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Impact of Sustainable Nutrition Education on Dietary, Environmental, and Purchasing Behaviors Among University Students: A Cross-Sectional Research

Sürdürülebilir Beslenme Eğitiminin Üniversite Öğrencilerinin Beslenme, Çevresel ve Satın Alma Davranışları Üzerindeki Etkisi: Kesitsel Araştırma

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ABSTRACT Objective: This study aimed to examine the differences in food consumption patterns, priorities in sustainable food purchasing, and associated behaviors among university students, depending on whether they had received education on sustainable nutrition. **Material and Methods:** This cross-sectional study was conducted between October 2022-May 2023 with 390 university students recruited via convenience sampling from Muğla Sıtkı Koçman University. Data were collected through a structured questionnaire that included demographic characteristics, food consumption frequency scores, food purchasing priority scores, and 2 validated Turkish versions of the Environmental Behavior Scale (EBS) and the Sustainable and Healthy Eating Behaviors Scale (SHEBS). Ethical approval was obtained from the Muğla Sıtkı Koçman University Medical and Health Sciences Ethics Committee. Statistical analyses were performed using IBM SPSS v24.0. The normality of continuous variables was evaluated using Kolmogorov-Smirnov and Shapiro-Wilk tests as well as visual methods (histograms, Q-Q plots, box plots). Depending on the distribution, either independent samples t-tests or Mann-Whitney U tests were applied for group comparisons, and Pearson or Spearman correlation analyses were conducted. **Results:** Approximately 48.7% of the participants reported that they had received education on sustainable nutrition. These students showed significantly higher consumption of poultry, fish, fruits, whole grains, and legumes ($p<0.05$), and placed greater importance on sustainability-oriented purchasing factors such as seasonality, organic production, nutritional quality, and minimal use of additives. They also achieved significantly higher scores on both the EBS and the SHEBS, including all of their respective sub-dimensions. Positive correlations were identified between the scores from these 2 scales and both plant-based food consumption and purchasing behaviors guided by sustainability principles. Education on sustainable nutrition appears to be positively linked to healthier and more environmentally responsible food-related behaviours. **Conclusion:** The findings underscore the importance of incorporating sustainability themes into nutrition education programs as a means of promoting both public health and environmental well-being.

Keywords: Healthy nutrition; environmental health; food labeling

ÖZET Amaç: Bu çalışma, üniversite öğrencilerinin sürdürülebilir beslenme eğitimi alıp almamalarına göre besin tüketim kalıpları, sürdürülebilir besin satın alma öncelikleri ve ilgili davranışlar açısından farklılıklarını incelemeyi amaçlamıştır. **Gereç ve Yöntemler:** Bu kesitsel çalışma, Ekim 2022-Mayıs 2023 tarihleri arasında Muğla Sıtkı Koçman Üniversitesi'nde kolayda örnekleme yöntemiyle seçilen 390 üniversite öğrencisi ile gerçekleştirilmiştir. Veriler; demografik özellikler, besin tüketim sıklığı puanları, besin satın alma önceliği puanları ve Türkçeye uyarlanmış 2 geçerli ölçme aracı olan Çevresel Davranış Ölçeği [Environmental Behavior Scale (EBS)] ile Sürdürülebilir ve Sağlıklı Beslenme Davranışları Ölçeği'ni [Sustainable and Healthy Eating Behaviors Scale (SHEBS)] içeren yapılandırılmış anket formu ile toplanmıştır. Etik onay, Muğla Sıtkı Koçman Üniversitesi Tıp ve Sağlık Bilimleri Etik Kurulu'ndan alınmıştır. İstatistiksel analizler IBM SPSS v24.0 programı ile yapılmıştır. Sürekli değişkenlerin normal dağılıma uygunluğu Kolmogorov-Smirnov ve Shapiro-Wilk testlerinin yanı sıra histogram, Q-Q plot ve box plot gibi görsel yöntemlerle değerlendirilmiştir. Dağılım durumuna göre bağımsız gruplar t-testi veya Mann-Whitney U testi ile grup karşılaştırmaları yapılmış, ilişkiler için Pearson veya Spearman korelasyon analizleri uygulanmıştır. **Bulgular:** Katılımcıların yaklaşık olarak %48,7'si sürdürülebilir beslenme eğitimi aldığını belirtmiştir. Bu öğrenciler; tavuk, balık, meyve, tam tahıllar ve baklagiller gibi besinleri istatistiksel olarak anlamlı düzeyde daha fazla tüketmiş ($p<0,05$) ve mevsimsellik, organik üretim, besin içeriğinin sağlıklı oluşu ve katkı maddesi içermemesi gibi sürdürülebilirlik odaklı satın alma kriterlerine daha fazla önem vermiştir. Ayrıca hem EBS hem de sürdürülebilir ve SHEBS ile bunların alt boyutlarında anlamlı düzeyde daha yüksek puanlar elde etmişlerdir. Bu 2 ölçekten alınan puanlarla bitki bazlı besin tüketimi ve sürdürülebilirlik odaklı satın alma davranışları arasında pozitif yönlü ilişkiler tespit edilmiştir. Sürdürülebilir beslenme eğitiminin, daha sağlıklı ve çevresel açıdan daha sorumlu beslenme davranışlarıyla olumlu yönde ilişkili olduğu görülmüştür. **Sonuç:** Bu bulgular hem toplum sağlığını hem de çevresel sürdürülebilirliği desteklemek amacıyla beslenme eğitimi programlarına sürdürülebilirlik temalarının entegre edilmesinin önemini vurgulamaktadır.

Anahtar Kelimeler: Sağlıklı beslenme; çevre sağlığı; gıda etiketleme

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Global food systems are increasingly vulnerable due to interconnected challenges such as climate change, pollution, geopolitical tensions, and economic slowdowns. According to the Food and Agriculture Organization (FAO) of the United Nations, the International Fund for Agricultural Development, the United Nations Children's Fund, the World Food Programme, and the World Health Organization, urbanization, population growth, and the growing strain on natural resources continue to disrupt agrifood systems, making it harder to ensure access to healthy and sustainable diets across the rural–urban continuum.[1]

The concept of sustainable food, nutrition, or diet is not new; it was defined by the FAO as dietary patterns that have low environmental impacts, contribute to food and nutrition security and a healthy life for present and future generations, preserve biodiversity and ecosystems, are culturally acceptable, accessible, economically fair and affordable, nutritionally adequate and healthy, and optimize the use of natural and human resources.[2] Although these dietary principles are well established, globally adopted eating patterns often fall short of meeting both health and sustainability goals. The increasing prevalence of diet-related non-communicable diseases underscores the urgent need for change; however, shifting consumption behaviours toward more environmentally friendly and health-conscious choices remains a complex challenge involving cultural, psychological, and social factors.[3]

Educational initiatives play a key role in shaping positive consumer attitudes toward sustainable dietary patterns. Beyond merely raising awareness, these programs should empower individuals to take control of their food choices and adopt consumption practices that support both personal and planetary health.[4] Adequate nutrition knowledge, gained through structured education, plays a key role in promoting healthy eating behaviours, as demonstrated by improved knowledge and attitudes among adolescents following targeted nutrition education interventions.[5] Although general nutrition education has been widely explored, research specifically evaluating the effects of sustainable nutrition training remains limited. Addressing this gap is essential for designing interventions that encourage environmentally responsible dietary behaviors.[6]

Given the limited research in this area, the present study aims to examine differences in sustainable and healthy nutritional behaviours, as well as environmental behaviors, among university students who have received training in sustainable nutrition and those who have not. By analyzing these differences, this study seeks to contribute to the growing body of evidence on the impact of sustainable nutrition education and inform the development of targeted educational interventions that promote sustainable and healthy dietary practices.

MATERIAL AND METHODS

STUDY DESIGN AND PARTICIPANTS

This cross-sectional study was conducted to examine the effects of sustainable nutrition training on healthy, sustainable, and environmentally responsible behaviors among university students. The research was carried out at Muğla Sıtkı Koçman University between October 2022-May 2023, with a total of 390 students from various faculties participating. Participants were recruited using a convenience sampling method through word-of-mouth communication. The only exclusion criterion was not being a registered student at the university during the data collection period. Ethical approval was obtained from the Medical and Health Sciences Ethics Committee of Muğla Sıtkı Koçman University (date: June 29, 2022; no: 220088-88). Additionally, necessary institutional permissions were granted by the relevant university departments prior to data collection. Written informed consent was obtained from all participants in accordance with the Declaration of Helsinki. Institutional permissions were also obtained separately from all faculties where this research will be conducted within the university.

Demographic and Anthropometric Characteristics

Data were collected through face-to-face interviews conducted by the researcher using a structured questionnaire. The questionnaire included questions on participants' sociodemographic characteristics (e.g. age, gender) and anthropometric data (e.g. self-reported height and body weight). Body Mass Index (BMI) was calculated as body weight (kg) divided by height squared (m^2).

Environmental Behavior Scale

Originally developed by Goldman et al. the Environmental Behavior Scale (EBS) was adapted and validated in Turkish by Timur and Yılmaz. The scale is composed of 20 items and 6 sub-dimensions and is scored using a 5-point Likert scale: 1=never, 2=rarely, 3=sometimes, 4=usually, and 5=always. The minimum score is 20 and the maximum score is 100.[7,8]

Sustainable and Healthy Eating Behaviors Scale

Developed by Żakowska-Biemans et al. and adapted into Turkish by Erdoğan et al. (2019), this scale consists of 34 items across 8 factors: Healthy and Balanced Nutrition, Quality Signs (Local and Organic), Reducing Meat Consumption, Local Food, Low Fat, Avoiding Food Waste, Animal Health, and Seasonal Foods. Items are scored on a 7-point Likert scale ranging from 1=never to 7=always, with higher scores indicating more sustainable eating behaviors. Total scores are calculated by summing the scores for all items.[9,10]

Exposure to Sustainable Nutrition Education

At the university where this study was conducted, students are offered various activities, elective courses, and informal learning opportunities on environmental awareness, sustainability, and food systems through the Green Campus Coordination Unit. These events are organized with varying content each semester, covering topics such as climate change, sustainable materials, ecological architecture, healthy eating, and environmentally friendly consumption. In this context, the participants were asked in the survey whether they had received any training on sustainable nutrition before. However, no additional data were collected regarding the content, duration, frequency, or structure of such training. Since these educational offerings are not based on a standardized curriculum and differ across academic terms, the level and scope of exposure among participants may vary considerably.

Other Measures

Participants also completed a food consumption frequency assessment, where they rated their frequency of consumption for various food groups on a scale from 1 (lowest) to 10 (highest). The resulting scores were recorded as Food Consumption Frequency Scores, with higher scores indicating higher consumption levels. Additionally, participants rated the priority they place on sustainability-related factors during food purchasing on a scale of 1 (lowest priority) to 10 (highest priority). These scores were calculated as Food Purchasing Priorities Scores.

STATISTICAL ANALYSIS

All statistical analyses were conducted using IBM SPSS Statistics for Windows, Version 24.0 (IBM Corp., Armonk, NY, USA). The normality of continuous variables was assessed using the Kolmogorov-Smirnov/Shapiro-Wilk test ($p>0.05$) and visual inspection (histograms, Q-Q plots, box plots). Descriptive statistics for qualitative variables were presented as frequencies (n) and percentages (%), while means and standard deviations were reported for quantitative variables. Non-parametric tests (Mann-Whitney U test) were performed when analyzing non-normally distributed variables (two independent groups) and parametric tests (independent sample t-test) were performed when analyzing normally distributed variables (2 independent groups). Pearson or Spearman correlation coefficients were used depending on whether the variables showed normal distribution or not. A p value <0.05 was considered statistically significant.

RESULTS

Of the students participating in the study, 76.4% (298/390) were female, 71.0% had normal body weight, 13.1% were underweight, and 15.9% were overweight or obese. The mean age was 21.9±4.6 (median 21.0), and the mean BMI was 21.9±3.5 (median 21.5). In total, 48.7% of the participants stated that they had received training on sustainable nutrition.

Table 1 presents the differences in food consumption frequency, food purchasing sustainability priorities, and behavioral scale scores according to participants' sustainable nutrition training status. Those who received sustainable nutrition education reported significantly higher consumption frequen-

TABLE 1: Differences in food consumption, environmental behavior, and purchasing priorities by sustainable nutrition training status

	Have you received any training on sustainable nutrition?		
	Yes (n=190)	No (n=200)	p value
Food consumption frequency scores			
S1: Poultry and fish	5.7±2.3 (6.0)	5.1±2.3 (5.0)	**0.010**
S2: Red meat and meat product	4.8±2.7 (5.0)	4.4±2.7 (5.0)	0.139
S3: Milk and dairy products	5.7±2.4 (6.0)	5.4±2.4 (6.0)	0.385
S4: Vegetables	5.7±2.6 (6.0)	5.3±2.7 (5.0)	0.109
S5: Fruits	5.9±2.6 (6.0)	5.3±2.4 (5.0)	**0.016**
S6: Grains and grain products	6.1±2.4 (7.0)	5.9±2.6 (7.0)	0.601
S7: Whole grain products	5.4±2.3 (5.0)	5.0±2.0 (5.0)	**0.027**
S8: Legumes and oilseeds	5.5±2.0 (6.0)	5.0±2.0 (5.0)	**0.008**
S9: Fatty-sugary foods	4.7±2.5 (5.0)	5.1±2.5 (5.0)	0.183
S10: Processed-packaged foods	4.3±2.8 (4.0)	4.7±2.7 (5.0)	0.115
Food purchasing priorities scores			
S1: Organic product	6.2±2.2 (6.0)	5.6±2.2 (6.0)	**0.016**
S2: Affordability	6.6±2.6 (7.0)	6.7±2.6 (8.0)	0.621
S3: Freshness	7.1±2.4 (8.0)	6.7±2.7 (8.0)	0.351
S4: Seasonality	6.6±2.3 (7.0)	5.8±2.3 (6.0)	**0.001**
S5: Traditional consumption	7.3±2.7 (9.0)	6.9±3.0 (9.0)	0.164
S6: Minimal additives	6.1±2.3 (6.0)	5.6±2.3 (5.5)	**0.029**
S7: Minimal processing	6.1±2.5 (6.0)	5.7±2.5 (6.0)	0.148
S8: Healthy content	6.5±2.3 (7.0)	5.7±2.3 (6.0)	**<0.001**
S9: Local production	4.7±2.5 (5.0)	4.2±2.3 (4.0)	**0.042**
S10: Eco-friendly production	4.8±2.5 (5.0)	4.4±2.4 (5.0)	0.080
EBS, total score	3.1±0.8 (3.1)	3.0±0.7 (3.0)	**0.034**
SF1: Resource-conserving actions with personal financial benefit	3.3±0.9 (3.7)	3.2±0.8 (3.3)	0.170
SF2: Environmentally responsible consumerism	3.6±1.0 (3.7)	3.5±1.0 (3.7)	0.568
SF3: Nature-related leisure activities	3.2±0.9 (3.0)	3.0±0.9 (3.0)	0.136
SF4: Recycling efforts	3.2±1.0 (3.0)	3.1±1.0 (3.0)	0.307
SF5: Citizenship action	2.8±0.8 (2.8)	2.6±0.7 (2.6)	**0.005**
SF6: Environmental activism	2.5±1.2 (2.5)	2.2±1.0 (2.0)	**0.005**
SHEBS, total score	4.2±1.3 (4.4)	3.7±1.0 (3.8)	**<0.001**
SF1: Quality labels (regional and organic)	4.1±1.3 (4.3)	3.6±1.1 (3.6)	**<0.001**
SF2: Seasonal food and avoiding food waste	4.3±1.4 (4.5)	4.0±1.2 (4.0)	**0.008**
SF3: Animal welfare	4.2±1.6 (4.2)	3.5±1.4 (3.5)	**<0.001**
SF4: Meat reduction	3.9±1.5 (4.0)	3.2±1.2 (3.0)	**<0.001**
SF5: Healthy and balanced diet	4.7±1.6 (4.8)	4.2±1.4 (4.0)	**<0.001**
SF6: Local food	3.9±1.5 (3.7)	3.2±1.2 (3.0)	**<0.001**
SF7: Low fat	4.6±1.7 (4.7)	4.2±1.5 (4.0)	**0.009**

SF: Sub-factor; S: score; EBS: Environmental Behavior Scale; SHEBS: Sustainable and Healthy Eating Behavior Scale

cies for poultry and fish (p=0.010), fruits (p=0.016), whole grain products (p=0.027), and legumes and oilseeds (p=0.008) compared to those who had not received such training. Similarly, food purchasing priority scores were significantly higher among educated participants for several sustainability-related factors, including organic product (p=0.016), seasonality (p=0.001), minimal additives (p=0.029), healthy content (p<0.001), and local production (p=0.042). While other purchasing priorities such as affordability, freshness, and eco-friendly production did not differ significantly, overall, those who received training showed a greater emphasis on sustainability-linked purchasing criteria. Furthermore, participants who received training had significantly higher total scores on the EBS (p=0.034) and on sub-

factors related to citizenship action (p=0.005) and environmental activism (p=0.005). Likewise, the total score of the Sustainable and Healthy Eating Behavior Scale (SHEBS) was significantly higher in this group (p<0.001), along with all sub-factor scores, including those related to quality labels, seasonal food, animal welfare, meat reduction, healthy diet, local food, and low-fat consumption (all p<0.05).

Figure 1 provides a visual comparison of these mean scores between participants who did and did not receive training in sustainable nutrition.

Correlations between sustainable and healthy eating behaviors, environmental behaviors, food consumption frequency, and food shopping sustainability priorities are presented in Table 2. Significant positive correlations were observed between the total and several sub-factor scores of the SHEBS and the consumption frequency of vegetables, fruits, whole grains, legumes, and oilseeds (p<0.05). Conversely, negative correlations were found between SHEBS scores and the frequency of fatty-sugary and processed-packaged food consumption. Although the total SHEBS score did not correlate with red meat intake, a positive correlation was found between SHEBS sub-factor 4 (meat reduction) and the frequency of red meat and meat product consumption.

Similarly, the EBS total and several sub-factor scores were positively correlated with vegetable consumption and negatively correlated with fatty-sugary food intake (p<0.05). EBS sub-factor 2 showed a positive correlation with red meat and meat product consumption, while EBS also showed negative correlations with the consumption of milk and dairy products, as well as grains and grain products (p<0.05).

Regarding sustainable food purchasing priorities, negative correlations were found between SHEBS and EBS scores and items such as organic product preference, freshness, seasonality, healthy content, minimal processing, and additive-free criteria. Additionally, SHEBS sub-factors 4-6 were negatively correlated with the priority given to recyclable packaging, while EBS sub-factors 5-6 were negatively correlated with the preference for locally sourced and recyclable packaging. Finally, strong positive correlations were found between the total

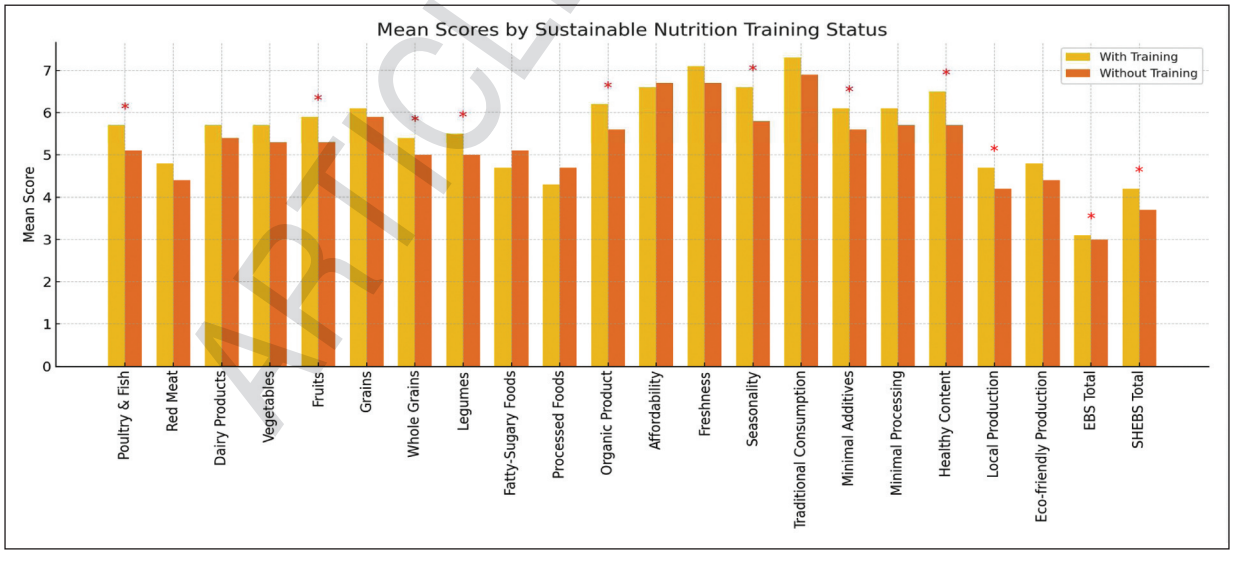

FIGURE 1: Comparison of Mean Scores Between Participants with and without Sustainable Nutrition Training

This figure illustrates the mean scores of food consumption frequency, food purchasing priorities, and behavioral scale indicators among participants who received sustainable nutrition training compared to those who did not. Items marked with an asterisk (*) indicate statistically significant differences between groups (p<0.05). Notably, trained individuals demonstrated higher scores in areas such as poultry and fish consumption, fruit intake, preference for organic and seasonal foods, healthy content, and environmentally conscious behaviors.

SHEBS: Sustainable and Healthy Eating Behaviors Scale; EBS: Environmental Behavior Scale

TABLE 2: Correlations between sustainable and healthy eating behaviors, environmental behaviors, food consumption frequencies, and food purchasing priorities

	SHEBS SF1	SHEBS SF2	SHEBS SF3	SHEBS SF4	SHEBS SF5	SHEBS SF6	SHEBS SF7	SHEBS TS	EBS SF1	EBS SF2	EBS SF3	EBS SF4	EBS SF5	EBS SF6	EBS TS
Food consumption frequency scores															
S1: Poultry and fish															
S2: Red meat and meat product				-0.153**						-0.111*					
S3: Milk and dairy products										0.117*	0.120*				
S4: Vegetables	0.201**	0.131**	0.139**	0.155**	0.117*	0.134**	0.127*	0.167**	0.121*	0.142**	0.173**	0.116*			0.156**
S5: Fruits	0.197**				0.131**	0.116*		0.127*							
S6: Grains and grain products									0.124*	0.116*				-0.106*	
S7: Whole grain products	0.154**			0.120*				0.108*							
S8: Legumes and oilseeds	0.151**		0.138**	0.164**		0.138**		0.138**							
S9: Fatty-sugary foods	-0.249**	-0.242**	-0.185**	-0.197**	-0.235**	-0.181**	-0.194**	-0.252**	-0.120*	-0.163**	-0.118*				-0.121*
S10: Processed-packaged foods	-0.200**	-0.176**	-0.164**	-0.162**	-0.142**	-0.163**	-0.136**	-0.197**							
Food purchasing priorities scores															
S1: Organic product	0.113*		0.109*			0.130*		0.112*			0.114*		0.159**		0.105*
S2: Affordability										0.146**					
S3: Freshness	0.225**	0.200**	0.144**		0.252**	0.102*	0.220**	0.207**	0.195**	0.311**	0.233**	0.223**	0.108*		0.239**
S4: Seasonality	0.280**	0.274**	0.245**	0.215**	0.299**	0.214**	0.268**	0.323**	0.186**	0.311**	0.262**	0.257**	0.199**		0.287**
S5: Traditional consumption	0.177**	0.207**			0.227**		0.210**	0.170**	0.235**	0.314**	0.234**	0.203**			0.222**
S6: Minimal additives	0.298**	0.224**	0.216**	0.178**	0.244**	0.173**	0.232**	0.272**	0.113*	0.272**	0.247**	0.254**	0.150**		0.245**
S7: Minimal processing			0.104*				0.120*	0.107*		0.146**	0.110*	0.105*			0.113*
S8: Healthy content	0.259**	0.226**	0.186**	0.130*	0.274**	0.111*	0.237**	0.255**	0.193**	0.292**	0.267**	0.235**	0.149**		0.267**
S9: Local production													0.103*	0.101*	
S10: Eco-friendly production				0.121*		0.102*							0.134**	0.111*	
SHEBS total score	0.872**	0.847**	0.859**	0.812**	0.872**	0.792**	0.826**	-	0.408**	0.533**	0.564**	0.509**	0.453**	0.248**	0.601**

*indicates significance at the 0.05 level; **indicates significance at the 0.01 level; only statistically significant relationships are presented in this table through correlation coefficient values. SF: Sub-factor, TS: Total score, SHEBS: Sustainable and Healthy Eating Behaviors Scale; EBS: Environmental Behavior Scale

and sub-factor scores of SHEBS and EBS ($p<0.01$), emphasizing a consistent relationship between healthy and sustainable eating behaviors and environmental responsibility.

DISCUSSION

IMPACT OF SUSTAINABLE NUTRITION EDUCATION ON FRUIT AND VEGETABLE CONSUMPTION

As the level of education and knowledge about sustainable nutrition increases, it becomes easier to adopt healthy eating habits.[11] Sustainable nutrition education in university students has been shown to increase Mediterranean Diet Adherence Scale and Healthy Eating Index-2020 scores, thereby supporting healthier dietary practices.[6] Increasing fruit and vegetable consumption is a cornerstone of healthy eating patterns promoted globally. Insufficient consumption of these foods can have nutritional, environmental, economic, and social consequences.[12] In our study, students who received sustainable nutrition training reported significantly higher fruit consumption than their peers. Additionally, a positive correlation was observed between total scores on the Sustainable and Healthy Nutrition Behavior Scale and both vegetable and fruit consumption ($p<0.05$), indicating that higher adherence to sustainable eating patterns is associated with greater intake of plant-based foods. This finding aligns with previous studies suggesting that education level and nutrition education interventions are linked with higher fruit and vegetable consumption.[13-15]

IMPACT OF SUSTAINABLE NUTRITION EDUCATION ON PLANT-BASED PROTEIN CONSUMPTION

A growing global population and increasing pressure on natural resources have limited the supply of high-quality protein. The environmental burden of animal protein production has driven the development of meat analogues as a sustainable alternative to traditional meat. For these reasons, plant-based protein sources (whole grains, legumes and oilseeds) have become increasingly popular.[16] Lack of knowledge and education are considered major obstacles to the adoption of sustainable practices, both now and in the future.[17] Low consumption of plant foods as a protein source is often attributed to both unfamiliarity and the misconception that they are inadequate meat substitutes.[18] Plant protein consumption is often associated with positive attitudes towards healthy nutrition and higher educational attainment.[19] Our study found that students who received sustainable nutrition education consumed more fish, whole grains, legumes and oilseeds than those who did not, and that there was a positive correlation between the total score of the Sustainable and Healthy Nutrition Behavior Scale and the consumption scores of legumes and oilseeds ($p<0.05$).

RELATIONSHIP WITH WESTERN-STYLE DIETARY PATTERNS

The Western diet is characterized by excessive consumption of red meat, fatty and sugary foods and beverages, and ultra-processed products, while being deficient in fruits and vegetables. This dietary model is associated with negative health outcomes and environmental degradation.[20] Our findings show that higher scores on the Sustainable and Healthy Nutrition Behavior Scale are associated with significantly lower intake of fatty-sugary and processed-packaged foods ($p<0.05$), signaling reduced adherence to Western-style eating habits.

Moreover, reducing red meat consumption-one of the well-documented strategies for dietary and environmental sustainability showed a negative correlation with subscales focused on meat reduction and environmentally responsible consumerism ($p<0.05$), indicating greater environmental sensitivity among those individuals.[21] However, shifting away from red meat and the Western diet remains challenging due to limited public awareness about the environmental consequences of meat consumption, the perception that individual choices have minimal global impact, and deep-rooted socioculturally norms where meat often symbolizes status and tradition. After all, the barriers extend beyond a lack of education. Meat consumption is often intertwined with social status and cultural norms. Policy interventions targeting social practices, rather than individual behaviors, and tailored to regional, cultural, and consumer group characteristics are therefore essential.[21,22]

ENVIRONMENTAL CONSCIOUSNESS AS A DRIVER OF DIETARY BEHAVIOR

Environmental knowledge is a key driver of low-impact dietary choices. Individuals with higher environmental awareness are more likely to reduce red meat consumption and increase intake of legumes, likely due to a better understanding of the environmental consequences of meat production.[23] Supporting this, research has shown that students with greater knowledge of environmental impacts-particularly those related to livestock-also exhibit more pro-environmental attitudes and sustainable dietary behaviors.[24] These findings suggest that improving environmental literacy may serve as an effective tool for guiding dietary decisions toward more plant-based and climate-conscious patterns. In our study, individuals with higher EBS scores reported dietary patterns aligned with sustainability principles, including greater vegetable intake and lower consumption of red meat and fatty-sugary foods.

IMPACT OF SUSTAINABLE NUTRITION EDUCATION ON SUSTAINABLE FOOD PURCHASING

Because sustainable food shopping recommendations (organic, local, seasonal) are frequently emphasized in nutrition education focused on sustainability, such education can be expected to support sustainable food purchasing behaviors.[25] In this study, participants who received such education were more likely to prioritize these attributes during food purchasing ($p<0.05$). Organic agriculture enhances sustainable food production, and organic food consumers often demonstrate dietary patterns aligned with sustainable nutrition principles.[26] Consuming more organic food is associated with several benefits: increased plant-based food intake, decreased animal-based food intake, improved diet quality, and reductions in diet-related greenhouse gas emissions, energy demand, and land use.[27] However, the higher cost of organic food appears to contradict the "economically fairness and accessible" principle of sustainability.[27,28]

Consuming local and seasonal food is a key strategy for promoting sustainable consumption, based on its potential to reduce the environmental impact of diets.[29] The concept of "local seasonality" offers valuable insights into sustainable consumption patterns.[30] Sustainable nutrition education increases consumer awareness of food additives and healthy ingredients ($p<0.05$). Although the Green Eating project successfully influenced students' short-term attitudes and behaviors towards environmentally friendly eating, the reluctance of a significant majority (68.3%) to change their local food purchasing habits highlights a key challenge for long-term behavior change.[31]

Food labeling plays a critical role in guiding consumers toward sustainable food choices by providing transparent information on health, environmental, and social attributes.[32] Consumers with higher scores on the Sustainable and Healthy Nutrition Behavior Scale and the EBS were more likely to prioritize food that was organic, fresh, seasonal, unprocessed, and additive-free ($p<0.05$).

Among the common drivers of food choices-taste, health, cost, and sustainability-the latter was significantly associated with a readiness to adopt sustainable dietary recommendations.[33] Our results revealed that sustainable nutrition education was associated with higher EBS scores, which were positively correlated with Sustainable and Healthy Nutrition Behavior Scale scores and their sub-factors ($p<0.05$). Kabasakal Cetin has shown that there is a positive correlation between the total and sub-factor scores of the Sustainable and Healthy Nutrition Behaviors Scale and the environmental awareness subfactor score of the Sustainable Consumption Behaviors Scale.[34] Another study revealed positive relationships between the Sustainable and Healthy Nutritional Behaviors Scale and the Environmental Literacy Scale for Adults in Generations X, Y, and Z. This finding highlights the potential connection between environmental awareness and sustainable dietary choices.[35]

Together, these findings highlight the multifaceted effects of sustainable nutrition education and the importance of integrating environmental, economic, and health considerations into future dietary policies and interventions.

LIMITATIONS

This study has several limitations that should be acknowledged. First, its cross-sectional design prevents the establishment of causal relationships between sus-

tainable nutrition education and observed behavioral outcomes. Although statistical associations were identified, the temporal direction of these relationships remains unclear. Behavioral change research often requires longitudinal or experimental study designs to assess causality, as such designs can capture the sequencing of exposure and outcome. Since this study collected data at a single time point, it is not possible to determine whether the educational exposure preceded or influenced the observed behaviors, or whether participants who already possessed more sustainable habits were more likely to seek out such education.

Second, data collection relied on self-reported measures, which may introduce reporting bias due to social desirability or recall inaccuracies. Moreover, the fact that the study was conducted at a single university campus may introduce regional or institutional biases and limits the generalizability of the findings to broader populations. Future studies including students from multiple institutions or regions could offer a more comprehensive perspective.

Another important limitation relates to how exposure to sustainable nutrition education was assessed. Participants were asked only whether they had received any training, without evaluating the specific content, duration, format, or intensity of such educational experiences. These training opportunities are offered intermittently across semesters by the university's Green Campus Coordination Unit and are not part of a standardized curriculum. As a result, the depth of exposure and level of engagement may differ significantly among individuals.

Future research would benefit from longitudinal and intervention-based designs, as well as from more diverse and representative samples. Moreover, the use of structured evaluation tools that document educational content, frequency, delivery mode, and participant involvement could provide a more accurate assessment of the educational impact on behavior.

CONCLUSION

This study highlights the positive impact of sustainable nutrition education on university students' food-related behaviors and priorities. Participants who received such training demonstrated more favorable dietary habits, including increased consumption of plant-based foods and healthier food choices. They also reported higher levels of environmental awareness, stronger prioritization of sustainable food purchasing criteria, and improved scores in both sustainable and healthy eating behavior and environmental behavior scales.

These findings underscore the need to integrate sustainability concepts into nutrition education programs. Promoting awareness about the environmental and health implications of dietary choices is essential for fostering lasting behavior change. Tailored interventions and educational strategies that incorporate environmental, cultural, and economic dimensions can guide individuals toward more sustainable eating patterns. Future policies should prioritize comprehensive, evidence-based educational models to equip younger generations with the knowledge and motivation necessary to support planetary and public health.

Further longitudinal and interventional studies are recommended to evaluate the long-term effectiveness of sustainable nutrition education and to explore its influence across different population groups and cultural contexts.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Büşra Başar Gökcen, Elif Buse Canpolat;* ***Design:*** *Büşra Başar Gökcen, Elif Buse Canpolat;* ***Control/Supervision:*** *Büşra Başar Gökcen;* ***Data Collection and/or Processing:*** *Elif Buse Canpolat;* ***Analysis and/or Interpretation:*** *Büşra Başar Gökcen;* ***Literature Review:*** *Büşra Başar Gökcen, Elif Buse Canpolat;* ***Writing the Article:*** *Büşra Başar Gökcen;* ***Critical Review:*** *Büşra Başar Gökcen, Elif Buse Canpolat;* ***References and Fundings:*** *Elif Buse Canpolat;* ***Materials:*** *Elif Buse Canpolat.*

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