psychiatry international

MDPI

Article

Association of Mediterranean Diet Adherence, Functional Food Consumption and Anthropometric Characteristics with Anxiety and Depression Indexes in a Sample of Healthy Greek Adults: A Cross-Sectional Study

Ioannis-Nektarios Elmaliklis, Elisavet Miserli, Maria Filipatou, Ioannis Tsikouras, Charalampia Dimou and Antonios Koutelidakis *

Unit of Human Nutrition, Department of Food Science and Nutrition, University of the Aegean, 81400 Myrina, Greece; ioannis.elmaliklis@gmail.com (I.-N.E.); friddh@hotmail.com (E.M.); mariaphilippatou@gmail.com (M.F.); tsikioan@yahoo.gr (I.T.); xadimxri1983@yahoo.gr (C.D.)

* Correspondence: akoutel@aegean.gr

Received: 4 October 2020; Accepted: 7 December 2020; Published: 8 December 2020

Abstract: The purpose of this randomized, retrospective study was to investigate the possible association among levels of anxiety and depression and functional food consumption frequency, Mediterranean diet adoption and anthropometric indices in a sample of Greek, mainly young, adults. One hundred twenty healthy adults, 80% of whom were 18–35 years old, were randomly recruited from the North Aegean Islands, mainly from the Aegean University campus. The degree of anxiety was evaluated using the State-Trait Anxiety Inventory (STAI-X-1,2) whereas the degree of depression was assessed using the Beck Depression Inventory (BDI). Mediterranean diet adherence was evaluated using the Med Diet Score and functional foods consumption frequency by a validated food frequency questionnaire (FFQ). According to our results, the study did not show a statistically significant association between Mediterranean diet adherence and anxiety or depression levels ($p > 0.05$), and a trend association was observed only for the depression grouped score. In parallel, increased depression level was significantly correlated with an increased body mass index (BMI) ($p = 0.019$). In addition, the consumption of specific functional foods, such as beans, nuts, pomegranate, spinach and foods enriched with β-glucans, correlated with state-trait anxiety or depression levels, as well as with anthropometric indices ($p < 0.05$). The results of the study may contribute to the elucidation of the possible role of the Mediterranean diet and functional food consumption on self-esteem, anxiety and depression.

Keywords: mediterranean diet; functional foods; Spielberger anxiety scale; Beck Depression Inventory; self-esteem

1. Introduction

Nowadays, there is an increased percentage of individuals with anxiety and depression, which are two of the most common mental health diseases globally [1–5]. About 85% of patients with depression have significant anxiety, and 90% of patients with anxiety disorder have depression. These different diseases present similar symptoms, with common cognitive and attitude characteristics that affect the quality of life, such as fatigue and loss of energy, feeling slowed-down or agitated and restless, poor attention and concentration, slow thinking, distractibility, impaired memory, indecisiveness, apprehension, derealization, irritability, sleeping difficulties and atypical anger. The severity of anxiety symptoms has been correlated with the persistence of subsequent depressive symptoms [1].

The etiopathology of both diseases could be attributed to both genetic [1] or environmental and social factors, such as external stressors such as job stress, adverse life events and financial problems [2], and may lead to a decrease in quality of life and an increase in the risk of developing chronic disease, such as cardiovascular diseases [1,2]. A great number of people with depression have a history of anxiety disorder earlier in life. There is no evidence as to whether one disorder causes the other, although there is clear evidence that a significant percentage of the population suffers from both diseases, and both depression and anxiety disorder require appropriate treatment [1]. Depression occurs more often in women than in men. Some differences in the way the depressed mood manifests have been found based on sex and age. In regard to gender, in men it manifests as irritability, tiredness and anger, whereas in women depression tends to manifest as sadness, worthlessness and guilt [1–3]. In regard to age, in younger people depression is more likely to manifest in school or university in the form of refusal, anxiety and worry, and younger people also frequently exhibit co-morbid anxiety, eating disorders, or substance abuse, with specific proposed pathways [3]. For university students, the aim of obtaining a degree as the key to success, with many students leaving their home at the same time, can be a cause of depression, anxiety and stress. [4] Anxiety is an automatic biological response of the organism to various external stimuli. This stressful reaction is only created when a person feels unable to deal with the requirements of a situation [5]. Scientific data suggest that stress and sleep are related to each other in a bidirectional way—increased anxiety is associated with poor sleep and stress reduction improves both anxiety and sleep [1]. According to Spielberger, state anxiety and permanent anxiety are two categories of anxiety [6]. On the one hand, the state of anxiety refers to an existing or immediate emotional situation which is characterized by anxiety and intensity. On the other hand, permanent anxiety is an acquired behavioral predisposition that causes individuals to react with stress and anxiety in non-threatening situations [6,7]. Psychological diseases such as depression and anxiety are extremely common in young people, especially during university life [4]. Various scientific data support the suggestion that mainly young adults with a history of psychological disorders in adolescence have a higher risk of developing anxiety or depression, also highlighting the possible protective role of foods against these diseases [8,9].

In recent years, the concept of foods developed particularly to promote human health or reduce the risk of disease has been introduced. Based on clinical and epidemiological studies, researchers have highlighted the significance and possible health effects of certain foods, known as functional foods [10–15]. It should be noted that in recent years production of these foods has increased, owing to their several possible beneficial effects on human health [10]. Functional foods are often indicated as 'natural health products' or 'healthy foods'. Although there is not a unique definition worldwide, foods can only be considered functional if, along with basic nutritional effects, they exhibit possible beneficial effects on specific functions into the human organism, with the result of improving the physical condition and/or decreasing the risk of chronic disease [11]. However, nutritional and health claims about the possible effect of functional foods on disease prevention have been established only in specific situations when there are sufficient scientific data to ensure these properties [12]. Furthermore, the scientific research shows conclusively that functional foods may have beneficial effects on human health only if they are part of a balanced diet, such as the Mediterranean diet [13]. Functional foods are considered to be those foods which are intended to be consumed as part of a balanced diet, with high consumption of fruits, vegetables, olive oil, cereal, fishes and low consumption of meat or saturated fats, such as Mediterranean diet, and which also contain bioactive components, offering the potential for enhanced health or limiting the risk of diseases [14–17]. For instance, some categories of functional foods are foods that contain specific minerals, vitamins, polyunsaturated fatty acids or dietary fiber, foods with added biologically active and valuable substances such as phytochemicals as polyphenols or other antioxidants, and probiotics that have live beneficial cultures and prebiotics. Functional foods also include curcumin, aloe vera, Chios gum, spirulina, hippophaes, royal jelly, mountain tea, sage, soy, broccoli, linseed, turmeric, kefir and ginger—these are all foods with a possible functional role in

protecting against various severe illnesses such as obesity, gastrointestinal diseases and autoimmune diseases [18–21].

The Mediterranean diet has also been recognized as a possible protective factor in the prevention of cardiovascular disease (CVD) and other chronic diseases [18,21,22]. This diet is characterized by a high consumption of vegetables, fruits, olive oil, cereals, fishes and a low consumption of meat and saturated fats. Several studies have concluded that specific functional foods of the Mediterranean diet may have a protective effect against atherosclerotic processes and thus the development of CVD [22]. Specific functional foods of the Mediterranean diet such as olive oil, honey, vegetables (tomatoes, cauliflower, broccoli), fruits (citrus fruits, pomegranate, grapes), wild greens (fennel, radish), and herbs (oregano, mint, dittany, salvia) may contribute to chronic disease prevention due to the bioactive compounds of those foods, such as phytochemicals and polyphenols like oleuropain, resveratrol, sulforaphan, anthocyanins, quercetin and tannins. Their possible mechanisms of action include improving lipid profile, endothelial factors, thrombotic factors and a possible effect on gene expression [19].

The scientific community has investigated the possible protective role of functional foods and has demonstrated the significance of a healthy diet based on Mediterranean dietary patterns for the psychological system. A balanced diet, rich in various functional foods, is a valuable nutritional concept in relation to eating disorders, suggested by scientists as a potential means of decreasing the risk of anxiety and depression, especially in young adults [23]. Undoubtedly, diet and lifestyle are closely associated with severe depression, anxiety and other chronic conditions, and it is especially obvious that Mediterranean diet adherence and several functional foods, such as fermented foods, may have a possible positive effect on human cognitive function, protecting adults of all ages against psychological diseases, with an emphasis in young people such as university students [24–29]. Although several studies have suggested a possible association between nutrition and depression or anxiety, further scientific research should be conducted—such as clinical or epidemiological studies—in order to further investigate the role of nutritional attitudes in psychological diseases and especially in depression and anxiety. The present study was performed due to the relatively small number of studies about the possible effect of specific functional foods in parallel with the adoption of a Mediterranean diet on psychological diseases, such as anxiety and depression.

The main purpose of the present retrospective study was to investigate the possibility of association between Mediterranean dietary patterns and the frequency of functional food consumption, as well as anthropometric indices, measuring anxiety and depression levels in Greek mainly young adults.

2. Materials and Methods

2.1. Subjects

The study protocol was approved by the Ethics Committee of University of the Aegean (October 2018) and the study was performed in accordance with the Declaration of Helsinki of 1975, revised in 2013. All participants signed an informed consent form and were informed about the prime target of the study, the confidentiality of the data, the voluntary nature of the study and the acceptance of their participation.

One hundred twenty healthy adults—37 men and 83 women, 99 of whom were aged 18–35 (82.5%) and 21 were aged >35 years old (17.5%)—were randomly recruited from the North Aegean Islands, specifically from the university campuses of the islands Lemnos and Lesvos. The selection of the participants was carried out via social media, announcements on the university campus and in e-mails, in a random and representative way. The inclusion criteria required participants to be healthy adults who had never suffered from chronic inflammations or infections, such as cardiovascular diseases, diabetes mellitus, cancer or psychological diseases. Exclusion criteria included people over the age of 65 and under the age of 18 years. All volunteers were required to complete a medical screening questionnaire containing not only baseline information such as demographics and medical history but also smoking habits, nutritional supplement consumption, level of physical activity and other

additional nutrition-related questions. After the first screening interview of 130 people randomly selected from initial 150, the final 120 participants were selected based on the inclusion and exclusion criteria of the study. The selection of the participants and the collection of the data were carried out by independent researchers (collaborating nutritionists).

2.2. Study Design

The study was conducted as a retrospective, cross-sectional, observational study. After initial screening of the volunteers, 120 healthy adults finally participated in the study, following the inclusion criteria. The study started on 15 October 2018 and finished on 18 June 2019. The participants visited the specifically designed Nutritional Unit, and with the assistance of nutritionists, completed two questionnaires, one to assess their nutritional patterns and functional food consumption frequency [30] and the other to assess the quality of their diet (adherence to the Mediterranean diet) [31]. The participants were asked to recall their nutritional habits during the past year. For the evaluation of anxiety and depression levels, the volunteers completed the Beck Depression Inventory questionnaire for depression [32] and the questionnaires of C. D. Spielberger about state and trait anxiety [33]. Then, anthropometric measurements were carried out (weight, height, waist-to-hip ratio, body fat, body water content, muscle mass and bone mass).

2.3. Functional Food Consumption and Mediterranean Diet Adherence Evaluation

Functional food consumption frequency and Mediterranean diet adherence were evaluated by two validated questionnaires. The first questionnaire was a food frequency questionnaire (FFQ) based on the FFQ used in a NHANES (National Health and Nutritional Examination Survey) study [30], after some modifications. Specifically, changes were carried out in order to include more natural and processed functional foods, without alterations to the type of questions, based on previous published studies about functional food consumption in the Greek population [12,13]. The questionnaire included four parts. The first contained questions about gender, age, occupation and marital status. The second part contained questions concerning the general and nutritional background of the participants, smoking, water intake and daily meals, as well as the use of medication. In the third and fourth parts, the frequency of functional food categories—groups and specific functional foods and kinds of consumption—were investigated. The food groups evaluated were red meat, white meat, fish, cereals, bread, nuts, sweets, milk, dairy products, legumes, fruits and vegetables. In addition, two sections for the evaluation of functional foods were included; one for categories of functional foods (probiotics, prebiotics, enriched foods with vitamins, minerals and polyunsaturated fats) and for types of functional foods-superfoods (goji berry, cranberry, mountain tea, spirulina, etc.). The possible answers were "every day", "4–5 times per day", "2–3 times per day", "1 time per day", "5–6 times per week", "3–4 times per week", "1–2 times per week", "3–4 times per month", "1–2 times per month" and "never" [12,13,30].

The second questionnaire was a Mediterranean diet (Med diet) score, designed by Panagiotakos et al. (2006) [31], consisting of 11 main components of the Mediterranean diet (non-refined cereals, fruits, vegetables, potatoes, legumes, olive oil, fish, red meat, poultry, full fat dairy products and alcohol). On the one hand, for the consumption of items to be close to this pattern, scores on a scale of 0, 1, 2, 3, 4 and 5 were assigned, corresponding to whether a participant reported no consumption, rare, frequent, very frequent, weekly and daily consumption, respectively. On the other hand, for the consumption of foods presumed to be separate from this pattern, the same scores were assigned on a reverse scale. Then, a total Med diet score ranging from 0 to 55 was calculated. This score is useful in assessing the nutritional status of an individual and investigating the relationship of the Mediterranean diet with various health outcomes. A high total Med diet score is an indicator of high Mediterranean diet adherence and, on the contrary, a low total Med diet score shows low Mediterranean diet adherence [31]. The Med diet scores were additionally grouped into three categories (low, 1–17; moderate, 18–36; high adherence, 37–55).

2.4. Anxiety and Depressive Evaluation

Anxiety and depression evaluations were performed with two scales. The Test Anxiety Inventory (TAI), a self-reported psychometric scale, was developed to measure individual differences in test anxiety as a situation-specific trait. Based on a Likert scale, the respondents are asked to report how frequently they experienced specific symptoms of anxiety during the past year. In addition to measuring individual differences in anxiety proneness in test situations, the TAI subscales access worry and emotionality as major components of test anxiety. The trait and state Anxiety Inventory scores were grouped into three categories (increased anxiety, 20–39; moderate anxiety, 40–59; high anxiety, 60–80) [33]. The Beck Depression Inventory (BDI) is a 21-question multiple-choice self-reported inventory, one of the most widely used psychometric tests for measuring the severity of depression. The BDI was originally developed to detect, assess and monitor changes in depressive symptoms among people in a mental healthcare setting. It is also used to detect depressive symptoms in a primary care setting. The BDI usually takes between five and ten minutes to complete as part of a psychological or medical examination. The Beck Depression Inventory scores were grouped into four categories (no possibility for depression development, 0–13; low, 14–19; moderate, 20–28; and high possibility, 29–63) [32].

2.5. Anthropometric Characteristics

Measurements of body mass index (BMI), body fat and water content, muscle mass and bone mass were performed with two models of body analyzers, TANITA BC-545 N and TANITA SC-330 P. The basic principle of the analyzers was bioelectrical impendence analysis (BIA). The electrode sites were cleaned with an alcohol swab prior to measurement. Prior to measurements, the participants removed their shoes, as well as their socks. The participants had also been informed not to drink large amounts of water, as well as not to eat, at least two hours prior to the procedure, to ensure more accurate measurements. Furthermore, they had been also advised not to participate in any intense exercise that could possibly induce dehydration. Height was measured using an audiometer (Gima Tape Height Measure) and the waist-to-hip ratio with a measuring tape. The classification of participants according to BMI was performed according to WHO guidelines [34,35]. Specifically, underweight was recorded when BMI was lower than 18.5, overweight when BMI was greater than or equal to 25 and obese when BMI was greater than or equal to 30. Volunteers' body composition was classified as follows—standard scales for the mass of water for women (45%–65%) and for men (50%–65%), standard fat mass for women (22%–34%) and for men (8%–22%), standard bone mass index for women (2.5%–4%) and for men (3%–5%) and standard muscle mass for women (63%–75.5%) and for men (75%–89%) [36,37].

2.6. Statistical Analysis

The statistical analysis of the study's data was conducted using the SPPS VER. 22 Statistical Package for Social Sciences. This program gave information about the intensity and the nature of the relationship between the variables in each case. Using SPSS, we performed analysis of variances (one-way ANOVA, Bonferoni post-hoc analysis) to demonstrate the relationship between categorical variables (frequency of consumption of functional food groups) and continuous variables (BMI, body fat, muscle tissue). Associations between one categorical variable and many quantitative variables were examined using the test of homogeneity variances, whereas associations between categorical variables were examined using the Chi-squared test. Subsequently, the reliability of the correlations was checked by observing the annotation under the Chi square test table. In order to accomplish all these analyses, the clustering of the variables was performed.

The statistical analysis of the results was performed based on two methods (one-way ANOVA, Chi-squared test) and each method had specific criteria. In the Chi-squared test method, a correlation was observed between variables when the p-value (Sig) < 0.05 (Criterion 1). Furthermore, for the correlation to be reliable (statistically significant), the percentages of cells lower than 20 were noted in

the annotation under the table of the Chi-squared test (Criterion 2). When both criteria were applied, the correlation between variables was reliable. In the one-way ANOVA method, a correlation was observed between variables when the F critical value > 1 and the *p*-value (Sig) < 0.05 (Criterion 3). Moreover, in order for the correlation to be reliable, in the table with the test of homogeneity of variances, significance was required to be higher than 0.05 (Criterion 4). When both criteria were applied, the correlation between variables was reliable (statistically significant).

3. Results

3.1. Demographic Characteristics of the Sample

Table 1 presents the basic characteristics of the participants. In total, 37 men (30.83%) and 83 women (69.2%) participated in the study. The majority of the participants were aged 18–35 years old, specifically 99 individuals (82.5%). In addition, 84 volunteers (70%) were university students and had a higher level of education. According to the level of physical activity, 43 healthy people (35.83%) had a moderate level of physical activity and only 15 participants (12.50%) had never exercised (Table 1).

Table 1. Sample distribution with demographic characteristics.

Demographic Characteristics		Greek Adults
Gender	Men	37 (30.83%)
	Women	83 (69.17%)
Age	18–35 years old	99 (82.50%)
	36–45 years old	13 (10.83%)
	47–57 years old	5 (4.17%)
	58–65 years old	3 (2.50%)
Profession	Student	84 (70%)
	Private employee	10 (8.33%)
	Civil servant	15 (12.50%)
	Freelance	4 (3.33%)
	Unemployed	6 (5%)
	Household	1 (0.83%)
Level of education	Primary	1 (0.83%)
	Secondary	18 (15%)
	Higher (Student)	84 (70%)
	Higher (Graduate)	11 (9.17%)
	Postgraduate/PhD	5 (4.17%)
	Other	1 (0.83%)
Level of physical activity	Too High	11 (9.17%)
	High	33 (27.50%)
	Moderate	43 (35.83%)
	Low	18 (15%)
	Never	15 (12.50%)

Note: The values in the Table indicate the number of the participants and their percentages are included in parenthesis.

In addition, according to Med diet scores, 68%of the participants had moderate adherence to the Mediterranean diet (Med diet score 18–36), 30% had high adherence (37–55), whereas 2% had low adherence (1–17). According to the DBI score, 49% of the participants had no possibility of depression development (score 0–13), 19% had a low possibility (14–19), 21% had a moderate possibility (20–28) and 11% had a high possibility (29–63). Referring to anxiety, 75% and 85% of the participants had decreased trait and state anxiety scores, respectively (20–39); 22% and 13% had moderate scores (40–59); and 3% and 2% had increased State-Trait Anxiety Inventory (STAI) scores (60–80).

3.2. Association among Functional Food Consumption and Anthropometric Characteristics, Anxiety and Depression Levels

The basic aim of the study was to investigate the association of functional food consumption with state-trait anxiety and depression indices, using the Chi-squared test method. The results demonstrate associations of some functional foods with those indexes. More specifically, a trend of association was found firstly among some functional foods and state-trait anxiety and secondly among some of functional foods and depression (Criterion 1). A correlation of mountain tea and sage with state anxiety was observed, showing that these functional foods can be associated with a reduced risk of state anxiety. Furthermore, the same result was found among specific foods (such as foods rich with β-glucan, sage, beans, spinach and nuts) and trait anxiety (Criterion 1). In regard to depression, the results indicated a trend of association of goji berries, cranberries, berries, mountain tea, beans and foods rich in β-glucan with depression (Criterion 1), suggesting a possible positive effect of these functional foods in relation to depression (Table 2).

Table 2. Associations among functional food consumption frequency, anthropometric indices, anxiety and depression levels.

Functional Foods		BMI	Body Fat	Muscle Tissue	Waist Size	Waist-to-Hip Ratio	State Anxiety Score (*p*-Value)	Trait Anxiety Score (*p*-Value)	Depression Score (*p*-Value)
Superfoods	F	0.923	1.528	1.320	1.046	1.352	0.781	0.665	0.941
	Sig	0.491	0.165	0.247	0.403	0.233			
Probiotics/Prebiotics	F	1.218	0.601	1.485	1.060	1.082	0.964	0.738	0.578
	Sig	0.295	0.776	0.171	0.396	0.381			
Foods rich in fiber	F	0.933	1.959	1.114	1.021	0.676	0.324	0.791	0.968
	Sig	0.499	0.051	0.359	0.428	0.729			
Foods enriched with vitamins and minerals	F	**2.052** *	1.124	1.244	1.927	1.596	0.577	0.858	0.955
	Sig	**0.047** *	0.353	0.280	0.063	0.134			
Low fat foods (light)	F	1.001	1.670	0.774	0.490	0.412	0.216	0.289	0.432
	Sig	0.440	0.114	0.626	0.861	0.911			
Foods rich in selenium (lean meat, poultry)	F	1.518	0.927	1.206	0.804	0.243	0.932	0.779	0.194
	Sig	0.168	0.489	0.305	0.586	0.973			
Foods with polyunsaturated fats	F	0.970	1.937	1.093	0.962	0.830	0.879	0.461	0.434
	Sig	0.463	0.206	0.373	0.469	0.578			
Gluten-free foods	F	1.278	0.959	0.671	1.441	1.275	0.105	0.523	0.989
	Sig	0.257	0.478	0.733	0.180	0.259			
Goji berries, cranberry, berries	F	1.657	0.871	1.521	1.581	1.176	0.991	0.772	0.016*
	Sig	0.117	0.543	0.158	0.139	0.320			
Tea (black, green etc.)	F	**2.114** **	1.471	1.698	1.625	0.632	0.351	0.099	0.103
	Sig	**0.034** **	0.167	0.098	0.117	0.768			
Broccoli, crumbled vegetables	F	**2.650** *	1.765	1.461	**2.253** **	0.943	0.496	0.779	0.730
	Sig	**0.008** *	0.083	0.171	**0.024** **	0.491			
Hippophaes	F	**8.479** *	**2.583** *	**3.503** *	**5.330** *	2.054	0.480	0.158	0.592
	Sig	**0.000** *	**0.041** *	**0.010** *	**0.001** *	0.091			
Spirulina	F	2.162	**2.760** *	**2.990** *	**2.861** *	1.200	0.351	0.242	0.362
	Sig	0.063	**0.022** *	**0.014** *	**0.018** *	0.314			
Royal jelly	F	**5.685** *	1.380	1.417	**2.569** *	1.079	0.660	0.226	0.821
	Sig	**0.000** *	0.229	0.214	**0.023** *	0.379			
Mountain tea	F	1.527	0.449	0.540	0.790	0.400	**0.015** *	**0.333**	**0.003** *
	Sig	0.156	0.889	0.824	0.613	0.918			
Cacao	F	1.400	0.715	0.488	1.515	1.434	0.825	0.405	0.109
	Sig	0.212	0.659	0.842	0.169	0.199			
Pomegranate	F	0.890	0.845	1.100	1.268	2.319	0.546	0.134	**0.031** *
	Sig	0.517	0.552	0.368	0.273	0.030			
Oats	F	0.864	0.636	1.319	0.608	0.660	0.571	0.277	0.174
	Sig	0.549	0.746	0.241	0.769	0.726			
Foods enriched with β-glucan	F	0.734	0.367	0.785	0.634	0.490	0.122	**0.006** *	**0.002** *
	Sig	0.623	0.899	0.584	0.703	0.815			
Garlic	F	0.436	1.021	**20.108** **	**2.171** *	1.009	0.485	0.478	0.595
	Sig	0.000	0.428	**0.035** **	**0.029** *	0.437			
Thyme	F	1.167	1.355	**2.725** **	1.395	0.983	0.369	0.259	0.695
	Sig	0.323	0.217	**0.007** **	0.199	0.458			

Table 2. *Cont.*

Functional Foods		BMI	Body Fat	Muscle Tissue	Waist Size	Waist-to-Hip Ratio	State Anxiety Score (*p*-Value)	Trait Anxiety Score (*p*-Value)	Depression Score (*p*-Value)
Chamomile	F	1.334	0.706	0.662	1.593	1.682	0.075	0.136	0.329
	Sig	0.241	0.667	0.704	0.145	0.120			
Beans	F	1.117	**2.850** **	1.755	1.110	0.917	0.291	**0.016** *	**0.025** *
	Sig	0.357	**0.005** **	0.085	0.362	0.513			
Sage	F	**3.197** **	1.529	1.844	**3.063** *	1.727	**0.008** *	**0.025** *	0.146
	Sig	**0.003** **	0.155	0.076	**0.004** *	0.100			
Spinach	F	0.677	0.767	1.714	1.530	1.253	0.092	**0.010** *	0.568
	Sig	0.691	0.616	0.113	0.164	0.280			
Nutmeg	F	**2.713** *	1.946	1.353	**2.863** **	2.181	0.140	0.651	0.667
	Sig	**0.017** *	0.679	0.240	**0.012** **	0.050			
Nuts	F	1.101	0.864	0.892	1.139	0.873	0.675	**0.002** *	0.066
	Sig	0.368	0.559	0.535	0.342	0.551			

* N = 120 healthy adults. Regarding the association of functional foods with anthropometric indices, the values (*p*-values (Sig) or F-values) cells with bold text and two asterisks showed a trend but no association between variables, as only criterion 3 applied, and cells with bold text and one asterisk showed a statistically significant (reliable) association between variables, because criteria 3 and 4 applied at the same time. Regarding the association of functional foods with state-trait anxiety and depression indices, cells with bold text indicate an association between variables, as only criterion 1 applied, and cells with bold text and an asterisk showed a trend but no statistically significant association between variables, because criteria 1 and 2 did not apply. ** Some functional foods, such as crumbled vegetables, royal jelly, nutmeg and sage were consumed by only a small subsample of the participants (approximately 10%). Specifically, 8 participants consumed crumbled vegetables, 7 royal jelly, 9 nutmeg and 6 participants consumed sage.

Apart from the above correlations, the present study also evaluated the possible association between functional foods and anthropometric characteristics, using the one-way ANOVA method and post-hoc analysis. On the one hand, the results showed statistically significant associations between some functional foods and anthropometric characteristics, especially, foods enriched with vitamins and minerals, broccoli and crumbled vegetables, hippophaes, royal jelly, nutmeg, tea and sage with body mass index (p = 0.008, 0.00, 0.00, 0.017, 0.034 and 0.03, respectively); hippophaes, spirulina and beans with body fat and muscle tissue (p = 0.04, 0.02 and 0.005 for fat, respectively); hippophaes, spirulina, royal jelly, garlic and nutmeg with waist size (p = 0.001, 0.018, 0.023, 0.029 and 0.012, respectively) (Criterion 3, Criterion 4). On the other hand, the results indicated an association of some specific foods with anthropometric parameters, especially tea and sage with body mass index; broccoli, crumbled vegetables and nutmeg with waist size; garlic and thyme with muscle tissue; and beans with body fat (Criterion 3) (Table 2).

3.3. Association of Mediterranean Diet Adherence with Anthropometric Characteristics, Anxiety and Depression Levels

The results shown in Table 3 indicated no statistically significant correlation between state-trait anxiety and anthropometric characteristics. The same results were found between Med diet score groups and anthropometric characteristics, using the one-way ANOVA method. Furthermore, using this method to evaluate the correlation between depression score groups and anthropometric parameters, the basic finding was a statistically significant association between depression score groups and body mass index (Criterion 3, Criterion 4, post hoc analysis, Bonferoni), indicating that a high body mass index was associated with an increased risk of depression. Another result of this analysis was a trend of correlation among depression score groups and other anthropometric indices such as muscle tissue, waist size and waist-to-hip ratio (meeting only Criterion 3) (Table 3).

Table 3. Association of anthropometric indices with state-trait anxiety, depression score groups and Mediterranean diet (Med diet) score groups.

Anthropometric Indices		BMI	Body Fat	Muscle Tissue	Waist Size	Waist-to-Hip Ratio
State anxiety Score	F	0.332	0.672	0.639	0.459	0.185
	Sig	0.718	0.513	0.530	0.633	0.832
Trait anxiety Score	F	0.264	0.108	0.007	0.132	0.120
	Sig	0.769	0.898	0.993	0.876	0.887
Depression score groups	F	**3.449** *	1.562	**8.195** **	**5.552** **	**7.137** **
	Sig	**0.019** *	0.202	**0.000** **	**0.010****	**0.000** **
Med diet score groups	F	0.604	0.139	0.955	0.237	0.065
	Sig	0.548	0.870	0.388	0.790	0.937

* N = 120 healthy adults. Cells with bold text and two asterisks show a trend but no association between variables, as only criterion 3 applied, and cells with bold text and one asterisk show a statistically significant (reliable) association between variables, because criteria 3 and 4 applied at the same time. ** "Med diet score groups" represent the categorization of the score into 3 groups (0–17, low; 18–36, medium; 37–55, high adherence). "Depression score groups" represent the categorization of the score into 3 groups (0–13, none; 14–19, low; 20–28, medium; 29–63, high possibility of developing depression).

Table 4 shows that there was no association of state-trait anxiety score with Med diet score and Med diet score groups. These results were in accordance with the results of the association between depression score groups and Med diet score. Statistical analysis also indicated a trend of association between depression score and Med diet score groups, although it was not reliable. This trend of correlation is an indicator that high Mediterranean diet adherence may be associated with a low risk of depression. In order to evaluate the above associations, the one-way ANOVA method and Bonferoni test were used (Table 4).

Table 4. Association between Mediterranean diet score, anxiety, and depression levels.

Med Diet		Med Diet Score	Med diet Score Groups
State anxiety Score	F	0.731	0.705
	Sig	0.573	0.496
Trait anxiety Score	F	1.735	0.136
	Sig	0.147	0.873
Depression score groups	F	1.524	
	Sig	0.222	
Depression score	F		**0.013** **
	Sig		**0.987** **

Note: N = 120 healthy adults. Cells with bold text and two asterisks show a trend but not a statistically significant (reliable) association between variables, because criteria 3 and 4 did not apply at the same time. ** "Med diet score groups" represent the categorization of the score into 3 groups (0–17, low; 18–36, medium; 37–55, high adherence). "Depression score groups" represent the categorization of the score into 3 groups (0–13, none; 14–19, low; 20–28, medium; 29–63, high possibility of developing depression).

4. Discussion

Although many studies have indicated that dietary habits and specific food consumption frequency may be associated with the appearance of psychological diseases such as anxiety and depression, there are few studies that investigate if specific foods, especially categories and kinds of functional foods, and Mediterranean diet adoption reduce the risk of the appearance of those diseases. The need for an in-depth examination of the possible association between nutrition and psychological diseases was the trigger for conducting the present study. A basic finding of the present study was that a statistically significant association was not observed among Mediterranean diet adherence and psychological diseases (depression, state or trait anxiety levels), whereas a trend of association was observed between Med diet score groups and depression scores in the healthy adults of this study. This finding is compelling, given the fact that several studies have recorded a strong association between the Mediterranean diet and anxiety or depression [38,39]. More specifically, in the context of the

Attica study, a cross-sectional survey consisting of 453 men and 400 women, a complete psychological evaluation was conducted. Participants were without any evidence of cardiovascular or other chronic disease. The main purpose of that study was to evaluate the mediating role of behavioral patterns, such as adherence to the Mediterranean diet and physical activity status, in the relationship between depression, anxiety and cardiovascular disease risk scores. According to their results, the adherence to the Mediterranean diet seems to mediate the unfavorable effect of depression and anxiety on cardiovascular disease risk [38]. Another study was performed in the University of Navarra among 10,094 healthy Spanish people for six years and indicated a potential protective role of Mediterranean dietary patterns against depressive disorders, with the authors claiming that a Mediterranean diet decreases the risk of developing depression by 30 percent [39].

Nowadays, the scientific community is focusing on the investigation of the possible association between a Mediterranean diet and psychological health in young individuals, such as adolescents and young adults, due to the specific circumstances in their life. A cross sectional study was performed in a sample of 263 participants, with a view to determining the association between adherence to a Mediterranean dietary pattern and depression, anxiety and stress among female adolescents in Tehran, Iran. According to the results of the study, there was a statistically significant association between the Mediterranean diet and depression. More specifically, Mediterranean diet adherence was connected with a reduced presence of depressive symptoms in female adolescents [25]. Furthermore, various studies support the suggestion that university students are an at-risk group for unhealthy habits such as poor diet or alcohol abuse, and thus conclude that anxiety levels appear to be higher among university students, which may lead to high levels of emotional eating. Based on the above findings, a study was designed in order to investigate if Mediterranean diet adherence is associated with a reduced level of anxiety in a sample of 252 university students from Spain. The results showed lower levels of Mediterranean diet adherence and considerable levels of emotional eating and anxiety. Therefore, as psychological disorders are frequent in young people, especially during university life, scientists support the positive effect of a Mediterranean diet and a healthy lifestyle on university students' health [27]. In the present study, the majority of the participants were university students from the North Aegean Islands. Although the remote location of the Aegean islands in relation to central Greece may affect the psychology of the students, high values in the anxiety and depression scores were not observed. The lack of statistically significant differences between Mediterranean diet adherence with anxiety and depression in the present study, in contrast with other studies, could be attributed to different demographic characteristics and nutritional habits of the participants and differences in the study design.

Another important finding reported herein was that an association of the consumption of specific functional foods was observed with state or trait anxiety and depression. Specifically, a trend of association was observed among mountain tea and sage with state anxiety and the same result was also found among other foods, such as those enriched with β-glucan, sage, beans, spinach, nuts, and trait anxiety levels. Furthermore, the study indicated a trend of association of the consumption of goji berries, cranberries, berries, mountain tea, beans and foods enriched in β-glucan with depression levels. Therefore, the above findings show a possible association of functional foods with psychological diseases, depression and anxiety, providing important information about the possible effect of functional foods on psychological health. Nevertheless, these associations are uncertain and further investigation is needed in a large sample in order to ensure the wider applicability of the correlation.

Regarding the association of functional foods with psychological health, the scientific community has shown a clear interest in recent years. According to recent studies, some categories of functional foods and foods with a high content of minerals, vitamins and polyunsaturated fatty acids may have a possible positive effect on the psychological system [40–43]. Particularly, a clinical trial regarding the effect of royal jelly for six months on healthy volunteers indicated that 10-hydroxy-trans-2-decenoic acid, an unsaturated fatty acid unique to royal jelly, protected against depression and anxiety [40], whereas a study in south Asia demonstrated associated vegetable consumption with anxiety among

adults [41]. Furthermore, according to the *Journal of Traditional and Complementary Medicine*, sage (*Salvia* sp.) has been used to prevent or cure illnesses such as depression [42], and another study in the *Journal of Phytomedicine* evaluated the anti-depressant activity of *Myristica fragrans* (Nutmeg) [43]. The results of these studies on royal jelly, vegetables (crumbled), sage and nutmeg were in accordance with the results of the present study, showing that some of these functional foods are possible protective factors against depression and anxiety. Nevertheless, it should be underlined that some functional foods, such as crumbled vegetables, royal jelly and sage were consumed by only a small subsample of the participants (approximately 10%); thus, a larger sample is needed to ensure the validity of these results.

A systematic review and meta-analysis of randomized controlled trials concluded that probiotics were beneficial for patients with depression [44,45], and scientific data demonstrate the possible positive effect of prebiotics on neuro-inflammation and anxiety [46,47]. Cereals enriched with tryptophan improved the sleep cycle, melatonin levels, serotonin levels and total antioxidant capacity and reduced anxiety and depression symptoms [48]. Herbs such as chamomile, black cohosh, chastberry and passionflower may be also useful in order to relieve anxiety and depression symptoms, which are prevalent among cancer patients, with a significant negative impact [49]. Turmeric is a type of functional food rich in curcumin, a bioactive compound that has a potential antioxidant capacity and appears to be safe, well-tolerated and efficacious among depressed patients [50,51]. Oats are a possible triple threat to anxiety, containing B vitamins, magnesium and fiber, all nutrients vital in reducing stress [19]. Avocados are foods with functional roles and are possibly one of the best foods to lower stress. These low-sugar fruits are rich in B vitamins such as B6 and folate, which may naturally lower stress levels. Avocados are also abundant in monounsaturated fats, which not only give them their rich and creamy taste, but may also reduce blood sugar spikes that can lead to anxiety [52]. Moreover, a number of studies have suggested the possible significant protective effects of nuts against mild cognitive disorders and depression [53]. The results of the present study—in which the consumption of nuts, pomegranate, spinach, foods enriched with β-glucans and beans were correlated, significantly or with trends, with depression or anxiety levels—are in accordance with those of several studies, and are supported by the presence of various bioactive compounds in these foods. Nevertheless, the interpretation of these specific functional foods as sources of nutrients could not be ensured in the present study, given the fact that the study design did not lead to results about the nutrient intake status of the volunteers.

The possible effect of functional foods on the psychological system and in general health promotion is strengthened when they are included in a balanced diet such as the Mediterranean diet, a standard nutritional model with a possible protective effect against psychological diseases, which includes the high consumption of fruits, vegetables, olive oil, cereals, fishes and the low consumption of meat, sugar and saturated fatty acids. In recent studies relating to the association between the Mediterranean diet and psychological health, researchers have concluded that eating a plant-based diet which contains fruits, vegetables, nuts and foods with polyunsaturated fats, vitamins and nutrients can reduce inflammation, and may lower the risk of depression and anxiety [54–56]. Physical activity can also positively affect serotonin levels in the human brain. Raising the level of this hormone boosts mood, improves appetite and sleep cycles, which are often negatively affected by depression. Exercise may be also effective for depression and anxiety when combined with the Mediterranean diet [57,58]. In our study, the majority of the young healthy participants had moderate and high physical activity, and their adherence to a Mediterranean Diet was also moderate or high. In parallel, they appeared to have decreased scores of anxiety and depression. Nevertheless, no strong reliable association was observed, as previously mentioned.

Another important finding of this study was a statistically significant association of the consumption of some functional foods, as well as of depression level with anthropometric indices. Specifically, the main finding was a reliable association between depression score groups and body mass index, showing that a high body mass index was correlated with an increased risk of depression.

This result was in accordance with the results of previous. A systematic review on depression, anthropometric parameters and body image in adults supported the suggestion that an increase in weight and high body mass index were associated with the appearance of depression or depressive symptoms [59]. In addition, the present study showed a reliable association of enriched foods, broccoli, crumbled vegetables, hippophaes, royal jelly and nutmeg with body mass index; hippophaes and spirulina with body fat; hippophaes and spirulina with muscle tissue; and hippophaes, spirulina, royal jelly, garlic and sage with waist size. This study also showed a trend of correlation of mountain tea and sage consumption with body mass index; broccoli, crumbled vegetables and nutmeg with waist size; garlic and thyme with muscle tissue; and beans with body fat. It must be noted that these correlations are merely indicative and should be further investigated in a larger sample. Apart from this study, similar findings emerged from a recent study of a sample of 301 healthy adults aged between 18–65 years old from various areas in Greece. The purpose of this study was to investigate possible correlations between functional food consumption and anthropometric characteristics. More specifically, the daily consumption of fiber-rich foods or other specific foods such as goji berries, cranberries and pomegranate were correlated with reduced body mass index, and daily consumption of oats was associated with reduced body fat. Consequently, there was an association among some functional foods and anthropometric parameters, as observed in the present study [12].

Considering the findings of the present research, which emerged from reliable statistical analyses and were discussed based on scientific data, it should be noted that the present study has some limitations and weakness in some points. First, the proportion of genders was not representative, as there were three times more women than men. Additionally, the age range of the participants was wide, given the fact that the majority of volunteers were students, and few participants were permanent residents from the islands of Limnos and Lesvos. Although the focus on young people in relation to possible correlations between nutritional attitudes and psychological diseases is of high interest, the wide age range in our study implies a possible bias in the interpretation of the results. Furthermore, it should be underlined that some functional foods, such as crumbled vegetables, royal jelly and sage were consumed by only a small subsample of the participants (approximately 10%) and therefore the associations observed with these foods should be verified using a larger sample. Furthermore, there were no conjunctive factors included in this study in order to investigate the exact effect of functional foods and the Mediterranean diet, Furthermore, this was a retrospective study and thus the results should be further confirmed by larger prospective studies. Another important limitation is that the study sample was limited to 120 participants and included only participants from the North Aegean region in Greece. Larger epidemiological studies with larger samples from other areas of Greece, from both urban and rural regions, are essential in order to extract more reliable conclusions regarding to the Greek population.

5. Conclusions

The present study indicated a statistically significant association among the consumption of some functional foods and anthropometric indices and between body mass index and depression in a sample of Greek adults, especially in university students. The results of this research showed that there was no statistically significant association of a healthy diet based on Mediterranean dietary patterns with anxiety and depression levels, although some trends were observed, in contrast with some other studies with different population characteristics and study designs. Correlations seemed to be found among some functional foods and the above psychological illnesses, increasing the need for further investigation of the importance of these foods on psychological health, especially in younger people with increased stressor parameters. Nevertheless, further research should be conducted, and more clinical and epidemiological studies should be carried out in larger samples in order to draw safer conclusions and also to investigate the possible exact mechanisms that nutritional choices and bioactive compounds exert on the mechanisms of anxiety and depression.

Author Contributions: Conceptualization, A.K.; methodology, A.K. and I.T.; software, C.D.; validation, A.K. and I.-N.E.; formal analysis, A.K.; investigation, E.M., M.F. and I.-N.E.; resources, E.M. and M.F.; data curation, C.D.; writing—original draft preparation, I.-N.E.; writing—review and editing, A.K.; visualization, I.-N.E.; supervision, A.K.; project administration, A.K. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Acknowledgments: This was a retrospective study conducted on a sample of healthy volunteers to encourage a nutritional policy that promotes functional foods. The authors thank every individual who participated in the study for his/her cooperation.

Conflicts of Interest: None of the authors declare any kind of conflict of interest.

References

1. Tiller, J. Depression and anxiety. *Med. J. Aust.* **2013**, *199*, S28–S31. [PubMed]
2. Rosengren, A.; Hawken, S.; Ôunpuu, S.; Sliwa, K.; Zubaid, M.; Almahmeed, W.; Blackett, K.N.; Sitthi-Amorn, C.; Sato, H.; Yusuf, S. Association of psychosocial risk factors with risk of acute myocardial infarction in 11119 cases and 13648 controls from 52 countries (the Interheart study): Case-control study. *Lancet* **2004**, *364*, 953–962. [PubMed]
3. Cummings, C.M.; Caporino, N.E.; Kendall, P.C. Comorbidity of anxiety and depression in children and adolescents: 20 years after. *Psychol. Bull.* **2014**, *140*, 816–845. [PubMed]
4. Beiter, R.; Nash, P.; McCrady, M.; Rhoades, D.; Linscomb, M.; Clarahan, M.; Sammut, S. The prevalence and correlates of depression, anxiety, and stress in a sample of college students. *J. Affect. Disord.* **2015**, *173*, 90–96.
5. Selye, H. The Physiology and Pathology of Exposure to Stress. In *A Treatise Based on the Concept of the General Adaptation Syndrome and the Diseases of Adaptation*, 1st ed.; Acta Inc., Medical Publisher: Montreal, QC, Canada, 1950.
6. Spielberger, C.D. *Anxiety and Behavior*, 1st ed.; Academic Press: New York, NY, USA, 1966.
7. Trousselard, M.; Steiler, D. Stress Management Based on Trait-Anxiety Levels and Sleep Quality in Middle-Aged Employees Confronted with Psychosocial Chronic Stress. *Psychology* **2014**, *5*, 78–89.
8. Pine, D.S.; Cohen, P.; Gurley, D.; Brook, J.; Ma, Y. The risk for early-adulthood anxiety and depressive disorders in adolescents with anxiety and depressive disorders. *Arch. Gen. Psychiatry* **1998**, *55*, 56–64.
9. Rao, T.S.; Asha, M.R.; Ramesh, B.N.; Rao, K.S. Understanding nutrition, depression and mental illnesses. *Indian J. Psychiatry* **2008**, *50*, 77–82.
10. Brown, L.; Caligiuri, S.P.B.; Brown, D.; Pierce, G.N. Clinical trials using functional foods provide unique challenges. *J. Funct. Foods* **2018**, *45*, 233–238.
11. Martirosyan, D.M.; Singh, J. A new definition of functional food by FFC: What makes a new definition unique? *Funct. Foods Health Dis.* **2015**, *5*, 209–223.
12. Ntrigiou, V.; Ntrigios, I.; Rigopoulos, N.; Dimou, C.; Koutelidakis, A.E. Functional food consumption correlates with anthropometric characteristics and body composition in healthy adults. *Curr. Top. Nutraceutical Res.* **2018**, *16*, 279–288.
13. Elmaliklis, I.N.; Liveri, A.; Ntelis, B.; Paraskeva, K.; Goulis, I.; Koutelidakis, A.E. Increased functional foods consumption may have a protective effect in the appearance of gastrointestinal diseases: A case—Control study. *Medicines* **2019**, *6*, 50.
14. Kwak, N.S.; Jukes, D.J. Functional foods. Part 1: The development of a regulatory concept. *Food Control* **2001**, *12*, 99–107.
15. Kwak, N.S.; Jukes, D. Functional foods. Part 2: The impact of current regulatory terminology. *Food Control* **2001**, *12*, 109–117.
16. Hasler, C.M.; Bloch, A.S.; Thomson, C.A.; Enrione, E.; Manning, C. Position of the American Dietetic Association. Functional foods. *J. Am. Diet. Assoc.* **2013**, *113*, 1096–1103.
17. Willet, W.C.; Sacks, F.; Trichopoulou, A.; Drescher, G.; Ferro-Luzzi, A.; Helsing, E. (Eds.) Mediterranean diet pyramid: A cultural model for health eating. *Am. J. Clin. Nutr.* **1995**, *61*, 1402–1406.
18. Dimou, C.; Karantonis, H.C.; Skalkos, D.; Koutelidakis, A.E. Valorization of fruits by-products to unconventional sources of additives, oil, biomolecules and innovative functional foods. *Curr. Pharm. Biotechnol.* **2019**, *20*, 776–786.

19. Koutelidakis, A.E.; Dimou, C. The effects of functional food and bioactive compounds on biomarkers of cardiovascular diseases. In *Functional Foods Text Book*, 1st ed.; Martirosyan, D., Ed.; Functional Food Center: Addison, TX, USA, 2016; pp. 89–117.
20. Lampropoulou, M.; Chaini, M.; Rigopoulos, N.; Evangeliou, A.; Papadopoulou-Legbelou, K.; Koutelidakis, A.E. Association between serum lipids levels in Greek children with dyslipidemia and Mediterranean diet adherence, dietary habits, lifestyle and family socioeconomic factors. *Nutrients* **2020**, *12*, 1600.
21. Konstantinidi, M.; Koutelidakis, A.E. Functional foods and bioactive compounds: A review of its possible role on weight management and obesity's metabolic consequences. *Medicines* **2019**, *6*, 94.
22. Trichopoulou, A.; Bamia, C.; Trichopoulos, D. Anatomy of health effects of Mediterranean diet: Greek EPIC prospective cohort study. *Br. Med. J.* **2009**, *338*, b2337.
23. Hart, M. The importance and elements of healthy nutrition. *Adv. Eat. Disord.* **2016**, *4*, 14–30.
24. Null, G.; Pennesi, L. Diet and lifestyle intervention on chronic moderate to severe depression and anxiety and other chronic conditions. *Complement. Ther. Clin Pr.* **2017**, *29*, 189–193. [CrossRef] [PubMed]
25. Tehrani, A.N.; Salehpour, A.; Beyzai, B.; Farhadnejad, H.; Reza, M.; Azita, H. (Eds.) Adherence to Mediterranean dietary pattern and depression, anxiety and stress among high-school female adolescents. *Mediterr. J. Nutr. Metab.* **2018**, *11*, 73–83. [CrossRef]
26. Lopez-Olivares, M.; Mohatar-Barba, M.; Fernandez-Gomez, E.; Enrique-Miron, C. Mediterranean diet and the emotional well-being of students of the campus of Melilla (University of Granada). *Nutrients* **2020**, *12*, 1826. [CrossRef] [PubMed]
27. Marchena, C.; Bernabeu, E.; Iglesias, M.T. Are adherence to the Mediterranean diet, emotional eating, alcohol intake, and anxiety related in University students in Spain? *Nutrients* **2020**, *12*, 2224.
28. Trigueros, R.; Padilla, A.M.; Aguilar-Parra, J.M.; Rocamora, P.; Morales-Gazquez, M.J.; Lopez-Liria, R. The influence of emotional intelligence on resilience, test anxiety, academic stress and the Mediterranean diet. A study with University Students. *Int. J. Environ. Res. Public Health* **2020**, *17*, 2071. [CrossRef] [PubMed]
29. Sivamaruthi, B.S.; Kesika, P.; Chaiyasut, C. Impact of fermented foods on human cognitive function—A review of outcome of clinical trials. *Sci. Pharm.* **2018**, *86*, 22. [CrossRef] [PubMed]
30. Dwyer, J.; Picciano, M.F.; Raiten, D.J. Collection of Food and Dietary Supplement Intake Data: What We Eat in America–NHANES. *J. Nutr.* **2003**, 590–600, NHANES Food Questionnaire. Available online: https://www.cdc.gov/nchs/data/nhanes/nhanes_03_04/tq_fpq_c.pdf (accessed on 29 September 2020). [CrossRef] [PubMed]
31. Panagiotakos, D.B.; Pitsavos, C.; Stefanadis, C. Dietary patterns: A Mediterranean diet score and its relation to clinical and biological markers of cardiovascular disease risk. *Nutr. Metab. Cardiovasc. Dis.* **2006**, *16*, 559–568. [CrossRef]
32. Beck, A.T.; Steer, R.A.; Ball, R.; Ranieri, W. Comparison of Beck Depression Inventories IA and II in psychiatric outpatients. *J. Personal. Assess.* **1996**, *67*, 588–597. [CrossRef]
33. Spielberger, C.D.; Gorsuch, R.L.; Lushene, R.; Vagg, P.R.; Jacobs, G.A. *Manual for the State-Trait Anxiety Inventory*; Consulting Psychologists Press: Palo Alto, CA, USA, 1983.
34. World Health Organization. Obesity and Overweight Fact Sheet. Available online: https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight (accessed on 29 September 2020).
35. Birren, E. *Encyclopedia of Gerontology: Age, Aging and the Aged*, 2nd ed.; Academic Press: Oxford, UK, 2007.
36. Grundy, S.M. Obesity, metabolic syndrome and cardiovascular disease. *J. Clin. Endocrinol. Metab.* **2004**, *89*, 2595–2600. [CrossRef]
37. Andreoli, A.; Garaci, F.; Cafarelli, F.P.; Guglielmi, G. Body composition in clinical practice. *Eur. J. Radiol.* **2016**, *85*, 1461–1468. [CrossRef] [PubMed]
38. Antonogeorgos, G.; Panagiotakos, D.; Pitsavos, C.; Papageorgiou, C.; Chrysohoou, C.; Papadimitriou, G.N.; Stefanadis, C. Understanding the role of depression and anxiety on cardiovascular disease risk, using structural equation modeling; the mediating effect of the Mediterranean diet and physical activity: The ATTICA study. *Ann. Epidemiol.* **2012**, *22*, 630–637. [CrossRef] [PubMed]
39. Sanchez-Villegas, A.; Delgado-Rodriquez, M.; Alonso, A.; Schlatter, J.; Lahortiqa, F.; Serra-Majem, L. Association of the Mediterranean dietary pattern with the incidence of depression: The Seguimiento Universidad de Navarra/University of Navarra follow-up (SUN) cohort. *Arch. Gen. Psychiatry* **2009**, *66*, 1090–1098. [CrossRef] [PubMed]

40. Morita, H.; Ikeda, T.; Kajita, K.; Fujioka, K.; Mori, I.; Okada, H. (Eds.) Effect of royal jelly ingestion for six months on healthy volunteers. *Nutr. J.* **2012**, *11*, 77. [CrossRef]
41. Bishwajit, G.; O'Leary, D.P.; Ghosh, S.; Sanni, Y.; Shangfeng, T.; Zhanchun, F. Association between depression and fruit and vegetable consumption among adults in South Asia. *BMC Psychiatry* **2017**, *17*, 1–9. [CrossRef]
42. Hamidpour, M.; Hamidpour, R.; Hamidpour, S.; Shahlari, M. Chemistry, Pharmacology and Medicinal Property of Sage (Salvia) to Prevent and Cure Illnesses such as Obesity, Diabetes, Depression, Dementia, Lupus, Autism, Heart Disease and Cancer. *J. Tradit. Complement. Med.* **2014**, *4*, 82–88. [CrossRef]
43. Moinuddin, G.; Devi, K.; Kumar-Khajuria, D. Evaluation of the anti-depressant activity of Myristica fragrans (Nutmeg) in male rats. *Avicenna J. Phytomed.* **2012**, *2*, 72–78.
44. Huang, R.; Wang, K.; Hu, J. Effects of probiotics on depression: A systematic review and meta-analysis of randomized controlled trials. *Nutrients* **2016**, *8*, 483. [CrossRef]
45. Messaoudi, M.; Lalonde, R.; Violle, N.; Javelot, H.; Desor, D.; Nejdi, A. (Eds.) Assessment of psychotropic-like properties of a probiotic formulation (Lactobacillus helveticus R0052 and Bifidobacterium longum R0175) in rats and human subjects. *Br. J. Nutr.* **2011**, *105*, 755–764. [CrossRef]
46. Schmidt, K.; Cowen, P.J.; Harmer, C.J.; Tzortzis, G.; Errington, S.; Burnet, P.W.J. Prebiotic intake reduces the walking cortisol response and alters emotional bias in healthy volunteers. *Psychopharmacology* **2015**, *232*, 1793–1801. [CrossRef]
47. Savignac, H.M.; Corona, G.; Mills, H.; Chen, L.; Spencer, J.P.E.; Tzortzis, G. (Eds.) Prebiotic feeding elevates central brain derived neurotrophic factor, N methyl-D-aspartate receptor subunits and D-serine. *Neurochem. Int.* **2013**, *63*, 756–764. [CrossRef] [PubMed]
48. Bravo, R.; Matito, S.; Cubero, J.; Paredes, S.D.; Franco, L.; Rivero, M. (Eds.) Tryptophan-enriched cereal intake improves nocturnal sleep, melatonin, serotonin, and total antioxidant capacity levels and mood in elderly humans. *Age* **2013**, *35*, 1277–1285. [CrossRef] [PubMed]
49. Yeung, K.S.; Hernandez, M.; Mao, J.J.; Haviland, I.; Gubili, J. Herbal medicine for depression and anxiety: A systematic review with assessment of potential psycho-oncologic relevance. *Phytother. Res.* **2018**, *32*, 865–891. [CrossRef] [PubMed]
50. Ng, Q.X.; Koh, S.S.H.; Chan, H.W.; Ho, C.Y.X. Clinical use of curcumin in Depression: A Meta-Analysis. *J. Am. Med Dir. Assoc.* **2017**, *18*, 503–508. [CrossRef] [PubMed]
51. Noorafshan, A.; Abdollahifar, M.; Karbalay-Doust, S.; Asadi-Golshan, R.; Rashidian-Rashidabadi, A. Protective effects of Curcumin and Sertraline on the Behavioral Changes in Chronic Variable Stress-Induced Rats. *Exp. Neurobiol.* **2013**, *22*, 96. [CrossRef] [PubMed]
52. Dreher, M.L.; Davenport, A.J. Hass Avocado Composition and Potential Health Effects. *Crit. Rev. Food Sci. Nutr.* **2013**, *53*, 738–750. [CrossRef] [PubMed]
53. Grosso, G.; Estruch, R. Nut consumption and age-related disease. *Maturitas* **2016**, *84*, 11–16. [CrossRef]
54. Sanchez-Villegas, A.; Henriquez, P.; Bes-Rastrollo, M.; Doreste, J. Mediterranean diet and depression. *Public Health Nutr.* **2006**, *9*, 1104–1109. [CrossRef]
55. Williams, A.L.; Cotter, A.; Sabina, A.; Girard, C.; Goodman, J.; Katz, D.L. The role of vitamin B-6 as treatment for depression: A systematic review. *Fam. Pract.* **2005**, *22*, 532–537. [CrossRef]
56. Hibbeln, J.R. Fish consumption and major depression. *Lancet* **1998**, *351*, 1213. [CrossRef]
57. Salmon, P. Effect of physical exercise on anxiety, depression and sensitivity to stress: A unifying theory. *Clin. Psychol. Rev.* **2001**, *21*, 33–61. [CrossRef]
58. Trivedi, M.H.; Greer, T.L.; Grannemann, B.D.; Church, T.S.; Galper, D.I.; Sunderajan, P. (Eds.) TREAD: Treatment with Exercise Augmentation for Depression: Study rationale and design. *Clin. Trials* **2006**, *3*, 291–305. [CrossRef] [PubMed]
59. Silva, D.; Ferriani, L.; Viana, M.C. Depression, anthropometric parameters, and body image in adults: A systematic review. *Rev. Assoc. Med. Bras.* **2019**, *65*, 731–738. [CrossRef] [PubMed]