Examining Sustainable Consumption and Sustainable Healthy Eating Behaviors in Individuals Doing Sports with Various Variables: University Students Example[*]

Çiler ÖZENİR[**], Mihrican KAÇAR[***], Mazhar Ahmet TOPTAŞ[****], Aytuğ YÖNTEM[*****]

Abstract

Aim: Sport affects all of the Sustainable Development Goals and plays a facilitating role in achieving each of them. This research aimed to determine the sustainable consumption and sustainable healthy eating behaviors of university students attending gyms.

Method: A cross-sectional study was conducted with 272 university students [female:61 (22.4%), male:211 (77.6%)] attending gyms. The survey prepared by the researchers was applied using the face-to-face interview technique. All anthropometric measurements were taken by researchers. The survey consists of general characteristics, anthropometric data, eating habits, the Sustainable and Healthy Eating (SHE) Behaviors Scale, and the Sustainable Consumption Behaviors Scale.

Results: The average age of the individuals in this study is 22.44±3.36 years and 49.6% go to the gym 3-4 times a week, and 40.1% go to the gym 5-6 times a week. The scores that women and men receive from the SHE Behaviors Scale and Sustainable Consumption Behavior Scale sub-dimensions are similar. It was determined that as the time individuals spent in the gym increased, their scores from the Environmental Awareness and Animal Welfare sub-dimensions increased ($p < 0.05$). It was determined that the scores of the Quality Labels sub-dimension, which questions the preference of regional-organic products, of individuals who go to the gym every day are higher than those of individuals who go to the gym 3-4 times a week ($p < 0.05$). It was determined that the scores of individuals who exercised for 61-120 minutes at the gym on the Meat Reduction sub-dimension were higher than those who exercised for less than half an hour. A moderate positive relationship was found between Meat Reduction and the scores obtained from the Environmental Awareness (r:0.375, $p < 0.001$) and Savings (r:0.338, $p < 0.001$) sub-dimensions.

Conclusion: The increase in the frequency of going to the gym and the time they spend in the gym among university students attending gyms has positive effects on sustainable consumption behaviors and sustainable healthy eating behaviors.

Keywords: Sports, nutrition, eating behavior, consumption, sustainable development.

Özgün Araştırma Makalesi (Original Research Article)
Geliş / Received: 27.01.2024 **Kabul / Accepted:** 10.11.2025
DOI: https://doi.org/10.38079/igusabder.1425895
[*] This study was supported by the Scientific and Technological Research Council of Turkey (TÜBİTAK) with project number 1919B012107296 within the scope of "2209-A University Students Research Projects Support Program".
[**] Corresponding Author, Asst. Prof., Kırıkkale University, Faculty of Health Sciences, Department of Nutrition and Dietetics, Kırıkkale, Türkiye. E-mail: cileraslanalp@gmail.com ORCID https://orcid.org/0000-0002-9249-3935
[***] Research Assistant, Erzincan Binali Yıldırım University, Faculty of Health Sciences, Department of Nutrition and Dietetics, Erzincan, Türkiye. E-mail: mihrican.kacar@erzincan.edu.tr ORCID https://orcid.org/0000-0002-5516-2029
[****] Graduate Student, Kırıkkale University, Institute of Health Sciences, Kırıkkale, Türkiye.
E-mail: dytmazharahmettoptas@gmail.com ORCID https://orcid.org/0009-0008-1788-0792
[*****] Dietitian. E-mail: aytugyontem@gmail.com ORCID https://orcid.org/0009-0005-4516-7247

ETHICAL STATEMENT: The study was approved by Kırıkkale University Non-Interventional Research Ethics Committee (Date: 8.06.2022, Decision number: 2022.05.25), and all subjects gave written consent.

Istanbul Gelisim University Journal of Health Sciences (IGUSABDER) is indexed by TUBITAK ULAKBIM TR Index.
Web site: https://dergipark.org.tr/en/pub/igusabder
Contact: igusabder@gelisim.edu.tr

Spor Yapan Bireylerde Sürdürülebilir Tüketim ve Sürdürülebilir Sağlıklı Yeme Davranışlarının Çeşitli Değişkenlerle İncelenmesi: Üniversite Öğrencileri Örneği

Öz

Amaç: Spor, Sürdürülebilir Kalkınma Amaçlarının tamamını etkilemekte ve her birinin gerçekleştirilmesinde kolaylaştırıcı rol oynamaktadır. Bu araştırmanın amacı, spor salonlarına devam eden üniversite öğrencilerinin sürdürülebilir tüketim ve sürdürülebilir sağlıklı yeme davranışlarının belirlenmesidir.

Yöntem: Spor salonlarına devam eden 272 [kadın:61 (%22,4), erkek:211 (%77,6)] üniversite öğrencisi ile kesitsel bir çalışma yürütülmüştür. Araştırmacılar tarafından hazırlanan anket yüz yüze görüşme tekniği kullanılarak uygulanmıştır. Tüm antropometrik ölçümler araştırmacılar tarafından alınmıştır. Anket genel özellikler, antropometrik veriler, beslenme alışkanlıkları, Sürdürülebilir ve Sağlıklı Yeme Davranışları Ölçeği ve Sürdürülebilir Tüketim Davranışları Ölçeği'nden oluşmaktadır.

Bulgular: Bu çalışmadaki bireylerin yaş ortalaması 22,44±3,36 yıldır ve %49,6'sı haftada 3-4 kez, %40,1'i haftada 5-6 kez spor salonuna gitmektedir. Kadınların ve erkeklerin Sağlıklı Yeme Davranışları Ölçeği ve Sürdürülebilir Tüketim Davranışı Ölçeği alt boyutlarından aldıkları puanlar benzerdir. Bireylerin spor salonunda geçirdikleri süre arttıkça Çevre Duyarlılığı ve Hayvan Sağlığı alt boyutundan aldıkları puanların arttığı belirlenmiştir ($p < 0,05$). Her gün spor salonuna giden bireylerin yöresel-organik ürünlerin tercihini sorgulayan Kalite İşaretleri alt boyutundan aldıkları puanların haftada 3-4 kez spor salonuna gidenlerden yüksek olduğu bulunmuştur ($p < 0,05$). Spor salonunda 61-120 dk spor yapan bireylerin Et Tüketiminin Azaltılması alt boyutundan aldığı puanların yarım saatten az süre spor yapan bireylerden daha yüksek olduğu belirlenmiştir. Et Tüketiminin Azaltılması ve Çevre Duyarlılığı ($r:0,375$; $p < 0,001$) ile Tasarruf ($r:0,338$, $p < 0,001$) alt boyutlarından alınan puanlar arasında pozitif, orta kuvvette bir ilişki saptanmıştır.

Sonuç: Spor salonlarına devam eden üniversite öğrencilerinin spor salonuna gitme sıklıklarının ve spor salonunda geçirdikleri sürenin artması, sürdürülebilir tüketim davranışları ve sürdürülebilir sağlıklı yeme davranışı üzerinde olumlu etkiler gösterir.

Anahtar Sözcükler: Spor, beslenme, yeme alışkanlığı, tüketim, sürdürülebilir gelişme.

Introduction

Nutrition and exercise are important factors in maintaining a healthy lifestyle[1]. The United Nations refers to sports as "a global accelerator of peace and sustainable development for all" in its decisions and action plans for the Sustainable Development Goals (SDGs)[2]. Sport impacts all of the SDGs and plays a facilitating role in achieving each of them[3]. On the other hand, integrating environmental awareness while making food choices in improving both health and sports performance seems to be no longer an option but a necessity in terms of sustainability[4]. Avoiding excessive consumption of nutrients, especially animal proteins, is recommended as a way to reduce the environmental impacts of the diet[5]. Compared to animal protein production, the production of plant proteins generally uses less land, water, and energy and less greenhouse gases are produced[6]. For this reason, it is advocated by the United Nations that basic animal protein sources such as milk and eggs should be replaced with more sustainable food alternatives, such as plant protein sources[1]. Athletes' diets are generally high in protein, although not excessively. The need for protein, met especially by meat and dairy products, also increases the intake of animal protein. For this reason, individuals who do sports should first aim to reduce red meat consumption and then integrate their diet with more vegetable protein[4].

Sustainable Development Goals are an international action plan developed against global problems such as irresponsible production and consumption and destruction of nature caused by industrialization and increasing population that has accelerated since the Industrial Revolution. To solve these problems, the article "ensure healthy lives and promote well-being for all at all ages" is included in the SDGs and Indicators booklet published by the Presidency of the Republic of Türkiye Strategy and Budget Department in 2019[7]. In this context, nutrition and sports come to the fore to ensure a healthy life and promote well-being. Determining the nutrition of individuals who do sports and making sustainability-oriented changes in their food preferences will make a significant contribution to reducing environmental problems. However, despite the critical importance of the effects of nutrition and consumption behaviors of individuals engaged in sports on sustainability and their role as a mediator in building a sustainable future, data are limited. The aim of this study is to examine the sustainable consumption and sustainable healthy eating behaviors of university students attending gyms. Thus, monitoring the nutritional habits of university students participating in sports is believed to improve diet quality in this specific group, promote sustainable nutritional behaviors in society, and guide nutritional interventions. In this respect, the data from this study are important for both improving the health of young adults and contributing to environmental goals.

Material and Methods

In this study, it was aimed to reach all university students attending gyms in Yahşihan district of Kırıkkale province between November 2022 and July 2023, and 272 university students [female:61 (22.4%), male:211 (77.6%)] who wanted to participate in the research were reached. Department of Nutrition and Dietetics students, pregnant and breastfeeding individuals, and disabled people were not included in this study. Posthoc power analysis was performed using the "G.Power 3.1.9.2" program to evaluate the adequacy of the sample size.

Collection and Evaluation of Research Data

The questionnaire form was administered by the researcher using the face-to-face interview technique. This survey prepared by the researchers consists of 5 sections. These sections consist of general characteristics (such as sociodemographic characteristics and sports activity), anthropometric data, eating habits (main and snack consumption status, frequency of consumption of some food groups in the last month), Sustainable and Healthy Eating (SHE) Behaviors Scale, and Sustainable Consumption Behaviors Scale.

Anthropometric Measurements

The height of all individuals participating in this study was measured with a SECA brand portable height meter, and body weight and body composition analyzes were measured with a TANITA brand BC 545N model bioelectric impedance analyzer in accordance with the technique in gyms[8]. Body mass index (BMI) was calculated by dividing the individuals' body weight by the square meter of their height (kg/m^2)[9].

Sustainable and Healthy Eating Behaviors Scale: To examine sustainable and healthy eating behaviors, the Turkish version of this scale developed by Zakowska-Biemans et al.[10], whose validity and reliability analysis was conducted with university students by Erdoğan et al.[11], was used in the study. The 8 factors in the scale are Healthy and Balanced Diet, Quality Labels (Regional and Organic), Meat Reduction, Local Food, Low Fat, Avoiding Food Waste, Animal Welfare, and Seasonal Foods. The 34 items in the scale are in a 7-point Likert type as never, very rarely, rarely, sometimes, often, very often or always, and are scored in increasing order from never: 1 to always: 7. In calculating the total scale score, the average of the scores given to all factors is taken[11].

Sustainable Consumption Behavior Scale: This scale was developed by Doğan et al.[12] to assess the sustainable consumption behavior of individuals in 2015 and whose validity and reliability were established, was used. The scale consists of 17 items and 4 dimensions: environmental awareness, unneeded consumption, savings, and reusability. The items in the scale are in a 5-point Likert type, ranging from 1: never to 5: every time, and are scored in increasing order, from never: 1 to always: 5. As the score from the unneeded consumption sub-dimension decreases, the sustainability of consumption increases, and as the scores from the other sub-dimensions increase, sustainable consumption behavior is positively affected [12].

Ethical Statement

The study was approved by Kırıkkale University Non-Interventional Research Ethics Committee (Date: 8.06.2022, Decision number: 2022.05.25), and all subjects gave written consent.

Statistical Analysis

The IBM SPSS 22.0 statistical package program was utilized in order to perform the statistical analysis. The categorizable data of the research are expressed as numbers (n) and percentages (%), and the numerical data are expressed as mean ($\bar{X}$)± standard deviation (SD). In the statistical evaluation of the data, parametric or non-parametric tests were applied depending on whether the data showed normal distribution or not. When parametric assumptions were not met, the Kruskal-Wallis test was used to compare more than two independent groups in terms of a numerical variable, and the Bonferroni post hoc test was used to identify the source of differences when the analysis was found to be significant. Mann-Whitney U test was used to compare two independent groups. When parametric assumptions were met, comparison of two independent groups in terms of a numerical variable was made with the student t-test. In comparing more than two independent groups, one-way analysis of variance was used when the variances were homogeneous, and the Tukey post hoc test was used to determine the source of the differences when the analysis was found to be significant. In cases where variances were not homogeneous, they were evaluated using the Welch test. The chi-square test was used to compare categorical variables. In all statistical tests, the confidence interval was accepted as 95.0% and the significance level was $p < 0.05$.

Results

The general characteristics of the participants are shown in Table 1. The average age of women is 21.08±1.62 years and the average BMI is 21.98±3.40 kg/m². The average age of men is 22.83±3.62 years and the average BMI is 25.34±3.29 kg/m². It was found that the average body fat percentage of women (21.67±8.06) was higher than that of men (16.64±5.85), and the average lean body mass was lower than that of men ($p < 0.05$). It has been detected that most women and men go to the gym 3-4 times a week and the time spent exercising in the gym is mostly between 61-120 minutes.

Table 1. General characteristics of individuals

General features	Female (n:61)		Male (n:211)		Total (n:272)		p
	n	%	n	%	n	%	
Age (years) ($\bar{X}$±SD) **(min-max)**	21.08±1.62 (18-26)		22.83±3.62 (18-40)		22.44±3.36 (18-40)		**<0.001[a]**
Economical situation							
Income is less than expenses	4	6.6	28	13.3	32	11.8	
Income equals expenses	47	77.0	143	67.8	190	69.8	0.277[b]
Income exceeds expenses	10	16.4	40	18.9	50	18.4	
Monthly budget allocated to nutrition							
0-500 Turkish liras	4	6.5	16	7.6	20	7.4	
501-1000 Turkish liras	15	24.6	36	17.1	51	18.7	
1001-1500 Turkish liras	18	29.5	64	30.3	82	30.1	0.442[b]
1501-2000 Turkish liras	14	23.0	40	18.9	54	19.9	
>2000 Turkish liras	10	16.4	55	26.1	65	23.9	
Frequency of going to the gym							
Every day	2	3.3	14	6.6	16	5.9	
5-6 times a week	14	22.9	95	45.0	109	40.1	
3-4 times a week	38	62.3	97	46.0	135	49.6	**<0.001[c]**
1-2 times a week	7	11.5	5	2.4	12	4.4	
Duration of sports							
<30 minutes	8	13.1	19	9.0	27	9.9	
30-60 minutes	19	31.1	33	15.6	52	19.1	
61-120 minutes	32	52.5	138	65.4	170	62.5	**0.027[c]**
121-180 minutes	2	3.3	20	9.5	22	8.1	

Istanbul Gelisim University Journal of Health Sciences (IGUSABDER) is indexed by TUBITAK ULAKBIM TR Index.
Web site: https://dergipark.org.tr/en/pub/igusabder
Contact: igusabder@gelisim.edu.tr

>180 minutes	-	-	1	0.5	1	0.4	
BMI (kg/m²) ($\bar{X}$±SD) **(min-max)**	21.98±3.40 (16.0-30.1)		25.34±3.29 (18.9-38.6)		24.59±3.59 (16.0-38.6)		**<0.001[d]**
Body fat percentage (%) ($\bar{X}$±SD) (min-max)	21.67±8.06 (5.0-37.9)		16.64±5.85 (5.0-39.7)		17.77±6.73 (5.0-39.7)		**<0.001[a]**
Lean body mass (kg) ($\bar{X}$±SD) **(min-max)**	47.03±8.38 (33.5-78.9)		67.12±9.44 (40.0-106.4)		62.62±12.45 (33.5-106.4)		**<0.001[d]**

[a] Mann-Whitney U test, [b] Pearson chi-square test, [c] Fisher's Exact chi-square test, [d] Independent Samples t-test, BMI: Body Mass Index.

There was no statistically significant difference between the scores of the individuals from the SHE Behaviors Scale and Sustainable Consumption Behavior Scale sub-dimensions according to their gender (p>0.05) (Table 2).

Table 2. Individuals' SHE Behaviors Scale and Sustainable Consumption Behavior Scale scores

	Female (n:61)	**Male (n:211)**	**Total (n:272)**	**p**
	($\bar{X}$±SD)	**($\bar{X}$±SD)**	**($\bar{X}$±SD)**	
SHEBS				
Healthy and balanced diet	4.70±0.99	4.57±0.93	4.60±0.94	0.357[a]
Quality labels	2.32±1.52	2.41±1.45	2.39±1.46	0.712[b]
Meat reduction	2.33±1.23	2.23±1.08	2.26±1.11	0.695[b]
Local food	1.83±1.10	2.15±1.27	2.08±1.24	0.075[b]
Low fat	4.68±1.03	4.31±1.42	4.39±1.35	0.076[b]
Avoiding food waste	4.85±1.15	4.61±1.43	4.66±1.37	0.397[b]
Animal welfare	1.96±1.47	2.34±1.63	2.26±1.60	0.083[b]
Seasonal foods	3.73±1.50	3.61±1.42	3.63±1.43	0.379[b]
SCBS				
Environmental awareness	2.64±1.12	2.41±1.10	2.46±1.10	0.183[b]
Unneeded consumption	2.16±0.87	2.01±0.86	2.04±0.87	0.218[b]
Savings	2.79±1.44	2.69±1.38	2.71±1.39	0.556[b]
Reusability	2.20±0.89	2.41±1.11	2.36±1.07	0.252[b]

[a] Independent Samples t-test, [b] Mann Whitney U test, SHEBS: Sustainable and Healthy Eating Behaviors Scale, SCBS: Sustainable Consumption Behavior Scale.

The scores that the individuals received from the SHE Behaviors Scale and Sustainable Consumption Behavior Scale according to the frequency of going to the gym and the time

Istanbul Gelisim University Journal of Health Sciences (IGUSABDER) is indexed by TUBITAK ULAKBIM TR Index.
Web site: https://dergipark.org.tr/en/pub/igusabder
Contact: igusabder@gelisim.edu.tr

they spent in the gym are given in Table 3. When the sub-dimensions of the SHE Behaviors Scale were examined, the scores of individuals who went to the gym every day in the Quality Labels sub-dimension were found to be statistically significantly higher than those of individuals who went to the gym 3-4 times a week ($p < 0.05$). Statistically significant differences were found between the scores they received from other sub-dimensions of the SHE Behaviors Scale and the sub-dimensions of the Sustainable Consumption Behavior Scale ($p<0.05$).

Table 3. Individuals' SHE Behaviors Scale and Sustainable Consumption Behavior Scale scores according to frequency of going to the gym and duration of exercise

	Frequency of going to the gym				**P**	**Exercise time at the gym**				**P**
SHEBS	**Every day**	**5-6 times a week**	**3-4 times a week**	**1-2 times a week**	**Post-hoc**	**<30 minutes**	**30-60 minutes**	**61-120 minutes**	**121-180 minutes**	**Post-hoc**
	($\bar{X}$±SD)	**($\bar{X}$±SD)**	**($\bar{X}$±SD)**	**($\bar{X}$±SD)**		**($\bar{X}$±SD)**	**($\bar{X}$±SD)**	**($\bar{X}$±SD)**	**($\bar{X}$±SD)**	
Healthy and balanced diet	4.83±1.42	4.65±0.96	4.53±0.86	4.60±0.87	0.587[a]	5.03±0.84	4.70±0.88	4.54±0.96	4.36±0.93	0.057[a]
Quality labels	3.41±1.79	2.43±1.49	2.22±1.39	2.55±1.14	**0.034[b]** **1>3**	1.52±0.62	2.20±1.29	2.58±1.56	2.38±1.40	**0.028[b]** **3>1**
Meat reduction	2.85±1.48	2.08±1.06	2.31±1.09	2.52±0.99	0.05[b]	1.52±0.57	2.14±1.02	2.41±1.15	2.23±1.17	**<0.001[b]** **3>1**
Local food	2.56±1.33	2.22±1.42	1.92±1.07	2.00±0.94	0.122[b]	1.64±0.80	1.78±1.06	2.22±1.34	2.28±1.12	**0.026[b-*]**
Low fat	4.60±1.63	4.50±1.43	4.30±1.27	4.11±1.07	0.477[b]	4.17±1.23	4.42±1.25	4.47±1.35	3.93±1.71	0.488[b]
Avoiding food waste	4.97±1.55	4.58±1.47	4.69±1.30	4.66±1.08	0.818[b]	4.79±1.14	4.44±1.37	4.74±1.39	4.57±1.39	0.496[b]
Animal welfare	3.31±2.25	2.29±1.66	4.69±1.30	2.22±1.39	0.128[b]	1.48±0.75	1.94±1.54	2.39±1.64	2.96±1.83	**0.009[b]** **4>1**
Seasonal foods	4.22±1.72	3.37±1.55	3.77±1.26	3.66±1.50	0.187[b]	4.56±1.18	3.17±1.56	3.71±1.29	2.95±1.82	**<0.001[b]** **1>2~3~4**
SCBS										
Environmental awareness	2.63±1.38	2.39±1.13	2.47±1.06	2.93±1.02	0.405[b]	1.89±1.09	2.11±1.00	2.64±1.10	2.72±0.98	**<0.001[b]** **3~4>1~2**
Unneeded consumption	1.96±1.11	2.03±0.91	2.04±0.81	2.35±0.84	0.364[b]	1.65±0.60	1.88±0.81	2.09±0.87	2.62±0.98	**<0.001[b]** **4>3>1**
Savings	2.56±1.48	2.51±1.35	2.90±1.39	2.64±1.45	0.188[b]	1.57±0.69	2.28±1.36	3.08±1.36	2.32±1.22	**<0.001[b]** **3>1** **3>2**
Reusability	2.79±1.29	2.27±1.09	2.41±1.03	2.19±0.95	0.225[b]	1.45±0.49	2.12±0.94	2.57±1.05	2.53±1.39	**<0.001[b]** **3>2>1** **4>1**

[a] ANOVA test, [b] Kruskall-Wallis test, SHEBS: Sustainable and Healthy Eating Behaviors Scale, SCBS: Sustainable Consumption Behavior Scale. * Post hoc tests could not be performed because there were fewer than two cases in at least one group.

The relationship between the scores of the individuals from the SHE Behaviors Scale and Sustainable Consumption Behavior Scale sub-dimensions is examined in Table 4. A positive, medium strength, statistically significant relationship was found between Meat Reduction sub-dimension and the Environmental Awareness (r:0.375; p<0.001) and Reusability sub-dimensions (r:0.480; p<0.001). It was found that there was a negative, weakly strong, statistically significant relationship between the Healthy and Balanced Diet sub-dimension and the Unneeded Consumption (r:-0.201; p:0.001) and Reusability (r:-0.124; p:0.041) sub-dimensions. A positive, weakly strong, statistically significant relationship was determined between the Animal Welfare sub-dimension and all sub-dimensions of the Sustainable Consumption Behavior Scale. A positive, weakly strong, statistically significant relationship was found between the Seasonal Foods sub-dimension and the Environmental Awareness sub-dimension (r:0.121; p:0.046).

Table 4. The relationship between individuals' SHE Behaviors Scale scores and Sustainable Consumption Behavior Scale scores

		SCBS			
		Environmental awareness	Unneeded consumption	Savings	Reusability
SHEBS					
Healthy and balanced diet	**r**	-0.023	**-0.201**	-0.102	**-0.124**
	p	0.711	**0.001**	0.092	**0.041**
Quality labels	**r**	**0.175**	**0.133**	0.097	**0.279**
	p	**0.004**	**0.028**	0.111	**<0.001**
Meat reduction	**r**	**0.375**	**0.186**	**0.338**	**0.480**
	p	**<0.001**	**0.002**	**<0.001**	**<0.001**
Local food	**r**	0.083	0.115	0.050	**0.217**
	p	0.174	0.057	0.413	**<0.001**
Low fat	**r**	**0.135**	0.008	**0.187**	0.047
	p	**0.026**	0.900	**0.002**	0.436
Avoiding food waste	**r**	**0.247**	0.034	**0.306**	**0.164**
	p	**<0.001**	0.582	**<0.001**	**0.007**
Animal welfare	**r**	**0.326**	**0.210**	**0.198**	**0.330**
	p	**<0.001**	**<0.001**	**0.001**	**<0.001**
Seasonal foods	**r**	**0.121**	-0.088	0.104	0.101
	p	**0.046**	0.148	0.086	0.097

Istanbul Gelisim University Journal of Health Sciences (IGUSABDER) is indexed by TUBITAK ULAKBIM TR Index.
Web site: https://dergipark.org.tr/en/pub/igusabder
Contact: igusabder@gelisim.edu.tr

Data were evaluated with Spearman correlation analysis. SHEBS: Sustainable and Healthy Eating Behaviors Scale, SCBS: Sustainable Consumption Behavior Scale.

The relationship between the SHE Behaviors Scale and Sustainable Consumption Behavior Scale scores of the individuals participating in the study and factors such as anthropometric measurements, age, and eating habits are shown in Table 5.

Table 5. Factors associated with individuals' SHE Behaviors Scale and Sustainable Consumption Behavior Scale scores

		SHEBS								SCBS			
		Healthy and balanced diet	**Quality labels**	**Meat reduction**	**Local food**	**Low fat**	**Avoiding food waste**	**Animal welfare**	**Seasonal foods**	**Environmental awareness**	**Unneeded consumption**	**Savings**	**Reusability**
Age (years)	**r**	0.098	0.054	0.025	0.090	0.078	0.052	0.065	0.090	0.019	-0.078	0.100	0.053
	p	0.107[a]	0.377[a]	0.682[a]	0.139[a]	0.199[a]	0.396[a]	0.283[a]	0.139[a]	0.755[a]	0.201[a]	0.100[a]	0.381[a]
BMI (kg/m²)	**r**	**-0.140**	-0.066	-0.078	0.058	0.007	-0.019	-0.010	0.034	-0.045	-0.037	-0.001	-0.019
	p	**0.021[b]**	0.279[a]	0.199[a]	0.343[a]	0.903[a]	0.752[a]	0.870[a]	0.580[a]	0.457[a]	0.538[a]	0.983[a]	0.752[a]
Body fat percentage(%)	**r**	**-0.163**	**-0.135**	0.031	-0.114	0.077	0.097	-0.098	0.110	0.103	0.118	**0.125**	-0.014
	p	**0.007[a]**	**0.026[a]**	0.612[a]	0.060[a]	0.206[a]	0.109[a]	0.107[a]	0.071[a]	0.090[a]	0.051[a]	**0.040[a]**	0.819[a]
Lean body mass (kg)	**r**	-0.052	-0.051	**-0.149**	0.044	-0.008	-0.080	0.034	-0.036	**-0.130**	-0.102	-0.111	-0.097
	p	0.389[b]	0.402[a]	**0.014[a]**	0.470[a]	0.894[a]	0.188[a]	0.578[a]	0.553[a]	**0.032[a]**	0.095[a]	0.068[a]	0.111[a]
Number of main meals	**r**	**0.180**	0.075	-0.042	0.025	**0.203**	0.072	0.052	0.037	-0.010	-0.114	0.100	0.062
	p	**0.003[a]**	0.215[a]	0.493[a]	0.682[a]	**0.001[a]**	0.233[a]	0.391[a]	0.538[a]	0.864[a]	0.061[a]	0.099[a]	0.307[a]
Number of snacks	**r**	**0.216**	-0.096	-0.117	-0.064	-0.014	-0.062	0.035	**0.154**	-0.092	-0.076	**-0.190**	**-0.144**
	p	**<0.001[a]**	0.114[a]	0.053[a]	0.292[a]	0.814[a]	0.309[a]	0.565[a]	**0.011[a]**	0.129[a]	0.112[a]	**0.002[a]**	**0.017[a]**

[a] Spearman correlation analysis, [b] Pearson correlation analysis, BMI: Body Mass Index, SHEBS: Sustainable and Healthy Eating Behaviors Scale, SCBS: Sustainable Consumption Behavior Scale.

While there was no correlation between the individuals' ages and the scores they received from the sub-dimensions of both scales (p>0.05), a weak, statistically significant relationship was found between the scores they received from several of the scale sub-dimensions and their anthropometric characteristics and number of meals per day (p < 0.05). The scores that the individuals participating in the study received from the SHE Behaviors Scale sub-dimensions, which are thought to be related to the frequency of consumption of the foods they consumed in the last month, are examined in Table 6.

Table 6. SHE Behaviors Scale scores according to individuals' food consumption frequency

		Every meal	Every day	5-6 times a week	3-4 times a week	1-2 times a week	1 time in 15 days	1 time per month	None	P Post-hoc
Food groups		**($\bar{X}$±SD)**	**($\bar{X}$±SD)**	**($\bar{X}$±SD)**	**($\bar{X}$±SD)**	**($\bar{X}$±SD)**	**($\bar{X}$±SD)**	**($\bar{X}$±SD)**	**($\bar{X}$±SD)**	
Sweetened/ sugared/ carbonated drinks	**Healthy and balanced diet**	3.57 ±1.31	4.53 ±1.20	4.46 ±0.77	4.56 ±0.98	4.42 ±0.76	4.72 ±0.71	5.10 ±0.79	4.79 ±1.21	0.05[a]
Whole grains	**Healthy and balanced diet**	4.42 ±1.46	4.83 ±0.92	4.79 ±0.88	4.70 ±0.90	4.57 ±0.82	3.95 ±0.80	4.04 ±0.64	4.06 ±0.79	**<0.001[b] 2~3>6 2~3>8**
Refined grains	**Healthy and balanced diet**	3.72 ±1.41	4.45 ±0.97	4.78 ±0.84	4.62 ±0.75	4.74 ±0.71	4.88 ±0.83	4.36 ±0.85	4.85 ±1.15	0.117[a]
Products such as pasta and rice pilaf	**Avoiding food waste**	5.33 ±1.72	4.54 ±1.39	4.64 ±1.34	4.96 ±1.31	4.3 8±1.12	5.22 ±0.38	- (n:0)	3.33 ±1.86	0.067[b]
Milk and milk products	**Quality labels**	4.30 ±1.85	2.30 ±1.36	2.38 ±1.53	2.61 ±1.39	1.85 ±1.14	2.48 ±1.36	3.70 ±2.40	3.00 ±2.10	**0.002[c] 1>5**
Red meat	**Meat reduction**	3.25 ±1.32	2.77 ±0.87	1.80 ±1.10	1.98 ±1.00	2.39 ±0.98	2.32 ±1.09	2.23 ±0.84	3.05 ±2.01	**0.001[c] 5>3**
White meat	**Meat reduction**	2.50 ±1.70	1.80 ±1.02	2.26 ±1.18	2.56 ±0.96	2.41 ±0.87	2.15 ±1.34	3.00 ±0.70	2.90 ±1.52	**<0.001[c] 4~5>2**
Fish and seafood	**Meat reduction**	- (n:1)	2.10 ±1.29	1.94 ±1.03	1.64 ±0.60	2.07 ±1.00	2.39 ±1.08	2.36 ±0.97	2.72 ±1.40	**0.002[c] 6~7~8>4**
Legume	**Meat reduction**	1.95 ±0.97	1.83 ±1.08	2.04 ±1.34	2.41 ±0.93	2.66 ±1.03	2.27 ±0.65	2.41 ±1.38	1.60 ±1.08	**<0.001[c] 4~5~6>25>3**
Vegetable oils	**Low fat**	4.68 ±1.63	4.71 ±1.20	3.84 ±1.50	3.94 ±1.28	4.50 ±1.20	4.69 ±1.09	- (n:1)	- (n:1)	**0.003[c] 2>4**
Animal fats	**Low fat**	4.22 ±1.64	3.66 ±1.61	3.92 ±1.71	4.16 ±1.14	4.09 ±1.02	4.39 ±1.24	4.61 ±1.26	4.91 ±1.53	**0.002[c] 8>5**
Margarine	**Low fat**	2.00 ±0.70	- (n:1)	2.50 ±1.35	2.03 ±1.0	1.86 ±0.87	2.09 ±1.01	2.26 ±1.00	2.49 ±1.19	**0.001[c] 8>5**
Oilseeds, kernels	**Low fat**	2.83 ±2.03	1.87 ±1.11	1.91 ±0.95	2.44 ±1.22	2.72 ±1.07	2.40 ±0.85	2.04 ±0.76	2.65 ±1.18	**0.035[c] 7>5**
Egg	**Animal welfare**	2.87 ±1.67	2.19 ±1.66	1.82 ±1.20	2.85 ±1.96	2.36 ±1.42	1.72 ±0.87	- (n:1)	- (n:1)	0.104[c]
Fruit	**Local food**	2.30 ±1.49	2.05 ±1.32	2.01 ±0.98	2.23 ±1.18	1.93 ±1.14	2.55 ±2.03	2.41 ±1.55	1.16 ±0.33	0.352[c]
Vegetable	**Seasonal foods**	4.16 ±1.41	3.66 ±1.59	3.79 ±1.63	3.87 ±1.11	3.61 ±1.17	3.25 ±1.13	2.20 ±1.60	2.66 ±1.69	0.05[c]

[a] Welch test, [b] ANOVA test, and [c] Kruskall- Wallis test

Discussion

Physical activity and exercise have positive effects on improving mood, cognitive and emotional behaviors, stimulating the reward centers of the brain, encouraging healthy behaviors/virtuous, and reducing unhealthy/bad behaviors. Since sports promote both healthy and virtuous consumption behavior, it is also likely that sports will have an impact on sustainable consumption choices[13]. In this study, which examined the sustainable consumption and sustainable healthy eating behaviors of university students attending gyms, it was found that the frequency of individuals going to the gym and the time they spend in the gym had positive effects on sustainable consumption behaviors and sustainable healthy eating behaviors. When you examine it in more detail, it was determined that as the time individuals spent in the gym increased, the scores they received from the Environmental Awareness and Animal Welfare sub-dimensions increased ($p<0.05$) and that there was a positive, medium strength relationship between

Istanbul Gelisim University Journal of Health Sciences (IGUSABDER) is indexed by TUBITAK ULAKBIM TR Index.
Web site: https://dergipark.org.tr/en/pub/igusabder
Contact: igusabder@gelisim.edu.tr

the scores they received from the Environmental Awareness and Animal Welfare sub-dimensions (r:0.326; p<0.001). It was found that individuals who exercised for 61-120 minutes in the gym had the highest Savings and Reusability sub-dimension scores. In addition, it was determined that the scores of individuals who go to the gym every day in the Quality Labels sub-dimension, which questions their preference for regional-organic products, are significantly higher than those who go to the gym 3-4 times a week. When the time spent in the gym was examined, it was found that individuals who exercised for 61-120 minutes had higher scores in the Quality Labels sub-dimensions compared to individuals who exercised for less than half an hour. Similar to the results of this study, in a study investigating the role of physical activity/exercise on consumers' sustainable behavior, it was determined that consumers who engage in physical activity/exercise are more likely to choose a sustainable product than those who do not (φ:0.319, OR:4.324, p<0.001) and in further analysis, physical activity/exercise was detected to be a significant predictor of sustainable product selection[13]. In another study examining sustainable consumption behaviors in individuals (n:753) who do and do not engage in physical activity, it was determined that individuals who engage in licensed or recreational physical activity show a more positive sustainable consumption behavior than individuals who do not engage in physical activity[14]. Another study found that participants who exercised for 5 years or longer had more sustainable food preferences and purchases and were more likely to reduce food waste. Increasing the time spent exercising increases awareness of sustainability and positively affects sustainable nutrition and lifestyle behaviors[15].

Individual dietary behaviors and food systems have impacts on human health and environmental sustainability, and unhealthy diets increase the risk of disease and death[16]. In a study involving university students, it was shown that food preference is affected by sustainable nutrition behavior scores, and it was determined that a one-unit increase in the sustainable nutrition behavior score caused a 0.021 unit increase in the weight control sub-dimension (p:0.001)[17]. In a cross-sectional study, the sustainable nutrition behaviour scores of individuals attending the gym showed a negative correlation with body weight, but no significant difference was found with BMI. Differences were particularly evident in the food preference and food purchasing subscales[15]. In a prospective cohort study, participants in the first quartile with the lowest sustainable diet pattern were found to have a higher risk of obesity compared to those in the highest quartile[18]. In this study, where the sustainable and healthy eating behavior of university students doing sports was evaluated, it was similarly found that as the scores individuals received from the Healthy and Balanced Nutrition sub-dimension increased, their average BMI (r:-0.140, p:0.021) and body fat percentage (r:-0.163, p:0.007) decreased. In addition, it was observed that those who scored high on the Healthy and Balanced Nutrition subscale preferred whole grain products more frequently. In this context, developing sustainable and healthy eating behavior is likely to have an impact on improving individual health by having positive effects on anthropometric measurements and food preferences.

Increased consumption of red and processed meat increases negative health consequences and environmental impacts[19,20]. A study of adults aged 18-91 found that women and older individuals (>60 years old) were more likely to have positive attitudes towards animal welfare ($p<0.01$) and less than a fifth of the study sample (18.4%) agreed that the impact of climate change could be reduced by consuming less meat, dairy products and eggs. Based on the results of this study, human health and animal welfare appear to be more common motivations than environmental sustainability for avoiding red and processed meat in the general population[19]. In a study conducted with university students, students rated reducing meat consumption as less effective in terms of sustainability than recycling and using less plastic[21]. However, unlike the general population, sport is likely to bridge the gap between young adults and sustainability, with many aspects beneficial to the individual and society in the individuals participating in this study. As a matter of fact, in this study, it was found that the scores of individuals who exercised for 61-120 minutes in the gym in the Meat Reduction sub-dimension were higher than those who exercised for less than half an hour. It was found that among the individuals, those who consumed red meat 1-2 times a week had higher scores in the Meat Reduction sub-dimension compared to those who consumed it 5-6 times a week. On the other hand, this study detected that there was a positive, medium strength, statistically significant relationship between the scores individuals received from the Meat Reduction and Environmental Awareness (r:0.375, $p<0.001$) and Savings (r:0.338, $p<0.001$) sub-dimensions. This result shows that environmental awareness / environmental sustainability is a more common motivation than others for individuals who do sports to reduce and avoid meat consumption. It is thought that the positive relationship between Meat Reduction and Savings sub-dimensions may be due to socio-economic reasons. Most of the students who do sports (69.8%) have an income equal to their expenses, and 76.1% of them have a budget of 2000 TL or less for nutrition. Consuming vegetable protein has positive effects in terms of environmental sustainability and health. It is also stated that consuming plant protein sources in an effective dose (in larger amounts than animal protein) in exercising individuals provides similar and positive changes to animal protein sources in muscle protein synthesis and adaptation to exercise[22]. In this study, it was seen that there was a negative relationship between the scores obtained from the Meat Reduction sub-dimension and lean body mass (kg) in individuals doing sports (r:-0.149, p:0.014). This situation shows the need to investigate and determine the reasons for reducing meat consumption (socio-demographic characteristics, health benefit, environmental sustainability, etc.) in individuals doing sports and to improve the diet in terms of plant protein sources.

Sport contributes to sustainable consumption (SDG 11) and the fight against climate change (SDG 13) to achieve the Ecological SDGs. However, caution is needed as sport has the potential to contribute to and reinforce the unsustainable[23]. As seen in this study, it has been detected that as individuals prefer regional and organic products, their environmental awareness increases, but their non-necessary purchasing behavior also increases (r:0.175, p:0.004). As the score taken from the Unneeded Consumption sub-dimension decreases, the sustainability of consumption increases[12]. It has been determined that as the time individuals spend in the gym increases, the scores they receive from the Unneeded Consumption sub-dimension increase, thus the sustainability of consumption decreases. In addition, it was seen that the scores of

Istanbul Gelisim University Journal of Health Sciences (IGUSABDER) is indexed by TUBITAK ULAKBIM TR Index.
Web site: https://dergipark.org.tr/en/pub/igusabder
Contact: igusabder@gelisim.edu.tr

individuals who exercised for less than half an hour at the gym in the Seasonal Foods sub-dimension were higher than those who exercised for longer periods. Consuming seasonal vegetables and fruits is very important for environmental sustainability[24]. Therefore, it is considered that consumption and nutrition behaviors of individuals doing sports should be addressed in detail, taking into account their effects on environmental sustainability.

This study makes valuable contributions to the literature as a comprehensive investigation addressing important health and environmental issues such as sustainable nutrition and consumption behaviours among university students who engage in sports. The fact that the study was conducted with a special group in terms of public health contributes to the solution of the limited level of evidence for this population. Supporting the scientific accuracy of the findings by using valid and reliable scales is another strength that makes the study stand out in the literature.

Conclusion

Based on the results of this study, it was found that the frequency of going to the gym and the time spent in the gym by university students attending gyms had positive effects on sustainable consumption and sustainable healthy eating behavior. It is envisaged that informing individuals who do sports in terms of sustainable consumption and sustainable healthy eating behaviors and raising awareness in these individuals will be effective in achieving the SDGs. As a result, more studies are needed to understand sustainable nutrition and consumption behaviors in individuals who do sports, the factors affecting them and their results.

Limitations: Due to the earthquake that occurred in Türkiye in February 2023, online education was switched and therefore a relatively small number of people were reached.

Conflict of Interest: There is no conflict of interest.

Ethics Committee Approval: This study was approved by Kırıkkale University Non-Interventional Research Ethics Committee (Date: 8.06.2022, Decision number: 2022.05.25).

Acknowledgments: This study was supported by the Scientific and Technological Research Council of Türkiye (TÜBİTAK) within the scope of "2209-A University Students Research Projects Support Program".

REFERENCES

1. López-Martínez MI, Miguel M, Garcés-Rimón M. Protein and sport: alternative sources and strategies for bioactive and sustainable sports nutrition. *Front Nutr*. 2022;9:926043.

2. United Nations. Report of the Secretary-General to the 75th Session of the General Assembly. Sport: a global accelerator of peace and sustainable development for all. Published 2020.https://www.un.org/development/desa/dspd/sport-development-peace/unsg-report2020.html

3. United Nations on Sport for Development and Peace (UNOSDP). Sport and the sustainable development goals: an overview outlining the contribution of sport to the SDGs. Published 2015. https://www.sport-for-development.com/imglib/downloads/unosdp2014-sport-and-the-sustainable-development-goals.pdf

4. Meyer N, Reguant-Closa A. “Eat as if you could save the planet and win!” sustainability integration into nutrition for exercise and sport. *Nutrients*. 2017;9(4):412.

5. Röös E, Karlsson H, Witthöft C, Sundberg C. Evaluating the sustainability of diets--combining environmental and nutritional aspects. *Environ Sci & Policy*. 2015;47:157-166.

6. Lynch H, Johnston C, Wharton C. Plant-based diets: considerations for environmental ımpact, protein quality, and exercise performance. *Nutrients*. 2018;10(12):1841.

7. T.C. Strateji ve Bütçe Başkanlığı, Sürdürülebilir Kalkınma Amaçları ve Göstergeleri, Haziran 2020.

8. Ward LC. Bioelectrical impedance analysis for body composition assessment: reflections on accuracy, clinical utility, and standardisation. *Eur J Clin Nutr*. 2019;73(2):194-199.

9. Peterson CM, Thomas DM, Blackburn GL, Heymsfield SB. Universal equation for estimating ideal body weight and body weight at any BMI. *Am J Clin Nutr*. 2016;103(5):1197-1203. doi: 10.3945/ajcn.115.121178

10. Żakowska-Biemans S, Pieniak Z, Kostyra E, Gutkowska K. Searching for a measure integrating sustainable and healthy eating behaviors. *Nutrients*. 2019;11(1):95.

11. Erdoğan N, Çıtar E, Köksal E, Bilici Saniye. A new method for determining nutritional behavior in university students: Sustainable and Healthy Eating Behavior Scale. In: 1st International Congress on Sustainable Life; March 15-16, 2019; Ankara, Türkiye.pp167.

12. Doğan O, Bulut Z, Kökalan Çımrın F. Bireylerin sürdürülebilir tüketim davranışlarının ölçülmesine yönelik bir ölçek geliştirme çalışması. *Atatürk Üniversitesi İktisadi ve İdari Bilim Derg*. 2015;29(4): 659-78.

13. Sarkar JG, Sarkar A, Dwivedi YK, Balaji MS. Sweat it for sustainability: Impact of physical activity/exercise on sustainable consumption. *Psychol & Mark*. 2022;39(11):2184-2199.

14. Polat E, Akoğlu HE, Konak O, Güçlü Ö. Fiziksel aktivite yapan ve yapmayan bireylerde sürdürülebilir tüketim davranışlarının incelenmesi. *Spormetre Beden Eğitimi ve Spor Bilim Derg*. 2019;17(2):53-63.

15. Kenger EB, Aydın Ö, Balkan C, et al. Assessment of sustainable nutrition practices among individuals attending the gym. *Frontiers in Life Sciences and Related Technologies*. 2024;5(3):203-209. doi: 10.51753/flsrt.1523250

16. Willett W, Rockström J, Loken B, et al. Food in the anthropocene: the EAT-

Lancet Commission on healthy diets from sustainable food systems. *Lancet (London, England)*. 2019;393(10170):447-492. doi: 10.1016/S0140-6736(18)31788-4

17. Engin Ş, Sevim Y. The relationship between knowledge and behaviors on sustainable nutrition with food choices of undergraduate students: a single centre study. *Eur J Sci Technol*. 2022;(38):259-269. doi: 10.31590/ejosat.1109521

18. Seconda L, Egnell M, Julia C, et al. Association between sustainable dietary patterns and body weight, overweight, and obesity risk in the NutriNetSanté prospective cohort. *The American Journal of Clinical Nutrition*. 2020;112(1):138-149. doi: 10.1093/ajcn/nqz259

19. Clonan A, Wilson P, Swift JA, Leibovici DG, Holdsworth M. Red and processed meat consumption and purchasing behaviours and attitudes: impacts for human health, animal welfare and environmental sustainability. *Public Health Nutr*. 2015;18(13):2446-2456.

20. Clonan A, Roberts KE, Holdsworth M. Socioeconomic and demographic drivers of red and processed meat consumption: implications for health and environmental sustainability. *Proc Nutr Soc*. 2016;75(3):367-373. doi: 10.1017/S0029665116000100

21. Slotnick MJ, Falbe J, Cohen JF, Gearhardt AN, Wolfson JA, Leung CW. Environmental and climate impact perceptions in university students: sustainability motivations and perceptions correspond with lower red meat intake. *Journal of the Academy of Nutrition and Dietetics*. 2023;123(5):740-750. doi: 10.1016/j.jand.2022.09.015

22. Kerksick CM, Jagim A, Hagele A, Jäger R. Plant proteins and exercise: what role can plant proteins have in promoting adaptations to exercise? *Nutrients*. 2021;13(6):1962.

23. Nigg C, Nigg CR. It's more than climate change and active transport—physical activity's role in sustainable behavior. *Transl Behav Med*. 2021;11(4):945-953.

24. Vargas AM, de Moura AP, Deliza R, Cunha LM. The role of local seasonal foods in enhancing sustainable food consumption: a systematic literature review. *Foods (Basel, Switzerland)*. 2021;10(9):2206. doi: 10.3390/foods10092206.