

## Evaluation of Probiotic Food Knowledge and Consumption Status of Sports Science Faculty Students

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### Research Article

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### Abstract

The purpose of this study was to evaluate the knowledge levels and consumption habits regarding probiotic foods among students of the Faculty of Sport Sciences. The study included 217 male and 173 female university students enrolled in the Faculty of Sport Sciences at Balıkesir University. A five-question survey was developed by reviewing the scientific literature relevant to the study's objectives for data collection. Data analysis was conducted using the SPSS program. The distribution of responses to the survey questions was examined through frequency and percentage analysis, and the relationships between the responses were assessed using chi-square analysis. No significant differences were found between participants' knowledge levels and consumption of probiotic-enriched foods concerning variables such as gender, type of sport, department, year of study, and national status ( $p>0.05$ ). However, when the perceived benefits of probiotic foods were examined, a significant difference was observed in favor of individual athletes according to the variable of sports discipline ( $p<0.05$ ). In conclusion, while no general differences were found in the knowledge and consumption habits regarding probiotic foods among the participants, the perceived benefits were associated with the type of sport, particularly favoring individual athletes.

**Keywords:** Nutrition, Sport, Sport sciences, Probiotic

## Spor Bilimleri Fakültesi Öğrencilerinin Probiyotik Gıda Bilgi ve Tüketim Durumlarının Değerlendirilmesi

### Öz

Bu çalışmanın amacı, Spor Bilimleri Fakültesi öğrencilerinin probiyotik gıdalar hakkındaki bilgi düzeylerini ve tüketim alışkanlıklarını değerlendirmektir. Araştırmaya Balıkesir Üniversitesi spor bilimleri fakültesinde öğrenim gören 217 erkek ve 173 kadın üniversite öğrencisi katılmıştır. Veri toplama amacıyla çalışmanın hedefleriyle uyumlu bilimsel literatür taranarak 5 soruluk bir anket oluşturulmuştur. Veri analizi SPSS programı kullanılarak gerçekleştirilmiştir. Anket sorularına verilen yanıtların dağılımı frekans ve yüzde analizi ile incelenmiş ve yanıtlar arasındaki ilişki ki-kare analizi ile değerlendirilmiştir. Katılımcıların probiyotik gıdalar hakkındaki bilgi düzeyleri ve probiyotik takviyeli gıda tüketimleri arasında cinsiyet, spor dalı, bölüm, eğitim yılı ve ulusal statü gibi değişkenlere göre anlamlı bir farklılık bulunmamıştır ( $p>0,05$ ). Ancak, probiyotik gıdaların algılanan faydaları incelendiğinde, spor disiplini değişkenine göre bireysel sporcular lehine anlamlı bir fark gözlenmiştir ( $p<0.05$ ). Sonuç olarak, katılımcıların probiyotik gıdalar hakkındaki bilgi ve tüketim alışkanlıklarında genel bir farklılık bulunmazken, algılanan faydalar bireysel sporcuların spor branşı ile ilişkili olduğu düşünülmektedir.

**Anahtar Kelimeler:** Beslenme, Spor, Spor bilimleri, Probiyotik

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## INTRODUCTION

Human health is influenced by many factors such as nutrition, genetics, climate, and environmental conditions. Among these factors, nutrition stands out as the most significant. Healthy eating involves meeting all the necessary nutrient needs of an individual, taking into account their age, gender, and physiological status. Nutrition is essential for growth, development, sustaining life, and preserving health. The healthy life and multifaceted development of societies depend on the health of individuals. Nutrition is one of the basic conditions for optimum health (Pekcan, 2008). It is an action that requires consciously taking the nutrients needed by the body in sufficient quantities and at the right times to protect and improve health and the quality of life. Adequate and balanced nutrition has a fundamental importance in the protection of health and prevention of diseases (Aslan et al., 2001).

Efforts to develop new formulations to improve the nutritional composition of the diet and thus achieve a healthier society continue intensively (Nale, 2021). This situation has increased people's desire for a healthy diet and increased their interest in nutritional supplements and functional foods (Yabancı and Şimşek, 2007). Functional foods are foods that support health, are effective in preventing diseases, and improve the quality of life in addition to meeting the basic nutritional needs of the body thanks to the components they contain (Demir and Aktaş, 2018). Probiotic foods also have an important place in the functional foods class (Kağan et al., 2019). Probiotics are non-pathogenic microorganisms that positively affect the health and physiology of the host and generally include species such as *Lactobacillus* and *Bifidobacterium* found in the intestinal flora (Can, 2007). For a long time, it was widely accepted that bacteria were harmful to our bodies and caused diseases. Today, however, an increasing number of scientific studies indicate that live microorganisms can be used in the treatment and even prevention of some diseases (Taşdemir, 2017). It has been observed that specific probiotic applications accelerate intestinal transit and increase the frequency of bowel movements, especially in patients with chronic constipation. In the field of gastroenterology, the use of probiotics in treatment is supported by the Mexican consensus statement and recommended based on high and moderate evidence (Valdovinos et al., 2017). Information in the literature shows that probiotics and prebiotics may be effective in reducing exogenous diseases, inhibiting inflammation, improving antioxidant defenses in diabetic patients, improving insulin sensitivity and pancreatic  $\beta$ -cell function to regulate blood glucose, balancing blood lipid profile and weight control (Kamarlı-Altun, 2017).

Probiotics have an important place in this category with individuals turning to functional foods and nutritional supplements (Öztürk, 2018). University students leave the family environment they are accustomed to with university education after childhood, become more open to environmental factors, and make more of their own choices. Therefore, studies on the nutrition of university students are important (Aydın et al., 2010). In addition, the number of studies conducted to determine probiotic consumption and knowledge level is limited. Therefore, it has become an important issue to determine people's level of knowledge about the beneficial effects of probiotics and their consumption status. In the study conducted by Rahmah et al. (2020), the knowledge and attitudes of health sciences students towards probiotics were examined, revealing that individuals had a high level of knowledge and

positive attitudes towards probiotics. When Nguyen et al. (2019) examined consumers' awareness and consumption status of probiotic products, it was observed that 39.4% of individuals were aware of and consumed these foods. Pradito et al., (2020) did not examine the probiotic knowledge levels of university students and concluded that the average score was high. In this context, this study aimed to evaluate the knowledge level and consumption status of the students of the Faculty of Sports Sciences about probiotic foods.

## MATERIAL AND METHOD

### Research Model

In this study, survey design, which is one of the quantitative research models, was used (Karasar, 2011).

### Population and Sample

The research group consisted of 390 voluntary university students with an average age of  $21.21 \pm 0.97$  years, studying at Balıkesir University Faculty of Sport Sciences in the 2023-2024 academic year. The sample of the study consists of university students studying at Balıkesir University Sports Sciences.

**Table 1.** Physical characteristics of the students participating in the study

Gender	n	Height Length (cm)	Body Weight (kg)	BMI (kg/m <sup>2</sup> )
		$\bar{X} \pm Sd$	$\bar{X} \pm Sd$	$\bar{X} \pm Sd$
Male	217	178.38±6.76	74.62±9.23	23.44±2.53
Woman	173	166.38±5.94	57.75±6.98	20.85±2.18
<b>Total</b>	390	173.06±8.75	67.13±11.80	22.29±2.71

When Table 1 is examined, the total number of participants is found to be 390, with 217 males and 173 females. The average height for males ( $M = 178.38$ ,  $SD = 6.76$ ) and for women ( $M = 166.38$ ,  $SD = 5.94$ ) was determined. The average weight for male participants was ( $M = 74.62$ ,  $SD = 9.23$ ), whereas for women, it was ( $M = 57.75$ ,  $SD = 6.98$ ). Finally, when body mass index (BMI) was examined, males had an average of ( $M = 23.44$ ,  $SD = 2.53$ ), while women had an average of ( $M = 20.85$ ,  $SD = 2.18$ ).

### Data Collection Tools

The data of the study were obtained by using the questionnaire method developed as a result of the literature review. The questionnaire form includes questions determined following the purpose of the study and has a structure based on the examination of scientific studies on the subject. The questionnaire form consists of sections including physical and personal information of the participants, information about probiotics and their use, consumption status, and reasons. The questionnaire form, consisting of 5 questions in total, was applied by face-to-

face interviews with 390 people. Following the content of the research, the questionnaire form also included discriminative questions in terms of sports science.

### Ethical Approval

This study was approved by Balıkesir University Health Sciences Non-Interventional Research Ethics Committee on 13/06/2023 with decision number 2023/56.

### Data Analysis

SPSS 25.0 package program was used for statistical evaluation of the data. In the study, the distribution of the answers given to the questions posed to the participants was analyzed by frequency and percentage analysis. Chi-square analysis was used to determine the relationship between the answers. All analyses were performed at a 95% confidence level.

## FINDINGS

**Table 2.** Chi-square analysis of knowledge of probiotic foods

		Do You Know Probiotic Foods?						X <sup>2</sup>	p
		Yes		No		General Total			
		n	%	n	%	n	%		
<b>Gender</b>	Male	112	51.6	105	48.4	217	100	3.216	0.07
	Woman	105	60.7	68	39.3	173	100		
	Total	217	55.6	173	44.4	390	100		
<b>Section</b>	Coaching	85	55.9	67	44.1	152	100	2.311	0.31
	Management	85	52.1	78	47.9	163	100		
	Teaching	47	62.7	28	37.3	75	100		
	Total	217	55.6	173	44.4	390	100		
<b>Sport Branch</b>	Team Sport	132	54.1	112	45.9	244	100	.628	0.42
	Individual Sport	85	58.2	61	41.8	146	100		
	Total	217	55.6	173	44.4	390	100		
<b>Year of Sport</b>	1-3 Years	48	56.5	37	43.5	85	100	2.454	0.48
	4-6 Years	68	59.6	46	40.4	114	100		
	7-9 Years	44	48.9	46	51.1	90	100		
	10+	57	56.4	44	43.6	101	100		
	Total	217	55.6	173	44.4	390	100		
<b>Nationality Status</b>	Yes	29	61.7	18	38.3	47	100	.795	0.37
	No	188	54.8	155	45.2	343	100		
	Total	217	55.6	173	44.4	390	100		

When the knowledge of probiotic nutrients of the students of the faculty of sports sciences participating in the study was analyzed according to the gender variable, 51.6% of men and 60.7% of women had information about probiotic nutrients. When analyzed in terms of department variables; 55,9% of them answered "yes" and 44,1% answered "no" in the coaching education department. When analyzed according to the sports branch, 54.1% of the students interested in individual sports and 58.2% interested in team sports answered "yes". According to the sports year variable, it was seen that the athletes with the most knowledge had 4-6 years of the sport, while the athletes with the least knowledge had 7-9 years of the sport. According to the nationality status, 61.7% of 47 national athletes said that they had

information, while 38.3% said that they did not have any information. Among the non-national athletes, 54.8% had information and 45.2% had no information. When the significance levels of the variables were analyzed, no significant result was found ( $p < 0.05$ ; Table 2)

**Table 3.** Frequency of consumption of foods containing probiotics

Natural probiotic foods	Frequency of Consumption													
	2-4 times a day		Every day		Every other day		1-2 times a week		1 time in 15 days		Once a month		I never consume	
	n	%	n	%	n	%	N	%	N	%	n	%	n	%
<b>Buttermilk</b>	22	5.6	57	14.6	57	14.6	175	44.9	47	12.1	23	5.9	9	2.3
<b>Yogurt</b>	23	5.9	89	22.8	65	16.7	122	31.3	55	14.1	22	5.6	14	3.6
<b>Milk</b>	22	5.6	63	16.2	54	13.8	101	25.9	43	11.0	63	16.2	44	11.3
<b>Cheese</b>	28	7.2	181	46.4	56	14.4	83	21.3	19	4.9	7	1.8	16	4.1
<b>Kefir</b>	6	1.5	12	3.1	8	2.1	44	11.3	37	9.5	36	9.2	247	63.3

In Table 3, where the frequency of consumption of natural probiotic foods is analyzed, 44.9% of the participants said that they consume buttermilk 1-2 times a week, while 2.3% said that they never consume it. Yogurt is consumed by 31.3% of the participants and milk by 25.9% of the participants at most 1-2 times a week. Cheese is the probiotic food consumed by athletes "every day" more than any other food. 63.3% of the participants stated that they never consume kefir, while 1.5% stated that they consume it 2-4 times a day.

**Table 4.** Chi-square analysis of consumption of foods with probiotic additives

		Do You Consume Foods with Probiotic Additives?						X <sup>2</sup>	p
		Yes		No		General Total			
		n	%	n	%	n	%		
<b>Gender</b>	Male	115	53.0	102	47.0	217	100	.900	0.34
	Woman	100	57.8	73	42.2	173	100		
	Total	215	55.1	175	44.9	390	100		
<b>Section</b>	Coaching	89	55.6	63	41.4	152	100	3.387	0.18
	Management	81	49.7	82	50.3	163	100		
	Teaching	45	60.0	30	40.0	75	100		
	Total	215	55.1	175	44.9	390	100		
<b>Sport Branch</b>	Team Sport	133	54.5	111	45.5	244	100	.101	0.75
	Individual Sport	82	58.2	64	41.8	146	100		
	Total	215	55.1	175	44.9	390	100		
<b>Year of Sport</b>	1-3 Years	48	56.5	37	43.5	85	100	1.517	0.67
	4-6 Years	61	53.5	53	46.5	114	100		
	7-9 Years	46	51.1	44	48.9	90	100		
	10+	60	59.4	41	40.6	101	100		
	Total	215	55.1	175	44.9	390	100		
<b>Nationality Status</b>	Yes	24	51.1	23	48.9	47	100	.357	0.55
	No	191	55.7	152	44.3	343	100		
	Total	215	55.1	175	44.9	390	100		

When the answers of the participants to the question "Do you consume probiotic-added products?" were analyzed according to gender, 53% of men and 57.8% of women stated that they consume these foods. When analyzed in terms of the department variable; it is seen that the students of the teaching department consume the most with 60%. When analyzed according to the sports branches, 58.2% of the athletes interested in individual sports answered "yes" more. According to the years of sport, it is seen that 59.4% of the athletes with 10 years and more years of sport know. According to nationality status, 51.1% of national athletes and

55.7% of non-national athletes stated that they had information. No significant difference was found between the variables ( $p>0.05$ ; Table 4).

**Table 5.** Frequency of consumption of foods with probiotic additives

Probiotic Additive Nutrients	Frequency of Consumption													
	1-3 times a day		Every day		Every other day		1-2 times a week		1 time in 15 days		Once a month		I never consume	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Probiotic dietary supplements-medicines/capsules	12	3.1	12	3.1	17	4.4	26	6.7	9	2.3	21	5.4	293	75.1
Yogurts with probiotic additives	3	0.8	25	6.4	26	6.7	83	21.3	55	14.1	97	24.9	101	25.9
Drinks with probiotic additives	3	0.8	30	7.7	32	8.2	73	18.7	89	22.8	63	16.2	100	25.6
Other foods with probiotic additives	3	0.8	16	4.1	19	4.9	61	15.6	39	10.0	51	13.1	201	51.5

When the frequency of consumption of probiotic supplements was analyzed, 75.1% of the participants stated that they never consumed probiotic dietary supplements (medication/capsules). While yogurts with probiotic additives are consumed 1-3 times a day by 0.8% of the participants, they are not preferred by 25.9%. The rate of those who stated that they never consume drinks with probiotic additives is 25.6%, while the rate of those who stated that they consume them 1-3 times a day is 0.8%. Other probiotic-added foods are not consumed at all by 51.5% of the athletes (Table 5).

**Table 6.** Chi-square analysis of benefits from probiotic foods

		Have You Benefited from Probiotic Foods?						X <sup>2</sup>	p
		Yes		No		General Total			
		n	%	n	%	n	%		
<b>Gender</b>	Male	128	59.0	89	41.0	217	100	.210	0.65
	Woman	106	61.3	67	38.7	173	100		
	Total	234	60.0	156	40.0	390	100		
<b>Section</b>	Coaching	88	57.9	64	42.1	152	100	5.641	0.06
	Management	92	56.4	71	43.6	163	100		
	Teaching	54	72.0	21	28.0	75	100		
	Total	234	60.0	156	40.0	390	100		
<b>Sport Branch</b>	Team Sport	134	54.9	110	45.1	244	100	7.014	0.00*
	Individual Sport	100	68.5	46	31.5	146	100		
	Total	234	60.0	156	40.0	390	100		
<b>Year of Sport</b>	1-3 Years	48	56.5	37	43.5	85	100	1.762	0.62
	4-6 Years	67	58.8	47	41.2	114	100		
	7-9 Years	53	58.9	37	41.1	90	100		
	10+	66	65.3	35	34.7	101	100		
	Total	234	60.0	156	40.0	390	100		
<b>Nationality Status</b>	Yes	34	72.3	13	27.7	47	100	3.391	0.06
	No	200	58.3	143	41.7	343	100		
	Total	234	60.0	156	40.0	390	100		

While 60% of the participants who answered the question "Have you benefited from probiotic-added foods?" stated that they benefited, 40% stated that they did not. When analyzed according to the gender variable; 61.3% of women stated that they benefited more than men. In terms of the department variable, the students in the teaching department benefited the most with 72%. According to the sports branch of the participants, 54.9% of the participants were interested in team sports, and 68.5% of the participants interested in individual sports stated that they benefited. According to the sport year variable, it was determined that the participants with 10 years and more sports years saw the most benefit. According to the nationality status, it was determined that national athletes benefited more than non-national athletes. While a significant difference was found according to the sport branch variable ( $p < 0.05$ ), no significant difference was found according to other variables ( $p > 0.05$ ; Table 6).

## DISCUSSION AND CONCLUSION

Probiotics are defined as microorganisms that can provide health benefits to the human body when consumed in adequate amounts. In adults, probiotics have evidence-based indications (WGO, 2017). A study investigating trends in complementary medicine approaches was conducted on a mixed sample of 88,962 people. In this study, data between 2007 and 2012 were compared and it was reported that the number of individuals taking probiotic supplements increased approximately 4-fold (Clarke et al., 2015).

Many studies investigating the probiotic use and knowledge levels of students in various provinces and universities in Turkey have been conducted (Aydın et al., 2010; Derin & Keskin, 2013; Koçak & Kalkan, 2014; Yabancı & Şimşek, 2007). However, there is no study to measure the probiotic use and knowledge levels of the students of the Faculty of Sports Sciences. In this context, it can be said that the results of this study, which evaluated the knowledge levels and consumption status of the students of the Faculty of Sports Sciences about probiotic foods, can make an important contribution to the literature.

When the knowledge of probiotic nutrients of the students of the faculty of sports sciences who participated in the study was examined, no significant difference was found according to gender, department, sports branch, sports year, and nationality, but the knowledge of these nutrients was higher in all groups (Table 2). In short, most of the athletes know what probiotic foods are. The fact that sports science students are knowledgeable about probiotics provides an important advantage in increasing a healthy lifestyle and sports performance. In a study conducted by Derin and Keskin (2013), it was revealed that 49.2% of university students who did not consume probiotic products did not consume probiotic foods because they did not know what probiotic foods were. Similarly, in a study conducted by Aydın et al., (2010) on university students, 54.7% of those who did not consume probiotic products stated that they did not know these products (Aydın et al., 2010). In parallel with the findings of these studies, there are studies indicating that university students do not know and consume probiotics sufficiently (Anas et al., 2014; Aydın et al., 2010; Chukwu et al., 2015; Derin & Keskin, 2013;

Yabancı & Şimşek, 2007). The findings of these studies are in parallel with the findings of this study. However, there are also studies similar to the findings of our study, in which most of the students have good probiotic knowledge levels and consume and recommend these foods. (Arpa-Zemzemoğlu et al., 2019; Soni et al., 2018). In this context, it is thought that increasing the probiotic knowledge level of individuals may have positive effects on probiotic food consumption.

When the frequency of consumption of probiotic-containing foods was analyzed, it was concluded that the athletes consumed "cheese" the most of these foods every day, followed by "yogurt" and "milk" (Table 3). Cheese is a common food in many cultures and is often part of daily dietary habits. Therefore, people may prefer cheese as an easily accessible and consumable source of probiotics. In addition, as there are many different types of cheese, people may be more likely to find the one that appeals to their taste buds than other products. Similarly, yogurt and milk were found to be the most commonly preferred probiotic sources after cheese. The least preferred probiotic source for athletes is "kefir". Kefir is considered a healthy drink and is rich in probiotics as well as protein, calcium, and other nutrients. However, it may not be preferred by athletes because it doesn't appeal to their taste buds. Kefir is a fermented milk product similar to yogurt but with a different taste and consistency than yogurt. Kefir can have a sour and sour taste and may not be preferred by some people. Also, the lumpy consistency of kefir may not appeal to some people.

When the participants' consumption of probiotic-added products was examined, it was determined that the consumption of probiotic-added products did not differ significantly according to the department variable, sports branch, sports age, and nationality variable (Table 4). Based on these findings, it is seen that probiotic-added foods (medicine, yogurt, drink, etc.) do not make any difference between the groups in the eyes of athletes. The least preferred probiotic-added foods are those in the form of medicines and capsules. These are drugs in which probiotic bacteria are used for therapeutic purposes. However, probiotic-enhanced medicines are generally different from probiotic-containing foods or supplements and are used for specific conditions. While probiotic-enhanced medicines are generally used for a specific purpose in the treatment of medical conditions, probiotic-containing foods or supplements are more commonly preferred for general health and digestive system well-being. When the literature is examined, Horasan et al., (2021) found a difference between male and female students according to their consumption of probiotic foods in a study conducted on university students. In the study conducted by Kes (2021), similar to our findings, it was determined that the least consumed probiotic-added foods were the ones in the form of medicine and capsules.

When the frequency of consumption of probiotic-added foods was analyzed, most of the participants stated that they did not prefer probiotic-added foods. When a distinction was made among the athletes who preferred them, they stated that they mostly preferred drinks and yogurts every day or every other day. However, the majority of them do not prefer probiotics in drug and capsule form. Apart from the drug form, it was determined that "other probiotic-added foods" were not preferred. Accordingly, sportsmen generally pay attention to the intensive use of probiotic foods in more natural forms. The fact that foods in the form of drugs



and capsules are not natural may be the reason why they are not preferred by athletes (Table 5). In the study conducted by Pehlivan (2020), the fact that the least preferred probiotic-added food was in drug and capsule form is similar to our findings.

According to the findings of the study; when the participants' benefit from probiotic-added foods was analyzed, it was determined that 60% of them benefited. Significance was found according to the sports branch variable, and students who practiced team sports stated that they benefited more than students who practiced individual sports. It was determined that there was no significant difference according to gender, department, sports year, and nationality variable (Table 6). Individual athletes generally have more intensive and personalized training programs. Intense training and competition programs can create more stress on the immune system and digestive systems of athletes. Probiotic foods can help to reduce this stress, helping to strengthen the immune system and improve digestive health. Individual athletes may have different nutritional needs than team athletes. Individual athletes may face specific nutritional requirements, such as weight management, optimizing energy levels, and improving performance, often during training periods. Probiotic foods can improve digestive health, enhance nutrient absorption, and support the nutritional goals of individual athletes. These reasons may lead to the conclusion that individual athletes benefit more from probiotic foods. In addition, even if no significant difference was detected, national-level athletes reported more benefits. When the literature was examined, it was determined that the rate of those who benefited in the studies conducted by Küçük and Yıbar (2021) and Aslantürk (2019) was higher than those who did not, and these findings are in parallel with our study.

As a result, it was determined that most of the students of the Faculty of Sports Sciences consume probiotic-added products and know probiotic foods. In addition, it was determined that students who do team sports benefit more from probiotic-added foods than students who do individual sports.

## RECOMMENDATIONS

In line with these results;

- The results can be re-tested with a larger sample.
- Similar to the methodology of the study, the study can be tested and compared with students of different genders and ages.

**Conflict of Interest:** There is no personal or financial conflict of interest within the scope of the study.

**Declaration of Contribution:** All authors have contributed equally.

## Ethical Approval

**Committee Name:** Balıkesir University Health Sciences Ethics Committee

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