (22.8%), and Slovenia (18.9%).

We recruited respondents by word-of-mouth, advertisements, contact in universities, shopping centres, and downtown areas. The inclusion criteria were volunteer adults (i.e. 18 years or older) who fully completed the questionnaire and were taken into consideration while respecting informed consent and anonymity. The exclusion criteria were respondents who had not completed the entire questionnaire, tourists, or students from other countries.

2.2. Questionnaire

The paper-and-pencil questionnaire was aimed at assessing people's motivations towards a healthy diet in coastal Mediterranean countries. A five-point Likert scale was used to estimate the respondents' opinions (e.g. 1-totally disagree, 2-disagree, 3-neither agree nor disagree, 4-agree, and 5-strongly agree). The original scale was first validated for the Portuguese population and then translated into English by the CI & DERS Research Center of the Polytechnic Institute in Vase, Portugal (Ferrão, Guiné, et al., 2019). The English version was translated into the native language of each participating country by native speakers with expertise in public health and nutrition. No questions were removed, added, or modified during the translation process and the overall unchanged structure was verified by native speakers before implementation.

The questionnaire consisted of two sets of questions (short version). The first set of questions (13) consisted of relevant sociodemographic data such as age, gender, education level (primary school, high school, university education), country and environment (rural, urban, suburban area), marital status (single, married/living together, divorced/separated, widow/widower), working status (employed, unemployed, retired, student, working student), anthropometric data (weight in kilograms, height in meters), body mass index (BMI = kg/m^2), participants' self-estimation, engagement in physical exercise (never, sporadically, occasionally, moderately, and intensively), and time spent watching TV or in front of a computer. To assess the medical conditions of respondents, we used the number of chronic diseases (none, one, two, or more) and chronic disease status (yes/no for cardiovascular diseases, diabetes, high cholesterol, arterial hypertension, gastric disorders, intestinal disorders), food allergy/intolerance status (lactose, casein, gluten, nuts, shellfish), whether they were experiencing an episode of any eating disorder (bulimia, anorexia, binge-eating), and responsibility for personal food supplies (yes/no). The second set contained questions about the perception of a healthy diet and MHB towards healthy eating (overall 20 questions). Perceptions about a healthy diet included respondents' opinions about counting calories, consumption of fruits and vegetables, sugary and fat-rich food products, the importance of a balanced diet, organic food, and tradition (10 questions). The MHB involved 10 questions about the hygiene and safety of food, low-fat diets, healthy and balanced diets and food which keeps people healthy, diets rich in vitamins and minerals, diet with low level of cholesterol, sugar, additives free, and diet without processed foods and genetically modified organisms. Overall perception was the sum of all the 10 responses of perception subscale, while overall MHB was the sum of all the 10 responses on MHB subcale. The higher score corresponded to greater level of perception and motivation, for both.

2.3. Ethical considerations

The study was approved by the Ethical Committee of the Polytechnic Institute of Viseu (registration number 04/2017) and conducted in accordance with the Helsinki Declaration. In each participating country, additional approval from the ethics committee was sought before the start of data collection. The study was conducted between October 2017 and March 2018.

2.4. Statistical methods

Statistical analyses were performed using SPSS 22.0 (IBM, Armonk, NY, USA). We used the Kolmogorov-Smirnov normality test to assess the data distribution. Since the data were non-normally distributed, we calculated the median and interquartile range for the numerical variables. Categorical variables were described using percentages and absolute numbers. To investigate differences between countries, we used the Kruskal-Wallis test with a post-hoc test, the Mann-Whitney *U* test.

Correlations between variables were analysed using the Spearman's correlation test. We used the correlation coefficient between variables to analyse the associations between variables before creating regression models. Using three linear regression models, we assessed the association between the perception of healthy food, MHB, and adherence to a balanced and healthy diet with the characteristics of different countries. Additionally, we included countries as studies groups (respondents of Portugal were a reference group because Portugal is the only country in this study on the Atlantic coast), age, gender (men were a reference group), level of education (university education was a reference group), marital status (married/living together was a reference group), working status (employed was a reference group), living environment (urban was a reference group), personal food supply ("no" was a reference group), BMI, physical exercise ("yes" was a reference group), watching TV or computer (hours per day), and chronic diseases (present was a reference group). All predictors were introduced into the model at the same time, to avoid statistical bias. Statistical significance was set at $P < 0.05$.

3. Results

3.1. Sociodemographic characteristics of study groups

The characteristics of participants differed between the subsamples according to the country. The average age of all participants was 31 years (interquartile range [IQR] = 23). Italian and Slovenian respondents were slightly older than other respondents (Table 1). Women were dominant in all countries (ranging from 63.7% to 87.5%), particularly in the Slovenian sample (men were only 12.5%; $p < 0.001$). Most respondents lived in an urban environment ($p < 0.001$), and generally had higher levels of education ($p < 0.001$). All respondents were personally responsible for buying the food they eat, while adherence to a balanced and healthy diet ranged from "sometimes" (for respondents from Croatia, Egypt, and Portugal) to "frequently" (for respondents from Italy, Greece, and Slovenia; $p < 0.001$ for both). In all groups, participants had normal body weight (ranged from 21.5 to 24.8%), while exercise activities were represented more often in respondents from Portugal (63.7%) and Slovenia (63.5%) compared to other respondents ($p < 0.001$). However, respondents from Portugal spent significantly more hours per day in front of a computer or TV Me 6.0 [IQR 5.0] ($p < 0.001$; Table 1).

3.2. Health characteristics of study groups

The manifestations of chronic diseases differed between the groups. Residents of Italy (28.1%) and Portugal (33.6%) had a somewhat higher incidence of chronic diseases than those in other countries. Although no high incidence of cardiovascular disease was reported in any of the countries, Portuguese residents had a somewhat higher percentage of hypercholesterolaemia (14.5%) and hypertension (33.1%). This was similarly observed in respondents from Italy, but with a lower incidence (7.0% and 6.1% for both). The incidence of allergic diseases was more than 10% in all respondents except respondents from Greece (6.8%), while respondents from Italy (16.8%) and Portugal (15.1%) had the highest incidence of allergic diseases. Of the Egyptian participants, 25.6% had anorexia and 10.1% had duodenal disease. In addition, respondents from Slovenia reported binge-eating disorders (10.3%) and obesity (6.5%). Other chronic diseases were reported in 5.9%, 6.7 %, 7.6 %, and 8.2% of respondents from Portugal, Croatia, Italy, and Slovenia, respectively (Table 2).

3.3. Perception of healthy food between study groups

Perception of healthy food was significantly different between the study groups (Table 3). The perception that a healthy diet is based on calorie count was higher in Egyptian respondents (median 4.0; IQR 1.0; mean rank 3835.6), while it was weakest in Croatia (median 2.0; IQR 1.0; mean rank 2453.3). The perception of Croatian respondents on

Table 1
Sociodemographic and lifestyle habits of study groups.

		Croatia (N = 1538)	Egypt (N = 790)	Greece (N = 498)	Italy (N = 541)	Portugal (N = 1314)	Slovenia (N = 1092)	Overall p
Age (years), Me (IQR)		32.0 (25.0)	21.0 (10.0)	23.0 (22.0)	40.0 (19.0)	37.0 (26.0)	41.5 (5.0)	<0.001*
Age groups, N (%)	Your Adults (18–30 yr)	736 (47.9%)	593 (75.1%)	333 (66.9%)	114 (21.1%)	532 (40.5%)	553 (50.6%)	0.003†
	Average Adults (31–50 yr)	487 (31.7%)	154 (19.5%	105 (21.1%)	282 (52.1%)	501 (38.1%	463 (42.4%)	
	Senior Adults (51–65 yr)	275 (17.9%)	34 (4.3%)	56 (11.2%)	116 (21.4%)	240 (18.3%)	68 (6.2%)	
	Elderly (66 + yr)	40 (2.6%)	9 (1.1%)	4 (0.8%)	29 (5.4%)	41 (3.1%)	8 (0.7%)	
Gender, N (%)	Female	1052 (68.4)	583 (73.8)	317 (63.7)	354 (65.4)	881 (67.0)	955 (87.5)	<0.001†
	Male	486 (31.6)	207 (26.2)	181 (36.3)	187 (34.6)	433 (33.0)	137 (12.5)	
Education, N (%)	Primary shool	45.0 (2.9)	9.0 (1.1)	1.0 (0.2)	36.0 (6.7)	2.0 (0.2)	10.0 (0.9)	<0.001†
	High school	671.0(43.6)	264.0 (33.4)	66.0 (13.3)	235.0(43.4)	568.0 (43.2)	525.0 (48.1)	
	University	822.0 (53.4)	517.0 (65.4)	431.0 (86.5)	270.0 (49.9)	744.0 (56.6)	557.0 (51.0)	
Living environment, N (%)	Rural	220 (14.3)	473 (59.9)	24 (4.8)	60 (11.1)	215 (16.4)	345 (31.6)	<0.001†
	Urban	1086 (70.6)	311 (39.4)	402 (80.7)	326 (60.3)	1008 (76.7)	457 (41.8)	
	Suburban	232 (15.1)	6 (0.8)	72 (14.5)	155 (28.7)	91 (6.9)	290 (26.6)	
Marital status, N (%)	Single	734 (47.7)	527 (66.7)	322 (64.7)	143 (26.4)	528 (40.2)	358 (32.8)	<0.001†
	Married/living together	724 (47.1)	238 (30.1)	154 (30.9)	357 (66.0)	654 (49.8)	689 (63.1)	
	Divorced/separated	44 (2.9)	12 (1.5)	21 (4.2)	31 (5.7)	74 (5.6)	29 (2.7)	
	Widow	36 (2.3)	13 (1.6)	1 (0.2)	10 (1.8)	58 (4.4)	16 (1.5)	
Working status, N (%)	Working status	915 (59.5)	233 (29.5)	157 (31.5)	405 (74.9)	793 (60.4)	644 (59.0)	<0.001†
	Unemployed	104 (6.8)	97 (12.3)	20 (4.0)	33 (6.1)	31 (2.4)	76 (7.0)	
	Student	340 (22.1)	460 (58.2)	251 (50.4)	36 (6.7)	382 (29.1)	210 (19.2)	
	Retired	96 (6.2)	0 (0.0)	13 (2.6)	47 (8.7)	41 (3.1)	28 (2.6)	
	Working Student	83 (5.4)	0 (0.0)	57 (11.4)	20 (3.7)	67 (5.1)	134 (12.3)	
Working or study area, N (%)	Nutrition and food	222 (14.4)	42 (5.3)	135 (27.1)	84 (15.5)	126 (9.6)	225 (20.6)	<0.001†
	Agriculture	67 (4.4)	34 (4.3)	22 (4.4)	14 (2.6)	42 (3.2)	10 (0.9)	
	Sport	33 (2.1)	305 (38.6)	8 (1.6)	21 (3.9)	54 (4.1)	57 (5.2)	
	Psicology	31 (2.0)	43 (5.4)	4 (0.8)	18 (3.3)	29 (2.2)	31 (2.8)	
	Health	350 (22.8)	321 (40.6)	47 (9.4)	55 (10.2)	187 (14.2)	152 (13.9)	
	Other	835 (54.3)	45 (5.7)	282 (56.6)	349 (64.5)	876 (66.7)	617(56.5)	
Personal food supply, N (%)	Yes	1210 (78.7)	606 (76.7)	405(81.3)	461 (85.2)	1219 (92.8)	999 (91.5)	<0.001†
	No	328 (21.3)	184 (23.3)	93 (18.7)	80 (14.8)	95 (7.2)	93 (8.5)	
Follow a balanced/healthy diet	Me (IQR)	3.0 (1.0)	3.0 (2.0)	4.0 (1.0)	4.0 (1.0)	3.0 (1.0)	4.0 (0.0)	<0.001*
	Mean Rank	2685.1	1561.7	3055.9	3013.8	2895.3	3824.9	
Body Mass Index, Me (IQR)		23.6 (5.4)	24.8 (5.5)	22.9 (4.7)	23.1 (5.0)	21.5 (3.2)	23.6 (5.3)	<0.001*
Category of Body Mass Index, N (%)	Underweight (≤18.5)	52 (3.4)	10 (1.5)	14 (2.8)	32 (5.9)	72 (5.5)	40 (3.7)	<0.001†
	Normal Weight (18.5–24.9)	922 (59.9)	329 (49.3)	340 (68.3)	342 (63.2)	1042 (79.9)	659 (60.4)	
	Overweight (25.0–29.9)	463 (30.1)	225 (33.7)	117 (23.5)	130 (24.0)	148 (11.3)	270 (24.7)	
	Obesity (≥30.0)	101 (6.6)	103 (15.4)	27 (5.4)	37 (6.8)	42 (3.2)	122 (11.2)	
Number of chronic disaeses, N (%)	None	1204 (78.3)	648 (82.0)	442 (88.8)	404 (74.7)	981 (74.7)	859 (78.7)	0.057†
	One	271 (17.6)	123 (15.6)	54 (10.8)	120 (22.2)	276 (21.0)	200 (18.3)	
	Two or more	63 (4.1)	19 (2.4)	2 (0.4)	17 (3.1)	57 (4.3)	33 (3.0)	
Television or computer, (hours per day)	Me (IQR)	3.0 (4.0)	4.0 (3.0)	3.0 (3.0)	4.0 (6.0)	6.0 (5.0)	2.0 (3.0)	<0.001*
	Mean Rank	2715.1	2835.7	2650.9	3009.3	3526.5	2283.8	
Exercise activity, N (%)	No	189 (12.3)	336 (43.4)	53 (10.7)	99 (18.3)	91 (6.9)	39 (3.6)	<0.001†
	Ocasionally	807 (52.6)	307 (39.6)	209 (42.1)	240 (44.4)	386 (29.4)	360 (33.0)	
	Yes	53 (35.1)	132 (17.0)	234 (47.2)	202 (37.3)	837 (63.7)	693 (63.5)	

Note: * Kruskal Wallis; †Chi square.

lower consumption of sugary products was accentuated (median 4.0; IQR 1.0; mean rank 3835.6), while these perceptions did not exist in Portuguese respondents. Portuguese respondents had the weakest perception of the negative effects of sugar consumption (median 2.0; IQR 0.0) compared with other study groups. For Greek respondents, fruits and vegetables were very important to the practice of healthy eating (median 5.0; IQR 1.0; mean rank 3196.4), and non-significant differences were found between Greek and Italian respondents ($p = 0.754$), Greek and Portuguese respondents ($p = 0.937$), and Italian and Portuguese respondents ($p = 0.739$). Additionally, according to Greek respondents, a healthy diet should be balanced, varied, and complete (median 5.0; IQR 0.0; mean rank 3217.4), and it is necessary to eat everything in small quantities (median 4.0; IQR 1.0; mean rank 3597.2). Compared with other groups, respondents from Greece believed that the tradition of consuming a healthy diet was very important (median 3.0; IQR 2.0; Mean Rank 3176.7), while there was no statistically significant difference in the perception of food traditions between Croatian and Portuguese respondents ($p = 0.227$), Croatian and Slovenian respondents ($p = 0.474$), Egyptian and Portuguese respondents ($p = 0.527$), Egyptian and Slovenian respondents ($p = 0.886$), and Portuguese and Slovenian respondents ($p = 0.650$). Regarding belief in the healthier nature of foods produced organically, Portuguese respondents scored highest (median 4.0; IQR 1.0; mean rank 3771.8). Additionally, compared with other groups, Croatian respondents believed that a healthy diet is not cheap (median 4.0; IQR 1.0; mean rank 3533.2). The overall perception of healthy food was higher in respondents from Egypt (median 36.0; IQR 6.0; Mean Rank 3797.1) and the lowest in respondents of Slovenia (Median 31.0; IQR 5.0; Mean Rank 1957.4) (Table 3).

3.4. MHB for food consumption between study groups

In regads to the MHB for food consumption, the results show dissimilarity among countries (Table 4). However, Portuguese

Table 2
Health characteristics of study groups.

		Croatia (N = 1538)	Egypt (N = 790)	Greece (N = 498)	Italy (N = 541)	Portugal (N = 1314)	Slovenia (N = 1092)	Overall p
Chronic disease	Yes	369 (24.0)	164 (20.8)	66 (13.3)	152 (28.1)	442 (33.6)	248 (22.7)	<0.001*
	No	1169 (76.0)	626 (79.2)	432 (86.7)	389 (71.9)	872 (66.4)	844 (77.3)	
Cardiovascular disease	Yes	70 (4.6)	19 (2.4)	1 (0.2)	9 (1.7)	42 (3.2)	14 (1.3)	<0.001*
	No	1468 (95.4)	771 (97.6)	497 (99.8)	532 (98.3)	1272 (96.8)	1078 (98.7)	
Diabetes	Yes	31 (2.0)	17 (2.2)	0 (0.0)	8 (1.5)	24 (1.8)	16 (1.5)	0.045*
	No	1507 (98.0)	773 (97.8)	498 (100.0)	533 (98.5)	1290 (98.2)	1076 (98.5)	
Hypercholesterolemia	Yes	69 (4.5)	5 (0.6)	12 (2.4)	38 (7.0)	191 (14.5)	27 (2.5)	<0.001*
	No	1469 (95.5)	785 (99.4)	486 (97.6)	503 (93.0)	1123 (85.5)	1065 (97.5)	
Hypertensio arterialis	Yes	72 (4.7)	38 (4.8)	11 (2.2)	33 (6.1)	242 (18.4)	34 (3.1)	<0.001*
	No	1466 (95.3)	752 (95.2)	487 (97.8)	508 (93.9)	1072 (81.6)	1058 (96.9)	
Duodenal disease	Yes	62 (4.0)	83 (10.5)	12 (2.4)	26 (4.8)	25 (1.9)	26 (2.4)	<0.001*
	No	1476 (96.0)	707 (89.5)	486 (97.6)	515 (95.2)	1289 (98.1)	1066 (97.6)	
Intestinal disease	Yes	34 (2.2)	10 (1.3)	16 (3.2)	22 (4.1)	18 (1.4)	30 (2.7)	0.002*
	No	1504 (97.8)	780 (98.7)	482 (96.8)	519 (95.9)	1296 (98.6)	1062 (97.3)	
Obesity	Yes	46 (3.0)	29 (3.7)	11 (2.2)	18 (1.4)	14 (2.6)	71 (6.5)	<0.001*
	No	1492 (97.0)	761 (96.3)	487 (97.8)	1296 (98.6)	527 (97.4)	1021 (93.5)	
Other chronic diseases	Yes	103 (6.7)	3 (0.4)	6 (1.2)	41 (7.6)	78 (5.9)	90 (8.2)	<0.001*
	No	1435 (93.3)	787 (99.6)	492 (98.8)	500 (92.4)	1236 (94.1)	1002 (91.8)	
Food alergy disorder	Yes	179 (11.6)	111 (14.1)	34 (6.8)	91 (16.8)	199 (15.1)	150 (13.7)	<0.001*
	No	1359 (88.4)	679 (85.9)	464 (93.2)	450 (83.2)	1115 (84.9)	942 (86.3)	
Eating disorder	Bulimia	4 (0.3)	14 (1.8)	16 (3.2)	8 (1.5)	5 (0.4)	42 (3.8)	<0.001*
	Anorexia	19 (1.2)	202 (25.6)	7 (1.4)	7 (1.3)	20 (1.5)	35 (3.2)	
	Binge-eating	44 (2.9)	78 (9.9)	35 (7.0)	30 (5.5)	17 (1.3)	113 (10.3)	
	Other	11 (0.7)	1 (0.1)	0 (0.0)	6 (1.1)	5 (0.4)	18 (1.6)	
	None	1457 (94.9)	493 (62.6)	440 (88.4)	490 (90.6)	1267 (96.4)	884 (81.0)	

Note: * Chi square test.

respondents reported higher scores in most of the MHB items. For example, they usually follow a healthy and balanced diet (Median 4.0; IQR 0.3; Mean Rank 3105.1), with a lot of vitamins and minerals (Median 4.0; IQR 0.0; Mean Rank 3275.4), without additives (Median 4.0; IQR 1.0; Mean Rank 3183.5), and prefer food which keeps them healthy (Median 4.0; IQR 1.0; Mean Rank 3386.0). On the other hand, Portuguese respondents regularly consume foods that may raise the blood cholesterol (Median 4.0; IQR 2.0; Mean Rank 3827.5), and raise blood glycaemia (Median 5.0; IQR 1.0; Mean Rank 3762.3). Somewhat higher concern about the hygiene and safety of the food observed in Egyptian population (Median 5.0; IQR 1.0; Mean Rank 3744.1), which reported the importance of consumption of a low-fat diet (Median 5.0; IQR 1.0; Mean Rank 3731.9). Although Croatian respondents consume less sugar-rich foods (Median 3.0; IQR 2.0; Mean Rank 2521.7), it is less important for them to eat food that keeps them healthy (Median 4.0; IQR 0.0; Mean Rank 2521.7). Slovenians avoided food with genetically modified organisms more than other countries (Median 4.0; IQR 1.0; Mean Rank 3239.2). The lowest overall motivation for health behavior was observed in Greece (Median 34.0; IQR 8.0; Mean Rank 2386.1) and most higher in Portugal (Median 38.0; IQR 7.0; Mean Rank 3709.8) (Table 4).

3.5. Association between perception, motivation for health behavior and adherence of healthy diet

The linear regression analysis confirmed the association between the perception of healthy food, motivation for health behavior and adherence to a balanced and healthy diet in different countries' characteristics (Table 5). Compared to respondents of Portugal, respondents of Croatia (ß=0.35; $p < 0.001$), Egypt (ß=0.24; $p < 0.001$), and Greece (ß=0.10; $p < 0.001$) had a higher probability for better perception of healthy food. Despite that, respondents of Croatia (ß=-0.26; $p < 0.001$) and Greece (ß=-0.17; $p < 0.001$), had a higher probability for reduced MHB in comparison with respondents of Portugal. Slovenian respondents had reduced perception of healthy food (ß=-0.10; $p < 0.001$) and MHB (ß=−0.22; $p < 0.001$), but higher adherence to a balanced or healthy diet (ß=0.22; $p < 0.001$). On the other hand, respondents of Egypt had lower adherence to a balanced or healthy diet (ß=−0.23; $p < 0.001$), while living in Croatia, Greece and Italy was associated with positive adherence, but these associations were weak. All of sociodemographic characteristics were negatively associated with the perception of healthy food, except age (ß=0.11; $p < 0.001$). Additionally, we find the association between some sociodemographic variables and MHB. For example, we found positive association with age (ß=0.15; $p < 0.001$) and unemployed working status (ß=0.04; $p = 0.005$), and negative with female gender (ß=-0.06; $p < 0.001$). Lifestyle habits as physical exercise were associated with MHB (ß=0.14; $p < 0.001$) and adherence to healthy food (ß=0.18; $p < 0.001$). Higher body mass index was negatively statistically significantly associated with MHB (ß=-0.14; $p < 0.001$), and weak perception of healthy food (ß=-0.06; $p < 0.001$), and non-significant association with adherence (ß=-0.01; $p = 0.468$). Most of chronic diseases are negatively associated with MHB. MHB was statistically significantly associated with the perception of healthy food (ß=0.27; $p < 0.001$), and contributed to an increase of adherence to a balanced and healthy diet (ß=0.36; $p < 0.001$) (Table 5).

4. Discussion

The aim of this cross-sectional study was to assess the association between MHB, perception of healthy food and adherence to a balanced and healthy diet with different characteristics of countries on the Mediterranean Sea coast. The results showed that MHB differed between the study groups. MHB was associated with the perception of healthy food and contributed to an increase in adherence to a balanced and healthy diet. The results also suggested that MHB was associated with some sociodemographic and health characteristics of participants. Another study suggested that adherence to a Mediterranean diet is higher for women who are employed, who consume more meals per day, and who have closer contact with nature (Andrade et al., 2020). Additionally, adherence to this diet has been found to be higher in coastal countries around the Mediterranean Sea than in non-coastal countries (Andrade et al., 2020; Quarta et al., 2021). In our study, a positive relationship between MHB, age, and working status may indicate that mature people are more likely to avoid risk-taking health behaviours (Antonucci, Akiyama, & Adelmann, 1990; M. Lee, Park, & Lee, 2020). For example, older respondents had higher MHB and adherence to a healthy diet. Quarta et al. found similar results, showing that increasing age was also

Table 3
Perception of heathy diet between study groups.

Variable		Croatia (N = 1538)	Egypt (N = 790)	Greece (N = 498)	Italy (N = 541)	Portugal (N = 1314)	Slovenia (N = 1092)	p*	Post-Hoc Test p-values†
Q1	Me (IQR)	2.0 (1.0)	4.0 (1.0)	3.0 (1.0)	3.0 (2.0)	4.0 (2.0)	2.0 (2.0)	<0.001	$<0.001^{C/E} < 0.001^{C/G} < 0.001^{C/I} < 0.001^{C/P} < 0.001^{C/S} <0.001^{E/G} < 0.001^{E/I}$ $0.030^{E/P} < 0.001^{E/S} < 0.001^{G/I} < 0.001^{G/P} < 0.001^{G/S} < 0.001^{I/P} < 0.001^{I/S} < 0.001^{I/P} < 0.001^{P/S}$
	Mean Rank	2453.3	3835.6	2823.9	3146.5	3542.7	1922.7		
Q2	Me (IQR)	4.0 (1.0)	3.0 (2.0)	3.0 (2.0)	2.0 (1.0)	2.0 (0.0)	2.0 (1.0)	<0.001	$<0.001^{C/E} < 0.001^{C/G} < 0.001^{C/I} < 0.001^{C/P} < 0.001^{C/S} <0.001^{E/G} < 0.001^{E/I} < 0.001^{E/P} < 0.001^{E/S}$ $0.159^{G/I} < 0.001^{G/P} < 0.001^{G/S} < 0.001^{I/P} 0.041^{I/S} < 0.001^{I/P} < 0.001^{P/S}$
	Mean Rank	4334.3	3359.2	2470.8	2378.5	1832.6	2217.5		
Q3	Me (IQR)	5.0 (1.0)	5.0 (1.0)	5.0 (1.0)	5.0 (1.0)	5.0 (1.0)	4.0 (1.0)	<0.001	$0.017^{C/E} < 0.001^{C/G} < 0.001^{C/I} < 0.001^{C/P} < 0.001^{C/S}$ $0.001^{E/G} < 0.001^{E/I} < 0.001^{E/P} < 0.001^{E/S} 0.754^{G/I} 0.937^{G/P} < 0.001^{G/S} 0.739^{I/P} < 0.001^{I/S} < 0.001^{I/P} < 0.001^{P/S}$
	Mean Rank	2757.8	2914.0	3196.4	3221.6	3210.6	2353.2		
Q4	Me (IQR)	5.0 (1.0)	5.0 (1.0)	5.0 (0.0)	5.0 (1.0)	5.0 (1.0)	4.0 (1.0)	<0.001	$0.007^{C/E} < 0.001^{C/G} < 0.001^{C/I} < 0.001^{C/P} 0.030^{C/S}$ $<0.001^{E/G} < 0.001^{E/I} < 0.001^{E/P} 0.162^{E/S} 0.240^{G/I} 0.014^{G/P} < 0.001^{G/S} 0.258^{I/P} < 0.001^{I/S} < 0.001^{I/P} < 0.001^{P/S}$
	Mean Rank	2819.3	2615.1	3217.4	3126.4	3061.2	2700.1		
Q5	Me (IQR)	4.0 (1.0)	4.0 (2.0)	4.0 (1.0)	4.0 (1.0)	3.0 (2.0)	4.0 (1.0)	<0.001	$<0.001^{C/E} 0.082^{C/G} < 0.001^{C/I} < 0.001^{C/P} < 0.001^{C/S} <0.001^{E/G} < 0.001^{E/I} < 0.001^{E/P} < 0.001^{E/S} < 0.001^{G/I} < 0.001^{G/P} < 0.001^{G/S} < 0.001^{I/P} 0.903^{I/S} < 0.001^{I/P} < 0.001^{P/S}$
	Mean Rank	3473.9	3227.9	3597.2	2561.9	2111.5	2584.1		
Q6	Me (IQR)	4.0 (1.0)	3.0 (2.0)	3.0 (2.0)	3.0 (2.0)	2.0 (2.0)	3.0 (1.0)	<0.001	$<0.001^{C/E} < 0.001^{C/G} < 0.001^{C/I} < 0.001^{C/P} < 0.001^{C/S} 0.386^{E/G} < 0.001^{E/I} < 0.001^{E/P} < 0.001^{E/S} < 0.001^{G/I} < 0.001^{G/P} 0.007^{G/S} 0.001^{I/P} < 0.001^{I/S} < 0.001^{I/P} < 0.001^{P/S}$
	Mean Rank	3533.2	2870.4	2952.1	2320.9	2108.0	3177.0		
Q7	Me (IQR)	2.0 (2.0)	3.0 (1.0)	2.0 (1.0)	2.0 (1.0)	2.0 (1.0)	2.0 (1.0)	<0.001	$<0.001^{C/E} < 0.001^{C/G} 0.660^{C/I} < 0.001^{C/P} < 0.001^{C/S} <0.001^{E/G} < 0.001^{E/I} < 0.001^{E/P} < 0.001^{E/S} < 0.001^{G/I} 0.002^{G/P} 0.049^{G/S} < 0.001^{I/P} < 0.001^{I/S} < 0.001^{I/P} 0.218^{P/S}$
	Mean Rank	2974.2	4312.0	2291.1	3017.2	2471.5	2440.4		
Q8	Me (IQR)	3.0 (2.0)	3.0 (2.0)	3.0 (2.0)	3.0 (1.0)	3.0 (2.0)	3.0 (2.0)	<0.001	$<0.001^{C/E} 0.002^{C/G} < 0.001^{C/I} 0.227^{C/P} 0.474^{C/S} 0.002^{E/G} 0.016^{E/I} 0.527^{E/P} 0.886^{E/S} < 0.001^{G/I} < 0.001^{G/P} < 0.001^{G/S} 0.039^{I/P} 0.008^{I/S} < 0.001^{I/P} 0.650^{P/S}$
	Mean Rank	2921.1	2885.8	3176.7	2651.7	2844.7	2875.2		
Q9	Me (IQR)	4.0 (1.0)	3.0 (1.0)	3.0 (1.0)	3.0 (2.0)	4.0 (1.0)	4.0 (1.0)	<0.001	$<0.001^{C/E} < 0.001^{C/G} < 0.001^{C/I} < 0.001^{C/P} 0.464^{C/S} 0.383^{E/G} 0.110^{E/I} < 0.001^{E/P} < 0.001^{E/S} 0.035^{G/I} < 0.001^{G/P} < 0.001^{G/S} < 0.001^{I/P} < 0.001^{I/S} < 0.001^{I/P} < 0.001^{P/S}$
	Mean Rank	2942.4	2210.7	2261.9	2122.3	3771.8	2897.5		
Q10	Me (IQR)	3.0 (2.0)	3.0 (1.0)	2.0 (1.0)	2.0 (1.0)	2.0 (1.0)	2.0 (1.0)	<0.001	$<0.001^{C/E} < 0.001^{C/G} < 0.001^{C/I} < 0.001^{C/P} < 0.001^{C/S} <0.001^{E/G} < 0.001^{E/I} < 0.001^{E/P} < 0.001^{E/S} 0.502^{G/I} 0.003^{G/P} < 0.001^{G/S} < 0.001^{I/P} < 0.001^{I/S} < 0.001^{I/P} < 0.001^{P/S}$
	Mean Rank	3317.9	3884.7	2606.0	2540.4	2841.6	1912.7		
Overall perception	Me (IQR)	35.0 (6.0)	36.0 (6.0)	33.0 (5.0)	32.0 (5.0)	32.0 (4.0)	31.0 (5.0)	<0.001	$0.016^{C/E} < 0.001^{C/G} < 0.001^{C/I} < 0.001^{C/P} < 0.001^{C/S} <0.001^{E/G} < 0.001^{E/I} < 0.001^{E/P} < 0.001^{E/S} 0.502^{G/I} 0.003^{G/P} < 0.001^{G/S} 0.028^{I/P} < 0.001^{I/S} < 0.001^{I/P} < 0.001^{P/S}$
	Mean Rank	3704.3	3797.1	2789.7	2315.4	2428.0	1957.4		

Note: Me-median; IQR-interquartile range; *Kruskal-Wallis test; †Mann-Whitney Test; C/E-Croatia *vs* Egypt; C/G-Croatia *vs* Greece; C/I-Croatia *vs* Italy; C/P-Croatia *vs* Portugal; C/S-Croatia *vs* Slovenia; E/G-Egypt *vs* Greece; E/I-Egypt *vs* Italy; E/P-Egypt *vs* Portugal; E/S-Egypt *vs* Slovenia; G/I-Greece *vs* Italy; G/P-Greece *vs* Portugal; G/S-Greece *vs* Slovenia; I/P - Italy *vs* Portugal; I/S-Italy *vs* Slovenia; I/P-Italy *vs* Portugal; P/S-Portugal *vs* Slovenia; Q1_A healthy diet is based on calorie count; Q2_We should never consume sugar rich food products; Q3_Fruits and vegetables are very important to a practice of a healthy eating; Q4_A healthy diet should be balanced, varied and complete; Q5_We can eat everything, as long as it is in small quantities; Q6_I believe that a healthy diet is not cheap; Q7_In my opinion it is strange that some people have cravings for sweets; Q8_ I believe that tradition is very important to a healthy diet; Q9_I believe that food produced in a organic way is healthier; Q10_We should never consume fat rich food products.

associated with adherence (Quarta et al., 2021). Older people may face food choice challenges as a natural part of their aging process (Hansen, 2019). Indeed, older adults, especially with poor self-rated health and chronic diseases, were more motivated to eat healthily (Dijkstra, Neter, Brouwer, Huisman, & Visser, 2014). Naturally, chronic diseases among older adults are quite common (Hansen, 2019), which may have affected our results. Although studies have suggested that women, older age, exercise, normal BMI, and intake of fruit and vegetables were associated with MHB (M. Lee et al., 2020; Naughton et al., 2015), our results were somewhat different. Women showed somewhat lower MHB, but this association was rather weak (β only −0.006; $p < 0.001$). This may have been due to other factors in the environment, since other studies from European countries around the Mediterranean region confirm that a higher adherence to healthy food (e.g. Mediterranean diet) is positively associated with increasing age, women, and employment (Andrade et al., 2020; Quarta et al., 2021). Negative association between higher BMI and MHB may indicate that people with higher BMI are not motivated to have a healthy diet and participate in physical activity (Warren, Smalley, & Barefoot, 2017). In addition, lack of MHB may result in overconsumption, higher weight gain, and occurrence of obesity with repercussions on incidence of chronic diseases (Meer, Charbonnier, & Smeets, 2016). In contrast, higher levels of physical exercise can be an indicator of healthy lifestyles (Maenhout et al., 2020), which was confirmed in our study. Evidence indicates that physical activity is positively associated with health behaviours and food intake, with negative consequences on human health (G. Lee & Choi, 2020). The negative associations between MHB, hypercholesterolaemia, and hypertension may have the same mechanism of association with obesity and higher BMI. Although chronic diseases can motivate a healthy lifestyle (Xiang, 2015), an alternative explanation for lower MHB despite the presence of risk factors for cardiovascular disease may be the effect of very weak perception and little knowledge about healthy food

Table 4
Motivation for health behavior for food consumption between study groups.

Variable		Croatia (N = 1538)	Egypt (N = 790)	Greece (N = 498)	Italy (N = 541)	Portugal (N = 1314)	Slovenia (N = 1092)	p*	Post-Hoc Test p-values†
Q1	Me (IQR)	4.0 (2.0)	5.0 (1.0)	3.0 (1.0)	4.0 (1.0)	4.0 (1.0)	4.0 (1.0)	<0.001	$<0.001^{C/E} < 0.001^{C/G} < 0.001^{C/I} < 0.001^{C/P} < 0.001^{C/S}$
	Mean Rank	2899.5	3744.1	1983.0	2482.9	3284.5	2383.4		$<0.001^{E/G} < 0.001^{E/I} < 0.001^{E/P} < 0.001^{E/S} < 0.001^{G/I} < 0.001^{G/P} < 0.001^{G/S} < 0.001^{I/P}$ $0.172^{I/S} < 0.001^{I/P} < 0.001^{P/S}$
Q2	Me (IQR)	3.0 (2.0)	4.0 (1.0)	3.0 (1.0)	3.0 (1.0)	4.0 (2.0)	2.0 (1.0)	<0.001	$<0.001^{C/E}$ $0.173^{C/G} < 0.001^{C/I} < 0.001^{C/P} < 0.001^{C/S} <0.001^{E/G} < 0.001^{E/I}$ $0.102^{E/P}$ $0.008^{E/S}$ $0.025^{G/I} < 0.001^{G/P} < 0.001^{G/S} < 0.001^{I/P} < 0.001^{I/S} < 0.001^{I/P} < 0.001^{P/S}$
	Mean Rank	2630.4	3731.9	2722.0	2914.1	3822.0	1573.9		
Q3	Me (IQR)	4.0 (1.0)	4.0 (1.0)	3.0 (1.0)	4.0 (1.0)	4.0 (0.3)	4.0 (1.0)	<0.001	$0.008^{C/E} < 0.001^{C/G}$ $0.097^{C/I} < 0.001^{C/P} < 0.001^{C/S} <0.001^{E/G}$ $0.469^{E/I}$ $0.013^{E/P}$ $0.108^{E/S} < 0.001^{G/I} < 0.001^{G/P} < 0.001^{G/S}$ $0.001^{I/P}$ $0.018^{I/S}$ $0.001^{I/P}$ $0.424^{P/S}$
	Mean Rank	2732.0	2923.6	2405.3	2860.9	3105.1	3049.0		
Q4	Me (IQR)	4.0 (1.0)	4.0 (1.0)	4.0 (1.0)	4.0 (1.0)	4.0 (0.0)	4.0 (0.0)	<0.001	$0.053^{C/E}$ $0.002^{C/G}$ $0.559^{C/I} < 0.001^{C/P} < 0.001^{C/S} <0.001^{E/G}$ $0.047^{E/I} < 0.001^{E/P}$ $0.008^{E/S}$ $0.023^{G/I} < 0.001^{G/P} < 0.001^{G/S} < 0.001^{I/P} < 0.001^{I/S} < 0.001^{I/P} < 0.001^{P/S}$
	Mean Rank	2696.1	2839.6	2460.7	2646.9	3275.4	3035.6		
Q5	Me (IQR)	3.0 (2.0)	3.0 (2.0)	3.0 (2.0)	2.0 (1.0)	4.0 (2.0)	3.0 (2.0)	<0.001	$0.132^{C/E}$ $0.007^{C/G} < 0.001^{C/I} < 0.001^{C/P}$ $0.022^{C/S} <0.660^{E/G} < 0.001^{E/I} < 0.001^{E/P}$ $0.668^{E/S} < 0.001^{G/I} < 0.001^{G/P}$ $0.935^{G/S} < 0.001^{I/} <0.001^{I/S} < 0.001^{I/P} < 0.001^{P/S}$
	Mean Rank	2574.9	2684.8	2722.9	2288.4	3827.5	2712.5		
Q6	Me (IQR)	3.0 (1.0)	3.0 (2.0)	3.0 (1.0)	4.0 (1.0)	4.0 (1.0)	4.0 (1.0)	<0.001	$<0.001^{C/E}$ $0.001^{C/G}$ $0.039^{C/I} < 0.001^{C/P} < 0.001^{C/S}$ $0.723^{E/G} < 0.001^{E/I} < 0.001^{E/P} < 0.001^{E/S} < 0.001^{G/I} < 0.001^{G/P} < 0.001^{G/S}$ $0.001^{I/P}$ $0.002^{I/S}$ $0.001^{I/P} < 0.001^{P/S}$
	Mean Rank	2758.2	2466.8	2482.5	2923.3	3183.5	3182.1		
Q7	Me (IQR)	3.0 (2.0)	3.0 (1.0)	3.0 (2.0)	3.0 (1.0)	3.0 (0.0)	4.0 (1.0)	<0.001	$0.023^{C/E}$ $0.943^{C/G}$ $0.125^{C/I} < 0.001^{C/P} < 0.001^{C/S}$ $0.097^{E/G}$ $0.564^{E/I} < 0.001^{E/P} < 0.001^{E/S}$ $0.245^{G/I}$ $0.001^{G/P} < 0.001^{G/S} < 0.001^{I/P} < 0.001^{I/S}$ $0.001^{I/P} < 0.001^{P/S}$
	Mean Rank	2777.6	2943.9	2777.5	2898.5	2458.5	3559.7		
Q8	Me (IQR)	4.0 (0.0)	4.0 (1.0)	4.0 (2.0)	4.0 (1.0)	4.0 (1.0)	4.0 (1.0)	<0.001	$<0.001^{C/E}$ $0.801^{C/G}$ $0.223^{C/I} < 0.001^{C/P} < 0.001^{C/S} <0.001^{E/G} < 0.001^{E/I} < 0.001^{E/P}$ $0.414^{E/S}$ $0.275^{G/I} < 0.001^{G/P} < 0.001^{G/S} < 0.001^{I/P} < 0.001^{I/S} < 0.001^{I/P} < 0.001^{P/S}$
	Mean Rank	2521.7	2965.0	2532.0	2610.5	3386.0	3043.6		
Q9	Me (IQR)	3.0 (2.0)	3.0 (2.0)	3.0 (2.0)	2.0 (1.0)	4.0 (2.0)	3.0 (2.0)	<0.001	$<0.001^{C/E} < 0.001^{C/G}$ $0.072^{C/I} < 0.001^{C/P} < 0.001^{C/S}$ $0.908^{E/G} < 0.001^{E/I} < 0.001^{E/P}$ $0.540^{E/S} < 0.001^{G/I} < 0.001^{G/P}$ $0.672^{G/S} < 0.001^{I/P} < 0.001^{I/S} < 0.001^{I/P} < 0.001^{P/S}$
	Mean Rank	2375.3	2904.2	2895.5	2236.1	3762.3	2860.7		
Q10	Me (IQR)	4.0 (1.0)	3.0 (2.0)	4.0 (1.0)	4.0 (1.0)	3.0 (1.0)	4.0 (1.0)	<0.001	$<0.001^{C/E}$ $0.167^{C/G}$ $0.987^{C/I} < 0.001^{C/P}$ $0.209^{C/S} <0.001^{E/G} < 0.001^{E/I} < 0.001^{E/P} < 0.001^{E/S}$ $0.255^{G/I} < 0.001^{G/P}$ $0.023^{G/S} < 0.001^{I/P}$ $0.333^{I/S} < 0.001^{I/P} < 0.001^{P/S}$
	Mean Rank	3142.0	2308.7	3023.7	3143.1	2486.3	3239.2		
Overall motivation for health behavior	Me (IQR)	34.0 (7.0)	36.0 (7.0)	34.0 (8.0)	34.0 (6.0)	38.0 (7.0)	35.0 (6.0)	<0.001	$<0.001^{C/E}$ $0.001^{C/G} < 0.971^{C/I} < 0.001^{C/P} < 0.001^{C/S} <0.001^{E/G} < 0.001^{E/I} < 0.001^{E/P}$ $0.031^{E/S}$ $0.066^{G/I} < 0.001^{G/P} < 0.001^{G/S} < 0.001^{I/P}$ $0.003^{I/S} < 0.001^{I/P} < 0.001^{P/S}$
	Mean Rank	2546.9	2916.5	2386.1	2520.9	3709.8	2764.3		

Note: Me-median; IQR-interquartile range; *Kruskal-Wallis test; †Mann-Whitney Test; C/E-Croatia *vs* Egypt; C/G-Croatia *vs* Greece; C/I-Croatia *vs* Italy; C/P-Croatia *vs* Portugal; C/S-Croatia *vs* Slovenia; E/G-Egypt *vs* Greece; E/I-Egypt *vs* Italy; E/P-Egypt *vs* Portugal; E/S-Egypt *vs* Slovenia; G/I-Greece *vs* Italy; G/P-Greece *vs* Portugal; G/S-Greece *vs* Slovenia; I/P - Italy *vs* Portugal; I/S-Italy *vs* Slovenia; I/P-Italy *vs* Portugal; P/S-Portugal *vs* Slovenia; Q1_I am very concerned about the hygiene and safety of the food I eat; Q2_ It is important for me that my diet is low in fat; Q3_Usually I follow a healthy and balanced diet; Q4_It is important for me that my daily diet contains a lot of vitamins and minerals; Q5_There are some foods that I consume regularly, even if they may raise my cholesterol (recoded); Q6_I try to eat foods that do not contain additives; Q7_I avoid eating processed foods, because of their lower nutritional quality; Q8_It is important for me to eat food that keeps me healthy; Q9_There are some foods that I consume regularly, even if they may raise my blood glycaemia (recoded); Q10_I avoid foods with genetically modified organisms.

(Ljubicic et al., 2017).

Despite the association between MHB and the perception of healthy food, we did not find a relationship between perception and most chronic diseases, except for hypercholesterolaemia and hypertensioarterialis. In contrast, we noticed a positive association between MHB and chronic diseases (e.g. hypercholesterolaemia, hypertension arterialis, duodenal disease, intestinal disease, and food allergy disorders). However, obesity, cardiovascular disease, and diabetes were not found to be associated with MHB. It is possible that the population is aware of the importance of healthy food but is not motivated to apply it in practice and to preserve their own health. It is also possible that these links are influenced by other factors, such as the psychological state of a person, as well as other environmental factors that affect quality of life and health care. This result was also confirmed in our research, by the association of following a balanced and healthy diet with MHB, but a lower perception of healthy food. For example, the perception that healthy food is expensive and that people with better economic status may have greater opportunities to buy healthy food compared to people with lower economic status may be partly correct (Darmon & Drewnowski, 2015; Yuan-Ting, Yu-Hung, Meei-Shyuan Lee, & Mark, 2009). A positive association between working status and MHB and a negative association with perception of healthy food may indicate that unemployed people are less receptive to the importance of perception of healthy food and practice less healthy behaviours due to limited financial capacity (Foscolou et al., 2017). In contrast, this does not necessarily mean that unemployed people are unmotivated by healthy eating or positive health behaviour, but they are at risk of disrupting them (Foscolou et al., 2017). It should be noted that, in our study, unemployment was associated with MHB, but this association was weak. However, fast food is not necessarily cheaper than fruits and vegetables,

Table 5
Association between perception of heathy food, motivation for health behavior and adherence of balanced/healthy diet with different country' characteristics using linear regression models.

	Perception of healthy food		Motivation for health behavior		Following a balanced/healthy diet	
	Beta	p	Beta	p	Beta	p
Croatia	0.35	<0.001	−0.26	<0.001	0.06	<0.001
Egypt	0.24	<0.001	0.06	<0.001	−0.23	<0.001
Greece	0.10	<0.001	−0.17	<0.001	0.08	<0.001
Italy	0.00	0.870	−0.17	<0.001	0.08	<0.001
Slovenia	−0.10	<0.001	−0.22	<0.001	0.22	<0.001
Age	0.11	<0.001	0.15	<0.001	0.01	0.613
Women	−0.01	0.282	−0.06	<0.001	−0.07	<0.001
High school	−0.04	0.002	0.01	0.542	0.07	<0.001
Not married	−0.01	0.305	0.02	0.074	−0.01	0.422
Rural environment	−0.05	<0.001	0.00	0.694	0.01	0.455
Unemployed	−0.08	<0.001	0.04	0.005	0.00	0.962
Personal food supply	0.01	0.571	−0.08	<0.001	−0.04	0.001
BMI	0.09	<0.001	−0.11	<0.001	−0.01	0.468
Physical exercise	−0.03	0.036	0.14	<0.001	0.18	<0.001
Watching TV or computer (hours per day)	−0.02	0.096	−0.01	0.648	−0.05	<0.001
Cardiovascular disease	−0.01	0.350	0.01	0.313	−0.01	0.197
Diabetes	−0.01	0.271	0.02	0.092	−0.01	0.308
Hypercholesterolemia	0.04	0.004	−0.03	0.011	0.01	0.441
Hypertensio arterialis	0.04	0.007	−0.06	<0.001	0.06	<0.001
Duodenal disease	−0.01	0.229	0.02	0.032	−0.01	0.555
Intestinal disease	0.01	0.314	−0.02	0.048	−0.02	0.057
Obesity	0.02	0.223	0.01	0.265	0.00	0.985
Other chronic diseases	−0.01	0.467	−0.01	0.458	−0.01	0.327
Food allergy disorders	−0.01	0.663	0.04	<0.001	0.00	0.857
Eating disorders	0.02	0.164	0.01	0.603	−0.04	0.002
Perception of heathy food	–	–	0.23	<0.001	−0.03	0.019
Healthy motivation	0.27	<0.001	–	–	0.36	<0.001
Following a balanced/healthy diet	−0.03	0.019	0.35	<0.001	–	–

Note: Portugal is referent group for other studies groups; men are referents groups for gender, university is referent group for education; married/living together is referent for marital status, urban is referent for environment status; employed is referent for working status, "no" is referent for personal food supply.

but often there is more motivation for fast food choices (Fuhrman, 2018; Rao, Afshin, Singh, & Mozaffarian, 2013). It is possible that the taste of food becomes a more important determinant of choice than economic status, and that habits and preferences in choosing food are very important (Fuhrman, 2018).

In fact, studies have confirmed a low intake of fruits, vegetables, legumes, and nuts in Mediterranean countries (García-Conesa et al., 2020; Quarta et al., 2021). The associations between living in a certain region/country and perception of healthy food, MHB, and following a balanced/healthy diet were different between countries. In comparison with respondents from Portugal, respondents from Croatia, Italy, and Greece had somewhat better associations with perception of healthy food, but their motivation for health behaviour was also lower than that of Portuguese respondents. Slovenian respondents had a lower perception of healthy food and lower MHB than Portuguese respondents, while Egyptian respondents had a better perception and MHB than Portugese respondents. One of the reasons for this may be that Egypt's population was somewhat younger, mostly recruited from the student population, and had a better overall MHB in bivariate analysis. In addition, in the Egyptian sample, there was a more frequent predisposition to eating disorders (especially anorexia) than in other countries, which may have increased their MHB. People who are more prone to eating disorders sometimes have a higher perception of healthy food and unhealthy obsession with healthy eating to get a better picture of their body (Cena et al., 2019). On the other hand, eating disorders and disrupted body image concerns are associated with various health-compromising reduction strategies, such as rigorous diet, overwhelming exercise, laxative use, and other activities (Panão & Carraça, 2020). Since the Egyptian sample is a slightly higher representation of the student population, in which these disorders are not rare (Graham et al., 2019), these results could be related to this data. Moreover, most Egyptian respondents lived in rural environments and worked or studied in health or sports areas. Studies have confirmed that higher exercise motivation may indicate healthier body image and eating outcomes (Panão & Carraça, 2020). Despite this, Egyptian respondents had the lowest physical activity and highest incidence of obesity. In addition, following a balanced/healthy diet in the Egyptian population was lower than that in Portuguese and other study groups. It is possible that better MHB among Portuguese respondents is a result of the higher incidence of chronic diseases in Portuguese respondents than in other countries in our study. When some diseases appear, personal care forof one's own health may be more pronounced than in healthy condition. However, it should be noted that Portuguese respondents had the lowest perception about harm to sugar consumption. Because excess sugar is converted to fat in the metabolic process (Prada, Saraiva, Garrido, Rodrigues, & Lopes, 2020), it is possible that poor knowledge and awareness of the harmfulness of sugar has taken to an increase hypercholesterolemia (Prada et al., 2020). However, we have not investigated the amount of sugar consumed and such considerations require further studies. On the other hand, Croatian respondents had a clearer perception that sugar should be used in as small a quantity as possible, but despite that they were in the middle position in terms of the number of reported chronic diseases. Also, we noticed that the Portuguese respondents spent the highest hours per day in front of the television or computer, but on the other they had the highest exercise activity.

Studies confirm that nutritional behavioural and food choices are often based on individual motivational factors. However, health behaviour may be influenced by environmental capabilities (Brug, 2008). Also, often people are more inclined to change their lifestyle in order to have a better look and image. However, when it comes to health and disease prevention, people do not care too much about how much certain foods affect their health. Still, people are well known that a healthy diet contributes to protecting the body against all forms of malnutrition as well as excessive intake that leads to some non-communicable chronic diseases, such as obesity, type-2 diabetes, heart diseases, or cancer. The question arises, why then consumers who are

aware of these implications often choose unhealthy food and do not adhere to healthy foods. The reason may lie in how people differently interpret the concept of healthy eating, too often it is underestimated and most often attach greater importance to a healthy diet when they become ill. Additionally, even though some people can comprehend the concept healthy diet, still they might not be willing or able to adopt it in practice because they are attracted to tastier rather than healthier food they feel young and healthy and don't worry about the future (Boustani & Guiné; Liu et al., 2017; Mai & Hoffmann, 2015; World Health Organization, 2020). Turns out it is behavior, the result of individual or collective action that is a key determinant of people's health and the most prevalent chronic health conditions are strongly linked with lifestyle including regular exercise, a balanced diet and smoking abstinence. Hence, it is necessary to change a lifestyle with small steps which can be trigger of cascade of positive life changes.

Interventions to motivate people for healthy food choice should address the important determinants of healthy food which can contribute to human health. Additionally, people should be MHB and exposed to environments which offer them opportunities for healthy dietary pattern behaviors (Brug, 2008). The traditional approach, still used in health consultations and media campaigns, relies on providing direct advice and information. While information is important for education and informing consumers, it is rarely sufficient to change behavior. The health practitioners must place emphasis on the benefits of change. The same is true of many education programs and campaigns aimed at raising awareness.

Despite these, our study has some limitations. First, this is cross sectional study and cannot prove causality of perception and MHB for consumption of healthy food in different Mediterranean countries. Second, we compared MHB and other variables in several countries, which make the interpretation of the results challenging. Third, volunteer bias as recall bias and other types of bias, could have affected the study results. Fourthly, this study is part of the EATMOT project which was over October 2017 and March 2018, and performed as a series of cross-sectional studies from different countries. Additionally, it is possible that all the participants in all the countries don't understand with the same way the "health behavior". This limitation was mitigated by using the multivariate analysis which involves the place of residence as a crucial predictor included in the models.

Despite these limitations, the advantages of this large study include new insights about the importance of MHB for consumption of healthy food, as well health consequences associated with unhealthy behavior and consumption of unhealthy dietary patterns. Overall, the results of this study may help to clarify the differently healthy behavior of participants from different Mediterranean countries, different traditions, aspects and level of motivation to adherence to healthy food consumption. Extensive approach to healthy lifestyle intervention should include motivation for health behaviour to control risk factors and deter risk behaviours (Spring et al., 2012). Developing educational public health programs, which would motivate for health behavior and promote healthy habits and prevent the onset of most chronic diseases, are needed.

5. Conclusion

This study provided interesting insights on behavioural and perception aspects in relation to eating motivations related to health aspects. Despite most of the well-known evidence over the previous decades referring to health behaviour, it never ends to improve health. Hence, MHB through changing personal behaviours have crucial implications on lifestyle especially for consumption of a healthy diet. In general, participants from different Mediterranean country revealed correct perceptions toward a healthy diet, but with significant differences in the score. The results revealed that the MHB may be associated with perception of healthy food and adherence to a balanced and healthy diet according to different countries' characteristics. These circumstances are very important because they can help to recognize crucial healthy eating issues and preserve human health. Hence, these results may be very useful for implementing strategies pointing to motivation for health in general and promoting healthy eating habits among the population. In addition, the results of this study would be very beneficial in prevention of many chronic diseases and improve positive public health impact.

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Ethical statement

No animal or human experimentation was conducted in this research.

CRediT authorship contribution statement

Marija Ljubičić: Conceptualization, Methodology, Formal analysis, Software, Writing – review & editing, Visualization. **Marijana Matek Sarić:** Conceptualization, Methodology, Formal analysis, Software, Investigation, Data curation, Writing – original draft, Visualization. **Ivo Klarin:** Writing – review & editing. **Ivana Rumbak:** Writing – review & editing. **Irena Colić Barić:** Writing – review & editing. **Jasmina Ranilović:** Writing – review & editing. **Ayman EL-Kenawy:** Writing – review & editing. **Maria Papageorgiou:** Writing – review & editing. **Elena Vittadini:** Writing – review & editing. **Maša Černelič Bizjak:** Writing – review & editing. **Raquel Guiné:** Validation, Writing – review & editing, Supervision, Project administration.

Declaration of Competing Interest

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

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jff.2022.105018.

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