



Tourism and Recreation

<https://dergipark.org.tr/tourismandrecreation>

E-ISSN: 2687-1971

Sustainable nutrition literacy and behaviors: A cross-sectional study exploring the status of professional kitchen staff*

Sürdürülebilir beslenme okuryazarlığı ve davranışları: Profesyonel mutfak personelinin durumunu araştıran kesitsel bir çalışma

Elif Güner^{1*}, Sıla Söylemez², Sefa Merve Aydın³, Dilan Yıldırım⁴, Sevede Neslişah Çambel⁵

^{1*}Istanbul Sabahattin Zaim University, Faculty of Health Sciences, Department of Nutrition and Dietetics, dyl.elifemiroglu@gmail.com, 0000-0003-0575-5587

²Istinye University, Faculty of Health Sciences, Department of Nutrition and Dietetics, s_sylmz_@hotmail.com, 0009-0008-0330-0654

³Istinye University, Faculty of Health Sciences, Department of Nutrition and Dietetics, s.merveaydin@hotmail.com, 0009-0009-3337-0546

⁴Istinye University, Faculty of Health Sciences, Department of Nutrition and Dietetics, dilanyildirim2012@gmail.com, 0009-0006-8240-1933

⁵Istinye University, Faculty of Health Sciences, Department of Nutrition and Dietetics, sneslisah88@gmail.com, 0009-0003-7350-0401

ARTICLE INFO

MAKALE BİLGİSİ

Research Article / Araştırma

Key Words:

Sustainable development, Environment, Behavior, Professional kitchen staff

Anahtar Kelimeler:

Sürdürülebilir gelişme, Çevre, Davranış, Profesyonel mutfak personeli

Received Date / Gönderme Tarihi:

30.06.2025

Accepted Date / Kabul Tarihi:

27.12.2025

Published Online / Yayımlanma Tarihi:

31.12.2025

DOI:

[10.53601/tourismandrecreation.1730520](https://doi.org/10.53601/tourismandrecreation.1730520)

ABSTRACT

Institutions that provide catering services have an important place in sustainable nutrition practices. The purpose of this study is to examine sustainable food literacy and sustainable nutrition behaviors among kitchen staff. In this cross-sectional study, a survey was conducted between March - June 2024 with personnel working in university and hospital kitchens serviced by four different catering companies. Data were collected via Sustainable Food Literacy Scale and Behaviors Scale Towards Sustainable Nutrition. A p-value of <0.05 was considered statistically significant. A total of 122 participants (female= 68, male= 54) were surveyed, with 47 from university kitchens and 75 from hospital kitchens. The sustainable food literacy and sustainable nutrition behaviors of female personnel were found to be higher than those of male personnel ($t=2.099$; $p<0.05$ and $t=2.365$; $p<0.05$, respectively). Sustainable food literacy varies according to the education level of individuals ($KW=10.631$; $p<0.05$). A moderate positive correlation was found between the total scores of the Sustainable Food Literacy Scale and Behaviors Scale Towards Sustainable Nutrition ($r=0.415$, $p<0.001$). The research findings show that the sustainable nutrition literacy and behaviors of kitchen staff can be affected by factors such as gender, position in the kitchen, education level, and sustainability training. It was also determined that as sustainable nutrition literacy increases, sustainable nutrition behaviors are also positively influenced. The results provided descriptive data on staff in need of training in sustainable nutrition. Interventions need to be carried out to instill sustainable nutrition awareness and transform it into behavior among professional kitchen workers.

ÖZET

Toplu yemek hizmeti sunan kurumlar sürdürülebilir beslenme uygulamalarında önemli bir yere sahiptir. Bu çalışmanın amacı, mutfak çalışanları arasında sürdürülebilir gıda okuryazarlığı ve sürdürülebilir beslenme davranışlarını incelemektir. Kesitsel tipteki bu çalışma kapsamında, 2024 yılı Mart - Haziran ayları arasında dört farklı catering firmasının hizmet verdiği üniversite ve hastane mutfaklarında çalışan personel ile anket çalışması gerçekleştirilmiştir. Veriler Sürdürülebilir Gıda Okuryazarlığı Ölçeği ve Sürdürülebilir Beslenmeye Yönelik Davranış Ölçeği ile toplanmıştır. Analizlerde $p<0.05$ değeri anlamlı kabul edilmiştir. Kırk yedisi üniversite mutfaklarından ve 75'i hastane mutfaklarından olmak üzere toplam 122 katılımcıya (kadın= 68, erkek= 54) anket uygulanmıştır. Kadın personelin sürdürülebilir gıda okuryazarlığı ve sürdürülebilir beslenme davranışları erkek personele göre anlamlı düzeyde yüksek bulunmuştur (sırasıyla $t=2.099$; $p<0.05$ ve $t=2.365$; $p<0.05$). Sürdürülebilir gıda okuryazarlığı bireylerin eğitim düzeyine göre değişkenlik göstermektedir ($KW=10.631$; $p<0.05$). Sürdürülebilir Gıda Okuryazarlığı ve Sürdürülebilir Beslenmeye Yönelik Davranışlar Ölçeği toplam puanları arasında pozitif yönde orta düzeyde bir ilişki bulunmuştur ($r=0.415$, $p<0.001$). Araştırma bulguları, mutfak personelinin sürdürülebilir beslenme okuryazarlığı ve davranışlarının cinsiyet, mutfaktaki pozisyonu, eğitim düzeyi ve sürdürülebilirlik eğitimi gibi faktörlerden etkilenebileceğini göstermektedir. Sürdürülebilir beslenme okuryazarlığı arttıkça sürdürülebilir beslenme davranışlarının da olumlu yönde etkilendiği tespit edilmiştir. Sonuçlar, sürdürülebilir beslenme konusunda eğitim ihtiyacı olan personel hakkında tanımlayıcı veri sağlamıştır. Profesyonel mutfak çalışanlarında sürdürülebilir beslenme bilincinin kazandırılması ve davranışlara dönüştürülmesi konusunda müdahalelerin gerçekleştirilmesi gerekmektedir.

* Corresponding author / Sorumlu yazar

Asst. Prof., Istanbul Sabahattin Zaim University, Faculty of Health Sciences, Department of Nutrition and Dietetics, dyl.elifemiroglu@gmail.com, 0000-0003-0575-5587

*This article is an expanded version of the paper entitled "Evaluation of Sustainability Awareness among Staff Working in Mass Catering Establishments," which was presented as an oral presentation at the 3rd International Symposium on Traditional Foods and Sustainable Nutrition held in Mersin on October 3–4, 2024, and published in the symposium proceedings book.

1. Introduction

The global population has increased by approximately 200% in the last 70 years and is estimated to reach 9 billion by 2050 (GBD 2017 Population and Fertility Collaborators, 2018). This rise in global population is a major concern for the environment (Grosso et al., 2020). Traditional production, processing, distribution, and waste management strategies deplete the Earth's resources, reduce biodiversity, and increase greenhouse gas emissions (Nordin et al., 2020). A significant amount of food is on a large scale produced, processed, transported, and consumed by humans through the food industry. This activity directly impacts human and environmental health. The substantial burden that current food system activities place on natural resources necessitates the establishment of more sustainable systems (Alsaffar, 2016). Sustainability practices primarily include a diet that has minimal environmental impact, prioritizes food safety, contributes to a healthy life for current and future generations, and is economically affordable and fair (Asghar & Khalid, 2023). To meet the requirements of sustainable nutrition practices, it is essential to establish interdisciplinary interventions (Gibas-Dorna & Żukiewicz-Sobczak, 2024). Experiences gained in recent years highlight the necessity of involving various stakeholders in sustainable food and nutrition practices.

Professional kitchen staff play a role in sustainability through activities such as combating food waste and maintaining traditional culinary practices (FAO & UNESCO, 2019). With kitchen staff having a high awareness of sustainability, environmental approaches can be exhibited in food production processes (such as purchasing, storage, cooking and menu planning). They can support sustainability by choosing organic, local or low-carbon footprint products, using renewable energy sources or waste management practices (Yen et al., 2025). Institutions that provide mass nutrition services hold significant importance in supporting sustainable nutrition because they serve a large number of people. By making decisions that promote sustainability in areas such as raw material selection and menu development, they can positively influence the nutritional preferences of society. Therefore, kitchen staff are regarded as important stakeholders in promoting healthy and sustainable food consumption (Franchini et al., 2024).

In this regard, the aim of this study is to evaluate the sustainable nutrition behaviors and sustainable food literacy (SFL) levels of professional kitchen workers and to determine the factors affecting these elements. The originality of this study is that this issue was evaluated for the first time among kitchen staff with Sustainable Food Literacy Scale (SFLS) and Behaviors Scale Towards Sustainable Nutrition (BSTSN). The research is designed to answer the following question: What are the levels of sustainable nutrition behavior and literacy among kitchen workers?

The hypotheses of the research are as follows:

- H₀: SFL does not differ significantly according to the characteristics of the staff (age group, gender, education level, etc.).
- H₁: SFL differs significantly according to the

characteristics of the staff (age group, gender, education level, etc.).

- H₀: Sustainable nutritional behaviors do not differ significantly according to the characteristics of the staff (age group, gender, etc.).
- H₁: Sustainable nutritional behaviors differ significantly according to the characteristics of the staff (age group, gender, etc.).
- H₀: There is no significant relationship between SFL and sustainable nutritional behaviors.
- H₁: There is a significant relationship between SFL and sustainable nutritional behaviors.

2. Theoretical Framework

2.1. Sustainability and Sustainable Nutrition

The term sustainable development was defined by the United Nations Brundtland Commission on Sustainable Development in 1987 as: *'meeting the needs of the present without compromising the ability of future generations to meet their own needs'* (World Commission on Environment and Development, 1987). Sustainable nutrition is defined as providing the balance of energy and essential nutrients needed to maintain the health of the population and not adversely affecting the ability of future generations to meet their nutritional needs (Asghar & Khalid, 2023). According to the Food and Agriculture Organization of the United Nations (FAO), sustainable diets are diets that contribute to food security and a healthy life for present and future generations, preserve biodiversity and ecosystems, are culturally acceptable, accessible, economically fair and affordable, nutritionally adequate, safe and healthy, and optimize natural and human resources (Bastian et al., 2021). The main recommendations for sustainable eating are to eat a plant-based diet, prefer seasonal and local foods, reduce food waste, reduce the consumption of red and processed meat, ultra-processed foods and sugar-sweetened beverages, and consume only fish from sustainable sources (FAO, 2025).

2.2. Sustainable Nutrition Literacy and Behaviors

The benefits of sustainable diets on human and environmental health have been reported in the literature. However, there are many factors that affect adherence to sustainable nutrition principles. Therefore, behavioral approaches are needed to understand what drives the adoption of eating behaviors with lower environmental impact. However, research on the behavioral aspects of sustainable food consumption is quite scanty (Aguirre Sánchez et al., 2021). In a 2023 study, Kenny et al. examined consumers' attitudes and behaviors towards sustainable diets. The research results showed that consumers approached the concept of sustainable diets from a human health perspective, but the connection between human health and environmental health was not sufficiently understood (Kenny et al., 2023). However, achieving behavioral change at the individual and social level is an important issue in the fight against the climate crisis. Interdisciplinary interventions that address the multiple drivers, barriers, and contexts of behaviors are necessary (Whitmarsh et al., 2021). Food literacy interventions have an important place in providing

Table 1. Descriptive Findings of the Participants

Variable	Category	n	%
Gender	Female	68	55.7
	Male	54	44.3
Educational Status	Elementary School	26	21.3
	Middle School	20	16.4
	High School	41	33.6
	University	35	28.7
	Service personnel	40	32.8
Position in the kitchen	Cook	38	31.1
	Dishwasher	15	12.3
	Dietitian	10	8.2
	Management and control personnel	19	15.6
Institution	Hospital	75	61.5
	University	47	38.5
Working hours	0-5 years	99	81.1
	6-10 years	23	18.9
Status of receiving training on sustainability	Yes	60	49.2
	No	62	50.8

X±SD (minimum-maximum)

Age (years) 36.23±12.34 (18-65)

X: mean; SD: standard deviation.

Source: Created by authors.

behavioral changes related to nutrition (Butcher et al., 2025). Determining the current situation and needs will be the first step in developing sustainable eating behaviors and literacy.

Theoretical models show that nutritional literacy influences eating behaviors not directly, but through psychosocial variables such as nutritional knowledge, attitudes, and self-efficacy. Approaches based on Nutbeam's health literacy model reveal that functional, interactional, and critical nutritional literacy levels are related to healthy food choices, label reading, and sustainable eating behaviors. In this context, nutritional literacy is considered a significant determinant in individuals' development of healthy eating behaviors (Nutbeam, 2000; Velardo, 2015).

3. Methods

3.1. Study Design and Participants

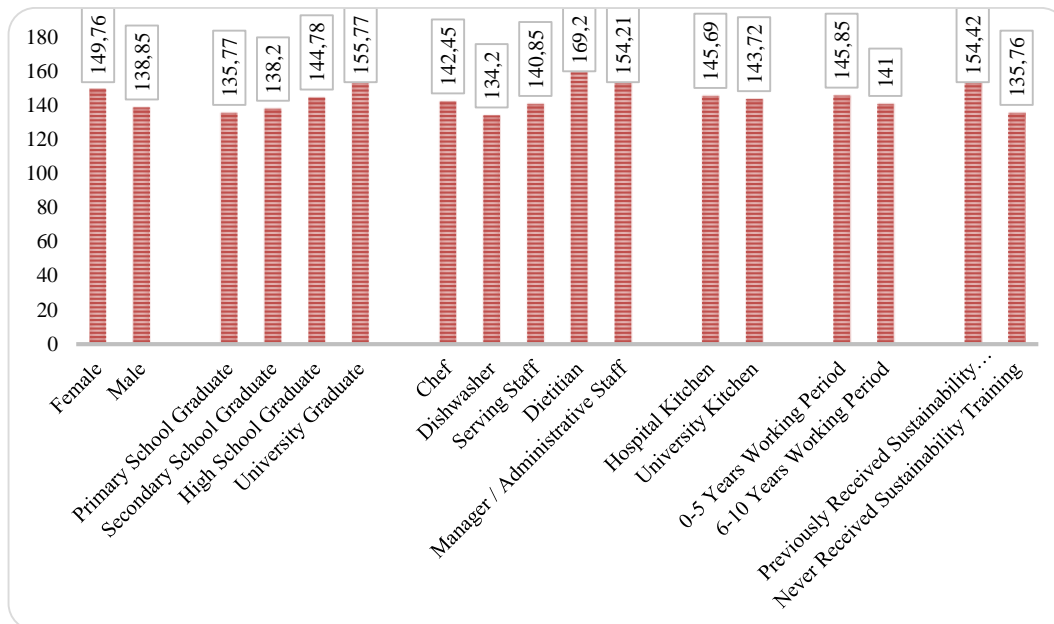
This cross-sectional study was conducted between March and June 2024 with the participation of staff working in the kitchens (hospitals and universities) served by 4 catering companies in Istanbul. Convenience sampling method was used to determine the companies to be included. In order to reach a sufficient sample size, all personnel working in the institutions were invited to participate in the research. Based on the sample size calculation, which considered the total number of kitchen staff (n=176) working in the institutions where the research was conducted (confidence level 95%, margin of error 5%), it was determined that the study should be completed with at least 121 participants. The calculation was made according to the following formula: $n = (N \cdot t^2 \cdot p \cdot q) / (d^2 \cdot (N - 1) + t^2 \cdot p \cdot q)$ (Cochran, 1977).

Inclusion criteria:

- Being between 18 and 65 years old,
- Having worked at the current institution for at least one month,
- Having an internet connection and a suitable device to access the online survey.
- Exclusion criteria:
- Being under 18 or over 65 years old,
- Not willing to share data.

3.2. Data Collection

Survey forms created using Google Forms were sent online to all participants working in the institutions. No one other than the researchers had access to the responses, and participants'



Gender: $t=2.099$; $p<0.05$; Educational status: $KW=10.631$; $p<0.05$; Positions in the kitchen: $KW=16.233$; $p<0.05$; Type of institution: $t=0.365$; $p<0.05$; Duration of work (0-5 years or 6-10 years): $Z= -.183$; $p>0.05$; Prior training in this subjects: $t=3.740$; $p<0.05$.

Figure 1. Differences in SFLS Total Score Averages According to the Descriptive Characteristics of the Participants

Source: Created by authors.

responses were anonymous. Responses were received from 124 participants, resulting in a response rate of 70.5%. One participant did not meet the inclusion criteria as they were under the age of 18, and another participant had been working in the institution for less than one month. The analyses were conducted using data from 122 participants.

The online survey form delivered to individuals consists of 3 sections. The first section includes questions regarding the individuals' age, gender, education level, institution name, position in the kitchen (cook, service staff, dishwasher, dietician, manager / administrative staff), length of time working in the current institution, and length of time actively working in the profession. The second section includes SFLS, while the third section contains BSTSN.

3.2.1. Sustainable Food Literacy Scale (SFLS)

SFLS is a scale developed by Teng and Chih in 2022. This scale, consisting of 26 questions, aims to assess SFL in adults. All questions are scored using a 7-point Likert scale (1 - strongly disagree, 7 - strongly agree). The lowest score that can be obtained from the scale is 7, while the highest score is 182, with a high score indicating high SFL (Teng & Chih, 2022). The validity and reliability study of the Turkish version of this scale was conducted by Kubilay and Yüksel in 2023. The scale has a five-factor structure (Sustainable Food Knowledge 1, Sustainable Food Knowledge 2, Cooking and Kitchen Skills, Attitudes and Intentions for Action, Action

Strategies). The Cronbach's Alpha value of the scale is 0.941 (Kubilay & Yüksel, 2023).

3.2.2. The Behaviors Scale Towards Sustainable Nutrition (BSTSN)

BSTSN was developed by Garipoglu et al. in 2023 to assess the sustainable food consumption behaviors of adults living in Türkiye. The scale consists of 29 items with Likert-type (1 - never, 5 - always) ratings and 4 sub-dimensions (food preference, reduction of food waste, seasonal and local nutrition, food purchasing). Cronbach's Alpha value of the scale is 0.92, and the test-retest reliability coefficient is 0.96. The sub-dimension and total score are directly proportional to the individual's sustainable nutritional behaviors (Garipoglu et al., 2023).

3.3. Data Analysis

In the statistical analyses, the IBM SPSS (Statistical Package for the Social Sciences) software was used. The Kolmogorov-Smirnov and Shapiro-Wilk tests were performed to determine whether the data showed normal distribution. In addition to these tests, kurtosis and skewness values were also examined. Number (n) and percentage (%) values were presented for categorical variables, while mean and standard deviation values were presented for continuous variables. In the analysis of the difference between independent groups, the Independent Samples t-Test or Mann-Whitney U Test was

Table 2. Differences Between Mean Scores of the Sub-dimensions of the SFLS According to the Descriptive Characteristics of the Participants

Variable	Category	Sustainable Food Knowledge 1		Sustainable Food Knowledge 2		Cooking and Kitchen Skills		Attitudes and Intentions for Action		Action Strategies	
		X±SD	Sig.	X±SD	Sig.	X±SD	Sig.	X±SD	Sig.	X±SD	Sig.
Gender	Female	32.01±8.21	t: 1.744	24.53±4.48	t: 1.853	36.28±6.20	t: 2.410	16.69±3.99	t: 1.450	40.25±7.14	t: 1.455
	Male	29.22±9.47	p: 0.084	22.83±5.63	p: 0.066	33.06±8.56	p: 0.017	15.63±4.05	p: 0.150	38.11±9.10	p: 0.148
Education Status	Primary School Graduate	27.73±8.43		22.65±5.60		33.85±7.73		14.81±4.15		36.73±8.27	
	Secondary School Graduate	27.65±8.61	KW: 13.662	23.00±5.99	KW: 4.665	33.55±9.09	KW: 4.116	16.10±4.17	KW: 4.315	37.90±9.52	KW: 10.979
	High School Graduate	30.85±9.56	p: 0.003	23.76±4.95	p: 0.198	34.56±7.48	p: 0.249	16.80±3.72	p: 0.229	38.80±8.38	p: 0.012
	University Graduate	34.74±7.01		25.09±4.06		36.69±6.16		16.66±4.14		42.60±5.68	
Position in the kitchen	Cook	29.97±8.24		23.55±5.41		35.32±7.70		15.34±4.10		38.26±8.54	
	Dishwasher	25.47±9.01		22.60±6.48		33.00±7.34		16.00±3.61		37.13±8.48	
	Service Staff	29.85±9.48	KW: 18.619	23.03±5.38	KW: 6.966	32.95±8.04	KW: 12.653	16.65±3.81	KW: 8.354	38.38±8.49	KW: 14.162
	Dietitian	39.00±3.09	p: 0.001	26.60±1.71	p: 0.138	39.20±2.82	p: 0.052	19.00±2.16	p: 0.079	45.40±3.13	p: 0.007
Institution	Manager / Administrative Staff	34.21±6.98		25.26±2.60		37.11±6.43		15.79±4.94		41.84±6.20	
	Hospital Kitchen	29.79±9.00	t: -1.572	23.88±4.78	t: .278	35.35±6.77	t: .921	16.80±3.62	t: 2.027	39.88±7.82	t: .993
Length of Employment	University Kitchen	32.36±8.48	p: 0.119	23.62±5.56	p: 0.782	34.06±8.52	p: 0.359	15.30±4.50	p: 0.045	38.38±8.53	p: 0.323
	0-5 years	31.02±8.87	Z: -.705	23.82±4.73	Z: -.740	35.04±6.95	Z: -.194	16.34±3.92	Z: -.556	39.63±7.28	Z: -.082
Status of receiving training on sustainability	6-10 years	29.74±8.96	p: 0.481	23.61±6.48	p: 0.459	34.04±9.58	p: 0.846	15.70±4.57	p: 0.578	37.91±11.05	p: 0.935
	Yes	34.03±8.71	t: 4.265	24.78±4.64	t: 2.185	36.95±6.08	t: 3.157	16.77±4.40	t: 1.476	41.88±7.33	t: 3.631
	No	27.63±7.87	p: 0.001*	22.81±5.32	p: 0.031*	32.82±8.17	p: 0.002**	15.69±3.60	p: 0.143	36.81±8.08	p: 0.001**

Source: Created by authors.

used, depending on whether the distribution was normal or not. The Kruskal-Wallis H Test was used to test the significance of the difference between the means of three or more groups in data that did not show normal distribution. Correlations between data that showed normal distribution were evaluated with Pearson Correlation analysis, while correlations between data that did not show normal distribution were evaluated with the Spearman Correlation test. A p-value of <0.05 was considered statistically significant.

3.4. Ethical Statements

Informed written consent was obtained from the individuals. All stages of the research were conducted in accordance with the Helsinki Declaration. Ethics committee approval was obtained from the Istinye University Social and Humanities Research Ethics Committee (Meeting Number: 2023/11, Decision No: 113, Meeting Date: 25/12/2023).

4. Results

A total of 122 adults participated in this study, which aimed to examine the knowledge level and behaviors of professional kitchen workers regarding sustainable nutrition. The average age of the participants, of whom 55.7% were female and 44.3% male was 36.23±12.34 years. The majority of the participants (33.6%) were high school graduates, and 81.1% had been working in this sector for 0-5 years. Almost half of the personnel (50.8%) reported that they had not received any training on sustainability previously. The data of the volunteers regarding their age, gender, education status, employment details, and whether they had received training on the subject are presented in Table 1.

Data regarding the average total scores of individuals from the SFLS are presented in Figure 1. According to the independent

samples t-test result, the SFL of female staff (149.76±26.05) is statistically significantly higher than that of male staff (138.85±31.39) (t=2.099; p<0.05). Kruskal-Wallis H test shows that SFL varies according to the education level of individuals (KW=10.631; p<0.05). University graduates have the highest SFL level, while primary school graduates have the lowest. The SFL of personnel working in different positions in the kitchen also varies according to the Kruskal-Wallis H test result (KW=16.233; p<0.05). According to this finding, the SFL level of dietitians was found to be higher than other employees. There is a difference depending on the type of institution where individuals work (university or hospital kitchen) (t=0.365; p<0.05). The Kruskal-Wallis H test show that the duration of work (0-5 years or 6-10 years) does not affect the level of SFL (Z= -.183; p>0.05). The SFL of personnel who have previously received training on sustainability is higher than that of those who have stated that they have never received training on this subject (t=3.740; p<0.05) (Figure 1).

The scores of the participants from the sub-dimensions of the SFLS are presented in Table 2. Sustainable Food Knowledge-1 sub-dimension scores are higher among university graduates compared to primary, secondary, and high school graduates. According to the Kruskal-Wallis H test result, there is a significant difference in Sustainable Food Knowledge-1 sub-dimension scores according to the position held. Dietitians and managers have the highest Sustainable Food Knowledge-1 scores, while dishwashers have the lowest. The independent samples t-test result shows that participants who have received previous training on sustainability have higher Sustainable Food Knowledge-1 sub-dimension scores than those who have not. Individuals' scores on Sustainable Food Knowledge-1 do not vary according to gender, institution, and length of employment.

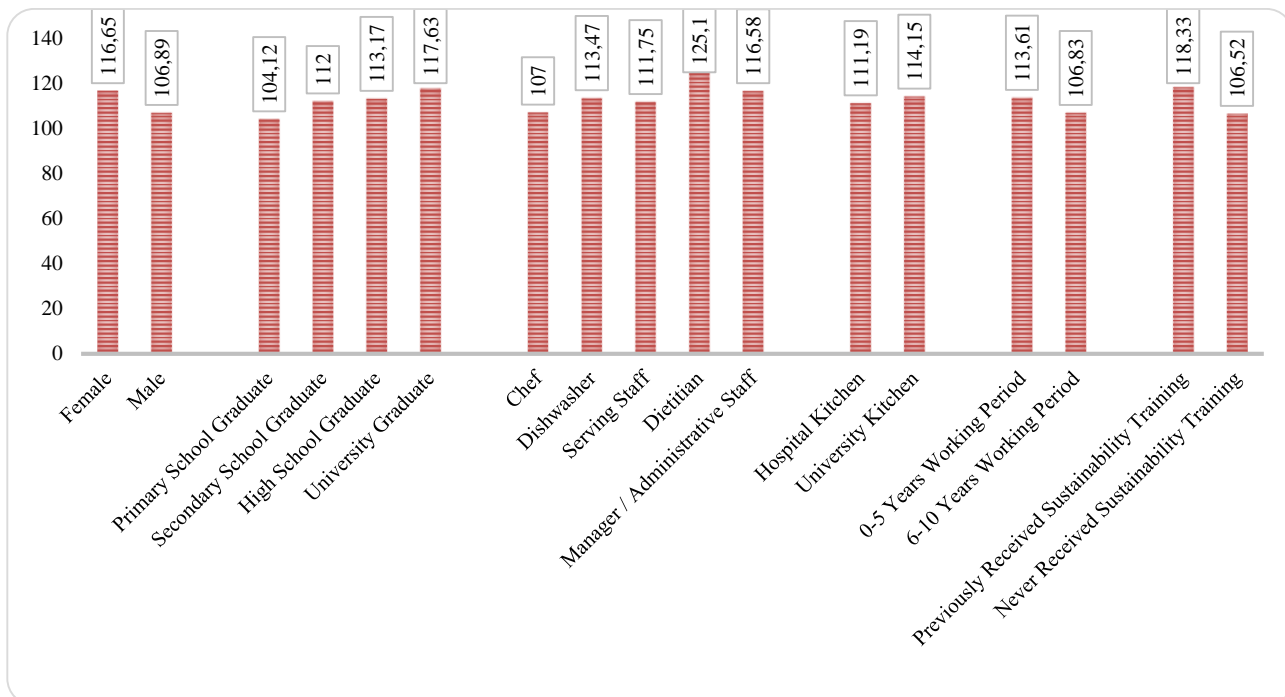


Figure 2. Differences in the Total Mean Scores of the BSTSN According to the Descriptive Characteristics of the Participants
Source: Created by authors.

The scores obtained from the Sustainable Food Knowledge-2 sub-dimension of the SFLS show a statistically significant difference depending on whether or not individuals have received training on sustainability before. Differences in gender, institution, length of employment, educational status and position in the kitchen do not lead to a significant difference in the scores obtained from the Sustainable Food Knowledge-2 sub-dimension.

Women have higher scores than men in the Cooking and Kitchen Skills sub-dimension of the scale. Having received training on sustainability before is associated with a higher score for this sub-dimension. Cooking and Kitchen Skills sub-dimension scores do not differ according to education level, position in the kitchen, institution of employment, and length of employment.

The score obtained from the Attitudes and Intentions for Action sub-dimension varies only according to the type of institution worked in, among the variables examined in the study. The Attitudes and Intentions for Action sub-dimension score of personnel working in hospital kitchens is higher than those working in university kitchens. The scores obtained from this sub-dimension do not vary according to gender, education level, position in the kitchen, length of employment and sustainability training status.

The Action Strategies sub-dimension score of university graduates is significantly higher than primary, secondary and high school graduates. Dietitians received the highest score from this sub-scale, while dishwashers received the lowest score. In addition, those who had previously received training on sustainability also received higher scores from this sub-dimension. The scores from this sub-dimension of the scale do not differ according to gender, institution of employment and length of employment.

The data regarding the mean total scores of individuals from BSTSN are presented in Figure 2. Independent samples t-test shows that women have higher scores than men ($t=2.365$; $p<0.05$). Additionally, having received training on sustainability previously was associated with a higher total score ($t=2.915$; $p<0.05$). The scores of participants from the BSTSN do not vary according to education level, position in the kitchen, institution, and length of employment (Figure 2).

Participants' scores from the sub-dimensions of the BSTSN are presented in Table 3. The score from the food preference sub-dimension of the scale is significantly higher in participants who have previously received sustainability training than in those who have not. This sub-dimension does not show a significant change according to gender, educational status, institution of employment, or length of employment.

It was determined that women received higher scores from the food waste reduction sub-dimension than men. Educational status, years of employment, institution of employment, or whether they had received sustainability training previously did not affect the score obtained from this sub-dimension.

The score obtained from the seasonal and local nutrition sub-dimension of the scale was higher in women compared to men. It was also determined that personnel who had previously received sustainability training achieved higher scores in this sub-dimension. Differences in factors such as institution type, length of employment, and educational status did not create a significant difference in the score obtained from this sub-dimension.

The score obtained from the food purchasing sub-dimension of the BSTSN is higher in those who have previously received sustainability training compared to those who have not. Differences in gender, educational status, institution of

Table 3. Differences in Mean Scores of the Sub-dimensions of the BSTSN According to the Descriptive Characteristics of the Participants

Variable	Category	Food Preference		Reduction of Food Waste		Seasonal and local nutrition		Purchasing food	
		X±SD	Sig.	X±SD	Sig.	X±SD	Sig.	X±SD	Sig.
Gender	Female	22.75±5.09	t: 1.732	37.38±7.22	t: 2.330	32.71±6.52	t: 2.426	23.81±5.31	t: 1.914
	Male	21.07±5.58	p: 0.086	34.13±8.18	p: 0.021*	29.78±6.75	p: 0.017*	21.91±5.62	p: 0.058
Education Status	Primary School Graduate	20.35±4.52		33.62±7.90		29.77±7.08		20.38±5.85	
	Secondary School Graduate	22.20±5.50	KW: 5.282	34.80±9.13	KW: 4.373	31.55±7.23	KW: 2.685	23.45±6.19	KW: 7.681
	High School Graduate	21.85±6.19	p: 0.152	36.78±8.20	p: 0.224	31.27±7.17	p: 0.443	23.27±5.58	p: 0.053
	University Graduate	23.31±4.59		37.34±6.09		32.71±5.65		24.26±4.21	
Position in the kitchen	Cook	21.18±6.00		33.68±9.40		30.39±7.82		21.74±6.41	
	Dishwasher	22.07±3.63		36.80±4.95		32.13±4.37		22.47±4.44	
	Service Staff	21.75±5.90	KW: 4.192	36.08±7.99	KW: 5.169	30.63±7.34	KW: 4.100	23.30±5.73	KW: 4.905
	Dietitian	24.90±3.78	p: 0.381	39.80±5.77	p: 0.270	34.50±4.79	p: 0.393	25.90±3.57	p: 0.297
Institution	Managerial / Administrative Staff	22.63±4.39		37.47±5.57		32.89±5.13		23.58±4.23	
	Hospital Kitchen	21.87±5.80	t: -.368	35.93±8.12	t: -.017	30.93±6.97	t: .984	22.45±5.72	t: -1.305
Length of Employment	University Kitchen	22.23±4.60	p: 0.714	35.96±7.35	p: 0.987	32.17±6.39	p: 0.327	23.79±5.10	p: 0.194
	0-5 years	22.25±5.20	Z: -.653	36.37±7.35	Z: -.867	31.53±6.49	Z: -.233	23.45±5.26	Z: -1.880
Status of receiving training on sustainability	6-10 years	20.96±5.97	p: 0.514	34.09±9.45	p: 0.386	30.91±7.91	p: 0.816	20.87±6.15	p: 0.060
	Yes	23.67±5.26	t: 3.522	37.32±7.87	t: 1.936	32.97±6.76	t: 2.562	24.38±5.25	t: 2.876
	No	20.40±4.98	p: 0.001**	34.61±7.56	p: 0.055	29.90±6.45	p: 0.012*	21.60±5.45	p: 0.005**

Source: Created by authors.

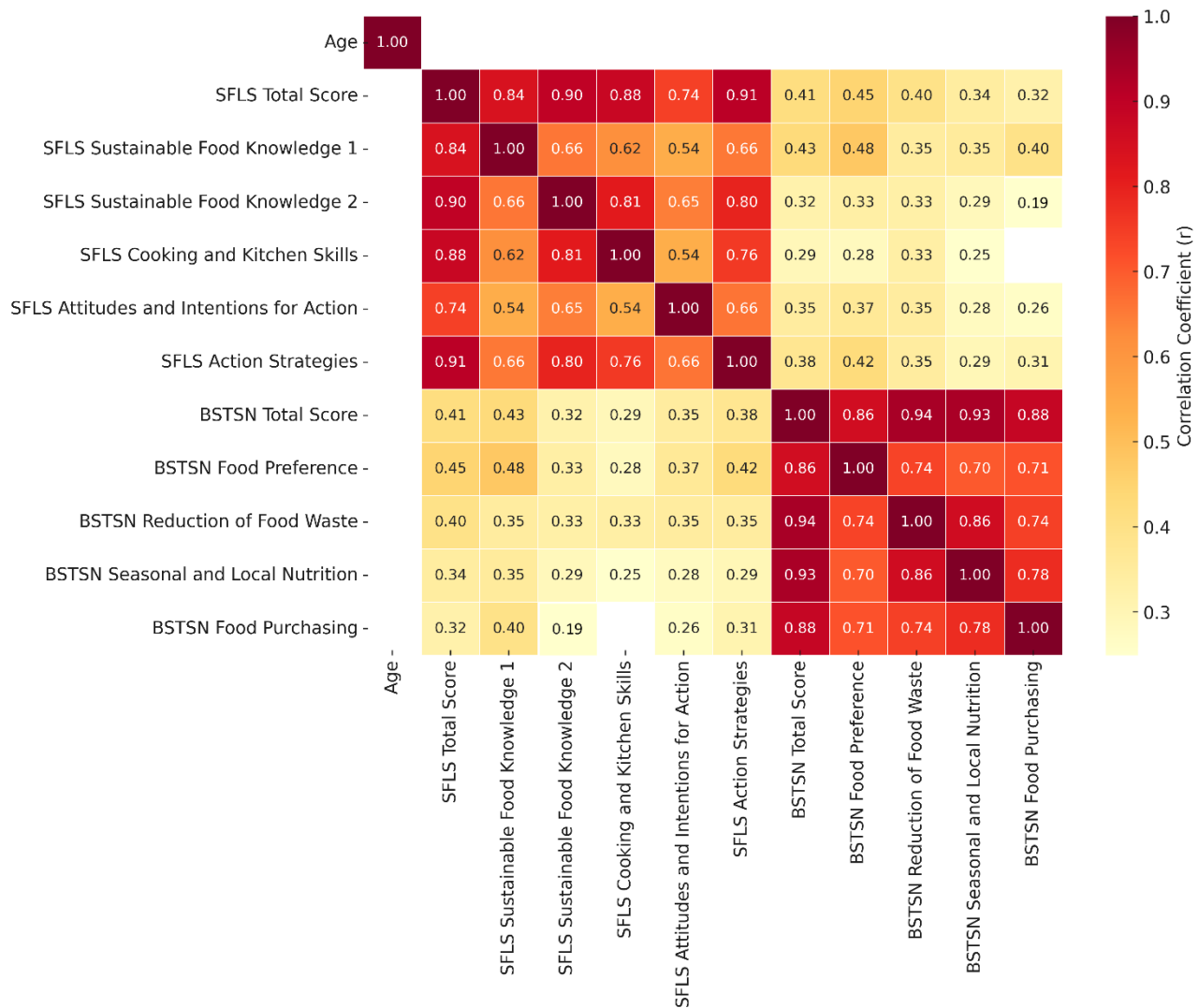
employment, and length of employment do not create a significant difference in this sub-dimension score.

The relationships between age, SFLS scores, and BSTSN scores are shown in Figure 3. According to Pearson correlation analysis, the personnel's age was not found to be related to SFL or sustainable nutrition behaviors. There was a moderately positive relationship between the total scores of the SFLS and BSTSN ($r=0.415$, $p<0.001$). Additionally, almost all sub-dimensions of these scales are positively correlated with each other. This finding indicates that as sustainable nutrition literacy increases, sustainable nutrition behaviors also improve.

5. Conclusion and Discussion

This cross-sectional study examining the sustainable nutrition literacy and behaviors of kitchen workers determined the current status of the staff ($n=122$) on this issue and analyzed how it varies according to various characteristics (gender,

education level, occupation, etc.). As a result of the high demand for meals eaten outside the home, the activities of mass catering services have also increased. This increased production affects the environment in terms of waste generation and the use of various natural resources. It is estimated that food and beverage services are among the least sustainable sectors in the world. However, today, the awareness of food service professionals regarding more sustainable food production procedures has increased (Maynard et al., 2021). The implementation of sustainability activities in institutions providing out-of-home catering services depends on the participation of the staff in this process and the extent to which they accept these activities (Reinders et al., 2024). This study aimed to establish a foundation for future initiatives that will enhance sustainability practices in mass catering services by examining the SFL and sustainable nutrition behaviors of the staff. The level of literacy and behaviors of the kitchen staff concerning sustainable nutrition, along with the analysis of the factors



SFLS: Sustainable Food Literacy Scale; BSTSN: Behaviors Scale Towards Sustainable Nutrition.

In the image, only the significant relationships determined as $p<0.05$ in the Pearson correlation analysis were colored. The darkness of the color indicates the increasing correlation strength.

Figure 3. Relationship Between Age, SFLS and BSTSN Scores

Source: Created by authors.

affecting this data, are important for identifying groups that are open to support.

Many previous studies on nutrition have focused on health literacy. However, nutrition extends beyond human health, necessitating an examination of the social, economic, and environmental dimensions of literacy (Park et al., 2020). Although health literacy and nutritional literacy have been shown to be associated with healthy eating habits in many studies, it remains unclear whether this level of knowledge positively affects sustainability behaviors, such as the amount of food waste generated. Therefore, promoting healthy nutrition is insufficient; all educational strategies should further integrate the environmental, economic, and ethical aspects of nutrition (Lisciani et al., 2024). In our study, by evaluating the SFL of individuals, we can also examine the social, environmental, and economic dimensions of nutrition. The findings indicate that female personnel have higher SFLS scores than male personnel ($t=2.099$; $p<0.05$), university graduates have higher SFLS scores than other personnel ($KW=10.631$; $p<0.05$) and dietitians have SFLS scores than other personnel ($KW=16.233$; $p<0.05$). Another important finding is that the SFLS score is significantly higher in those who have previously received training on sustainability ($t=3.740$; $p<0.05$). In their study published in 2023, Mortaş et al. examined the relationship between food and nutrition literacy and sustainable healthy eating behaviors in adults (265 females, 235 males). Similar to the results of our study, they determined that women had higher food and nutrition literacy than men (89.9 ± 13.1 and 94.8 ± 10.9 points, respectively; $p<0.001$). In their study (2023), Sariyer et al. aimed to evaluate the effect of gender on SFL. They analyzed data from 200 adult individuals. This study shows that women have higher scores than men in all sub-dimensions of the SFLS (Sariyer et al., 2023). These results indicate that activities aimed at increasing SFL, especially in male personnel, can be supported.

A study conducted with 546 students at a culinary school in the United States examined the perceptions of culinary students regarding their future roles in sustainability as chefs. The results showed that students agreed that chefs should be knowledgeable about nutrition (96.0%) and the environmental impact of food ingredients (90.8%). However, only 57.8% of participants considered the healthiness of their food and 60.2% viewed the environmental impact of food as a primary concern in their careers as chefs. The study suggests that while future chefs may be aware of the importance of sustainability, they may need support in determining their priorities (Bertoldo et al., 2022). Franchini et al. aimed to determine the effectiveness of a sustainable nutrition education programme designed for apprentice chefs. Students studying at the Italian School of Culinary Arts (control: 264, intervention: 252) were included in the study. The results showed that food sustainability knowledge was low in both groups before the study, and the educational intervention improved the level of knowledge about nutrition and the environmental impact of food production and consumption (Franchini et al., 2024). In a study conducted by Lu and Ko (2023), data from a total of 415 kitchen staff were examined to determine the factors that could prevent food waste in the catering sector. Professional competence in preventing food waste was found to be a

mediating factor between ethical sustainability and behavioral intentions towards sustainable food preparation. Self-efficacy was also a mediating factor between professional competence in preventing food waste and behavioral intentions towards sustainable food preparation (Lu & Ko, 2023). Reinders et al. (2024) examined the views of catering staff on promoting healthy and sustainable food choices. The results showed that staff were generally motivated to choose healthy and sustainable options in food. Researchers have emphasized the need for a collaborative approach with practitioners when implementing sustainable and healthy food practices. Additionally, the importance of improving the knowledge and skills of staff -not only through educational but also through fun, active, creative, and inspiring training programmes- has been highlighted (Reinders et al., 2024). These results emphasize the importance of enhancing the knowledge level and behaviors of kitchen staff regarding sustainability. In our study, it was determined that women had higher scores than men on sustainable nutrition behaviors ($t=2.365$; $p<0.05$). In addition, having received training on sustainability before was associated with a higher total sustainable nutrition behavior score ($t=2.915$; $p<0.05$). The scores of the participants from the BSTSN did not vary according to their educational status, position in the kitchen, institution they worked in and length of employment. These data show that personnel in all positions need support in developing behaviors.

Schools are among the areas where interventions aimed at improving health yield the best results. School cafeterias are considered a primary tool for ensuring adequate and balanced nutrition, with the participation of children, families, and teachers. Similarly, hospital mass catering services play a crucial role in meeting the needs of heterogeneous populations, including those requiring special diets. Therefore, school and hospital cafeterias should provide high-quality service at all stages of the food chain, from production to transportation and consumption (Marcotrigiano et al., 2023). The results of our study indicate that the SFL and sustainable nutritional behaviors of staff working in school or hospital kitchens are similar. It was also found that staff with fewer than or more than five years of service showed similar results, regardless of their experience.

As a result, our study showed that SFL was higher among female staff compared to men, university graduates compared to staff with lower education levels, and dietitians compared to staff with other professions. Sustainable eating behaviors are more developed in female personnel than in male personnel. The SFLS and BSTSN scores of the staff who had previously received any training on sustainable nutrition were higher than those who had not received training, and the SFLS total score and the BSTSN total score were positively correlated. These results show that education can have an impact on the positive development of knowledge level and behaviors and draw attention to groups that need interventions.

5.1. Practical Implications

This study provides comprehensive data on the status of SFL and sustainable nutrition behaviors among kitchen staff. Awareness has been created that the SFL level of individuals may be related to behaviors that are compatible with the

concept of sustainability. This insight will provide a new path for experts in planning interventions that reinforce sustainable nutrition behaviors among kitchen staff. This study, which presents the effects of certain characteristics of the staff (age, gender, occupation, educational status, etc.) on knowledge and behaviors regarding sustainability, emphasizes the importance of identifying groups that are open to development and supporting them with education. In this context, we recommend the following for practitioners: (1) planning and carrying out in-service trainings on sustainable nutrition, (2) planning practices to identify and eliminate barriers to sustainable nutrition behaviors, (3) adopting approaches that increase the motivation of the personnel on this issue, (4) managers being role models with their behaviors on sustainability, (5) establishment of monitoring policies.

5.2. Theoretical Implications

Sustainable nutrition is a topic that is increasingly of interest to policy makers, practitioners and researchers alike. Catering services are an area where important steps can be taken in terms of all dimensions of sustainability (social, environmental, economic). Despite this, descriptive and intervention studies aimed at increasing sustainable catering services are quite limited. This study reveals the status of sustainable nutrition knowledge and behaviors among kitchen staff working in catering. As far as we know, BSTSN and SFLS were used for the first time among kitchen professionals as data collection tools in this study.

5.3. Limitations and Suggestions for Future Research

The fact that the institutions where the data were collected were selected using a convenience sampling method is a limitation. The researchers' choice of institutions in their immediate vicinity may create a misperception regarding the generalizability of the data. Future studies should assess the situation of personnel working not only in university and hospital kitchens but also in other workplaces.

The fact that the research data were collected online caused people without internet access or appropriate devices to be excluded from the study. Another limitation of the study is that the data was collected based on statements. It should be considered that the participants may have given misleading answers to the questions. Although the data was collected anonymously to prevent this error, such margins of error should also be considered in scientific data collected through surveys.

We recommend that future studies examine sustainability behaviors among kitchen staff using observational methods, identify barriers to these behaviors using qualitative methods, and evaluate the effectiveness of interventions aimed at improving sustainability practices.

Ethic Statement: Ethics committee approval was obtained from the Istinye University Social and Humanities Research Ethics Committee (Meeting Number: 2023/11, Decision No: 113, Meeting Date: 25/12/2023). In case of detection of a contrary situation, TO&RE Journal has no responsibility and all responsibility belongs to the author(s) of the study.

Author Contribution Statement: The first author's

contribution rate is 60%. The contribution rates of the 2nd, 3rd, 4th and 5th authors are 10%.

Conflict of Interest: The author(s) have no conflicts of interest.

References

- Aguirre Sánchez, L., Roa-Díaz, Z. M., Gamba, M., Grisotto, G., Moreno Londoño, A. M., Mantilla-Urbe, B. P., Rincón Méndez, A. Y., Ballesteros, M., Kopp-Heim, D., Minder, B., Suggs, L. S., & Franco, O. H. (2021). What influences the sustainable food consumption behaviours of university students? A systematic review. *International Journal of Public Health*, 66(1), 1604149. <https://doi.org/10.3389/ijph.2021.1604149>
- Alsaffar, A. A. (2016). Sustainable diets: The interaction between food industry, nutrition, health and the environment. *Food Science and Technology International* 22(2), 102-111. <https://doi.org/10.1177/1082013215572029>
- Asghar, W., & Khalid, N. (2023). Sustainable nutrition - healthy populations. *Nutrition and Health*, 29(1), 3-4. <https://doi.org/10.1177/02601060231159915>
- Bastian, G. E., Buro, D., & Palmer-Keenan, D. M. (2021). Recommendations for integrating evidence-based, sustainable diet information into nutrition education. *Nutrients*, 13(11), 4170. <https://doi.org/10.3390/nu13114170>
- Bertoldo, J., Hsu, R., Reid, T., Righter, A., & Wolfson, J.A. (2022). Attitudes and beliefs about how chefs can promote nutrition and sustainable food systems among students at a US culinary school. *Public Health Nutrition*, 25(2), 498-510. <https://doi.org/10.1017/S1368980021003578>
- Butcher, L. M., Batt, C., Royce, S., Barron, E., Giglia, R., Begley, A. (2025). Analysing the behaviour change techniques in an effective food literacy program to inform future program design. *Nutrition & Dietetics*, 82(3), 268-282. <https://doi.org/10.1111/1747-0080.12908282>
- Cochran, W. G. (1977). Sampling techniques (3rd ed.). New York, NY: John Wiley & Sons.
- FAO & UNESCO. (2019). *Chefs as Agents of Change*, retrieved from; <http://www.fao.org/3/ca3715en/ca3715en.pdf>. Access date: 02 February 2025.
- The Food and Agriculture Organization (FAO). (2025). *Dietary Guidelines and Sustainability*. <https://www.fao.org/nutrition/education/dietary-guidelines/background/sustainable-dietary-guidelines/en/>. Access date: 11 October 2025.
- Franchini, C., Biasini, B., Giopp, F., Rosi, A., & Scazzina, F. (2024). Promoting nutrition and food sustainability knowledge in apprentice chefs: An intervention study at The School of Italian Culinary Arts-ALMA. *Nutrients*, 16(4), 537. <https://doi.org/10.3390/nu16040537>
- Garipoglu, G., Koc, B. M., & Ozlu, T. (2023). Behaviors scale towards sustainable nutrition: development and validity-reliability analysis. *Nutrition & Food Science*, 53(8), 1332-1343. <https://doi.org/10.1108/NFS-09-2022-0335>
- GBD 2017 Population and Fertility Collaborators. (2018). Population and fertility by age and sex for 195 countries and territories, 1950-2017: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet*, 392, 1995-2051. [https://doi.org/10.1016/S0140-6736\(18\)32278-5](https://doi.org/10.1016/S0140-6736(18)32278-5)
- Gibas-Dorna, M., & Żukiewicz-Sobczak, W. (2024). Sustainable nutrition and human health as part of sustainable development. *Nutrients*, 16(2), 225. <https://doi.org/10.3390/nu16020225>

- Grosso, G., Mateo, A., Rangelov, N., Buzeti, T., & Birt, C. (2020). Nutrition in the context of the Sustainable Development Goals. *European Journal of Public Health*, *30*(Suppl_1), i19-i23. <https://doi.org/10.1093/eurpub/ckaa034>
- Kenny, T. A., Woodside, J. V., Perry, I. J., & Harrington, J. M. (2023). Consumer attitudes and behaviors toward more sustainable diets: a scoping review. *Nutrition Reviews*, *81*(12), 1665-1679. <https://doi.org/10.1093/nutrit/nuad033>
- Kubilay, M. N., & Yüksel, A. (2023). Validity and reliability study of the Turkish adaptation of the sustainable food literacy scale. *Gümüşhane Üniversitesi Sağlık Bilimleri Dergisi*, *12*(4), 1562-1570. <https://doi.org/10.37989/gumussagbil.1367727>
- Lisciani, S., Camilli, E., & Marconi, S. (2024). Enhancing food and nutrition literacy: A key strategy for reducing food waste and improving diet quality. *Sustainability*, *16*(5), 1726. <https://doi.org/10.3390/su16051726>
- Lu, M. Y., & Ko, W. H. (2023). Sustainable preparation behavior for kitchen staff in order to limit food waste. *Foods*, *12*(16), 3028. <https://doi.org/10.3390/foods12163028>
- Marcotrigiano, V., Stingi, G. D., Nugnes, P. T., Mancano, S., Lagreca, V. M., Tarricone, T., Salerno, G., Pasquale, P., Marchet, P., Sava, G. A., Citiulo, A., Tissi, M., Oliva, S., Cinquetti, S., & Napoli, C. (2023). Collective catering activities and official controls: Dietary promotion, sustainability and future perspectives. *Healthcare*, *11*(9), 1347. <https://doi.org/10.3390/healthcare11091347>
- Maynard, D. C., Zandonadi, R. P., Nakano, E. Y., Raposo, A., & Botelho, R. B. A. (2021). Green Restaurants ASSESSment (GRASS): A tool for evaluation and classification of restaurants considering sustainability indicators. *Sustainability*, *13*(19), 10928. <https://doi.org/10.3390/su131910928>
- Mortaş, H., Navruz-Varlı, S., Çıtar-Dazıroğlu, M. E., & Bilici, S. (2023). Can unveiling the relationship between nutritional literacy and sustainable eating behaviors survive our future? *Sustainability*, *15*(18), 13925. <https://doi.org/10.3390/su151813925>
- Nordin, S., Isbill, J., & Qamar, Z. (2020). Nutrition Education for Sustainable Global Food Systems. *Journal of Nutrition Education Behavior*, *52*(3), 213. <https://doi.org/10.1016/j.jneb.2020.01.010>
- Nutbeam, D. (2000). Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. *Health Promotion International*, *15*(3), 259-267. <https://doi.org/10.1093/heapro/15.3.259>
- Park, D., Park, Y. K., Park, C. Y., Choi, M. K., & Shin, M. J. (2020). Development of a comprehensive food literacy measurement tool integrating the food system and sustainability. *Nutrients*, *12*(11), 3300. <https://doi.org/10.3390/nu12113300>
- Reinders, M. J., Battjes – Fries, M. C. E., Bouwman, E. P., & Meeusen – van Onna, M. J. G. (2024). Effectively implementing healthy and sustainable food practices in out-of-home food service locations: The perspective of the catering staff members. *Appetite*, *193*(1), 107152. <https://doi.org/10.1016/j.appet.2023.107152>
- Sarıyer, E. T., Yıldırım, G., Can, B., & Gören, A. N. (2023). Assessing gender effect in sustainable food literacy. *JFNG*, *2*(2), 151-158. <https://doi.org/10.58625/jfng-2299>
- Teng, C. C., & Chih, C. (2022). Sustainable food literacy: A measure to promote sustainable diet practices. *Sustainable Production and Consumption*, *30*(1), 776-786. <https://doi.org/10.1016/j.spc.2022.01.008>
- Velardo, S. (2015). The Nuances of health literacy, nutrition literacy, and food literacy. *Journal of Nutrition Education and Behavior*, *47*(4), 385-9.e1. <https://doi.org/10.1016/j.jneb.2015.04.328>
- Whitmarsh, L., Poortinga, W., & Capstick, S. (2021). Behaviour change to address climate change. *Current Opinion in Psychology*, *42*(1), 76-81. <https://doi.org/10.1016/j.copsyc.2021.04.002>
- World Commission on Environment and Development. (1987). *Our common future*. Oxford University Press.
- Yen, W.-S., Ko, W.-H., Huang, H.-H., Lu, M.-Y., & Tung, F.-Y. (2025). Exploring carbon reduction culinary expertise in the foodservice industry. *Sustainability*, *17*(8), 3534. <https://doi.org/10.3390/su17083534>