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Can Unveiling the Relationship between Nutritional Literacy and Sustainable Eating Behaviors Survive Our Future?

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Abstract: The primary objective of this study was to explore the relationship between food and nutrition literacy and sustainable, healthy eating behaviors among young adults. This cross-sectional study took place in Ankara, the capital city of Turkey, involving 500 participants (265 females, 235 males) whose average age was 22.6 ± 3.97 years. A questionnaire was administered through face-to-face interviews, covering three sections: (1) general information, (2) the food and nutrition literacy instrument (FNLI), and (3) the sustainable and healthy eating behaviors scale (SHEBS). The females exhibited a higher FNLI score (94.8 ± 10.9) compared with the males (89.9 ± 13.1), with a statistically significant difference ($p < 0.001$). Statistically significant differences were observed in the mean SHEBS scores for the FNLI behavior sub-dimension among all three categories: inadequate (106.6 ± 32.7), limited (125.5 ± 23.6), and excellent (147.5 ± 28.8) ($p < 0.05$). The significant correlations of the FNLI score with various factors, including seasonal foods (0.163-unit increase per unit), avoidance of food waste (0.312-unit increase per unit), reduction in meat consumption (0.750-unit increase per unit), and education status (1.399-unit increase per unit) ($p < 0.001$) was revealed in the study. Based on the findings from this study, we can plan to promote sustainable resource utilization by developing educational materials in the field of nutrition.

Keywords: sustainable eating; food and nutrition literacy; eating behaviors; young adults

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1. Introduction

Sustainable eating behaviors, which promise to be an indicator parameter in terms of their strong effects on both planet and individual health, are expressed as one of the main aspects of nutrition literacy [1]. In studies conducted with prospective and large samples, it has been shown that sustainable eating behaviors are associated with reduced mortality rates and lower environmental effects [2–4]. In addition, due to its low environmental effects, sustainable diet models recommended for both planetary and human health are more affordable, increasing the ease of application in undeveloped and developing countries [5]. However, on the other side of the coin, the high rate of iron deficiencies, which are the conditions that necessitate animal-based nutrition in these countries, and the difficulty in accessing vegetables and fruits in arid regions show that innovative and relevant options focused on increasing the level of individual knowledge on the subject are needed to ensure that sustainable nutrition recommendations are adequately implemented [6]. The view that the process will be successful with the harmony of increasing individual awareness and nutritional literacy level on the consumer side, encouraging local production on the producer side, and adopting policy-oriented approaches on the management side requires a more holistic approach [7]. From a dietitian's point of view, from this holistic approach, it is known that food and nutrition literacy is necessary to create knowledge, behavior, and attitudes towards sustainable nutrition [1]. The Academy of Nutrition and Dietetics also emphasized that although the creation of a sustainability education curriculum is complex in terms of application and definition diversity, it is crucial for future generations

to encourage practices that will increase awareness about this concept, including food and nutrition literacy [8]. The Society for Nutrition Education and Behavior underlined that the only way to develop and maintain nutritional health for a population is through sustainable food systems and stated that food and nutrition literacy, which is provided by improving both the content and application of dietary guidelines, will contribute to this goal [9]. Sustainability is one of the most influential factors in food literacy assessments, supporting the idea that sustainability behavior is related to food and nutrition literacy [10]. In addition, inquiries about scopes such as local and seasonal food choices, portion control, reducing food waste, promoting diversity in diets, and the characteristics of food packaging material in food and nutrition literacy assessment tools are also closely related to sustainable nutrition models [11–14].

Limited research has explored the link between sustainable dietary habits and food/nutritional literacy. These studies indicate that food and nutrition literacy can effectively impart the knowledge necessary to comprehend the factors influencing food choices and their environmental impacts [14,15]. However, a research article that directly explores the relationship between the principles of sustainable nutrition and food and nutrition literacy is not available within the available information. Revealing the relationship between food and nutrition literacy and sustainable nutrition behaviors will not only provide data to researchers in this field but will also raise awareness for policymakers and universities in shaping education in this field.

In this study, it was aimed to investigate the relationship between food and nutrition literacy and sustainable and healthy eating behaviors in young adults applying the tools, including the food and nutrition literacy instrument and the sustainable and healthy eating behaviors scale, via face-to-face interview.

2. Materials and Methods

2.1. Participants and Study Design

This cross-sectional study, conducted with 500 volunteer participants (265 females, 235 males) with a mean age of 22.6 $\pm$ 3.97 years and an education level of high school and above, was carried out in Ankara, the capital city of Turkey. Notice boards throughout the city were used to inform individuals who wanted to participate in the study voluntarily. The individuals included in the study were working young adults and university students with Turkish ethnicity. In order to determine the sample size, the analysis was performed by taking the alpha (α) = 0.05 and power ($1 - \beta$) = 0.95 via the G*Power 3 software program. The number of samples determined as a result of the analysis was 480. Participants who were pregnant or lactating females, and those who left any of the scale questions blank, were excluded from the research. Inclusion criteria for the study: being a young adult (between 19 and 30 years old) and having been educated for at least 8 years, which is the compulsory education period in Turkey. Moreover, while explaining the cultural nutrition practices of the individuals participating in the study, it would be useful to consider that the cultural nutrition of individuals living in Turkey varies considerably according to geographical regions. While individuals in geographical regions located by the sea have a diet focused on vegetable and fish consumption, there is a dietary habit focused more on meat and pastry consumption in the interior. Ankara, the capital of Turkey, is a city that receives immigrants from every geographical region. Therefore, it is a region that contains the nutritional culture of every geographical region and where both vegetable and meat-oriented dishes are consumed.

All stages of the study were carried out following the 1964 Helsinki declaration. The study protocol was approved by the Ethical Committee of the Gazi University of Ankara/Turkey (28 December 2021, Decision no: 2021-1194). In addition, written informed consent was obtained from the participants in the study.

2.2. Study Protocol

The survey form, which included (1) general information, (2) the food and nutrition literacy instrument (FNLI), and (3) the sustainable and healthy eating behaviors scale (SHEBS), was administered to the participants through face-to-face interviews by the researchers. In the general information section, the sociodemographic characteristics, educational status, and anthropometric measurements (body weight and height) of the individuals were recorded by the researchers. Body mass index (BMI, kg/m^2) calculated using height (cm) and body weight (kg) measurements of participants was evaluated according to the World Health Organization classification [16]. After the survey form was prepared, a pilot application was carried out, and the research was started by making it formally more understandable and applicable in line with the suggestions. Moreover, permission for use was received via e-mail from the researchers who developed the instrument for the FNLI. For the use of the SHEBS Turkish version, permission was obtained via e-mail from the researchers who translated the scale into Turkish.

The food and nutrition literacy instrument used in the study was developed by Demir and Özer (2022) to evaluate declarative, procedural, and subjective knowledge outputs about planning and management of consumption, food selection, sustainable food system, food preparation, and eating in young adults [17]. The instrument evaluated knowledge, attitude, and behavior sub-dimensions. It included Likert-type items and knowledge questions in which five and four factors are evaluated in each sub-dimension. Cronbach's α reliability coefficient of the instrument was calculated as 0.803 in the present study. In the analyses, the FNLI score was used either as a continuous variable or as a categorical variable by dividing the scores of sub-dimensions into three categories as excellent level (43–50 points for knowledge, 34–50 points for attitude, and 30–50 points for behavior), limited level (33–42 points for knowledge, 26–33 points for attitude, and 19–29 points for behavior), and inadequate level (0–32 points for knowledge, 0–25 points for attitude, and 0–18 points for behavior) [17].

Sustainable and healthy eating behaviors scale was developed by Żakowska-Biemans et al. (2019) to measure the reflection of the concept of "sustainable and healthy eating" in behavior in young adults [18]. The Turkish validity and reliability study of this scale, which included a total of eight factors and 34 items, was performed by Köksal et al. (2022) [19]. The confidence coefficient (Cronbach's alpha) of the scale, performed validity and reliability of its Turkish version by Köksal et al., 2022 [19], was calculated as 0.946 in the present study. In the analyses, the SHEBS score was used either as a continuous variable or as a categorical variable by classifying into seven factors: healthy and balanced nutrition, quality labels (local and organic), meat reduction, local food, low fat, animal welfare, seasonal foods, and avoiding food waste.

2.3. Statistical Analysis

All statistical data were analyzed using IBM SPSS 22.0 (The Statistical Package for Social Sciences-SPSS Inc., Chicago, IL, USA). The mean values, frequencies (%), and standard deviation (SD) were calculated to present socio-demographic profiles and anthropometric measurements of the participants. Student's *t*-test and Chi-square test were performed to determine mean values and to compare characteristic features, respectively. One-way ANOVA was conducted to test for the differences in the SHEBS scores according to categories of the FNLI sub-dimensions. When significant, the honest significant difference post hoc test was performed to locate the differences. Bivariate correlations of FNLI sub-dimensions scores and the eight factors scores of SHEBS were evaluated using Pearson's correlation, with $p < 0.05$ considered statistically significant. The linear regression model was evaluated using variables of seven factors of SHEBS, BMI, age, and education status as dependent variable of the FNLI total score.

3. Results

Sociodemographic and anthropometric characteristics of participants are presented in Table 1. It has been determined that the mean age of males (22.9 ± 3.83) was significantly higher than that of females (22.4 ± 4.09). While there is no significant difference between the education duration of individuals according to gender, the rate of single females was higher than males' (93.6% and 88.1%, respectively; $p < 0.05$), and the mean BMI value of females was lower than males' (21.7 ± 3.1 and 24.3 ± 2.8, respectively; $p < 0.001$). It was determined that those with a normal body weight in females had a higher percentage than males (87.2% and 61.7%, respectively; $p < 0.001$), and the rate of overweight individuals was higher in males (35.7% and 10.5%, respectively; $p < 0.001$).

Table 1. Distribution of participants' sociodemographic and anthropometric characteristics.

Variables	Males (n:235)	Females (n:265)	Total (n:500)
Age (year, $\overline{x}$ ± SD)	22.9 ± 3.83	22.4 ± 4.09	22.6 ± 3.97
	$t = 2.550$	$p = 0.011$ *	
Education status (year, $\overline{x}$ ± SD)	14.9 ± 1.76	15.1 ± 1.47	15.0 ± 1.61
	$t = 1.066$	$p = 0.0287$	
Marital status (n(%))			
Married	28 (11.9)	17 (6.4)	45 (9.0)
Single	207 (88.1)	248 (93.6)	455 (91.0)
	$\chi 2 = 4.600$	$p = 0.032$ *	
BMI (kg/m^2, $\overline{x}$ ± SD)	24.3 ± 2.8	21.7 ± 3.1	22.9 ± 3.2
	$t = 9.972$	$p < 0.001$ **	
BMI classification (kg/m^2, n(%))			
Normal weight	145 (61.7) [b]	231 (87.2) [a]	376 (75.2)
Overweight	84 (35.7) [b]	28 (10.5) [a]	112 (22.4)
Obese	6 (2.6) [a]	6 (2.3) [a]	12 (2.4)
	$\chi 2 = 46.036$	$p < 0.001$ **	

All percentages are calculated in columns. [a,b] represent the statistically significant differences among the line groups at $p < 0.05$. BMI: Body Mass Index. * $p < 0.05$; ** $p < 0.001$.

The scores of the participants in SHEBS and FNLI by gender are shown in Table 2. There was no significant difference between genders in SHEBS total scores and SHEBS factor scores. However, food and nutritional literacy was found to be higher in females than in males (94.8 ± 10.9 and 89.9 ± 13.1, respectively; $p < 0.001$). In the knowledge dimension of food and nutrition literacy, the rate of those who were evaluated as inadequate was found to be higher in males (31.1% and 16.2% in males and females, respectively; $p < 0.001$), while the rate of those who were evaluated as excellent, was found to be higher in females (46.0% and 39.6% in females and males, respectively; $p < 0.001$). While the rate of those who were excellent in the attitude, dimension of food and nutrition literacy was higher in females (50.9%) than in males (36.6%), the rate of those who were inadequate in males (31.1%) is higher than in females (9.8%). Similarly, in the behavior sub-dimension, the rate of inadequacy in males was higher than that of females, while the rate of excellence was higher in females ($p > 0.05$). In the total of the participants, the rates of those who were evaluated as excellent in the knowledge (43.0%), attitude (44.2%), and behavior (43.6%) dimensions of food and nutrition literacy were higher than those who were evaluated as inadequate (23.2%, 19.8%, and 16.2%, respectively) and limited (33.8%, 36.0%, and 40.2%, respectively), while the highest rate (23.2%) of inadequacy was in the knowledge sub-dimension.

Table 2. The scores of the assessment tools according to gender.

Variables	Males (n:235)	Females (n:265)	Total (n:500)
SHEBS scores ($\overline{x} \pm$ SD)	131.9 ± 34.1	132.1 ± 28.8	132.1 ± 31.4
	t = 0.073	p = 0.942	
SHEBS factors' scores ($\overline{x} \pm$ SD)			
Healthy and balanced nutrition	18.8 ± 5.1	19.2 ± 4.3	19.1 ± 4.7
	t = 0.984	p = 0.326	
Quality labels	32.1 ± 9.5	32.1 ± 8.1	32.1 ± 8.8
	t = 0.106	p = 0.915	
Meat reduction	11.1 ± 4.5	10.8 ± 4.3	10.9 ± 4.4
	t = 0.873	p = 0.383	
Local food	9.1 ± 3.9	9.6 ± 3.7	9.4 ± 3.8
	t = 1.172	p = 0.242	
Low fat	13.8 ± 4.1	14.2 ± 3.6	13.9 ± 3.8
	t = 1.186	p = 0.236	
Seasonal foods and avoiding food waste	30.9 ± 8.5	31.2 ± 7.4	31.1 ± 7.9
	t = 0.345	p = 0.730	
Animal welfare	16.1 ± 5.7	15.1 ± 5.8	15.5 ± 5.8
	t = 1.959	p = 0.051	
FNLI scores ($\overline{x} \pm$ SD)	89.9 ± 13.1	94.8 ± 10.9	92.5 ± 12.2
	t = 4.430	p < 0.001 *	
FNLI sub-dimensions status (n(%))			
Knowledge			
Inadequate level	73 (31.1) [a]	43 (16.2) [b]	116 (23.2)
Limited level	69 (29.4) [b]	100 (37.7) [a]	169 (33.8)
Excellent level	93 (39.6) [b]	122 (46.0) [a]	215 (43.0)
	$\chi 2$ = 15.613	p < 0.001 *	
Attitude			
Inadequate level	73 (31.1) [a]	26 (9.8) [b]	99 (19.8)
Limited level	76 (32.3) [b]	104 (39.2) [a]	180 (36.0)
Excellent level	86 (36.6) [b]	135 (50.9) [a]	221 (44.2)
	$\chi 2$ = 35.862	p < 0.001 *	
Behavior			
Inadequate level	46 (19.6)	35 (13.2)	81 (16.2)
Limited level	90 (38.3)	111 (41.9)	201 (40.2)
Excellent level	99 (42.1)	119 (44.9)	218 (43.6)
	$\chi 2$ = 3.736	p = 0.154	

All percentages are calculated in columns. [a,b] represent the statistically significant differences among the line groups at $p < 0.05$. FNLI: Food and Nutrition Literacy Instrument; SD: Standard deviation; SHEBS: Sustainable and Healthy Eating Behaviors Scale. * $p < 0.001$.

Total SHEBS scores according to knowledge, attitude, and behavior sub-dimensions of FNLI are shown in Figure 1. The median value of the total sustainability score increased in all three sub-dimensions, from inadequate to excellent, and this was found to be sta-

tistically significant. While the SHEBS scores of the individuals classified as excellent in the knowledge (140.3 ± 32.4) and attitude (145.4 ± 30.5) sub-dimensions of food and nutrition literacy were significantly higher than those of the inadequate (122.3 ± 30.6 and 119.5 ± 33.2 in knowledge and attitude sub-dimensions, respectively) and limited ones (128.2 ± 27.8 and 124.9 ± 26.4 in knowledge and attitude sub-dimensions, respectively), there was no statistically significant difference between the SHEBS scores of those classified as limited and inadequate in both sub-dimensions. All of the mean SHEBS scores in the inadequate (106.6 ± 32.7), limited (125.5 ± 23.6), and excellent (147.5 ± 28.8) categories in the behavior sub-dimension were found to be significantly different from each other ($p < 0.05$).

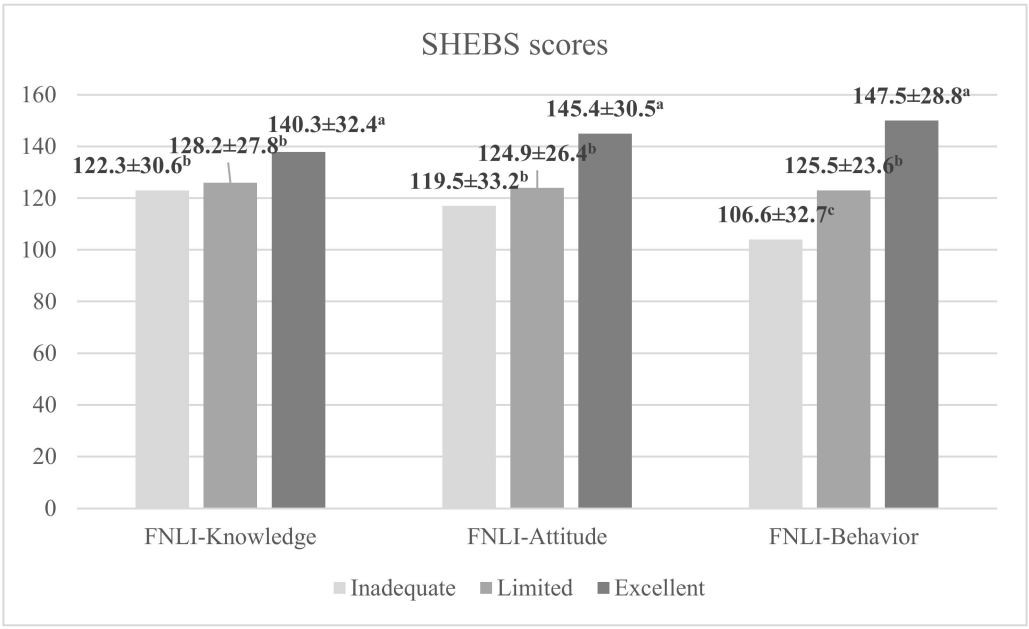

Figure 1. Total SHEBS scores according to FNLI knowledge, attitude, and behavior sub-dimensions. [a,b,c] represent the statistically significant differences among the groups at $p < 0.05$.

The relationship of FNLI total and sub-dimension scores with SHEBS total, SHEBS seven categories, age, duration of education and BMI are given in Table 3. FNLI total, knowledge, attitude and behavior scores were found to be strongly positively correlated with SHEBS total, quality labels, seasonal foods and avoiding food waste, animal welfare, meat reduction, healthy and balanced nutrition, low fat, and education status ($p < 0.001$). FNLI total, knowledge and behavior scores were shown to be negatively correlated with age ($p < 0.05$). It was determined that BMI and FNLI—knowledge scores were significantly negatively correlated ($p < 0.05$). Local food and FNLI—behavior scores were significantly positively correlated ($p < 0.001$).

In the linear regression model, where the FNLI total score was defined as the dependent variable; one-unit increases in the variables of quality labels, seasonal foods and avoiding food waste, meat reduction, healthy and balanced nutrition, and education status were shown to be significantly associated with unit increases of 0.344, 0.163, 0.312, 0.750, and 1.399 in the food and nutrition literacy score, respectively ($p < 0.001$). A one-unit increase in local food and age was associated with a 0.944 and 0.628-unit decrease in FNLI total score, respectively ($p < 0.001$).

Table 3. Pearson correlation of FNLI total and sub-dimensions scores with variables including SHEBS scores, age, education status, and BMI.

		FNLI Total	FNLI—Knowledge	FNLI—Attitude	FNLI—Behavior
SHEBS total	r	0.507	0.255	0.381	0.51
	p	0.000 **	0.000 **	0.000 **	0.000 **
Quality labels	r	0.503	0.245	0.371	0.496
	p	0.000 **	0.000 **	0.000 **	0.000 **
Seasonal foods and avoiding food waste	r	0.495	0.277	0.402	0.435
	p	0.000 **	0.000 **	0.000 **	0.000 **
Animal welfare	r	0.373	0.231	0.283	0.388
	p	0.000 **	0.000 **	0.000 **	0.000 **
Meat reduction	r	0.344	0.22	0.277	0.369
	p	0.000 **	0.000 **	0.000 **	0.000 **
Healthy and balanced nutrition	r	0.507	0.22	0.377	0.481
	p	0.000 **	0.000 **	0.000 **	0.000 **
Local food	r	0.065	−0.031	−0.052	0.25
	p	0.148	0.488	0.249	0.000 **
Low fat	r	0.405	0.233	0.328	0.34
	p	0.000 **	0.000 **	0.000 **	0.000 **
Age	r	−0.125	−0.175	−0.053	−0.117
	p	0.000 **	0.000 **	0.234	0.009 *
Education status	r	0.224	0.141	0.194	0.144
	p	0.000 **	0.000 **	0.000 **	0.000 **
BMI	r	−0.048	−0.120	−0.085	0.052
	p	0.281	0.007 *	0.057	0.247

BMI: Body Mass Index; FNLI: Food and Nutrition Literacy Instrument; SHEBS: Sustainable and Healthy Eating Behaviors Scale. * $p < 0.05$; ** $p < 0.001$.

4. Discussion

The increasing emphasis on sustainability in recent years is driven by the urgent challenges posed by climate change [20]. For this purpose, the Sustainable Development Goals were determined by the United Nations in 2015, and healthy and sustainable diets and global food security were taken as the basis [21]. FNLI, on the other hand, is a relevant method for ensuring the sustainability of the food system, which significantly impacts both public and environmental health [22]. Food literacy enhances personal nutrition and well-being and enables individuals to grasp the environmental impacts of their food decisions [1]. In this sense, food literacy can also provide the basis for developing programs and policies to prevent disease and promote health protection and promotion [23].

This study was conducted to determine the relationship between sustainable nutrition and FNLI, and the results of the study support the above information. Considering the sub-headings that affect the SHEBS score, it has been seen that almost all of them have a significant relationship with FNLI (Figure 1, Tables 3 and 4). Concerning this, the ability to cook, a trait associated with food literacy [24], was associated with better indicators of diet quality. In a cross-sectional study of older Japanese subjects, lower cooking skill levels were associated with more unhealthy eating behaviors [25]. Similarly, students who reported their greatest skills in cooking were significantly more likely to meet the recommended consumption of fruits and vegetables [26]. In another study supporting these findings, it was reported that higher direct food literacy scores in addition to cooking abilities, led to higher fruit and vegetable consumption [27]. Home-cooked meals and cooking skills are used as an effective strategy for maintaining a healthy body weight, and forming the basis of sustainable diets such as the Mediterranean diet. For this reason, it is noteworthy that these skills will also be closely related to sustainable eating behaviors. Taken together, it is clear that healthy eating behaviors are related to both sustainable nutrition and greater commitment to FNLI. In this study, healthy and balanced nutrition was also found to be significantly associated with all sub-dimensions of FNLI (Tables 3 and 4). Food literacy can empower individuals to improve their eating behavior, promoting healthy eating [28].

Relatedly, in a systematic review of adolescents, the authors noted that food literacy, in general, impacts dietary intake and that increased food literacy in adolescence may be a viable public health strategy to prevent unwanted excessive body weight gain in adolescents [29]. Moreover, it is known that within the scope of the "knowing where the food comes from" approach in nutrition literacy, it is aimed to promote sustainable food consumption [30]. As an objective proof of this, in this study, one-unit increases in the variables of quality labels, seasonal foods and avoiding food waste, meat reduction, healthy and balanced nutrition, which are the sub-parameters of sustainable nutrition behaviors, were shown to be significantly associated with unit increases of 0.344, 0.163, 0.312, and 0.750 in the food and nutrition literacy score, respectively (Table 4).

Table 4. Linear regression results as dependent variable of the Food and Nutrition Literacy Instrument total score.

	B (SE)	β	t	*p*	*R*	R^2	*F*
Constant	57.756 (5.563)		10.382	0.000	0.665	0.442	38.668
Quality labels	0.344 (0.080)	0.248	4.293	0.000 **			
Seasonal foods and avoiding food waste	0.163 (0.089)	0.105	1.831	0.000 **			
Animal welfare	0.011 (0.112)	0.005	0.096	0.924			
Meat reduction	0.312 (0.132)	0.112	2.368	0.018 *			
Healthy and balanced nutrition	0.750 (0.145)	0.286	5.174	0.000 **			
Local food	−0.944 (0.125)	−0.297	−7.561	0.000 **			
Low fat	0.185 (0.151)	0.058	1.230	0.219			
Age	−0.628 (0.152)	−0.147	−4.120	0.000 **			
Education status	1.399 (0.267)	0.184	5.243	0.000 **			
BMI	0.004 (0.135)	0.001	0.032	0.974			

BMI: Body Mass Index; SE: Standard error. * $p < 0.05$; ** $p < 0.001$.

Meat plays a crucial role in sustainability because it is one of the most energy-intensive and environmentally burdensome food categories [31]. The negative effects of meat consumption on the environment have become of greater concern after the Food and Agriculture Organization reported that livestock farming contributes to high percentages of greenhouse gas emissions [32]. Moreover, processed meats are classified as Group I and red meats as Group 2A carcinogens by the World Health Organization International Agency for Research on Cancer (IARC) [33]. For these reasons, plant-based diet alternatives come to the forefront to lower greenhouse gas emissions and reduce biodiversity, supporting environmental sustainability, and reducing diet-related mortality [34]. Growing agreement exists that shifting toward lower meat consumption and embracing plant-based diets is a crucial strategy to tackle significant health and sustainability issues. At the same time, reducing meat consumption is associated with adherence to the Mediterranean diet [35]. The Mediterranean diet, which is defined as a diet that encourages the consumption of cereals, fresh fruits, and vegetables, and aims to reduce the consumption of dairy products, eggs, meat, and processed foods, comes to the fore among the diets that comply with the sustainable diet definition of the Food and Agriculture Organization [36]. In one study in kidney transplant recipients, higher food literacy was associated with better adherence to a Mediterranean-style diet [37]. However, although Turkey, where this study was conducted, is geographically the most adaptable to implementing the Mediterranean diet, and meat consumption is not common due to the low-income level of the households, the Mediterranean diet is not widely practiced. In a study in which the cause of this situation can be related, potential obstacles and facilitators in reducing meat consumption may include inadequate consumer information, challenges in acquiring new cooking skills, shifts in communal meal services, and favorable taste expectations for plant-based meals [38]. Thus, the finding of FNLI total, knowledge, attitude, and behavior scores were found to be strongly positively correlated with the SHEBS meat reduction sub-dimension score

($p < 0.001$), which is promising to supporting nutrition literacy would improve sustainable healthy behaviors. The importance of the relationship between nutritional literacy and sustainable nutrition parameters and the strategies based on this relationship was also demonstrated in the study conducted by Rosas et al. (2022). Additionally, in this study, the FOODLIT-Tool was developed [39], which evaluates the nutritional literacy associated with sustainable food systems. Including this tool in future studies on food and nutrition literacy and sustainable nutrition models would be valuable.

Identifying the factors that may actively promote sustainable healthy eating behaviors begins with knowing the contributions of traditional and local foods to human and natural health. In this context, promoting indigenous and local foods also appears to be effective in promoting food literacy and food security [40]. In this study, local food consumption showed a significant positive correlation with the behavior sub-dimension of FNLI (Table 3). This finding supports the data obtained from the study conducted by Durmuş et al. (2018), who reported that participants who were able to identify organic foods as adults also had more information about food literacy [41]. In addition, seasonal food consumption and avoiding food waste were also associated with higher FNLI (Tables 3 and 4). This is thought to be related to the fact that people with high FNLI are more accurate decision-makers and have more accurate information on food selection and food security as required. Seasonal food consumption is not just a matter of health but also serves as a safeguard for food security by contributing to various aspects of the environment.

Some demographic characteristics also seem to affect FNLI. In this study, the total score of FNLI in females was found to be significantly higher than in males (Table 2). It is possible to find similar results in studies in the literature [42,43]. Having high nutritional knowledge is very important for public health. In Turkey, where the participants originated, females are often the primary caretakers of children [44]. Considering that the leading gender group that raises individuals in society is mostly females, it seems inevitable that females will carry out more research on this subject and use today's technology more in this direction.

Increasing age, on the other hand, is associated with a significant decrease in FNLI (Tables 3 and 4). Similarly, a recent study reported that lower food literacy skills are more common in the elderly [45]. A study of Japanese adults also showed that nutrition knowledge and all the food approach behaviors averaged lower in 60–80 year olds compared with younger age groups. In the same study, when cooking and food skills were examined, while age was inversely proportional to these skills in males, the opposite was observed in females [46]. Moreover, education level can also be a determining feature for FNLI (Tables 3 and 4). In support of this, many studies have revealed that a low education level is closely associated with inadequate food or nutritional literacy [42,45,47,48]. This may be due to the higher economic level in the occupational groups worked, depending on the level of education. In other studies, the better economic situation brought about a high level of food or nutrition literacy total scores [46,48].

Despite our efforts to obtain more accurate data with a more homogeneous group in terms of age and balanced gender, the limitation of the study may be that the data obtained cannot be generalized to the entire population due to the young mean age of the participants in the study and the cultural diversity in the sample group. Turkey, which includes seven geographical regions, has a different food culture in each region. Although it seems to be an advantageous country in adapting to the Mediterranean diet geographically, the food culture applied especially in the inner and eastern parts of the country is quite far from the Mediterranean diet and meat consumption is predominant. Ankara, the capital city of Turkey, where the study was conducted, has a more complex culinary culture that receives internal migration from every geographical region and includes traces of the food culture of each region. In addition, the participants of the study consisted of the local population. Considering that Ankara, the city where the study was conducted, has a culinary culture bearing traces of all geographical regions and the majority of the population in Turkey (approximately 80%) is considered to be the local population, the results of the study

present a general perspective of Turkey. All these factors are effective in shaping the results of the study. In addition, it will be beneficial to consider this information when comparing the study results with other geographies. Additionally, for better interpretable results, it is recommended to use a specific scale to assess sustainable nutrition literacy for further studies.

5. Conclusions

In conclusion, the study has shed light on some intriguing insights. Firstly, it is noteworthy that females tend to exhibit higher levels of knowledge and more positive attitudes regarding food and nutrition literacy when compared with males. However, there is no significant difference between genders when it comes to translating this knowledge and attitude into behavioral practices.

Furthermore, a compelling relationship was discovered between the depth of knowledge, attitudes, and behaviors in young adults concerning food and nutrition literacy and their commitment to sustainable eating practices. In essence, those who excel in understanding and implementing food and nutrition literacy principles tend to embrace more sustainable dietary habits. Notably, this includes reducing meat consumption, adhering to seasonal eating patterns, and maintaining a healthy, balanced diet.

However, it is crucial to acknowledge that age and BMI showed an inverse correlation with high food and nutrition literacy knowledge, indicating that these factors can influence one's approach to sustainable nutrition.

From a conceptual standpoint, the study has raised awareness about the profound impact that individuals' knowledge of food and nutrition can have on sustainability. This insight underscores the importance of broadening the scope of food and nutrition education beyond health-related disciplines within educational institutions. By extending basic food and nutrition education to all academic disciplines, we can take significant steps toward promoting sustainability in young adults, ultimately fostering more conscious food consumption practices. Moreover, the results of this study not only provide ideas for creating educational material to be planned in the future, but also highlight the effectiveness of food and nutrition literacy, which is another dimension of sustainability. Additionally, the sample population in the study is not representative of the global population because it is from a specific region.

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